Attachment 8

Noise Assessment

BROMELTON NORTH QUARRY - NOISE IMPACT ASSESSMENT

Project ID: 14565

9/12/2022

Release: R1

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Groundwork Plus

Assured Environmental

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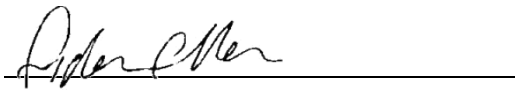


Reviewer: Aiden Allen

Table 1: History of Revisions

Revision	Date	Issued to	Changes
R0	24/11/2022	M. Benham	Initial Release
R1	9/12/2022	M. Benham	Comments

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

GLOSSARY

A-Weighting	A response provided by an electronic circuit which modifies sound in such a way that the resulting level is similar to that perceived by the human ear.
Background Noise	Noise level at a given location and time measured in the absence of any alleged noise nuisance sources. Typically, represented by the L_{A90} noise statistic.
Calibrator	An instrument used to carry out 'field calibrations' before and after monitoring to ensure the sound level meter does not drift.
dB (decibel)	This is the scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and the reference pressure (0.00002 N/m^2).
dB(A) or dBA	This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (i.e., 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Fast Time Weighting	Sound level meters apply a time-smoothing function to the measured sound. Fast time weighting has an exponential smoothing time constant of 125 milliseconds.
Free-field	Refers to a sound pressure level determined at a point away from reflective surfaces other than the ground with no significant contribution due to sound from other reflective surfaces; generally, as measured outside and away from buildings.
L_{Aeq}	This is the equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over the given period. Noise levels often fluctuate over a wide range with time. Therefore, when a noise varies over time, the LAeq is the equivalent continuous sound which would contain the same sound energy as the time varying sound. Many studies show that human reaction to level-varying sounds tends to relate closer to the LAeq noise level than any other descriptor.
L_{Amax}	The A-weighted, maximum, sound level. It should be noted that maximum noise levels are not peak levels.
L_{Amin}	The A-weighted, minimum, sound level.

ABBREVIATIONS

AHD	Australian Height Datum
DES	Department of Environment and Science
EA	Environmental Authority
EPP(Noise)	Environmental Protection (Noise) Policy 2019
ERA	Environmentally Relevant Activities
Mtpa	Million tonnes per annum
SDAP	State Development Assessment Provisions
SDRC	Southern Downs Regional Council
SLM	Sound Level Meter
tpa	Tonnes per annum

1 INTRODUCTION

1.1 Background

The Neilsens Group (Neilsens) operate the hard rock quarry known as Bromelton North Quarry, (Subject Site). Bromelton North Quarry is operated pursuant to Consent Order for Material Change of Use – Development Permit for Extractive Industry (ref: 3448 of 2003) granted on 23 June 2004. The Consent Order allows for extraction of 400,000 tonnes per annum of material from the site.

The operation holds an Environmental Authority (EA) EPPR0054113 for the extraction and screening of between 100,000 to 1,000,000 tonnes of material per annum.

Neilsens propose to increase the extraction rate to 800,000 tonnes per annum and extend the east pit footprint. It is not proposed to change the approved hours of operation or location of fixed plant, and equipment.

1.2 Scope of Assessment

Assured Environmental (AE) was appointed by Groundwork Plus to undertake a noise and vibration impact assessment from the increase in extraction and screening from 400,000 tpa to 800,000 tpa.

In undertaking the assessment, reference has also been made to the following regulations and guidelines:

- Environmental Protection Act 1994;
- Environmental Protection Regulation 2019;
- Environmental Protection (Noise) Policy 2019; and
- Application requirements for activities with noise impacts (DES, 2021); and
- Noise Measurement Manual (NMM) (DES, 2019).

In accordance with the requirements of the above guidelines, computational modelling and first principle calculations have been undertaken to assess the potential for adverse amenity and health impacts as a result of the proposed development.

1.3 This Report

This report summarises the methodology, results, and conclusions of the noise and vibration assessment.

2 DESCRIPTION OF ENVIRONMENTAL VALUES

2.1 Location

The Subject Site is located at Sandy Creek Road, Bromelton, on Lot 1 on RP98576. The Site is approximately 5 km south west of Beaudesert and has a total site area of approximately 62 hectares. The site is located in the Transition Precinct of the Bromelton State Development Area, in which extractive industry is an expected land use. The Subject Site and the adjacent quarry are classified as a Key Resource Area (KRA 61), which is a planning tool designed to protect resources from being rendered inaccessible by urban expansion.

The existing setting is dominated by agricultural land used for cropping and grazing purposes interspersed with clusters of rural residential land. Other non-rural activities occur within proximity of the site, including an adjacent extractive industry use to the south and energy facility to the west.

2.2 Receptors

There are five sensitive receptors within 1 km of the Subject Site and 20 sensitive receptors within 2 km. The receptors within 2 km of the Subject Site are listed in Table 2 and have been identified as shown in Figure 2.

The nearest sensitive receptor, R1 is a single dwelling located approximately 558 metres south west of the Subject Site boundary. The quarry workings will retain a ridgeline to the south, which will topographically screen the operations from receptors to the south-east and south-west.

Table 2: Modelled Sensitive Receptors

ID	Location (UTM Zone 56)		Elevation (m)	Land use
	Easting	Northing		
R1	492722	6903088	89	Residential
R2	492669	6902126	61	Residential
R3	492499	6902079	66	Residential
R4	492511	6902002	68	Residential
R5	492453	6901925	73	Residential
R6	492452	6901859	73	Residential
R7	492404	6901783	75	Residential
R8	492477	6901708	73	Residential
R9	492405	6901635	81	Residential
R10	492389	6901573	85	Residential
R11	493456	6901579	64	Residential
R12	493992	6901471	68	Residential
R13	495239	6901390	57	Residential
R14	495024	6902098	55	Residential
R15	495795	6902032	57	Residential
R16	496042	6902189	49	Residential
R17	495388	6902837	61	Residential
R18	495644	6903536	54	Residential
R19	494717	6904259	60	Residential
R20	493997	6904642	60	Residential

2.3 Terrain

Figure 3 illustrates the local topography, as obtained from a combination of Lidar data at 10 m resolution. The terrain of the local area is undulating to hilly varying from approximately 30 m to 170 m AHD within 1 km radius of the Subject Site.

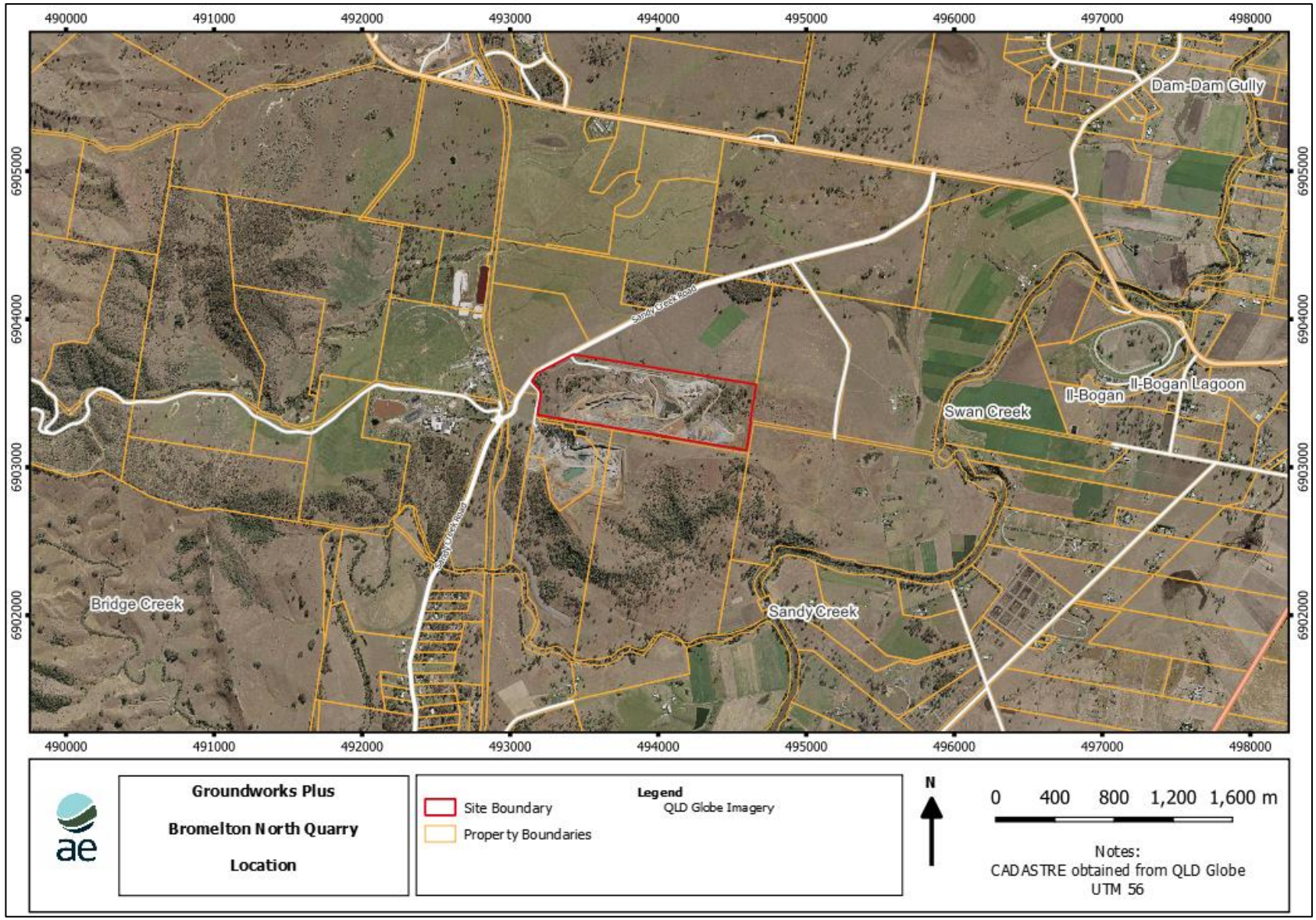


Figure 1: Site Location

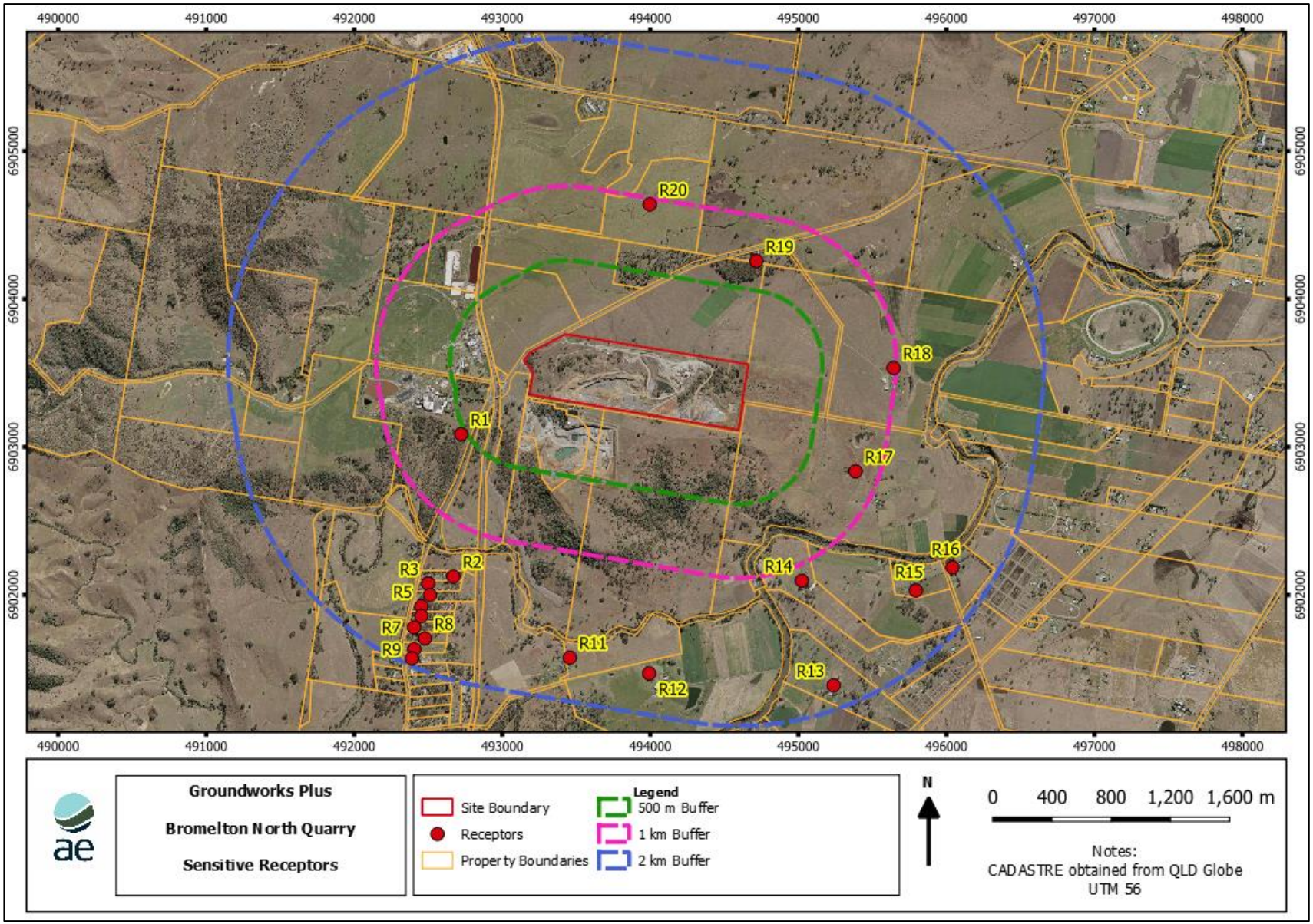


Figure 2: Sensitive Receptors

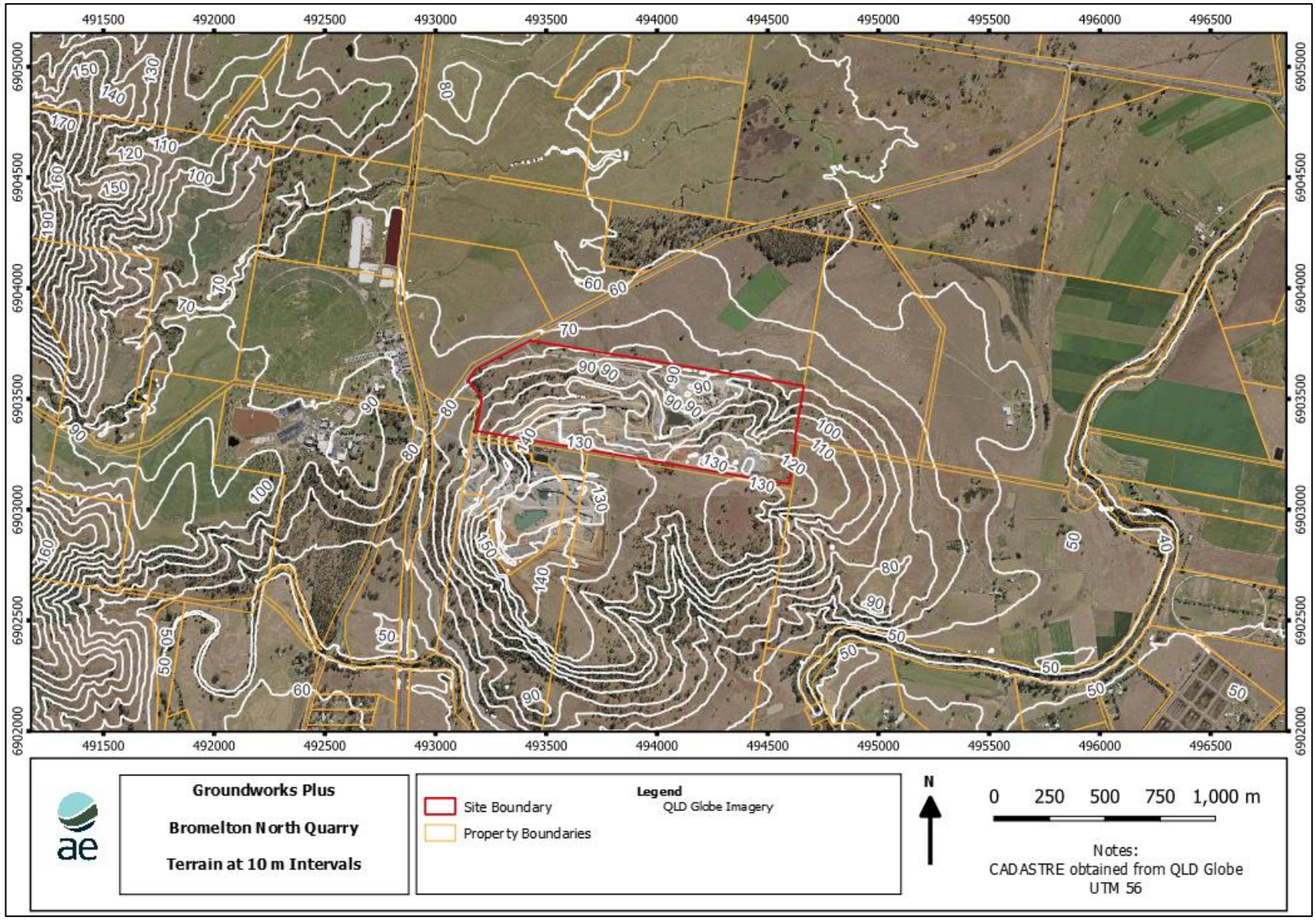


Figure 3: Surrounding Topography at 10 m Intervals (Extracted from LiDAR Data)

3 QUARRY OPERATIONS

3.1 Overview

Neilsens operate the hard rock quarry known as Bromelton North Quarry, (Subject Site). The quarry operates under:

- Consent Order for Material Change of Use – Development Permit for Extractive Industry (ref: 3448 of 2003) granted on 23 June 2004;
- Environmental Authority EPPR00540113 (EA), issued by the Department of Environment and Science (DES), authorising the following Environmentally Relevant Activities (ERAs):
    - ERA Threshold 16 (2)(b) - Extractive and screening activities - extracting, other than by dredging more than 100,000 but not more than 1,000,000 tonnes of material in a year.
    - ERA Threshold (3)(b) - Extractive and screening activities - screening more than 100,000 but not more than 1,000,000 tonnes of material in a year.

3.2 Current Consent Conditions

Conditions of Environmental Authority EPPR00540113 (effective 12 August 2020) issued by the Department of Environment and Science provides specific requirements relating to emissions of noise from the activity as summarised in Table 3

Table 3: Conditions Relevant to Noise (EPPR00540113)

<table>
<tr><th>Condition number</th><th>Condition</th></tr>
<tr><td>Noise</td><td></td></tr>
<tr><td>N1</td><td>In the event of a complaint about noise that constitutes intrusive noise being made to the administering authority, that the administering authority considers is not frivolous or vexatious, then the emission of noise from the premises to which this environmental authority relates must not result in levels greater than those specified in Table 1 – Noise Limits.
Table 1 – Noise Limits
<table>
<tr><th></th><th>7am–6pm</th><th>6pm–10pm</th><th>10pm–7am</th></tr>
<tr><td></td><td colspan="3">Noise measured at the sensitive place</td></tr>
<tr><td>LAmax, adj, T</td><td>Background noise level plus 5 dB(A)</td><td>Background noise level plus 5 dB(A)</td><td>Background noise level plus 3 dB(A)</td></tr>
<tr><td></td><td colspan="3">Noise measured at the commercial place</td></tr>
<tr><td>LAmax, adj, T</td><td>Background noise level plus 10 dB(A)</td><td>Background noise level plus 10 dB(A)</td><td>Background noise level plus 8 dB(A)</td></tr>
</table></td></tr>
<tr><td>N2</td><td>All blasting must be carried out in a proper manner by a competent person in accordance with best practice environmental management to minimise the likelihood of adverse effects being caused by the impact of airblast overpressure and ground borne vibrations on sensitive premises and people living in or using the surrounding area.</td></tr>
<tr><td>N3</td><td>Blasting activities must be carried out in such a manner that if blasting noise should propagate to a noise-sensitive place, then</td></tr>
</table>

Condition number	Condition
	(i) the blast overpressure must be not more than 115 dB (linear peak) for four (4) out of five (5) consecutive blasts; and (ii) the ground vibration must be: • for vibrations of more than 35 Hz-not more than twenty-five (25) millimetres per second ground vibration, peak particle velocity; and • for vibrations of not more than 35 Hz-not more than 10 (10) millimetres per second ground vibration, peak particle velocity.
N4	The ground-borne vibration transducer (or array) must be attached to a mass of at least 30kg to ensure good coupling with the ground where the blast site and measurement site cannot be shown to be on the same underlying strata. The mass shall be buried so that its upper most surface is at the same level as the ground surface.
N5	The ground-borne vibration transducer (or array) must be placed at a distance of at least the longest dimension of the foundations of a noise-affected building or structure away from such building or structure between that building or structure and the site of the blasting.

There are three points to make about Condition N1.

Firstly, the noise parameter $L_{Amax\ adj,\ T}$ is considered equivalent to $L_{A10\ adj,\ T}$. The noise level metric that has been set for determining the acceptable level of noise emission is the $L_{A10\ adj}$ noise level parameter. This is defined as the A-weighted sound pressure level adjusted for tonal character and impulsiveness of the sound that is exceeded for 10% of the measurement period (typically 15 minutes) using fast response. In practice, there are some difficulties in both (i) accurately measuring emitted quarry noise using this parameter and (ii) accurately predicting emitted noise levels using this parameter.

Recognising these difficulties, in recent years the State has been adopting the more readily measured and predicted $L_{Aeq\ adj,T}$ noise level parameter. $L_{Aeq,\ adj\ T}$ is defined as the adjusted A-weighted equivalent continuous sound pressure level measured on fast response, adjusted for tonality and impulsiveness, during the time period T, where T is measured for a period no less than 15-minutes when the activity is causing a steady state noise, and no shorter than one hour when the approved activity is causing an intermittent noise.

If the noise source is generating steady-state noise, there will generally be no significant difference between the resultant $L_{A10\ adj,T}$ value and the resultant $L_{Aeq\ adj,T}$ noise level value when each is measured concurrently over the same measurement time period, T. Rather, and putting aside any contribution from extraneous noise sources, the differences in the resultant values measured using each parameter will be due to fluctuations in wind speed and direction.

Secondly, while it is possible to logarithmically add the $L_{Aeq,T}$ noise level generated by one source, i.e., quarry noise in this instance, and the $L_{Aeq,T}$ noise level generated by one source, i.e. road traffic noise, to generate a resultant $L_{Aeq,T}$ or $L_{Aeq\ adj,T}$ noise level generated by both sources, it is not technically correct to attempt the same process using $L_{A10,T}$ values.

In these circumstances and recognising there is likely to be a small difference between the $L_{A10,T}$ at source and the $L_{Aeq,T}$ noise level at source it is appropriate to predict quarry noise levels using the $L_{Aeq,T}$ noise level parameter after making an appropriate adjustment to account for the likely difference between the two noise level parameters. In this way, and adopting unchanging atmospheric conditions, e.g., unvarying wind speed and direction, the resultant

predicted $L_{Aeq,T}$ noise level after adjustment will be an appropriate surrogate for the $L_{A10,T}$ noise level which cannot be predicted.

Additionally, the assessment of background plus 5 dB(A) is consistent with the current approach of assessing noise impacts from development. Table 4 presents the noise limits as derived from Condition N1 from the noise monitoring data outlined in Section 4.

Table 4: Environmental Authority Condition N1 Noise Limits

Monitoring Location	Receptors	Day	Evening	Night
NML1	Sensitive Place	32 + 5 = 37	29 + 5 = 34	29 + 3 = 32
	Commercial Place	32 + 10 = 42	29 + 10 = 39	29 + 8 = 37

3.3 Current Operations

The existing quarry operation provides for extraction, processing, stockpiling, ancillary operations area, and stormwater controls over 5 stages. The current operation generally aligns with the approved Stage 4 layout, avoiding mapped remnant vegetation between the east and west pits.

Material is processed using a crushing and screening plant located in the central sector of the quarry. The primary bin tipping platform is approximately 15 metres above the plant and stockpile pad whilst the remainder of the plant (screens and secondary and tertiary crushers) are located on a pad north of the primary bin tipping platform. This processing plant produces a wide range of quality quarried products.

The quarry component of the operation comprises two pits. The quarrying process begins with removal of overburden material and excavation at the quarry face and/or floor using various heavy machinery (excavators, bulldozers, and wheeled loaders).

Fragmented material is transported from the pit floor to the onsite processing area (referred to as the crushing floor) using dump trucks traversing a haul road up and out of the pit to the feeder dump point above the crushing floor.

The crushing floor comprises of an array (or train) of equipment including a feeder, crushers, and impactors as well as numerous conveyors and screens. This crushing floor is a permanent fixture and the range, and the type of material being processed, and its required sizing dictate the number of crushers, conveyors and screens used at any point in time.

It is important to note that not all crushing plant is operated simultaneously; the number of crushers and screens operating is dependent on client contracts. Once crushed and screened, the final product is then loaded again into dump trucks and transported along haul roads to stockpiles awaiting sale or further processing (i.e., aggregate coating). Upon sale, the final product is loaded at its stockpile into trucks of multiple sizes for transportation offsite.

3.4 Proposed Operations

The proposed development is for an increase to the scale and intensity of the existing hard rock extraction operation by:

- Extending the eastern quarry footprint north; and

- Increasing the extraction rate to 800,000 tpa.

The east pit has been designed to avoid clearing of remnant vegetation. It is not proposed to alter other aspects of the existing operation such as hours of operation or location of fixed plant and equipment. This development application is intended to replace the conditions of the Consent Order.

The fixed processing plant and associated stockpiling area will be retained in the centre of the site. No additional buildings or structures are proposed, including the site office, amenities block, parking areas, weighbridge, workshop, and truck wash down facilities.

3.5 Comparison of Operations

Table 5 provides a comparison of the current approved existing activities and future proposed modification activities as part of the increase in production.

Table 5: Comparison of Activities

Aspect	Current Activities	Proposed Activities
Land Use	Approval granted for an extractive industry and associated processing and crushing and grinding.	Continued use of existing west pit and extension to east pit.
Quarry footprint	As per Figure 5 (Stage 4 of approved plans)and Figure 4	Primarily focused on the East Pit (80%) with some minor extraction in the West Pit (20%)
Approved Hours of operation	06:00 to 18:00 Monday to Friday. 07:00 – 17:00 Saturday No operation on Sundays or Public Holidays	N/A – no change proposed.
Production and Transportation limits	Up to 400,000 tpa from the site. Daily maximum generally 4,000 tpd	Up to 800,000 tpa from the site. Daily maximum generally 4,000 tpd
Extraction method	Extraction by blast and drill.	N/A – no change proposed.
Site infrastructure and plant	Drilling, blasting, and extraction in quarry pit	No change to the operations in the quarry pit.
	Primary, secondary, and tertiary crushing and screening facilities on crushing floor	No change to the crushing/ screening facilities on crushing floor
Product transport method and access	Via truck to Sandy Creek Road	N/A – no change proposed.
Truck Movements	Average daily truck dispatches based on current payloads (9% trucks/ 86% truck and dog and 5% B-double): • 43 truckloads per day • 85 movements per day Staff vehicles: • 10 movements per peak hour (start and end of shift)	Average daily truck dispatches based on current payloads (9% trucks/ 86% truck and dog and 5% B-double): • 78 truckloads per day • 156 movements per day Staff vehicles: • 10 movements per peak hour (start and end of shift)
Blasting	Typically, 12 blasts per year	Expected 24 blasts per year
Blasting hours	09:00 to 17:00 Monday to Friday	N/A – no change proposed.

Aspect	Current Activities	Proposed Activities
Equipment	Refer to Section 3.3.	N/A – no change proposed. Increased extraction and processing based on increasing efficiency

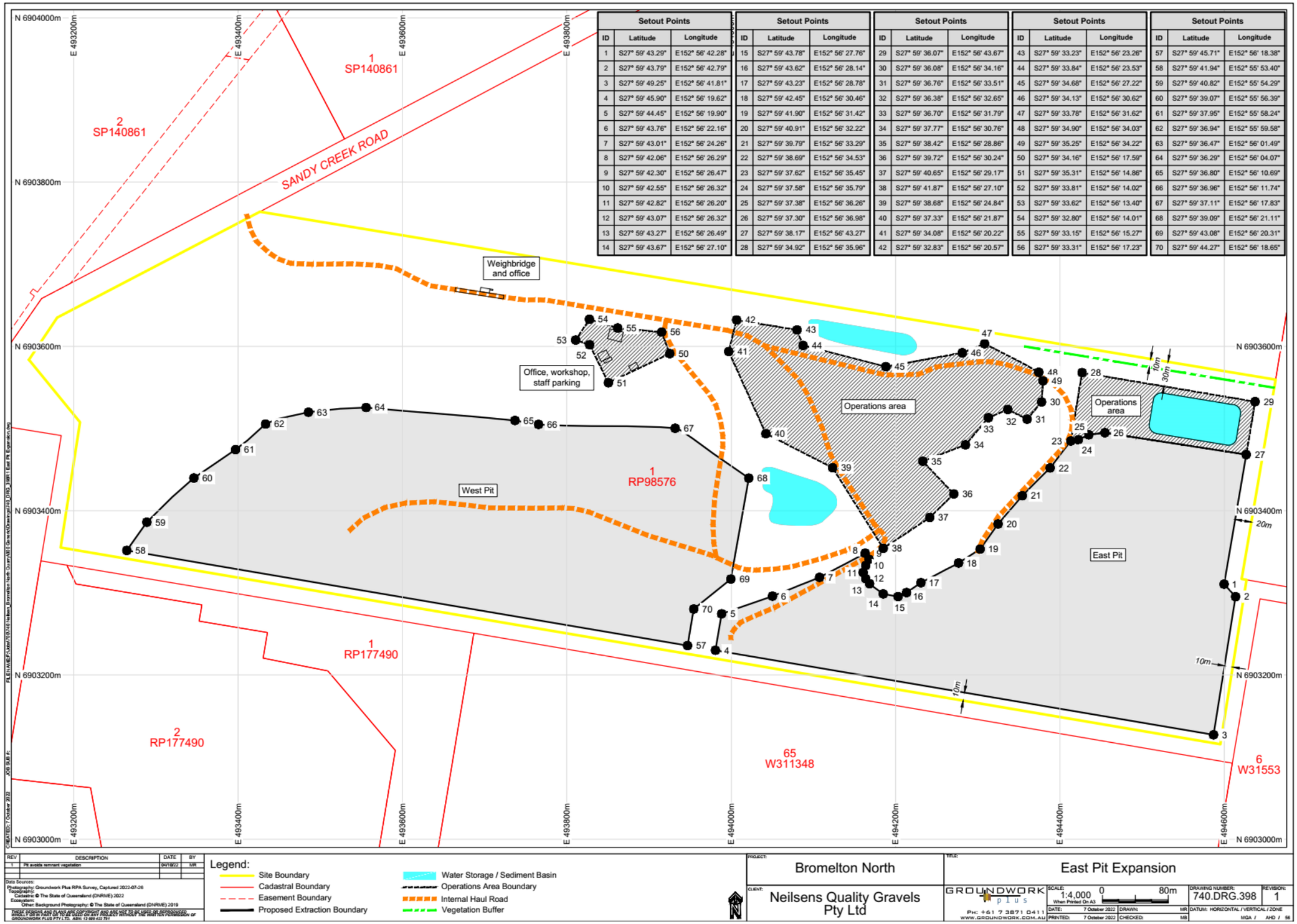


Figure 4: Proposed East Pit Extension

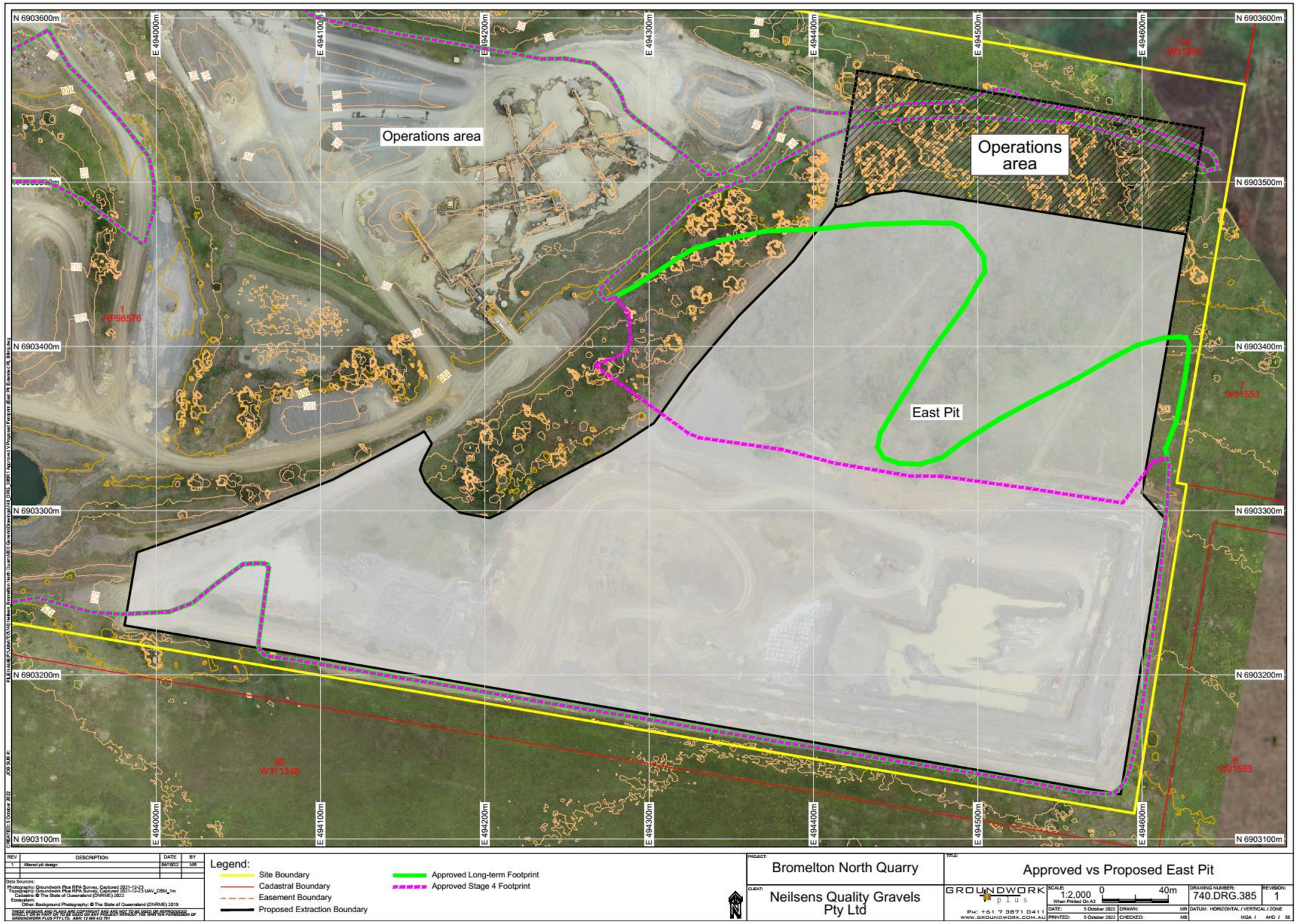


Figure 5: Approved and Proposed Footprint of East Pit

4 EXISTING NOISE ENVIRONMENT

4.1 Existing Sources of Noise

The existing acoustic environment in the area is influenced by traffic along Sandy Creek Road. Additional noise sources include birds and wind through vegetation at receptors.

4.2 Baseline Noise Monitoring

Background noise monitoring was undertaken from 12 to 20 October 2022 at one location in order to quantify the background noise levels at nearby sensitive receptors. The noise monitoring location (ML1) information is presented in Appendix A. Neither the Subject Site nor the adjacent quarry were audible at the monitoring location. The noise monitoring location is presented in Figure 6.

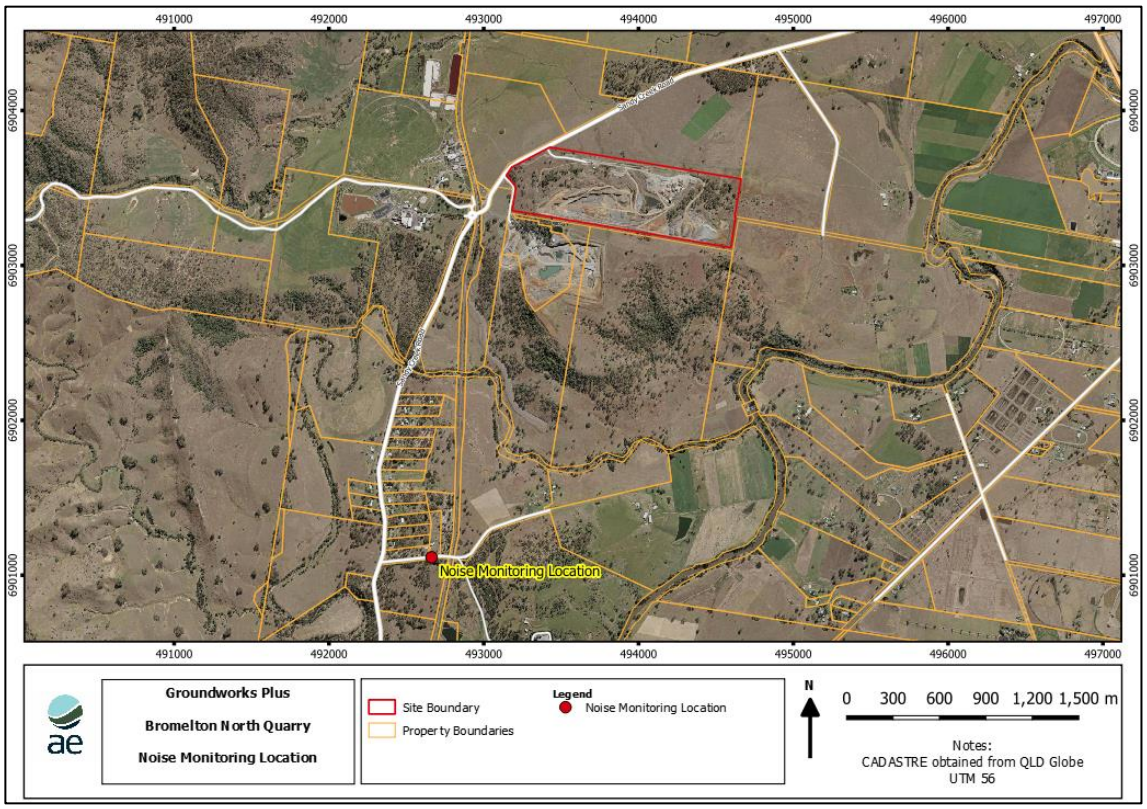


Figure 6: Monitoring Location

Noise measurements were undertaken in accordance with the requirements of Australian Standard AS 1055-2018 *'Acoustics – Description and measurement of environmental noise'*. One sound level meter (SLM) was used for the continuous monitoring. The SLM was situated in a free-field position and a data logging time of 15 minutes was adopted. The microphone was positioned at a height of 1.2 metres above ground level and fitted with a windshield throughout the measurements. The serial numbers and calibration information for the instruments as well as daily measurement data and time histories are presented in Appendix A.

Noise monitoring has a potential to be affected by rainfall and wind speeds above 5 m/s. A review of meteorological data from the DES Josephville, found that there were four hours affected by high wind speeds and/or rain during the monitoring period (7 days). To avoid

weather-related bias, and in accordance with the Noise Measurement Manual noise data collected during the weather-affected periods are not considered in analysis.

A review of the 1/3 octave spectrum for each measurement has identified that during some evenings and night time periods, the monitoring data was influenced by insects. These frequencies have been removed from the analysis. Table 6 below provides a summary of noise levels of each period for a variety of statistical noise parameters with both the weather and insect affected data removed.

Table 6: Summary of Noise Monitoring Results

Location	Period	L_{Amax}	L_{A1}	L_{A10}	L_{A90}	L_{Aeq}	RBL
ML 1	Day (7 am to 6 pm)	97	64	48	35	56	32
	Evening (6 pm to 10 pm)	88	57	47	32	52	29
	Night (10 pm to 7 am)	94	55	45	32	52	29

It can be seen from Table 6 that the rated background noise levels are typical for the monitoring location setting (i.e., rural). Detailed noise monitoring analysis is presented in Appendix A.

5 REGULATORY REQUIREMENTS

5.1 Overview

This Section reviews the applicable criteria taking into consideration the following:

- Scenic Rim Regional Council Planning Scheme;
- State Development Code 22;
- Bromelton State Development Area Development Scheme;
- Environmental Protection (Noise) Policy 2019; and
- Cement Concrete & Aggregates Australia (CCAA) *Assessment and Control of Environmental Noise Emission from Quarries – Queensland.*

5.2 Scenic Rim Regional Council

The site is located within the Scenic Rim Regional Council Area. The Scenic Rim Planning Scheme includes assessment benchmarks relating to noise within the Extractive Industry Code (PO13) as provided in Table 7.

Table 7: Scenic Rim Regional Council Extractive Industry Code Acceptable Outcomes

Performance Outcomes	Acceptance Outcomes
Environmental management requirements for the Extractive industry are properly identified in an Environmental Management Plan prepared by a suitably qualified person and submitted to Council that demonstrates appropriate management practices to protect environmental standards, by addressing the following: (1) Air quality; (2) Stormwater; (3) Noise; (4) Waste; (5) Water quality including erosion and sedimentation control; (6) Stream bed and bank stability; (7) Landscape and rehabilitation; (8) Workplace procedures; (9) Emergency and hazard procedures; (10) Flora and fauna protection; and (11) Auditing and review.	AO13 No acceptable outcome is prescribed.

5.3 State Code 22: Environmentally Relevant Activities

The State Development Assessment Provisions (SDAP) provide assessment benchmarks for an Environmental Relevant Activity (ERA). A development should demonstrate compliance with the relevant provisions in table 22.2.2 of the code, which summarised in Table 8.

Table 8: State Code 22 Performance Conditions

Performance Outcome	Acceptable Outcome
PO1 Development is suitably located and designed to avoid or mitigate environmental harm to the acoustic environment	AO1.1 Development meets the acoustic quality objectives for sensitive receptors identified in the Environmental Protection (Noise) Policy 2019.

5.4 Bromelton SDA Development Scheme

The Subject Site is located within the Transition Precinct of the Bromelton State Development Area. Section 2.5.4 Emissions details the requirements a development within the SDA area must achieve:

- (1) Development is designed to avoid or minimise:
    - (a) adverse impacts from air, noise and other emissions that will affect the health and safety, wellbeing and amenity of communities and individuals and
    - (b) conflicts arising from (but not limited to), spray drift, odour, noise, dust, light spill, smoke, or ash emissions with sensitive and/or incompatible land uses
- (2) Development supports the achievement of the relevant acoustic and air quality objectives of the Environmental Protection (Noise) Policy 2008 and the Environmental Protection (Air) Policy 2008.
- (3) Development with high levels of emissions is to, in accordance with current best practice, avoid adverse impacts on the cumulative air quality1 of the Bromelton air shed.

The Environmental Protection (Noise) Policy 2008 has been superseded by Environmental Protection (Noise) Policy 2019.

5.5 Cement Concrete & Aggregates Australia

The Guideline Assessment and Control of Environmental Noise Emission from Quarries - Queensland (CCAA, 2015) presents the strategy to be adopted to control environmental noise emission from Queensland quarries. The noise control strategy comprises three elements for setting the appropriate limit for the acceptable level of noise emission from any particular quarry.

The three elements are:

- Adoption of default noise limits based on time of day, with a 45 dBA limit during the day time period.
- Adoption of site-specific noise limits where the default limits are not appropriate
- Adoption of Industry Best Practice Noise Control.

Table 9 presents the Element 1 (Default) noise levels for quarries in Queensland.

Table 9: Element 1 Schedule of Acceptable Noise Levels

Day	Period	Noise level at a noise sensitive place measured as the equivalent continuous sound pressure level ($L_{Aeq\ adj,T}$)
Monday to Saturday	07:00 – 18:00 hours	45 dB(A)
	18:00 – 22:00 hours	35 dB(A)
	22:00 – 07:00 hours	30 dB(A)
Sundays and Public Holidays	08:00 – 18:00 hours	40 dB(A) Emergency maintenance only
All other times	-	Not audible

5.6 Environmental Protection (Noise) Policy

The EPP (Noise) provides acoustic quality objectives for a range of receptors with respect to the potential impact of an activity upon on the health and well-being and biodiversity of the receptors. Specifically, the objectives are intended to enhance or protect the following environmental values:

- The qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystem.
- The qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following:
    - sleep
    - study or learn
    - be involved in recreation, including relaxation and conversation.
- The qualities of the acoustic environment that are conducive to protecting the amenity of the community.

Table 10 presents a summary of the acoustic quality objectives applicable to the receptors surrounding the Project.

Table 10: EPP(Noise) Schedule 1 Acoustic Quality Objectives

Sensitive receptor	Time of day	Acoustic quality objectives (measured at the receptor) *dB(A)*			Environmental value
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$	
Residence (for outdoors)	daytime and evening	50	55	65	health and wellbeing
Residence (for indoors)	daytime and evening	35	40	45	health and wellbeing
	night-time	30 (37)	35 (42)	40 (47)	health and wellbeing (ability to sleep)

Sensitive receptor	Time of day	Acoustic quality objectives (measured at the receptor) *dB(A)*			Environmental value
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$	
Commercial and retail activity (for indoors)	When the activity is open for business	45 (52)	-	-	health and wellbeing (ability to converse)
Protected area or critical area	-	the level of noise that preserves the amenity of the existing area or place			-

Note: Brackets ( ) denote the external noise criteria assuming a 7 dB(A) façade transmission loss.

The EPP(Noise) provides amenity objectives which do not take into consideration the surrounding environment, which could be sensitive to any increase in noise environment. The EPP(Noise) explanatory note states:

> *The acoustic quality objectives are considered in assessment processes and help inform the decision-making process, including any conditions that may be placed on approvals for environmentally relevant activities. The acoustic quality objectives are not individual point source emission standards but are total levels of noise in the surrounding environment. They assist to inform what the point source acoustic emission level as a condition of approval for a particular activity at a site may be.*
>
> *It is not intended that, as part of achieving the acoustic quality objectives, any part of the existing acoustic environment be allowed to deteriorate. That means in using this policy for making decisions including under the Environmental Protection Act 1994, the acoustic quality objectives should not be seen as a noise limit without consideration of whether the acoustic environment is being allowed to deteriorate due to an existing acoustic environment that is better than the acoustic quality objective.*

The Acoustic Quality Objectives from the EPP(Noise) are shown in Table 11.

Table 11: EPP(Noise) 2019 Acoustic Quality Objectives

Receiver Type	Receptors	$L_{Aeq,adj,1\ hr}$ dB(A)			$L_{A1,\ adj,\ 1\ hr}$ dB(A)
		Day	Evening	Night	Night
Residential Dwellings	All receptors	50	42	37	65

Note: Assuming 7 dB(A) façade transmission loss is accounted for

In addition to the above acoustic quality objectives, the EPP (Noise) 2019 requires that, where reasonable to do so, background creep should be prevented or minimised [Section 9(2)(b)]. While specific noise limits to achieve this outcome are not provided in the EPP (Noise) 2019, reference is made to the previous objectives provided in the now repealed EPP (Noise) 2008 as follows:

(a) for noise that is continuous noise measured by $L_{A90,T}$—more than nil dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$; or

(b) for noise that varies over time measured by $L_{Aeq,adj,T}$—more than 5 dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$.

Given that there are no future industries expected in the local area, the control of background creep is not applicable to this assessment.

5.7 Summary of Criteria

For this project, the limiting L_{AMax} criteria is the EPP(Noise) acoustic quality objectives. For the L_{Aeq}, the Element 1 (default) values in the CCAA guidelines are applied.

Table 12: Summary of Applicable Noise Criteria at Sensitive Receptors

Criteria Parameter	Receptors	$L_{Aeq,T}$			Night L_{Amax}
		Day	Evening	Night	
EPP AQO (Table 10)	All Sensitive Receptors	50	42	37	65
CCAA Element 1 Limits (Table 9)	All Sensitive Receptors	45	35	30	-

a) In accordance with Schedule 1 of the Environmental Authority, $L_{A10\ adj,\ T}$ has been taken as approximately equivalent to $L_{Amax\ adj,\ T}$.

6 NOISE ASSESSMENT METHODOLOGY

6.1 Software

For the purposes of predicting impacts associated with noise emissions from the Subject Site on nearby sensitive receptors, noise modelling of the sources was completed using the proprietary software CadnaA (version 2022 build 189.5221) developed by DataKustik. CadnaA incorporates the influence of meteorology, terrain, ground type and air absorption in addition to source characteristics to predict noise impacts at receptor locations.

6.2 Meteorology

Noise levels were predicted using the CONCAWE propagation methodology, which incorporates the influence of meteorological conditions on the propagation of noise through the atmosphere. The modelled meteorological parameters shown in Table 13 were selected to predict the worst-case noise levels at all receptors during all seasons and all time periods.

Table 13: Model Parameters

Parameter	Day (Noise-Enhancing)	Evening (Noise-Enhancing)	Night (Noise-Enhancing)
Temperature (night)	20°C	10°C	10°C
Relative Humidity	75%	75%	75%
Wind Speed (m/s)	3.0	3.0	2.0
Stability Class	D	D	F
Wind Direction:	Worst Case	Worst Case	Worst Case

6.3 Model Configuration

Table 14 summarises the model configuration used for the modelling.

Table 14: Model Configuration

Parameter	Approach
Standards	CONCAWE
Time Periods	Day (07:00 – 18:00 hours) Evening (18:00 – 22:00 hours) Night (22:00 – 07:00 hours)
Digital Terrain	LIDAR data at 1 m intervals. Triangulation calculation applied.
Ground Absorption	Default absorption for hard surface. Aerial mapping used to include soft ground.

7 NOISE ASSESSMENT

7.1 Scenario Assessed

As detailed in Section 3, there isn't much difference from current and future operations other than the expansion of the eastern pit. There are no additional equipment or mobile plant. As such, only the proposed peak scenario will be assessed.

7.2 Noise Sources

The main noise sources from the proposed change in operations are primarily:

- Truck movements and truck unloading activities;
- External plant (fixed and mobile);
- Pit activities; and
- Crushing activities.

AE carried out a site visit to measure noise from mobile plant and other equipment on 28 October 2022 and 4 November 2022. For safety reasons, noise measurements of mobile plant were not undertaken. Data for these noise sources were obtained from Assured Environmental's sound power level database which includes a number of measurements from quarries and extraction activities.

During two site visits in October and November 2022, sound pressure level measurements of the crushing activities were obtained. In addition, a measurement at the boundary of the crushing floor was obtained for the purposes of validating the crushing activities in the noise model. The measured noise level was 82.5 dB(A) and the predicted noise level at the measurement location was 81.4 dB(A). As the difference (-1.1 dB(A)) between the measurement and prediction noise level were <2 dB(A), the model is considered to be suitable.

Table 15 provides a summary of the noise sources adopted for this assessment and the operational details of each source.

7.3 Modelling Assumptions

The following assumptions have been applied to the noise model:

- All noise sources operating 100% of any 15-minute period;
- All vehicles will follow the internal haul roads;
- Stockpile heights and locations based on site observations and recent drone contours;
- Internal haul roads vehicle movements are based on daily peak production; and
- Rock drills have been represented as operating at elevated and exposed locations. Drilling at lower and less topographically exposed benches and pit locations throughout the majority of the quarry life will result in reduced noise exposure at surrounding sensitive receptors compared to the results presented in this report; and
- All sources occur between 06:00 – 18:00 hours except drilling which only operates between the hours of 07:00 – 18:00.

Table 15: Sound Power Levels

Activity	Noise Source	Qty	Height above Ground Level (m)	Sound Power Level (dB(A) (Excluding Corrections)		Corrections Applied (tonality, low frequency, impulsiveness)	Operating Hours	Acoustical Usage (%)
				L_{Aeq}	L_{Amax}			
Processing Plant	Vibrating Feeder and Jaw Crusher [a)]	1	6	118	125	+5 dB	06:00 – 18:00	100%
	Trio Cone Crusher and Horizontal Screen [a)]	1	5	115	118	+5 dB	06:00 – 18:00	100%
	Cone Crusher and Horizontal Screen [a)]	2	8	114	116	+5 dB	06:00 – 18:00	100%
	Screen [a)]	3	6	107	108	-	06:00 – 18:00	100%
Drilling	Rock Drill	1	1.5	118	128	+5 dB	07:00 – 18:00	100%
Mobile Plant	Excavator	3	2	106	113	+5 dB	06:00 – 18:00	100%
	FEL	3	2	106	111	-	06:00 – 18:00	100%
	Dump Truck	4	2	109	118	+5 dB	06:00 – 18:00	100%
	Water Cart	1 /hr	2	109	115	+5 dB	06:00 – 18:00	100%
Haulage	Truck idling (weighbridge – in and out)	14/hr	2.5	97	98	-	06:00 – 18:00	1.4 mins per vehicle
	Truck and dog (unladen)	7/hr	2.5	102	108	+5 dB	06:00 – 18:00	100%
	Truck and dog (laden)	7/hr	2.5	102	108	-	06:00 – 18:00	100%
	Truck Exhaust	14/hr	3.5	94	98	-	06:00 – 18:00	100%
	Loading trucks	7/hr	2	109	117	-	06:00 – 18:00	100%
	Truck Unloading at ROM Pad	6/hr	3	115	122	+5 dB	06:00 – 18:00	100%
Office	AC Unit	4	1	70	72	-	06:00 – 18:00	100%
	Staff Vehicles	10	1.0	77	80	-	06:00 – 18:00	100%
	Car door slam	10	1.0	-	94	-	06:00 – 18:00	5%

a) Includes all auxiliary equipment (conveyors, conveyor motors etc). Measured at site

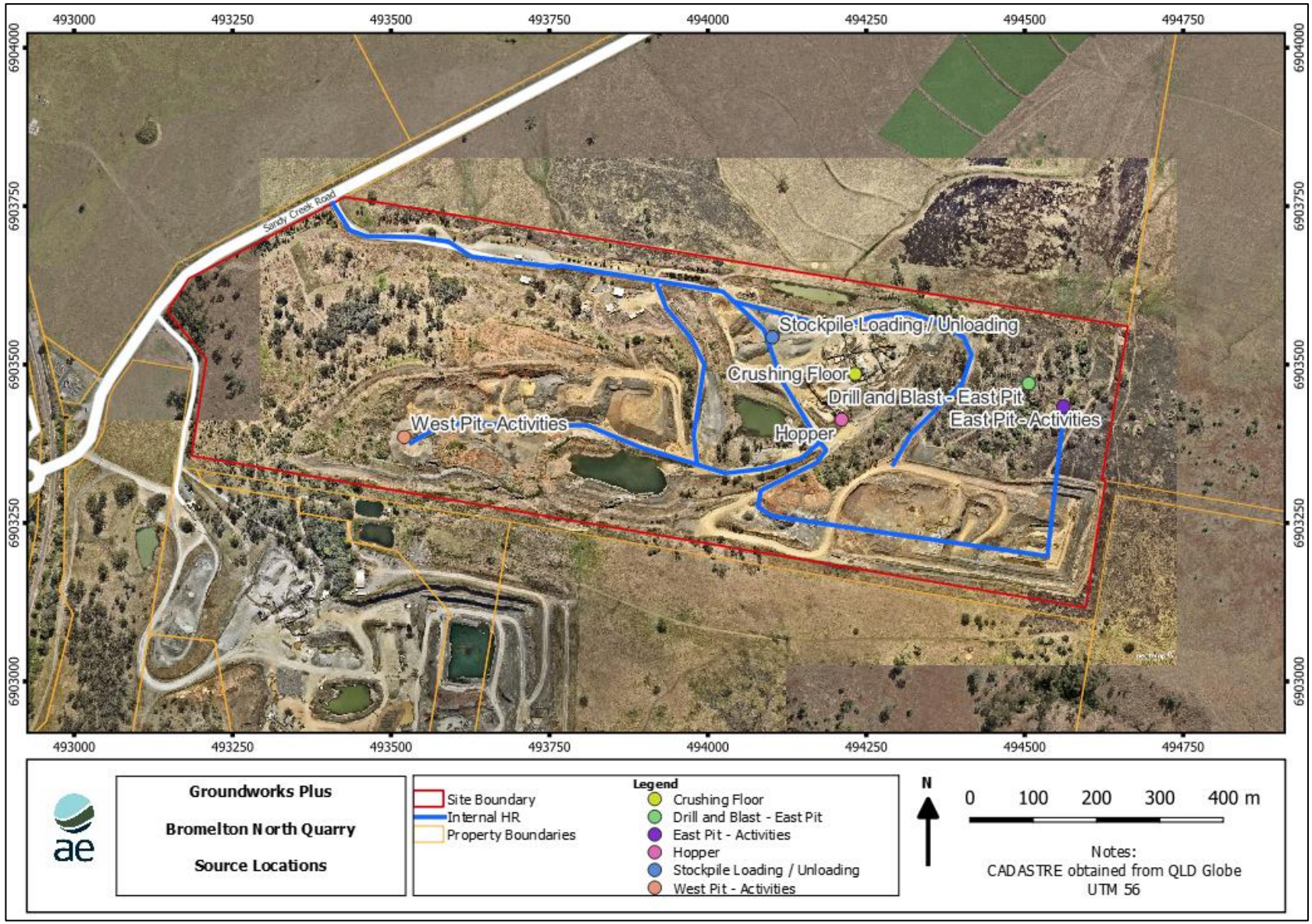


Figure 7: Modelled Source Location for Bromelton North Quarry

8 PREDICTED NOISE LEVELS

8.1 Overview

Criteria used for this assessment is the CCAA Element 1 noise limits as discussed in Section 5. This Section presents the predicted noise levels for future operations and Appendix C provides contour noise levels.

8.2 Future Activities

The current and future hours limit operations within the hours of 06:00 – 18:00 hours, being day time and night time periods.

Table 16 provides the current and future hours limit operations within the hours of 6am and 6pm, being day (D) and night (N) time periods. The results show that all receptors comply with assessment criteria except receptors R19 and R20 for the night time period (i.e., 22:00 – 07:00), which are located north of the Subject Site and are visible from the crushing area.

Table 16: Maximum Predicted Results – Future Quarry Activities

ID	Predicted Operational Noise Levels (dB L_{Aeq})				Criteria Levels (dB L_{Aeq})				Exceedence (dB(A))			
	D	E	N	L_{AMax}	D	E	N	L_{AMax}	D	E	N	L_{AMax}
R01	18	-	<10	<10	45	35	30	65	-	-	-	-
R02	<10	-	<10	<10	45	35	30	65	-	-	-	-
R03	<10	-	<10	<10	45	35	30	65	-	-	-	-
R04	<10	-	<10	<10	45	35	30	65	-	-	-	-
R05	<10	-	<10	<10	45	35	30	65	-	-	-	-
R06	<10	-	<10	<10	45	35	30	65	-	-	-	-
R07	<10	-	<10	<10	45	35	30	65	-	-	-	-
R08	<10	-	<10	<10	45	35	30	65	-	-	-	-
R09	<10	-	<10	<10	45	35	30	65	-	-	-	-
R10	<10	-	<10	<10	45	35	30	65	-	-	-	-
R11	11	-	<10	<10	45	35	30	65	-	-	-	-
R12	13	-	<10	<10	45	35	30	65	-	-	-	-
R13	<10	-	<10	<10	45	35	30	65	-	-	-	-
R14	16	-	<10	<10	45	35	30	65	-	-	-	-
R15	<10	-	<10	<10	45	35	30	65	-	-	-	-
R16	<10	-	<10	<10	45	35	30	65	-	-	-	-
R17	20	-	10	10	45	35	30	65	-	-	-	-
R18	27	-	16	15	45	35	30	65	-	-	-	-
R19	40	-	31	31	45	35	30	65	-	-	1	-
R20	41	-	31	33	45	35	30	65	-	-	1	-

A review of the causes of the exceedences have identified that during the night time, the two highest noise levels at both R19 and R20 are the Trio Crusher and Metso Crusher.

8.3 Mitigation

Detailed noise measurements and modelling of the Trio cone crusher identified this source as the highest contributor to the predicted exceedences at R19 and R20. Onsite observations confirmed there is a 1.5 m high bund to the north of the quarry boundary, which provides noise mitigation for low level sources (i.e., truck movements), however the Trio cone crusher is elevated on a platform.

There are two forms of mitigation:

- Cease operation of the trio crusher during the night-time period (i.e., 06:00 – 07:00 hours); or
- Install a barrier as detailed below.

Based on observations, it is recommended that a 1.6 m high (with the top of the panel being at RL 95 m), U-shaped barrier is installed on the platform to protect the receptors to the north of the Subject Site, as shown in Figure 8. Discussions with Bromelton North Quarry has identified the platform can bare the weight of the selected panels.

The proposed acoustic panels are a Sonata 75 mm thick panels as detailed in Appendix B.

Figure 8: Location of Noise Panels on Trio Cone Crusher Platform

Table 17 provides the predicted noise for the future quarry activities for day (D) and night (N) periods. The results show that all receptors comply with the assessment criteria as detailed in Table 12 when the acoustic panels are installed on the Trio cone crusher platform.

Table 17: Maximum Predicted Results – Future Quarry Activities with Mitigation

ID	Predicted Operational Noise Levels (dB L_{Aeq})				Criteria Levels (dB L_{Aeq})				Exceedence (dB(A))			
	D	E	N	L_{AMax}	D	E	N	L_{AMax}	D	E	N	L_{AMax}
R01	18	-	<10	<10	45	35	30	65	-	-	-	-
R02	<10	-	<10	<10	45	35	30	65	-	-	-	-
R03	<10	-	<10	<10	45	35	30	65	-	-	-	-
R04	<10	-	<10	<10	45	35	30	65	-	-	-	-
R05	<10	-	<10	<10	45	35	30	65	-	-	-	-
R06	<10	-	<10	<10	45	35	30	65	-	-	-	-
R07	<10	-	<10	<10	45	35	30	65	-	-	-	-
R08	<10	-	<10	<10	45	35	30	65	-	-	-	-
R09	<10	-	<10	<10	45	35	30	65	-	-	-	-
R10	<10	-	<10	<10	45	35	30	65	-	-	-	-
R11	11	-	<10	<10	45	35	30	65	-	-	-	-
R12	13	-	<10	<10	45	35	30	65	-	-	-	-
R13	<10	-	<10	<10	45	35	30	65	-	-	-	-
R14	16	-	<10	<10	45	35	30	65	-	-	-	-
R15	<10	-	<10	<10	45	35	30	65	-	-	-	-
R16	<10	-	<10	<10	45	35	30	65	-	-	-	-
R17	20	-	10	10	45	35	30	65	-	-	-	-
R18	27	-	16	15	45	35	30	65	-	-	-	-
R19	40	-	30	30	45	35	30	65	-	-	-	-
R20	38	-	28	28	45	35	30	65	-	-	-	-

9 VIBRATION ASSESSMENT

9.1 Introduction

An assessment of the potential for vibration impacts has been undertaken to determine potential impacts as a result of vibration generated by plant and equipment during quarry operation. In particular, the assessment has considered the potential for impacts on both human comfort and structural damage for the nearest residence to the quarry.

9.2 Vibration Assessment Criteria

For blasting, the existing environmental authority EPPR0005410113 provides the following criteria as outlined in Table 18.

Table 18: Blasting Noise Limits (EPPR0005410113)

Blasting Criteria	Blasting Limits
Airblast overpressure	115 dB (Linear) Peak for 4 out of 5 consecutive blasts
Ground vibration peak particle velocity	• for vibrations of more than 35 Hz-not more than twenty-five (25) millimetres per second ground vibration, peak particle velocity; and • for vibrations of not more than 35 Hz-not more than ten (10) millimetres per second ground vibration, peak particle velocity

It is not recommended or expected that the Blasting Conditions in the EA would need to change as a result of the proposed modification to the Development Consent.

9.3 Assessment of Vibration Impacts

9.3.1 Assessment of Impacts – Site Specific Information

A review of the Blast Management Plan[a] identified a typical maximum instantaneous charge of 98 kg and a site constant of K = 1041.

9.3.2 Assessment of Impacts – Ground Vibration from Blasting

Ground vibration levels have been estimated using the following equation from AS 2187.2-2006 *"Explosives - Storage and use - Use of explosives"*:

$$V = K_g \left(\frac{R}{Q^{1/2}}\right)^{-B}$$

Where:

V = ground vibration as PPV (mm/s)

[a] Groundwork Plus (2022). *Bromelton North Quarry - Blast Management Plan*. Document reference 740_410_002 dated June 2022.

Q = explosives mass charge (kg)

R = distance from charge (m)

K_g = site constant (1041)[a)]

B = site constant (1.6) [a)]

Table 19 presents the predicted ground vibration levels (PPV) at each receptor using typical mass charge of 98.77 kg. It can be seen from Table 19 that compliance is achieved at all sensitive receptors. Additional calculations have identified that an MIC of 600 kg would still achieve compliance at all sensitive receptors.

It should be noted however that the impacts of blasting are dependent on-site specific factors including the blast management techniques, ground conditions and geological stratum types and locations. Given this, monitoring of the blasts should also be undertaken at the nearest sensitive receptor in accordance with the EA and Blast Management Plan.

Table 19: Predicted Ground Vibration from Blasting using Typical MIC

Predicted Ground Vibration from Blasting using Typical MIC							
Receptor	Distance from Site Boundary (m)	K	β	Typical Q (kg)	Predicted PPV (mm/s)	Criteria (mm/s)	Compliant
R1	1400	1041	1.6	98.77	0.38	10	Y
R2	1850	1041	1.6	98.77	0.24	10	Y
R3	2020	1041	1.6	98.77	0.21	10	Y
R4	2130	1041	1.6	98.77	0.19	10	Y
R5	2170	1041	1.6	98.77	0.19	10	Y
R6	2200	1041	1.6	98.77	0.18	10	Y
R7	2250	1041	1.6	98.77	0.18	10	Y
R8	2270	1041	1.6	98.77	0.18	10	Y
R9	2350	1041	1.6	98.77	0.17	10	Y
R10	2400	1041	1.6	98.77	0.16	10	Y
R11	1750	1041	1.6	98.77	0.27	10	Y
R12	1100	1041	1.6	98.77	0.56	10	Y
R13	2100	1041	1.6	98.77	0.20	10	Y
R14	1100	1041	1.6	98.77	0.56	10	Y
R15	1610	1041	1.6	98.77	0.30	10	Y
R16	1720	1041	1.6	98.77	0.27	10	Y
R17	830	1041	1.6	98.77	0.88	10	Y
R18	1000	1041	1.6	98.77	0.65	10	Y
R19	720	1041	1.6	98.77	1.10	10	Y
R20	1130	1041	1.6	98.77	0.53	10	Y

9.3.3 Assessment of Impacts – Blast Overpressure

Airblast levels have been estimated using the following equation from AS 2187.2-2006, *"Explosives - Storage and use - Use of explosives"*:

$$P = K_a \left(\frac{R}{Q^{1/3}}\right)^a$$

Where:

P = pressure (kPa)

Q = explosives mass charge (kg)

R = distance from charge (m)

K_a = site constant (10 – 100)

A = site exponent (-1.45)

Applying a site constant (K_a) of 20, the predicted over blast pressure at each receptor is presented in Table 20. It can be seen that receptor R19 exceeds the 115 dB(Z). If the MIC is reduced to 89 kg, the predicted over blast pressure is 115 dB(Z) at receptor R19; therefore, it is expected to comply with the assessment criteria.

Monitoring of the blasts should be undertaken at the nearest sensitive receptor in accordance with the EA and Blast Management Plan. Monitoring data will provide more accurate data in relation to the site constant when the pit extends closest to R19.

Table 20: Predicted Blast Overpressure using Typical MIC

Predicted Ground Vibration from Blasting using Typical MIC							
Receptor	Distance from Site Boundary (m)	Ka	a	Typical Q (kg)	Predicted Over-Pressure (dB(Z))	Criteria (dB(Z))	Compliant
R1	1400	20	-1.45	98.77	108.0	115	Y
R2	1850	20	-1.45	98.77	104.5	115	Y
R3	2020	20	-1.45	98.77	103.4	115	Y
R4	2130	20	-1.45	98.77	102.8	115	Y
R5	2170	20	-1.45	98.77	102.5	115	Y
R6	2200	20	-1.45	98.77	102.4	115	Y
R7	2250	20	-1.45	98.77	102.1	115	Y
R8	2270	20	-1.45	98.77	102.0	115	Y
R9	2350	20	-1.45	98.77	101.5	115	Y
R10	2400	20	-1.45	98.77	101.3	115	Y
R11	1750	20	-1.45	98.77	105.2	115	Y
R12	1100	20	-1.45	98.77	111.1	115	Y
R13	2100	20	-1.45	98.77	102.9	115	Y
R14	1100	20	-1.45	98.77	111.1	115	Y

Predicted Ground Vibration from Blasting using Typical MIC							
Receptor	Distance from Site Boundary (m)	Ka	a	Typical Q (kg)	Predicted Over-Pressure (dB(Z))	Criteria (dB(Z))	Compliant
R15	1610	20	-1.45	98.77	106.3	115	Y
R16	1720	20	-1.45	98.77	105.5	115	Y
R17	830	20	-1.45	98.77	114.6	115	Y
R18	1000	20	-1.45	98.77	112.3	115	Y
R19	720	20	-1.45	98.77	115.4	115	N
R20	1130	20	-1.45	98.77	110.7	115	Y

10 CONCLUSIONS

Neilsens propose to increase the extraction rate to 800,000 tonnes per annum and extend the east pit footprint. It is not proposed to change the approved hours of operation or location of fixed plant, and equipment.

A noise impact assessment has been undertaken to demonstrate that the expansion of the quarry will not have adverse effects on surrounding receptors. The assessment has been conducted in accordance with Department of Environment & Science (DES) *Guideline - Application requirements for activities with impacts to noise*.

Predictive noise modelling has been undertaken for the site to assess the potential impacts of noise emission from quarry operations and traffic generation. The results of the predictive noise modelling have determined that compliance with the adopted noise criteria is expected to be achieved if the mitigation discussed in Section 9 is implemented.

A blasting vibration assessment has predicted over blast pressure at each receptor is achieve with a MIC of 89 kg whilst ground vibration is also predicted to comply with the assessment criteria with an MIC of 98 kg.

APPENDIX A: BACKGROUND NOISE MONITORING

Table 21: ML1 - Site Details

Site Details: NML 1	
Coordinates:	-28.015153 "S, 152.925362"E
Start / End Date	12 October 2022 at 13:50 hours to 20 October 2022 at 10:35 hours
Logger Details	Norsonic 139 (serial number – 1392800) Next Laboratory Calibration Due: 05/01/2023
Calibration Details	Pulsar 106 (serial number 70394) Start / End Calibration Level: 94.0 dB(A) / 94.4 dB(A) Next Laboratory Calibration Due: 29/08/2023
Measurement Details:	Fast/ A-weighting / 15-min duration / 1.2 m microphone height / Free field position
Weather Details	DES Josephville weather station indicated during the monitoring period 4 hours was affected by rainfall or wind.
On-site Observations:	Located along Flood Lane. Dominant noise sources were wind through vegetation, birdsong, and traffic on Sandy Creek Road and air conditioning.

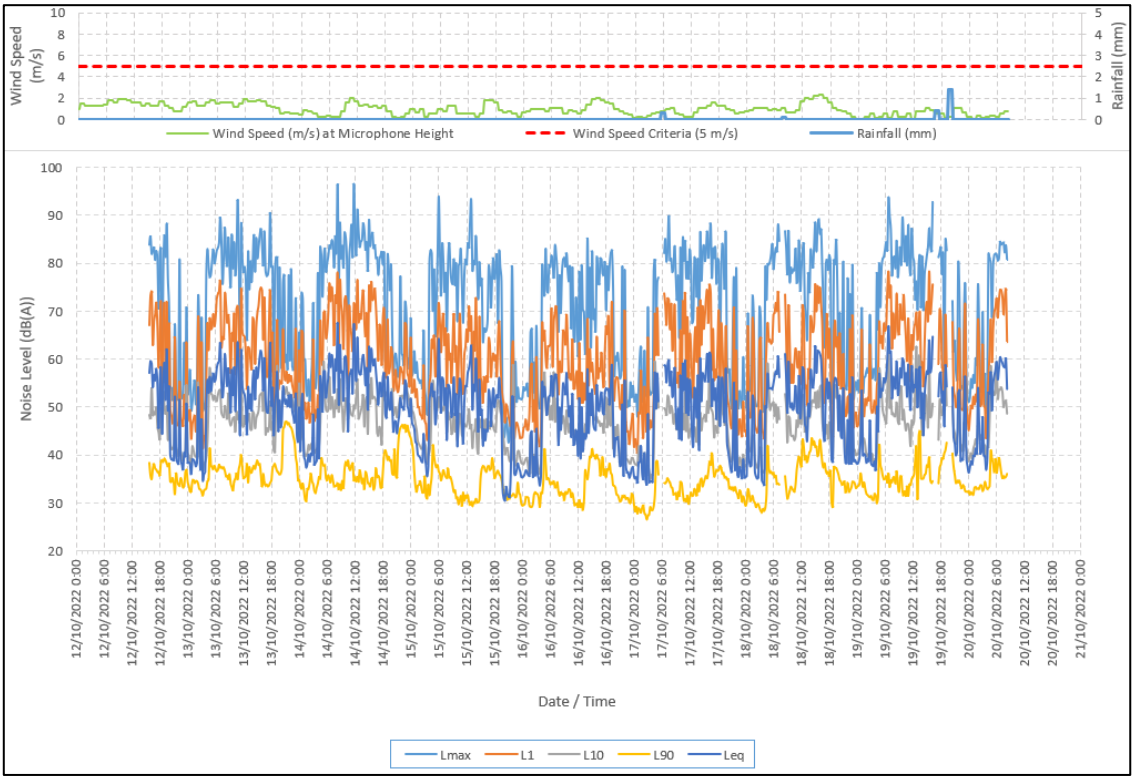


Table 22: ML1 - Noise Monitoring Results

Date	Period	L_{max}	L_1	L_{10}	L_{90}	L_{eq}	minL_{90}, 1-hour	Median L_{eq}, 1-hour
12/10/2022	Day	-	-	-	-	-	-	-
	Evening	88.2	57.9	46.0	36.6	54.4	34.3	51.8
	Night	84.2	55.8	44.2	33.5	52.2	30.3	46.1
13/10/2022	Day	93.2	65.7	48.6	36.0	57.3	33.6	57.7
	Evening	81.3	57.5	50.0	35.1	51.8	33.4	51.2
	Night	83.6	57.1	46.9	33.5	52.3	31.2	50.2
14/10/2022	Day	96.5	68.8	49.8	35.0	59.6	33.0	58.8
	Evening	82.1	59.1	50.9	30.2	51.8	28.6	51.0
	Night	93.9	56.7	47.9	33.3	52.6	31.0	51.5
15/10/2022	Day	92.9	61.0	46.2	33.4	53.9	30.0	52.9
	Evening	82.3	54.7	44.1	32.0	49.5	29.4	49.0
	Night	83.0	52.7	43.1	31.9	48.7	29.1	40.7
16/10/2022	Day	85.1	58.7	46.5	34.1	51.4	29.7	51.3
	Evening	82.6	57.0	44.7	29.2	51.2	26.9	49.1
	Night	85.0	51.9	41.2	29.5	50.2	27.0	43.0
17/10/2022	Day	89.8	64.3	47.6	33.7	55.8	30.9	55.6
	Evening	86.3	56.8	45.3	30.7	52.2	28.2	51.8
	Night	84.0	55.1	42.8	31.1	50.8	28.1	47.5
18/10/2022	Day	89.1	63.3	48.0	37.8	56.4	32.6	55.6
	Evening	84.8	57.0	47.3	32.0	51.6	30.5	49.8
	Night	93.5	56.2	44.5	33.1	54.2	31.1	48.0
19/10/2022	Day	92.8	66.8	49.5	35.4	57.6	32.3	56.4
	Evening	-	-	-	-	-	-	-
	Night	84.4	57.6	45.4	32.5	52.6	29.3	48.9

DAY DESIGN	ACOUSTIC PANEL SOUND TRANSMISSION LOSS TEST CERTIFICATE	4725-12

Client:

Sound Control Pty Ltd

Test Specimen:

Sonata 75 mm Panel

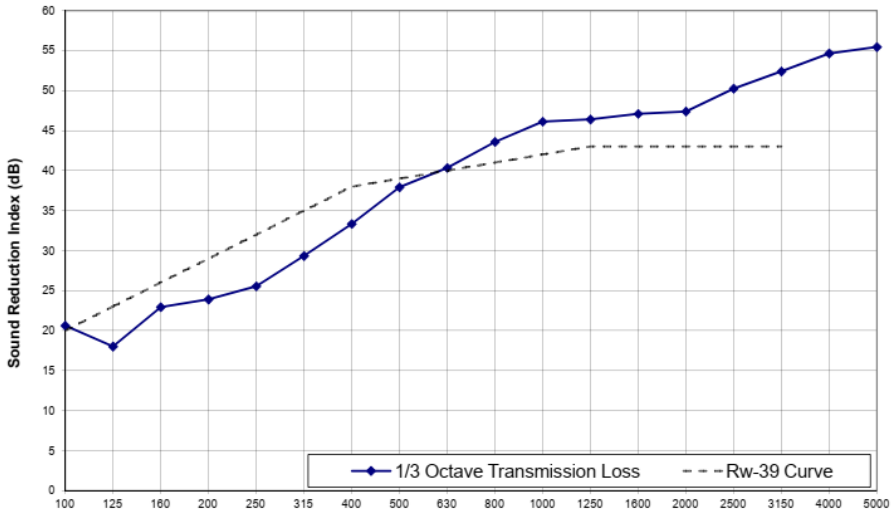
Frequency - Hz	Sound Reduction Index - dB	
	1/3 Octave	1/1 Octave
100	21	
125	18	20
160	23	
200	24	
250	26	26
315	29	
400	33	
500	38	36
630	40	
800	44	
1000	46	45
1250	46	
1600	47	
2000	47	48
2500	50	
3150	52	
4000	55	54
5000	55	
R_w ($C;C_{tr}$)	39 (-2 ; -7)	

Australian Standards:
Measured according to AS 1191-2002
Rated to AS/NZS ISO 717.1:2004

Test Specimen Dimensions:
1.2 m (H) x 1.8 m (W)

Test Location:
Twin Reverberation Rooms
National Acoustic Laboratories
126 Greville Street, Chatswood NSW

Instrumentation:
Brüel and Kjær Pulse Analyser type 3560C
Brüel and Kjær Cathode Follower type 2660
Brüel and Kjær Cathode Follower type 2669
Brüel and Kjær Microphone type 4144 (x2)
Brüel and Kjær Microphone Power Supply type 2804
Brüel and Kjær Sound Level Calibrator type 4231
Yamaha Professional Sound Sources type S500

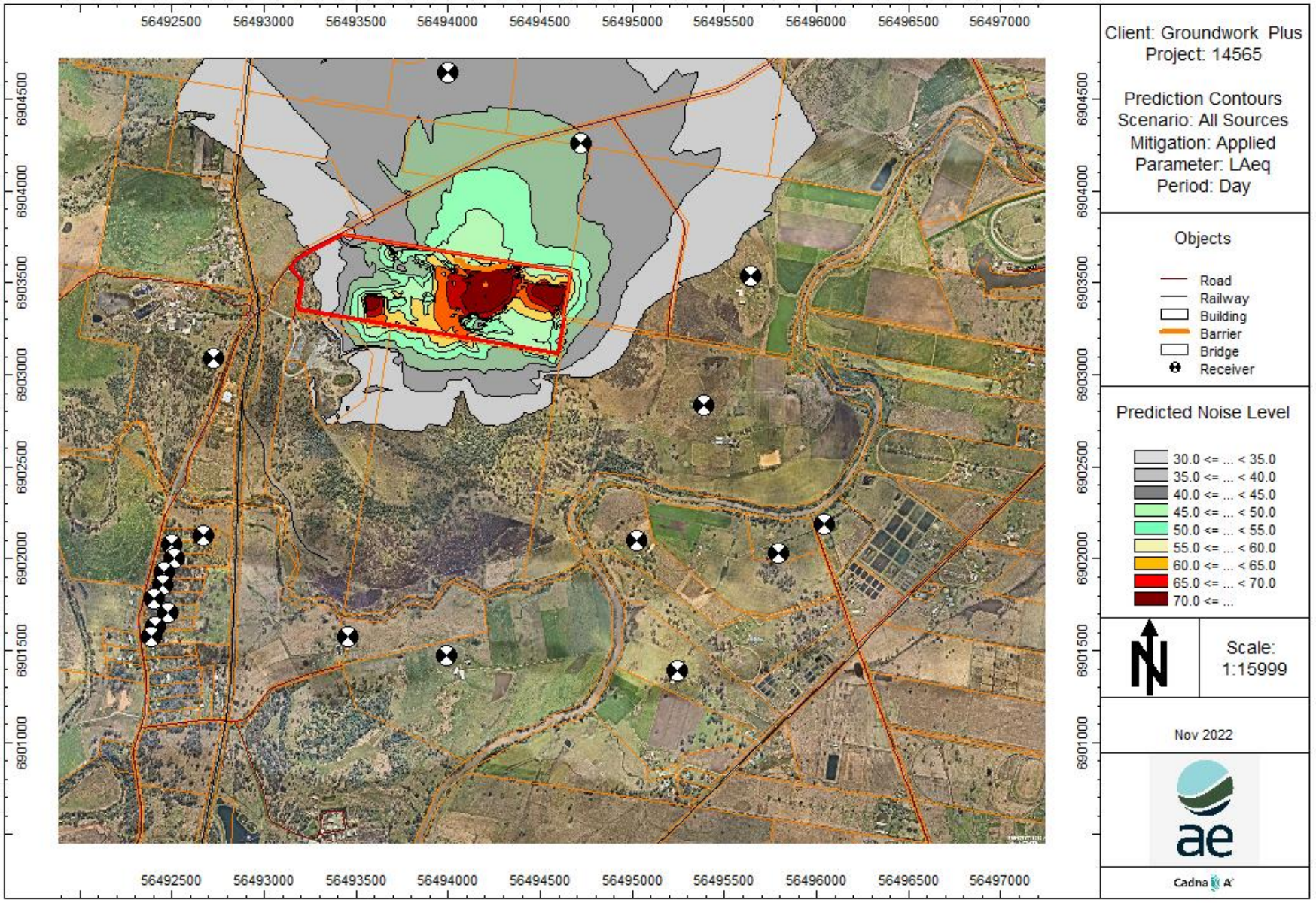


Date of Test: Monday, 31 October 2011
Project Number: 4725-12

Test Engineer: **Alex Li, BE(Mech) Hons**
For and on behalf of Day Design Pty Ltd

APPENDIX C: NOISE CONTOURS

Contour plots illustrate the spatial distribution of ground-level concentrations across the modelling domain for each time period of interest. However, this process of interpolation causes a smoothing of the base data that can lead to minor differences between the contours and receptor model predictions.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6903000
6902500
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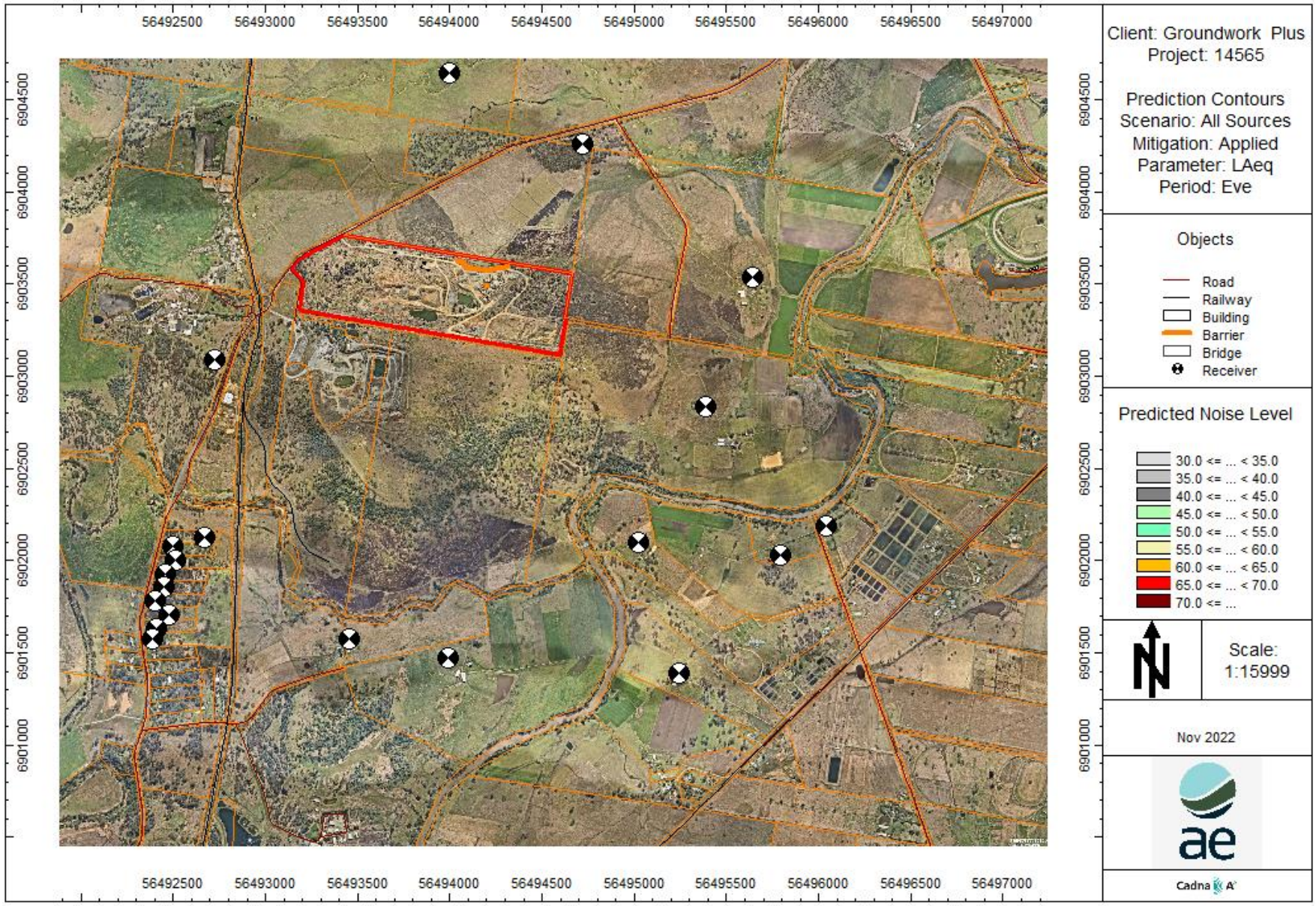
6901000
Client: Groundwork Plus
Project: 14565
Prediction Contours
Scenario: All Sources
Mitigation: Applied
Parameter: LAeq
Period: Day
Objects
Road
Railway
Building
Barrier
Bridge
Receiver
Predicted Noise Level
30.0 <= ... < 35.0
35.0 <= ... < 40.0
40.0 <= ... < 45.0
45.0 <= ... < 50.0
50.0 <= ... < 55.0
55.0 <= ... < 60.0
60.0 <= ... < 65.0
65.0 <= ... < 70.0
70.0 <= ...
N
Scale:
1:15999
Nov 2022
Cadna A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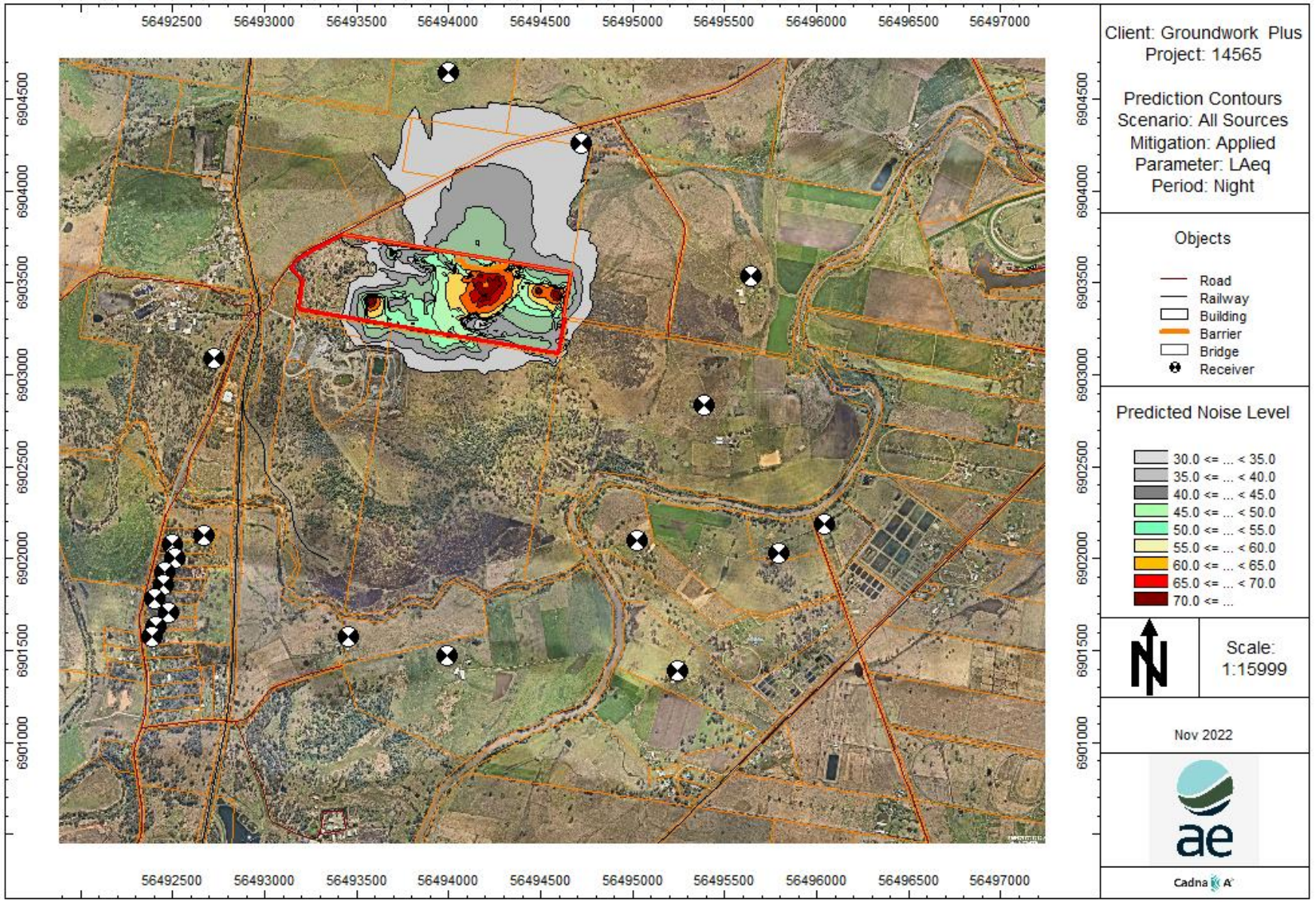
6901500
6901000
Client: Groundwork Plus
Project: 14565
Prediction Contours
Scenario: All Sources
Mitigation: Applied
Parameter: LAeq
Period: Eve
Objects
Road
Railway
Building
Barrier
Bridge
Receiver
Predicted Noise Level
30.0 <= ... < 35.0
35.0 <= ... < 40.0
40.0 <= ... < 45.0
45.0 <= ... < 50.0
50.0 <= ... < 55.0
55.0 <= ... < 60.0
60.0 <= ... < 65.0
65.0 <= ... < 70.0
70.0 <= ...
N
Scale:
1:15999
Nov 2022
Cadna A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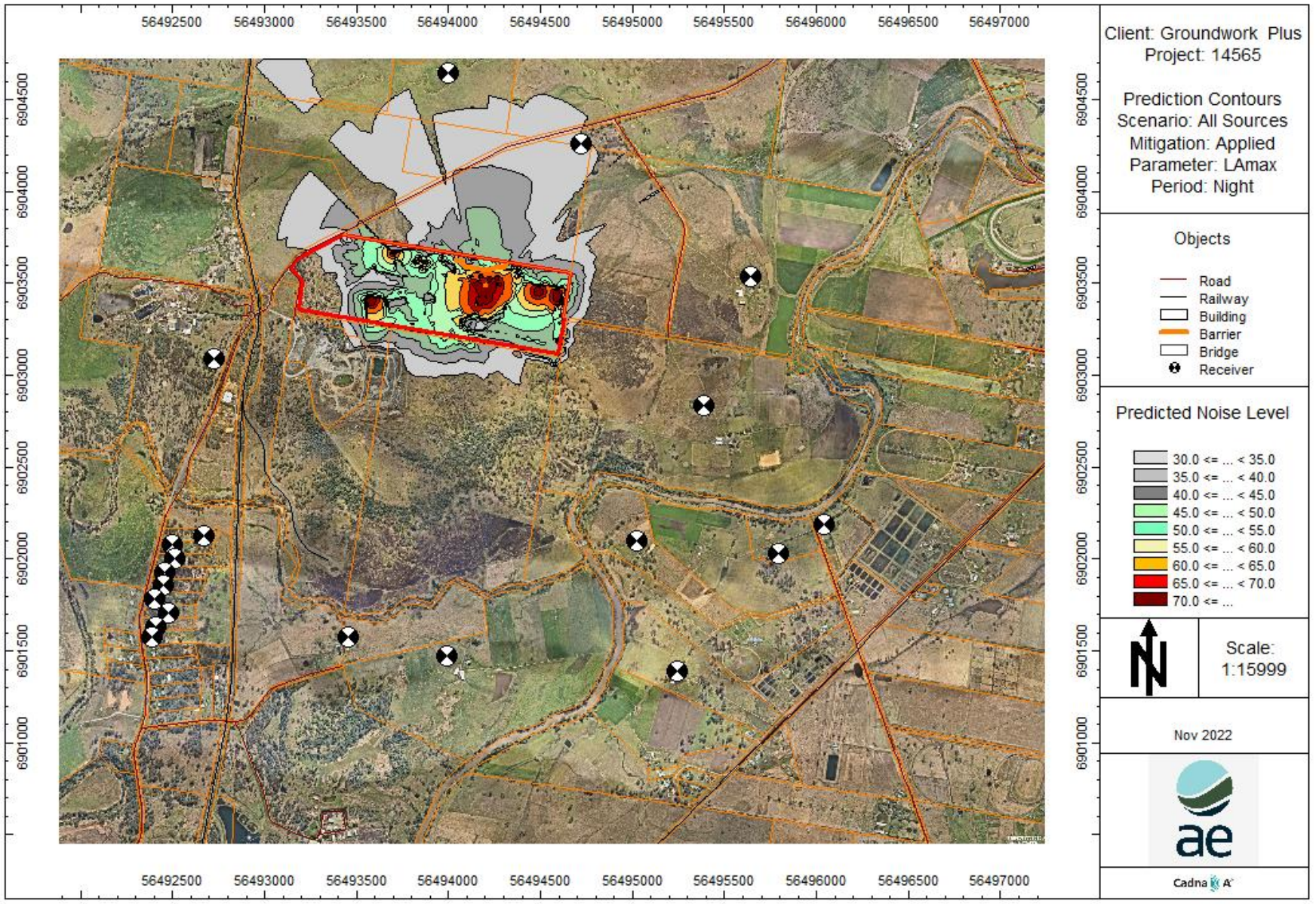
6903000
6902500
6902000
6901500
6901000
Client: Groundwork Plus
Project: 14565
Prediction Contours
Scenario: All Sources
Mitigation: Applied
Parameter: LAeq
Period: Night
Objects
Road
Railway
Building
Barrier
Bridge
Receiver
Predicted Noise Level
30.0 <= ... < 35.0
35.0 <= ... < 40.0
40.0 <= ... < 45.0
45.0 <= ... < 50.0
50.0 <= ... < 55.0
55.0 <= ... < 60.0
60.0 <= ... < 65.0
65.0 <= ... < 70.0
70.0 <= ...
N
Scale:
1:15999
Nov 2022
Cadna A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6904500
6904000
6903500
6903000
6902500
6902000
6901500
6901000
Client: Groundwork Plus
Project: 14565
Prediction Contours
Scenario: All Sources
Mitigation: Applied
Parameter: LAmax
Period: Night
Objects
Road
Railway
Building
Barrier
Bridge
Receiver
Predicted Noise Level
30.0 <= ... < 35.0
35.0 <= ... < 40.0
40.0 <= ... < 45.0
45.0 <= ... < 50.0
50.0 <= ... < 55.0
55.0 <= ... < 60.0
60.0 <= ... < 65.0
65.0 <= ... < 70.0
70.0 <= ...
N
Scale:
1:15999
Nov 2022
ae
Cadna A