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Report

Hillview Hard Rock Quarry

Noise & Vibration Impact Assessment

Prepared for:

Coastwide Materials Pty Ltd c/c- ADW Johnson Pty Limited

Prepared by:

Advitech Pty Limited

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Endorsements

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Executive Summary

Advitech Pty Limited (Advitech) was engaged by Coastwide Materials Pty Ltd c/- ADW Johnson Pty Limited to conduct an assessment of potential noise impacts of the construction and operation of a proposed Hillview hard rock quarry located at 67 Maytoms Lane, Booral, NSW. This assessment will form part of a submission to the NSW Department of Planning, Housing and Infrastructure (DPHI) regarding construction and operation of the proposed quarry, as well as additional traffic movements along Maytoms Lane and Bucketts Way. The assessment has been conducted as per the Secretary's Environmental Assessment Requirements (SEARs), with reference to relevant policy and guidelines.

Project Tigger Noise Levels for adjacent receiving environments were reviewed, and the assessment conservatively adopted the most stringent criteria for potentially affected receivers in the project area.

Construction Noise and Vibration Management

The assessment has shown that there is the potential for construction noise management level goals to be intermittently exceeded throughout the site development at some residential receivers. Therefore, the proposed construction work shall require noise management by investigation and application of all feasible and reasonable noise mitigation work practices provided in this report to minimise impacts on surrounding receivers.

Operational Noise

Review of operational noise modelling under enhancing meteorological conditions indicates that the proposed operations will generate offsite noise levels below the PTNL at all receivers, during the day period, however, control measures and operational restrictions on mechanical plant items have been provided to result in operational compliance during both the evening and night periods.

Site activities may well be audible at some locations given the characteristics of the receiving environment. It is thus recommended that measures be put in place to ensure the timely and effective response to any concerns raised by adjacent sensitive receivers.

Blasting

Airblast overpressure levels are expected to be below the ANZECC guidance values at all receivers. The limiting charge size has been specified in the report body to result in the airblast overpressure to remain below the 115 dB annoyance threshold at modelled receivers.

The results of the assessment indicate that, based on the observed separation distances, ground vibration levels are unlikely to exceed the criteria for human annoyance at sensitive receivers adjacent to the blast site.

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Appendices

B: Daily noise logging results

1. Introduction

Advitech Pty Limited (Advitech) was engaged by Coastwide Materials Pty Ltd c/- ADW Johnson Pty Limited to conduct a Noise Impact Assessment (NIA) for the construction and operation of a proposed hard rock quarry located at 67 Maytoms Lane, Booral, New South Wales (NSW). This assessment will form part of a submission to the NSW Department of Planning, Housing and Infrastructure (DPHI) regarding construction and operation of the proposed quarry. The assessment has been conducted as per the Secretary's Environmental Assessment Requirements (SEARs), with reference to relevant policy and guidelines.

It should be noted that this report was prepared by Advitech Pty Limited for Coastwide Materials Pty Ltd c/c- ADW Johnson Pty Limited ('the customer') in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

2. Background and Objectives

2.1 Hillview Hard Rock Quarry

The Hillview Hard Rock Quarry (Hillview Quarry) is located on the lower north coast of NSW, approximately 2.5 km southwest of Booral. The quarry is proposed to output hard rock products, and contains facilities for extraction, on-site processing and transporting site materials. An outline of the proposed development will include:

- clearing of vegetation to gain access to the processing pad and extraction areas, site preparation works and installation of infrastructure and supporting services to facilitate operations at the site.
- road upgrades to Maytoms Lane and Bucketts Way will be required to cater for vehicle movements;
- development and operation of the site will be undertaken over seven (7) stages. Approximately 45 million tonnes of resources are expected to be extracted over the 30 year project life, with a peak extraction rate of 1.5 million tonnes per annum (mtpa);
- an outline of the quarry staging is provided below;
  - Stage 1 (construction) – Commence Haul Road Construction from Maytoms Lane to Processing Pad;
  - Stage 2 (construction) – Increase processing pad and continue slot and haul road, develop southwards. Commence intersection and Maytoms Lane upgrade;
  - Stage 3 (construction) – Finalise processing pad, haul road to Maytoms lane. Complete intersection and Maytoms Lane upgrade. Commence internal haul road to 158 m RL pad;
  - Stage 4 (operations) – Continue internal haul road construction and 158 m RL Run of mine (ROM) pad;
  - Stage 5 (operations) – Extraction commences at the top of the hill;
  - Stage 6 (operations) – Extraction continues down the eastern face; and
  - Stage 7 – Final Landform.

The development has been designed to minimise noise emissions by taking advantage of natural terrain features. Site establishment works will include:

- construction of a significant road cutting through an existing ridge (approximately RL+115 m):
  - alignment of the access road 'slot' has been designed to ensure that much of the existing ridge is retained as a visual and acoustic barrier to receivers south and east of the development;

- the proposed construction of the access road 'slot' has also been designed to proceed in a north-westerly to south-easterly direction. This ensures that the ridge remains between the noise generating works and adjacent sensitive receivers for the majority of the construction program;

- the main processing area will be located on a pad that will be predominantly cut to a level of RL+95 m. This ensures that noise sources located within the processing area are located at a relatively low point within the development site, protected by significant terrain features;
- upgrades to Maytoms Lane and its intersection with Bucketts Way (also known as The Bucketts Way), as well as installation of processing infrastructure will commence towards the end of this site development phase.

The abovementioned acoustic design commitments require significant civil works to establish the site; it is anticipated that site preparation and development activities – Stages 1 to 4 – will be undertaken over a period of approximately two (2) years. Some incidental production, including haulage of material from the site via Bucketts Way, may occur during this time, but design production rates (i.e. 1.5 mtpa) will not be realised until this development phase has been completed.

Operation of the quarry – Stage 5 to 7 – would commence following completion of site development activities. Typical site operations include:

- fracturing hard rock resources via drill and blast activities;
- recovery of blasted material via excavator, and transport to an on-site processing plant
- crushing, screening, and sizing material prior to stockpiling; and
- loading product onto road trucks for transport off site.

The proposed hours of operation are summarised in Table 1. Further detail on the proposed staging program is provided in **Section 6**.

Table 1: Proposed operating hours: Development and Operational phase

Project Stage	Activity	Operating Hours
Project Development Phase		
Stages 1 to 4	Construction of access road slot and processing pad	Monday to Friday: 7 am to 6 pm Saturday: 8 am to 1 pm
	Blasting activities (access road slot)	Monday to Friday: 9 am to 4 pm
Project Operation Phase		
Stages 5 to 7	Extraction and processing operations	Monday to Saturday: 6 am to 10 pm
	Internal product transfers to stockpiles	Monday to Saturday: 6 am to midnight
	Haulage of material from the development site	Monday to Saturday: 7 am to 6 pm
	Blasting activities	Monday to Friday: 9 am to 4 pm
	Maintenance activities	24 hours per day, 7 days per week

Figure 1: Indicative site arrangement

2.2 Surrounding Areas and Receiving Environments

Development and operation of the Hillview Quarry is proposed in a rural area, south of Booral NSW. Landscape to the west of the site is heavily vegetated bushland, while areas to the south, east and north support farming and agricultural activities. Isolated residences are found in both the bushland and agricultural areas.

Noise environments to the north, west and south of the site are expected to be largely dominated by environmental sound and noise from existing agricultural development. Noise levels are expected to be relatively low in these parts of the study area.

Bucketts Way is an arterial road which transects the study area. This roadway is the primary transportation corridor linking the towns of Booral, Stroud, and Gloucester to the Pacific Motorway, and carries significant traffic. This roadway is a significant feature of the existing acoustic environment, particularly at receivers close, or with direct frontage to, the road corridor.

On this basis, sensitive receivers adjacent to the Hillview Quarry site may be considered in terms of:

1. those receivers in more isolated rural environments that are not exposed to existing road traffic noise from ucketts Way; or
2. receivers affected by noise from existing road traffic on the Bucketts Way.

Receivers close to Bucketts Way may be further classified as:

- receivers potentially affected by proposed operations at the Hillview Quarry; and
- receivers potentially affected by road noise associated with heavy vehicle movements that would be generated by the Quarry.

Further consideration of each of these receiver groups is provided below.

2.2.1 Sensitive Receivers – Adjacent to the Hillview Quarry

Potentially sensitive noise receivers nearest to the project site are identified in **Table 2** and **Figure 2**. All identified receivers are of the residential type. Other sensitive receivers such as schools, childcare centres and places of worship were not identified in the study area. Assessment of the receiver catchment type (i.e., isolated rural receiver vs those affected by existing noise from Bucketts Way) is also provided.

2.2.2 Sensitive Receivers – Adjacent to Proposal Haulage Route

Table 3 and **Figure 3** indicates potentially noise sensitive receivers adjacent to the proposed haulage route for heavy vehicles transporting quarry products from the site. This haulage route follows Bucketts Way south, joining the Pacific Motorway at Twelve Mile Creek. The analysis seeks to identify all receivers within 600 m of the road corridor, in accordance with guidance presented in Section 3.4 of the NSW Road Noise Policy.

146 potentially sensitive noise receivers were identified within the study area. Receivers were initially located via query of the Geocoded National Address File (GNAF) dataset, with receiver points subject to desktop review against NSW Spatial Information Exchange aerial imagery to ensure digitised points were indicative of dwelling locations.

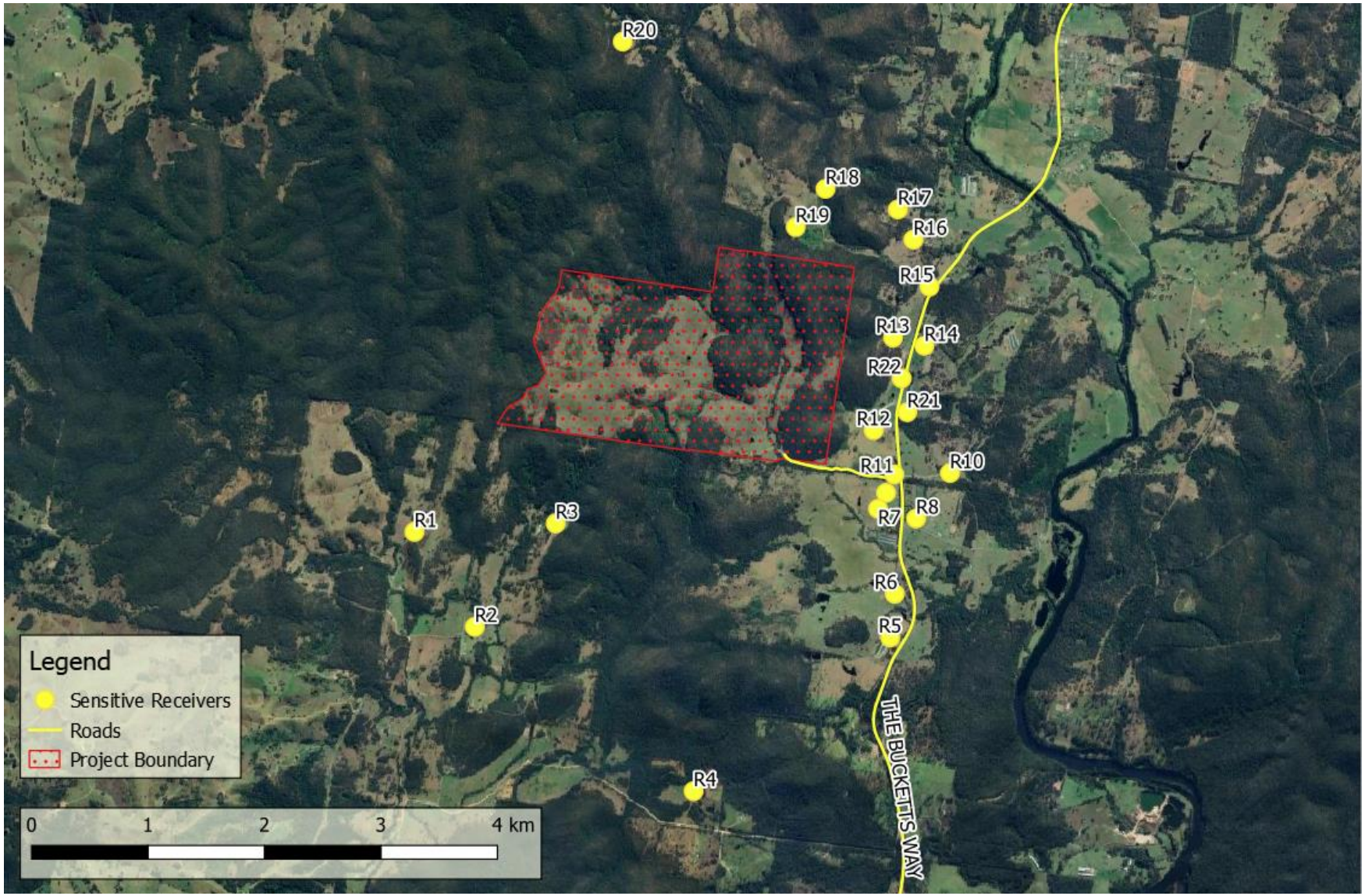

Figure 2: Identified noise sensitive receivers and their positions relative to the Hillview Quarry site

Table 2: Nearest noise sensitive receivers – Hillview Quarry project site

Receiver ID	Street Address	Receiver Catchment
R1	635 Carlton Road	Isolated Rural
R2	58 Julia Road	Isolated Rural
R3	190 Julia Road	Isolated Rural
R4	180 Gunns Gully Road	Isolated Rural
R5	1803 Bucketts Way	The Bucketts Way
R6	28 Blueberry Ln	The Bucketts Way
R7	1895 Bucketts Way	The Bucketts Way
R8	13 Lemon Grove Road	The Bucketts Way
R9	1927 Bucketts Way	The Bucketts Way
R10	1950 Bucketts Way	The Bucketts Way
R11	1953 Bucketts Way	The Bucketts Way
R12	2035 Bucketts Way	The Bucketts Way
R13	2069 Bucketts Way	The Bucketts Way
R14	6 Isaacs Road	The Bucketts Way
R15	2117 Bucketts Way	The Bucketts Way
R16	35 Booral-washpool Road	The Bucketts Way
R17	59 Booral-washpool Road	The Bucketts Way
R18	29A Booral-washpool Road	Isolated Rural
R19	29B Booral-washpool Road	Isolated Rural
R20	400 Washpool Creek Road	Isolated Rural
R21	2009 Bucketts Way	The Bucketts Way
R22	Bucketts Way	The Bucketts Way

Table 3: Noise sensitive receivers – Haulage Route (Bucketts Way, Receiver Catchment)

Receiver ID	Street Address	Suburb
R5	1803 Bucketts Way	Booral
R6	28 Blueberry Lane	Booral
R7	1895 Bucketts Way	Booral
R8	13 Lemon Grove Road	Booral
R9	1927 Bucketts Way	Booral
R10	1950 Bucketts Way	Booral
R11	1953 Bucketts Way	Booral
R23	571a Bucketts Way	Limeburners Creek
R24	7 Twelve Mile Creek Road	Twelve Mile Creek
R25	8 Shetland Drive	Limeburners Creek
R26	12 Shetland Drive	Limeburners Creek
R27	74 Old Coach Road	Limeburners Creek
R28	Shetland Drive	Limeburners Creek
R29	6 Shetland Drive	Limeburners Creek
R30	10 Shetland Drive	Limeburners Creek
R31	4 Shetland Drive	Limeburners Creek
R32	1644 Bucketts Way	Allworth
R33	14 Shetland Drive	Limeburners Creek
R34	1712 Bucketts Way	Booral
R35	37 Old Coach Road	Limeburners Creek
R36	Bucketts Way	Limeburners Creek
R37	49 Old Coach Road	Limeburners Creek
R38	59 Old Coach Road	Limeburners Creek
R39	57 Old Coach Road	Limeburners Creek
R40	63 Old Coach Road	Limeburners Creek
R41	67 Old Coach Road	Limeburners Creek
R42	69 Old Coach Road	Limeburners Creek
R43	71 Old Coach Road	Limeburners Creek
R44	64 Old Coach Road	Limeburners Creek
R45	62 Old Coach Road	Limeburners Creek
R46	60 Old Coach Road	Limeburners Creek
R47	58 Old Coach Road	Limeburners Creek
R48	56 Old Coach Road	Limeburners Creek
R49	54 Old Coach Road	Limeburners Creek
R50	52 Old Coach Road	Limeburners Creek

R51	50 Old Coach Road	Limeburners Creek
R52	48 Old Coach Road	Limeburners Creek
R53	41 Old Coach Road	Limeburners Creek
R54	43 Old Coach Road	Limeburners Creek
R55	38 Old Coach Road	Limeburners Creek
R56	36 Old Coach Road	Limeburners Creek
R57	34 Old Coach Road	Limeburners Creek
R58	32 Old Coach Road	Limeburners Creek
R59	30 Old Coach Road	Limeburners Creek
R60	28 Old Coach Road	Limeburners Creek
R61	26 Old Coach Road	Limeburners Creek
R62	24 Old Coach Road	Limeburners Creek
R63	22 Old Coach Road	Limeburners Creek
R64	20 Old Coach Road	Limeburners Creek
R65	Old Coach Road	Limeburners Creek
R66	61 Old Coach Road	Limeburners Creek
R67	55A Old Coach Road	Limeburners Creek
R68	55 Old Coach Road	Limeburners Creek
R69	51 Old Coach Road	Limeburners Creek
R70	42A Old Coach Road	Limeburners Creek
R71	46 Old Coach Road	Limeburners Creek
R72	47 Old Coach Road	Limeburners Creek
R73	45 Old Coach Road	Limeburners Creek
R74	44 Old Coach Road	Limeburners Creek
R75	53 Old Coach Road	Limeburners Creek
R76	Bucketts Way	Twelve Mile Creek
R77	40 Old Coach Road	Limeburners Creek
R78	42 Old Coach Road	Limeburners Creek
R79	38 Allworth Road	Allworth
R80	27 Baldy Knob Road	Limeburners Creek
R81	28 Baldy Knob Road	Limeburners Creek
R82	15 Allworth Road	Allworth
R83	15 Captain Hills Creek Road	Limeburners Creek
R84	1284 Bucketts Way	Allworth
R85	67 Maytoms Lane	Booral
R86	Bucketts Way	Allworth
R87	1793 Bucketts Way	Booral

R88	1912 Bucketts Way	Booral
R89	1741 Bucketts Way	Booral
R90	2 Shetland Drive	Limeburners Creek
R91	12 Limeburners Creek Road	Limeburners Creek
R92	10 Limeburners Creek Road	Limeburners Creek
R93	69 Bucketts Way	Twelve Mile Creek
R94	159 Bucketts Way	Twelve Mile Creek
R95	85 Bucketts Way	Twelve Mile Creek
R96	47 Bucketts Way	Twelve Mile Creek
R97	39 Bucketts Way	Twelve Mile Creek
R98	113 Bucketts Way	Twelve Mile Creek
R99	125 Bucketts Way	Twelve Mile Creek
R100	133 Bucketts Way	Twelve Mile Creek
R101	151 Bucketts Way	Twelve Mile Creek
R102	87 Bucketts Way	Twelve Mile Creek
R103	42 Bucketts Way	Twelve Mile Creek
R104	66 Old Coach Road	Limeburners Creek
R105	72 Old Coach Road	Limeburners Creek
R106	25 Forest Glen Road	Limeburners Creek
R107	51 Forest Glen Road	Limeburners Creek
R108	59 Forest Glen Road	Limeburners Creek
R109	52 Forest Glen Road	Limeburners Creek
R110	1511 Bucketts Way	
R111	1017 The Bucketts Way	Limeburners Creek
R112	1157 Bucketts Way	Limeburners Creek
R113	1479 Bucketts Way	Allworth
R114	1281 Bucketts Way	Allworth
R115	39 Forest Glen Road	Limeburners Creek
R116	780 Bucketts Way	Limeburners Creek
R117	1341 Bucketts Way	Allworth
R118	1569 Bucketts Way	Allworth
R119	714 Bucketts Way	Limeburners Creek
R120	841 Bucketts Way	Limeburners Creek
R121	1075 Bucketts Way	Limeburners Creek
R122	1195 Bucketts Way	Limeburners Creek
R123	18 Ironstone Drive	Allworth
R124	73 Ironstone Drive	Allworth

R125	32 Deep Creek Road	Limeburners Creek
R126	796 Bucketts Way	Limeburners Creek
R127	33 Forest Glen Road	Limeburners Creek
R128	31 Lemon Grove Road	Booral
R129	29 Lemon Grove Road	Booral
R130	739 Bucketts Way	Limeburners Creek
R131	1365 Bucketts Way	Allworth
R132	749 Bucketts Way	Limeburners Creek
R133	574 Bucketts Way	Limeburners Creek
R134	631 Bucketts Way	Limeburners Creek
R135	571 Bucketts Way	Limeburners Creek
R136	691 Bucketts Way	Limeburners Creek
R137	721 Bucketts Way	Limeburners Creek
R138	1741 Bucketts Way	Booral
R139	19 Shetland Drive	Limeburners Creek
R140	16 Shetland Drive	Limeburners Creek
R141	20 Shetland Drive	Limeburners Creek
R142	1277 Bucketts Way	Limeburners Creek
R143	1225 Bucketts Way	Limeburners Creek
R144	696 Bucketts Way	Limeburners Creek
R145	571A Bucketts Way	Limeburners Creek
R146	1013 Bucketts Way	Limeburners Creek

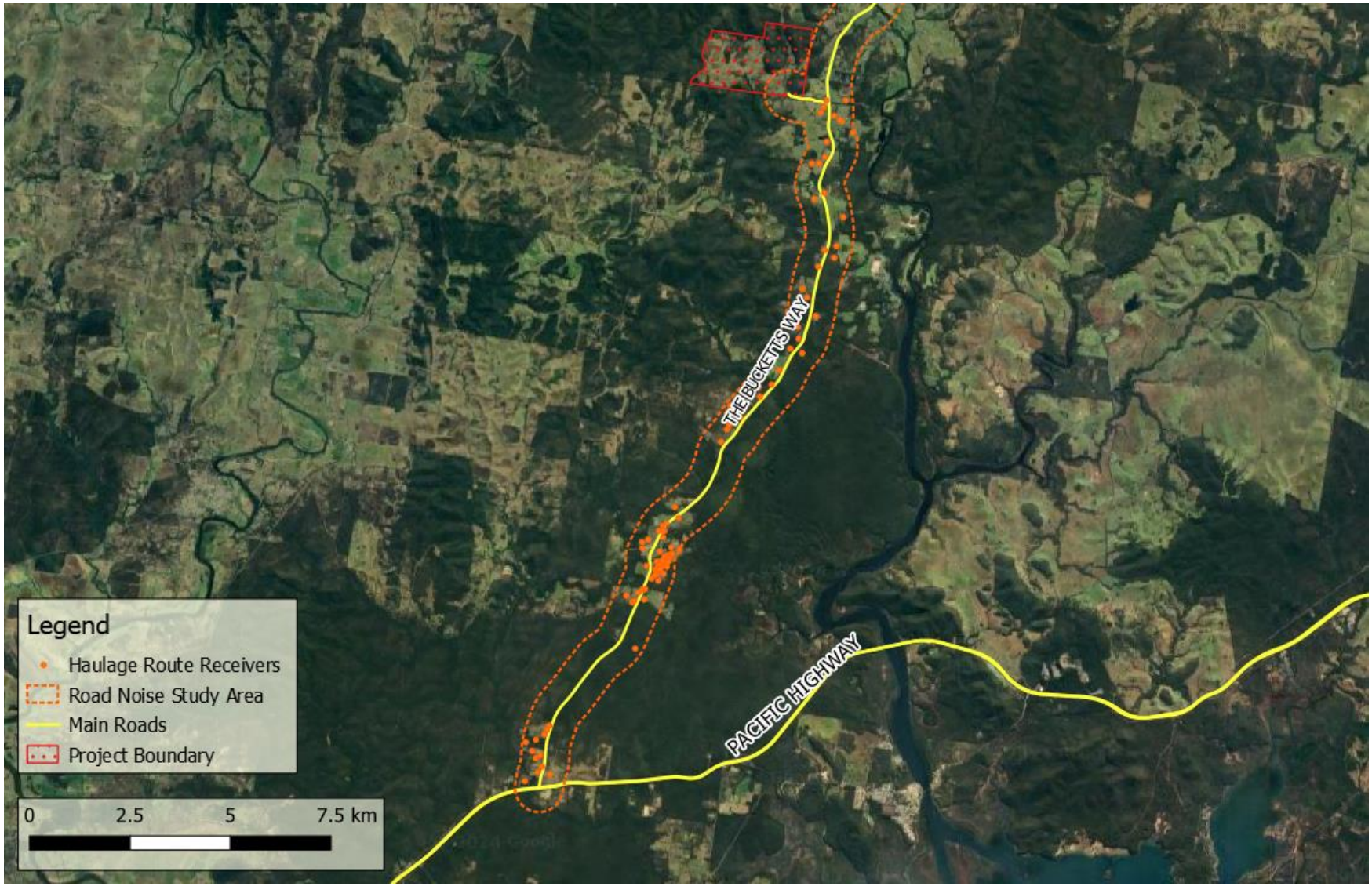

Figure 3: Identified noise sensitive receivers adjacent to proposed principal haulage route

2.3 Assessment Objectives

The aim of this report is to assess potential noise impacts at receivers adjacent to the project site in accordance with requirements established in the project SEARs. To that end, the following potential noise and vibration impact concerns have been considered as part of this assessment.

2.3.1 Construction Noise

Construction noise assessment concerns the noise impacts associated with initial construction or preparation activities at the site. This assessment is conducted in accordance with the NSW EPA's *Interim Construction Noise Guideline* (ICNG) in accordance with the project SEARs.

2.3.2 Operational Noise

The operational noise assessment considers impacts associated with proposed operations during each stage of the quarry development. This assessment is conducted in accordance with the NSW EPA's *Noise Policy for Industry* (NPfI), as directed by the SEARs, and considers operational parameters as indicated by the site.

2.3.3 Sleep Disturbance

Sleep disturbance assessment concerns the potential for noise from the site operations to impact sleep at nearby residences during the night period and is assessed in accordance with guidance presented in the NPfI.

2.3.4 Road Noise

Road noise assessment concerns noise generated at receivers due to increased traffic volumes associated with the development. This assessment is conducted in accordance with the NSW *Road Noise Policy* (RNP).

2.3.5 Blast Overpressure and Ground Vibration

Blast overpressure and ground vibration concerns the potential for noise and vibration associated with blasting from site operations to impact residences nearby. This assessment is conducted in accordance with Australian and New Zealand Environment Council (ANZEC 1990) *Technical basis for guidelines to minimise annoyance due to blasting overpressure and vibration* along with Australian Standard AS2187.2-2006.

3. References

The analyses in this report were based on the following Australian Standards, codes and/or design references:

- NSW Environment Protection Authority, NSW Noise Policy for Industry, 2017
- NSW Environment Protection Authority, Interim Construction Noise Guideline, 2008
- NSW Department of Environment, Climate Change & Water, NSW Road Noise Policy, 2011
- Australian and New Zealand Environment Council (ANZEC), Technical basis for guidelines to minimise annoyance due to blasting overpressure and vibration, 1990
- Australian Standard. AS2187.2 Explosives – Storage and Use Part 2: Use of Explosives, 2006
- Australian Standard. AS2436 Guide to noise and vibration control on construction, demolition, and maintenance sites, 2010
- VGT Environmental Compliance Solutions and Laboratories, Hillview Quarry SEARs – Site Location 1195_HV_SEARs_Q001_V0_F1, 23 December 2022
- VGT Environmental Compliance Solutions and Laboratories, Hillview Quarry SEARs – Existing Site 1195_HV_SEARs_Q02_V0_F2, 23 December 2022
- VGT Environmental Compliance Solutions and Laboratories, Hillview Quarry SEARs – Stage 1 1195_HV_SEARs_Q03_V0_F3, 23 December 2022
- VGT Environmental Compliance Solutions and Laboratories, Hillview Quarry SEARs – Stage 2 1195_HV_SEARs_Q04_V0_F4, 23 December 2022
- VGT Environmental Compliance Solutions and Laboratories, Hillview Quarry SEARs – Stage 3 1195_HV_SEARs_Q05_V0_F5, 23 December 2022
- VGT Environmental Compliance Solutions and Laboratories, Hillview Quarry SEARs – Stage 4 1195_HV_SEARs_Q06_V0_F6, 23 December 2022
- VGT Environmental Compliance Solutions and Laboratories, Hillview Quarry SEARs – Stage 5 1195_HV_SEARs_Q07_V0_F7, 23 December 2022
- Traffic & Parking Impact Assessment of Proposed Hard Rock Quarry at 67 Maytoms Lane, Booral, McLaren Traffic Engineering & Road Safety Consultants, 220764.01DC, revision D, dated 14 June 2023

4. Existing Environment

4.1 Noise Environment

Background noise monitoring was conducted between 13 January and 1 February 2023 to assist with characterising the existing noise environment. Monitoring was carried out at two (2) locations:

- **Location L1** was considered representative of the noise environment that may be expected at receivers located along Bucketts Way. Bucketts way is an arterial road, and it is expected that receivers in the vicinity of this corridor would be exposed to high levels of noise due to existing road traffic;
- **Location L2** was considered representative of more isolated receivers adjacent to the project site. This location was largely free of road traffic noise impacts, and indicative of ambient rural noise environments.

Monitoring locations are indicated in **Figure 4**, and details of the monitoring equipment that were used are included in **Table 4**. Response of all monitoring instrumentation was checked with a field calibrator before and after the measurement campaign; no calibration drift was observed. Copies of laboratory calibration certificates for Sound Level Meters (SLM) and field calibration equipment are provided in **Appendix A**.

Figure 4: Background noise monitoring location

Table 4: Monitoring Equipment

Item	Sound Level Meter		Field Calibrator
Make / Model	Svantek 971 (L1)	Svantek 958A (L2)	Svantek SV35A
Serial No.	77606	97995	90218
Laboratory Calibration	12/1/2023	5/9/2022	5/7/2022

Resulting 15-minute measurement data was analysed in accordance with the procedure specified in Fact Sheet A of the NPfI. The logger data was screened for the effects of adverse weather conditions using weather data collected from an on-site weather station operated by the proponent. Assessment of measurement data for both monitoring locations is provided below.

4.1.1 Background Monitoring Results: Location L1

Preliminary analysis of 15-minute monitoring data indicated unexpected trends in evaluated acoustic background level (ABLs), with ABLs (and resulting rating background noise level (RBLs)) during the night period observed at levels higher than the corresponding day-period results. Seasonal effects of insect noise were suspected, and analysis presented in **Figure 5** and **Figure 6** validates this suspicion:

- large differences between full spectrum and low-pass (<2.5 kHz) $L_{A90,15minute}$ values during the night period indicate significant influence of insect noise; and
- full spectrum and low-pass $L_{A90,15minute}$ results during the day period follow a similar trend, indicating background levels at these times are controlled by other sources of ambient noise which are less likely to be an expression of seasonal insect noise.

Monitoring data were consequently re-analysed via a low pass (<2.5 kHz) filter to exclude the seasonal effect of insect noise on evaluation of RBLs.

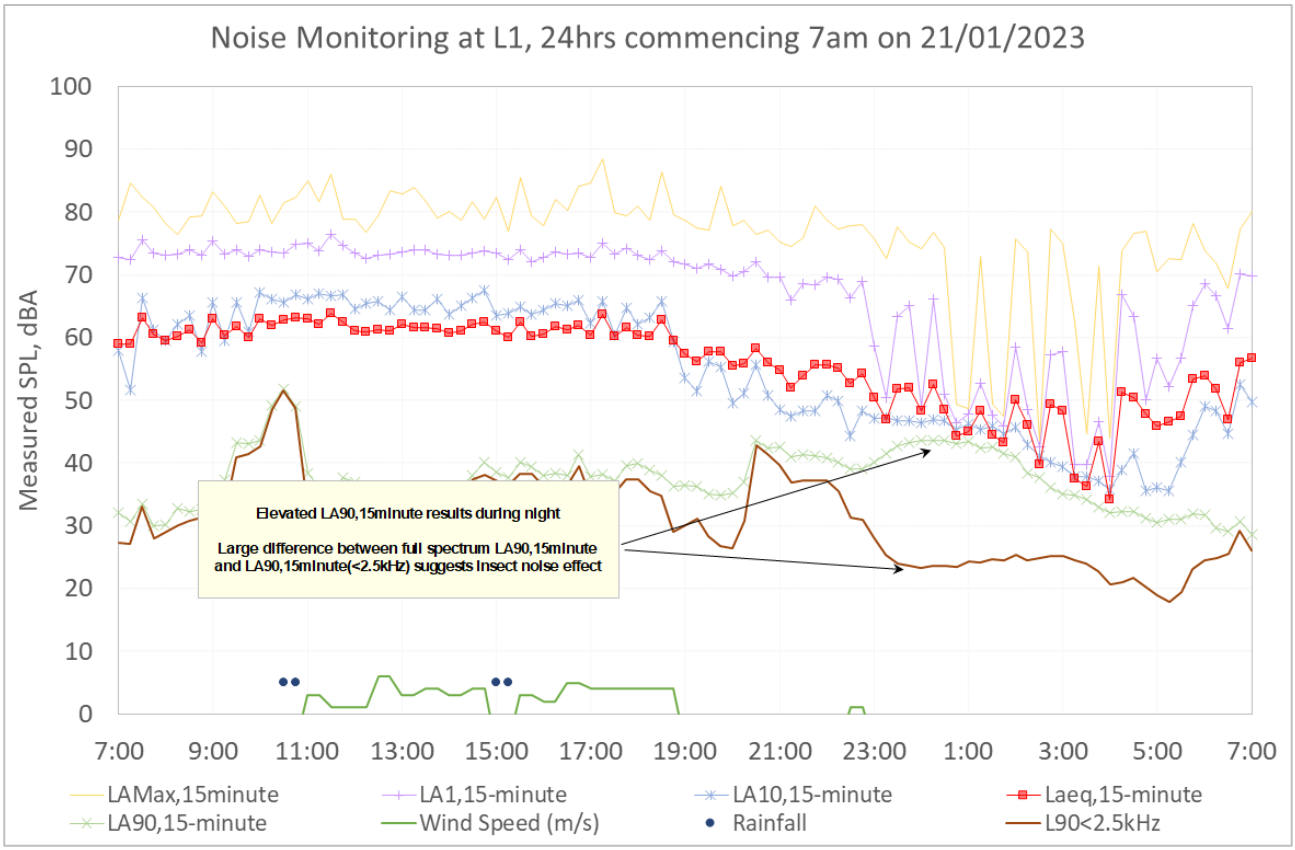

Figure 5: Analysis indicating seasonal insect noise effects on night period background levels

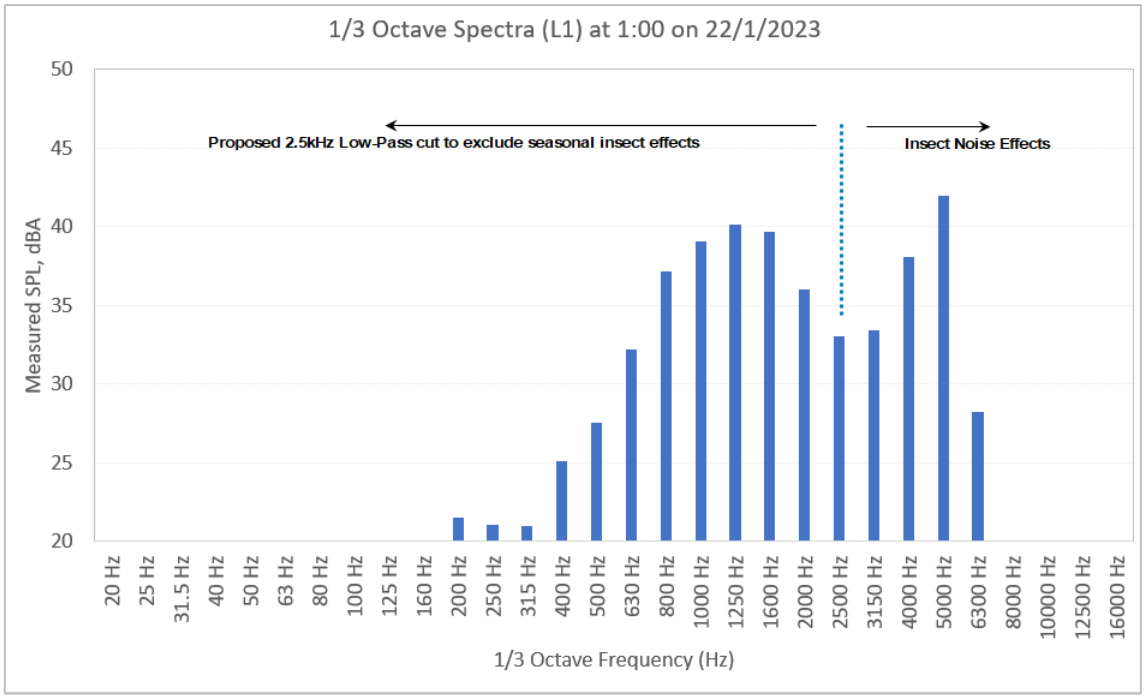

Figure 6: Bimodal distribution of 1/3 octave spectra indicating insect noise

Table 5 provides assessment of ambient noise levels for each day of the monitoring campaign. Analysis of ABLs – utilising the abovementioned 2.5kHz low-pass filter – and associated RBLs are shown in Table 6. The day, evening and night periods are determined in accordance with guidance provided in Section 2.4 of the NPfI. Charts of the logging period are included in Appendix B.

Table 5: Logged L_{Aeq} results, Location L1 adjacent to Bucketts Way

Date	Daily $L_{Aeq,period}$ levels		
	Day	Evening	Night
21/1/2023	61	57	51
22/1/2023	63	57	58
23/1/2023	62	58	56
24/1/2023	61	n/a[1]	56
25/1/2023	62	60	54
26/1/2023	60	56	55
27/1/2023	62	57	52
28/1/2023	61	57	52
29/1/2023	61	56	56
30/1/2023	62	58	56
31/1/2023	61	57	56
Overall measured $L_{Aeq,period}$ levels	62	58	55

Note 1: Insufficient data available to determine levels in this period due to weather effects

Table 6: Location L1 – Logged ABL and RBL results

Date	Daily ABLs (<2.5 kHz Low Pass)		
	Day	Evening	Night
21/1/2023	29	28	20
22/1/2023	28	31	20
23/1/2023	28	29	26
24/1/2023	30	n/a[1]	27
25/1/2023	28	28	24
26/1/2023	26	29	21
27/1/2023	30	28	19
28/1/2023	29	28	21
29/1/2023	29	36	18
30/1/2023	31	30	26
31/1/2023	31	28	25
Overall measured RBLs	29	29	21
Minimum RBLs as per NPfI	35	30	30
RBLs adopted for assessment	35	30	30

Note 1: Insufficient data available to determine levels in this period due to weather effects

4.1.2 Background Monitoring Results: Location L2

Table 7 provides assessment of ambient noise levels for each day of the monitoring campaign. Analysis of ABLs and RBLs are shown in **Table 8**. The day, evening and night periods are determined in accordance with guidance provided in Section 2.4 of the NPfI. Charts of the logging period are included in **Appendix B.**

Table 7: Logged L_{Aeq} results, Location L2, isolated rural receivers

Date	Daily $L_{Aeq,period}$ levels		
	Day	Evening	Night
13/1/2023	n/a[1]	52	49
14/1/2023	45	49	49
15/1/2023	45	47	47
16/1/2023	44	47	46
17/1/2023	43	46	64
18/1/2023	46	52	47
19/1/2023	44	n/a[1]	44
20/1/2023	45	n/a[1]	n/a[1]
21/1/2023	45	55	51
22/1/2023	55	51	48
Overall measured $L_{Aeq,period}$ levels	**48**	**49**	54

Note 1: invalid data due to weather effects

Table 8: Location L2 – Logged ABL and RBL results

Date	Daily ABLs (<2.5 kHz Low Pass)		
	Day	Evening	Night
13/1/2023	n/a[1]	31	25
14/1/2023	28	30	27
15/1/2023	27	30	25
16/1/2023	28	28	24
17/1/2023	27	27	24
18/1/2023	28	29	23
19/1/2023	25	n/a[1]	26
20/1/2023	28	n/a[1]	n/a[1]
21/1/2023	26	30	25
22/1/2023	39	40	34
Overall measured RBLs	28	30	25
Minimum RBLs as per NPfI	35	30	30
RBLs adopted for assessment	35	30	30

Note 1: Insufficient data available to determine levels in this period due to weather effects

4.2 Prevailing Weather

Fact Sheet D of the NPfI provides two (2) options for accounting for noise-enhancing weather conditions. These are:

- adopt the noise-enhancing meteorological conditions for all assessment periods without assessing how often these conditions occur; and
- determine the significance (frequency) of noise-enhancing weather conditions.

This assessment adopts the approach of applying the noise-enhancing weather conditions regardless of their frequency. As such, no analysis of existing weather conditions was conducted.

5. Assessment Criteria

5.1 Operational Noise

5.1.1 Project amenity noise level

All receivers identified in the assessment were considered Rural, and so Rural Residential criteria (as per Table 2.2 of the NPfI) were adopted for all receivers. Since the methodology of this assessment models $L_{Aeq,15min}$ noise levels, the procedure specified in Section 2.2 of the NPfI is also adopted to transform the amenity criteria from $L_{Aeq,period}$ values to $L_{Aeq,15min}$ values. The amenity levels and associated criteria for monitoring locations L1 and L2 are presented in **Table 9** and **Table 10** respectively.

Table 9: Location L1 – Project amenity noise levels

	Day	Evening	Night
Rural residential recommended amenity level ($L_{Aeq,period}$)	50	45	40
Project amenity noise level ($L_{Aeq,period\ (traffic)}$)[1]	47	43	40
Project amenity noise level ($L_{Aeq,15min}$ equivalent)	50	46	43

Note 1: S2.4.1 of the NPfI, the high traffic project amenity noise level applies in each assessment period. The existing traffic noise level is 10 dB or more above the recommended amenity noise level for the area.

Table 10: Location L2 – Project amenity noise levels

	Day	Evening	Night
Rural residential recommended amenity level ($L_{Aeq,period}$)	50	45	40
Project amenity noise level ($L_{Aeq,period}$)	45	40	35
Project amenity noise level ($L_{Aeq,15min}$ equivalent)	48	43	38

5.1.2 Project intrusiveness noise level

The project intrusiveness levels are derived from measured RBLs from the site. However, the NPfI (section 2.3 and table 2.1) specifies that minimum assumed RBLs apply, and where measured RBLs are lower than these values, the assessed RBL and associated intrusiveness criteria should be based on the minimum assumed RBLs instead. Analysis of monitoring data indicates that this is the case for both assessment locations; hence, the minimum RBL values established by the NPfI may be adopted at both assessment locations.

Table 11: Project intrusiveness noise levels (L1 – adjacent to Bucketts Way)

	Day	Evening	Night
Measured RBL (dBA)	29	29	21
Minimum assumed RBL, as per NPfI (dBA)	35	30	30
RBL adopted for assessment purposes (dBA)	35	30	30
Project intrusiveness noise level (dBA)	40	35	35

Table 12: Project intrusiveness noise levels (L2 – isolated rural receivers)

	Day	Evening	Night
Measured RBL (dBA)	28	30	25
Minimum assumed RBL, as per NPfI (dBA)	35	30	30
RBL adopted for assessment purposes (dBA)	35	30	30
Project intrusiveness noise level (dBA)	40	35	35

5.1.3 Project Noise Trigger Level

Since both the project amenity noise levels and project intrusiveness noise levels will be assessed against 15-minute peak noise levels, the Project Noise Trigger Levels were adopted as the lowest value of the two.

Table 13: Project noise trigger level

	Day	Evening	Night
Project amenity noise level ($L_{Aeq,15min}$ equivalent)[1]	48	43	38
Project intrusiveness noise level (dBA)	40	35	35
Project noise trigger level ($L_{Aeq,15min}$ equivalent)	40	35	35

5.2 Cumulative Impacts

The assessment of cumulative impacts is taken into account by virtue of the extant industrial noise being considered in the derivation process of the project amenity noise level and adjustments where required, using the result of the ambient sound levels resultant from the site monitoring.
Cumulative road traffic noise is taken into account during the assessment by the comparison of the no-build and build options assessment as well as the relative increase criteria.

5.3 Construction Noise

The ICNG provides guidance on managing construction works to minimise noise. Equipment and site activities during construction are likely to be similar to those occurring during operation of the quarry. However, it's likely that equipment will be initially operating at (or close to) natural surface levels as the significant program of civil works that is required to implement the acoustic design features of the development (cutting of the access road slot, and establishment of processing pad at RL95 m) are carried out.

These construction activities represent much of Stages 1 and 2 of the quarry development and may take in the order of 2-years to construct but will deliver long-term benefits over the quarry's Life of Mine (LoM) as the design takes advantage of terrain features to minimise impacts of noise generating activities. **Table 14** summarises the NMLs relevant to the proposed development.

Table 14: Construction Noise Management Levels, $L_{Aeq,15\ minute}$.

Receiver Type	Construction Hours	Management Level ($L_{Aeq,\ (15\ min)}$)	
Residential Receivers	Monday to Friday: 7am to 6pm Saturday: 8am to 1pm	Noise Affected NML (RBL + 10 dB)	45 dB(A)
		Highly Noise Affected NML	75 dB(A)

Receiver Type	Construction Hours	Management Level ($L_{Aeq, (15\ min)}$)	
	Outside recommended standard hours	Noise Affected NML (RBL + 5 dB)	40 dB(A)

5.4 Road Noise

Section 2.2.2 of the RNP indicates that principal haulage routes are assessed using criteria for arterial/sub-arterial roads. Overall traffic noise levels and relative increase in noise levels are considered during the assessment. Road traffic noise assessment criteria relevant to the study area are outlined in **Table 15**.

Table 15: Road traffic noise assessment criteria for residential land uses

Road Category	Type of Project / Land Use	Assessment Criteria – dB(A)	
		Day 7am – 10pm	Night 10pm – 7am
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq,15hour}$ 60 (external)	$L_{Aeq,9hour}$ 55 (external)
Local roads	Existing residences affected by additional traffic on local roads	$L_{Aeq,1hour}$ 55 (external)	$L_{Aeq,1hour}$ 50 (external)

The proposal haulage of material from the Hillview Quarry site will be primarily via Bucketts Way south towards the Pacific Motorway. Bucketts Way is considered an existing arterial road, so the noise limits for arterial roads (and principal haulage routes) would apply to receivers adjacent to this corridor.

The Hillview Quarry is proposed to connect to the Bucketts Way via Maytoms Lane. This corridor is consistent with the description of a local road contained within the RNP. While traffic generated by the Hillview Quarry will be required to travel along this local road corridor, assessment presented in Figure 3 indicates that receivers bordering Maytoms Lane:

- are approximately equidistant from Maytoms Lane and Bucketts Way;
- are likely to be primarily affected by noise from road traffic on Bucketts Way, given that this corridor carries significantly more traffic (and at higher speeds) than Maytoms Lane.

While the Maytoms Lane corridor is consistent with the description of a local road, receivers adjacent to this corridor may be more appropriately defined as receivers adjacent to an arterial road. On this basis, noise criteria relevant to receivers adjacent to arterial roads are adopted for the assessment of road traffic noise impacts across the entire study area.

5.4.1 Relative Increase Criteria

Section 2.4 of the RNP establishes that, in addition to absolute road traffic noise assessment criteria, any increase in total traffic noise should also be considered. The relative increase criterion is determined as the existing traffic noise level plus 12 dBA. Residences experiencing increases in total traffic noise level above the relative increase criteria should be considered for mitigation.

Due to the large number of receivers adjacent to the haulage route direct measurement of existing noise levels was not practical. Determination of the relative increase criterion relies on a noise model of the road under current conditions. This criterion will be calculated for each receiver individually for comparison to modelled post-build noise levels.

5.5 Sleep disturbance

Sleep disturbance is assessed with reference to Section 2.5 of the NPfI. This document provides criteria for both $L_{Aeq,15minute}$ levels and L_{AFmax} levels, set at a standard level or referenced to the prevailing RBL (whichever is greater). The appropriate sleep disturbance criteria for the site are set out in **Table 16**.

Table 16: Sleep Disturbance Criteria, dBA

Item	Criterion $L_{Aeq,15min}$	Criterion L_{AFmax}
Night time RBL	30	
RBL plus margin for sleep disturbance threshold	$L_{Aeq,15minute}$ 35 (RBL +5dB)	L_{AFmax} 45 (RBL + 15dB)
Minimum sleep disturbance threshold	40	52
Applicable sleep disturbance criteria	40	52

5.6 Ground vibration and air-blast overpressure criteria

The NSW EPA recommends that impacts associated with blasting be assessed in accordance the Australian and New Zealand Environment Council (ANZEC 1990) *Technical basis for guidelines to minimise annoyance due to blasting overpressure and vibration*. The guideline establishes the following criteria to minimise annoyance associated with blasting:

- Air-blast Overpressure:
  - the recommended peak maximum level for air blast overpressure at sensitive receivers is 115 dB(Lin); and
  - the maximum air blast overpressure level should not exceed 115 dB(Lin) during more than 5% of blasts in any 12 month period, and should never exceed 120 dB(Lin);
- Ground Vibration:
  - the recommended maximum peak particle velocity (PPV) value of 5 mm/s; and
  - the maximum PPV should not exceed 5mm/s during more than 5% of blasts in any 12 month period, and should never exceed 10 mm/s; and
- Timing:
  - blasting should be restricted to the hours 9:00 to 17:00, Monday to Saturday; and
  - blasting should not take place on Sundays or public holidays.

These criteria represent thresholds for the assessment of potential impacts at residential receivers adjacent to the proposed development. Australian Standard AS2187.2-2006 provides outline methods for evaluating potential ground vibration and air blast overpressure impacts.

6. Modelling Inputs

6.1 Construction and Operational Noise

All plant projected to be used in the operational stages of quarry are not yet in operation and has been determined and confirmed by Coastwide Materials. As such, representative Sound Power Levels (SWLs) for significant noise generating plant are derived from published reference sources (eg DEFRA) or previous NIA and Advitech reference data.

The following section provides detailed discussion of noise sources at the site, including the number of plant per stage of development, sound power levels for each plant in octave bands, along with maps showing the indicative locations of all plant items.

6.1.1 Model Configuration

The modelling process and settings for operational noise are summarised in **Table 17**.

Table 17: Noise modelling procedure – construction and operational noise

Item	Setting
Modelling software	iNoise v2023
Noise propagation model	ISO 9613
Adopted weather conditions	Noise enhancing as per Fact Sheet D of the NPfI Day Period: Source-to-receiver winds of 3 m/s (D-class stability) Evening and Night Period: Source-to-receiver winds of 2 m/s (F-class stability)
Terrain data	Site: 2 m contour interval extracted from client supplied digital elevation models (DEM) Study Area: 10 m contour interval (https://elevation.fsdf.org.au/)
Site Configuration	DEM and noise source arrangements for each stage of Quarry development as outlined below
Receiver height	1.5 m
Ground absorption	0.8 (adopted due to mixed but predominantly vegetated land use)

Client supplied information relating to staging of the quarry development was reviewed and used to develop representative noise models of the site over the course of the project life. These stages are summarised in Section 2.1 and discussed in detail below.

A key acoustic design considerations of the quarry development include:

1. design of and construction of the access road extension from Maytoms Lane within the project site;
2. the location and arrangement of the main processing area;
3. the proposed extraction design of the main quarry area.

These are intentional design features which are intended to take advantage of natural terrain features to minimise noise impacts over the life of the project. Implementation of these design features does require significant initial effort (including major civil works associated with the excavation of an access road slot through and existing ridge). These works are likely to require a protracted construction program (up to 2 years) but will deliver a long-term benefit to noise management at the site.

Table 18: Summary of quarry staging

Stage	Description of Activities	Proposed Operating Hours	Anticipated Timing	Assessment Criteria
Stage 1	Peg out and clear vegetation for site access route around northern face of existing spur. Clear and excavate area at RL95 m (up to 20 m below natural surface); this area will initially host infrastructure required to construct access road slot). Construction of access road slot commences via drill, blast and crushing behind existing ridge.	Monday to Friday 7am to 6pm Saturday 8am to 1pm (Blasting restricted to 9am to 4pm Monday to Friday)	Years 0 to 2	Construction
Stage 2	Clear Maytoms Lane of vegetation, expand road envelope and in preparation for intersection works at Bucketts Way Expand footprint of RL95 m pad to accommodate initial site facilities (offices, weighbridge and maintenance shed). Construct these facilities. Construction of access road slot progresses in SE direction.		Years 0 to 2	Construction
Stage 3	Following breakthrough of access road slot to SE side of ridge, push cut material out as fill for completion of access road to Maytoms Lane Carry out road upgrades to intersection of Maytoms Lane and Bucketts Way Revegetate benches in access road cutting Complete cut and fill of RL95 m processing pad to its full design extent Install primary (jaw) crusher in slot at NW extent of RL95 m processing pad. Construct permanent conveyors, screens, and downstream crushing plant. (This equipment is not operational at this stage, but installed in preparation for next stage) Commence construction of northern haul road from RL95 m processing pad to western extent of proposed pit at RL158 m)		Years 0 to 2	Construction

Stage	Description of Activities	Proposed Operating Hours	Anticipated Timing	Assessment Criteria
Stage 4	Construct RL105 m Run of Mine (RoM) pad Processing pad operation switches from mobile to fixed crushing and processing infrastructure upon completion of RoM pad.		Years 0 to 2	Operational
Stage 5	Extraction commences via northern haul road at top of the hill (RL206 m). This represents the most exposed extraction location. A working face will be created using box-cut blasts, with all quarry faces oriented in a NW direction allowing equipment to drop below natural ground level minimising noise emissions to the SE. This stage will see extraction of NW faces of the box-cut down to a quarry floor of RL158 m	Extraction and Processing: ▪ Monday to Saturday 6am to 10pm Internal product transfers to stockpiles: ▪ Monday to Saturday 6am to midnight Haulage of material from site: ▪ Monday to Saturday 7am to 6pm Blasting activities: ▪ Monday to Friday 9am to 4pm Maintenance activities: ▪ 24 hours per day, 7 days per week	Years 2 to 10	Operational
Stage 6	Extraction continues from RL158m down to RL126 m and in a SE direction (as required). Most of the blast, load and haul will take place behind the working face (i.e. minimising exposure to receivers to the SE). Final landform (benches) cut into western and NW faces of quarry and progressively rehabilitated as quarry floor drops.		Years 10 to 20	Operational
Stage 7	Extraction continues from RL126 m down to RL95 m (meeting the processing pad) and in a SE direction (as required). Progressive rehabilitation of benches and creation of final landform (self-draining void).		Years 20 to 30	Operational

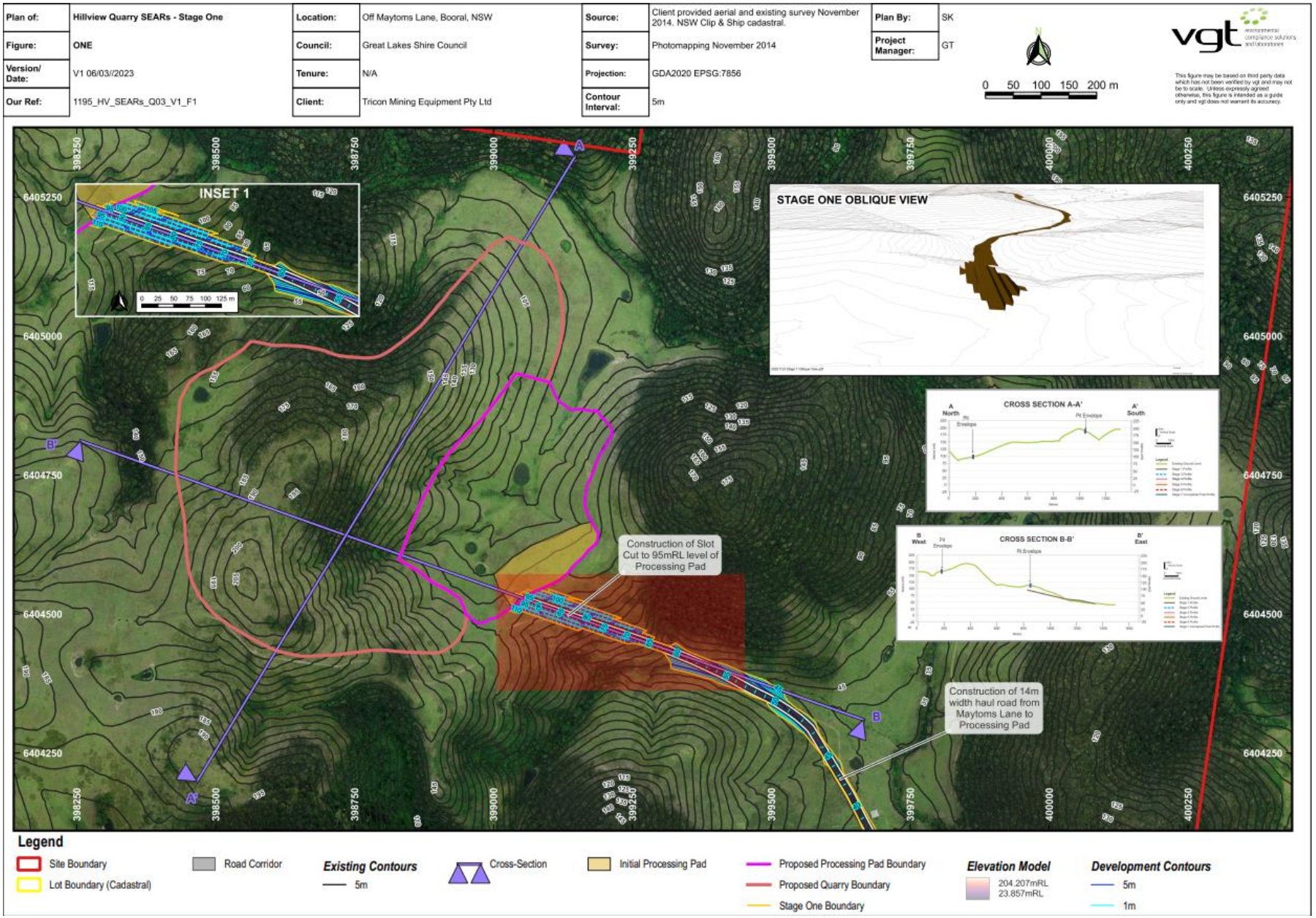

Figure 7: Indicative development activities: Stage 1

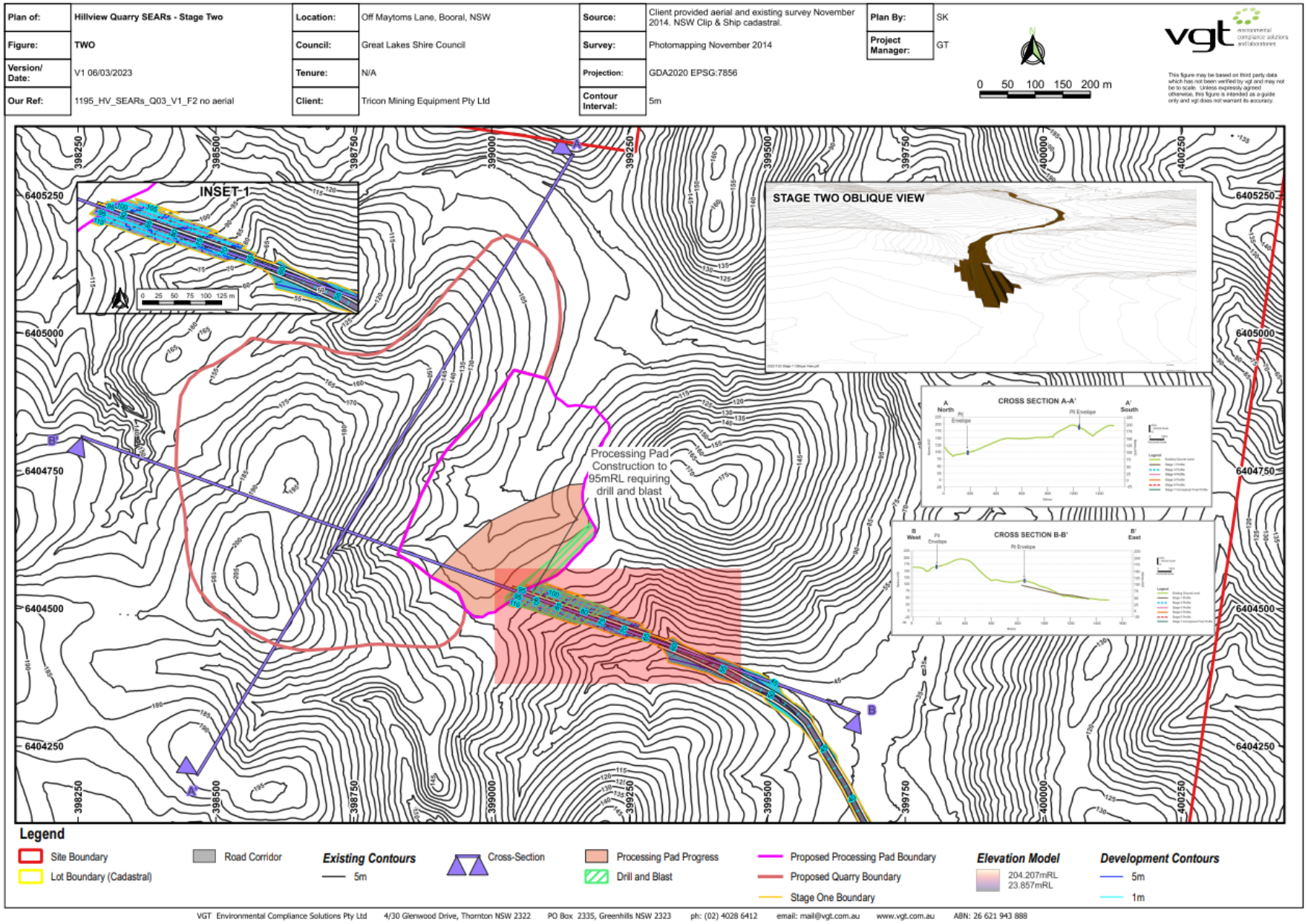

Figure 8: Indicative development activities: Stage 2

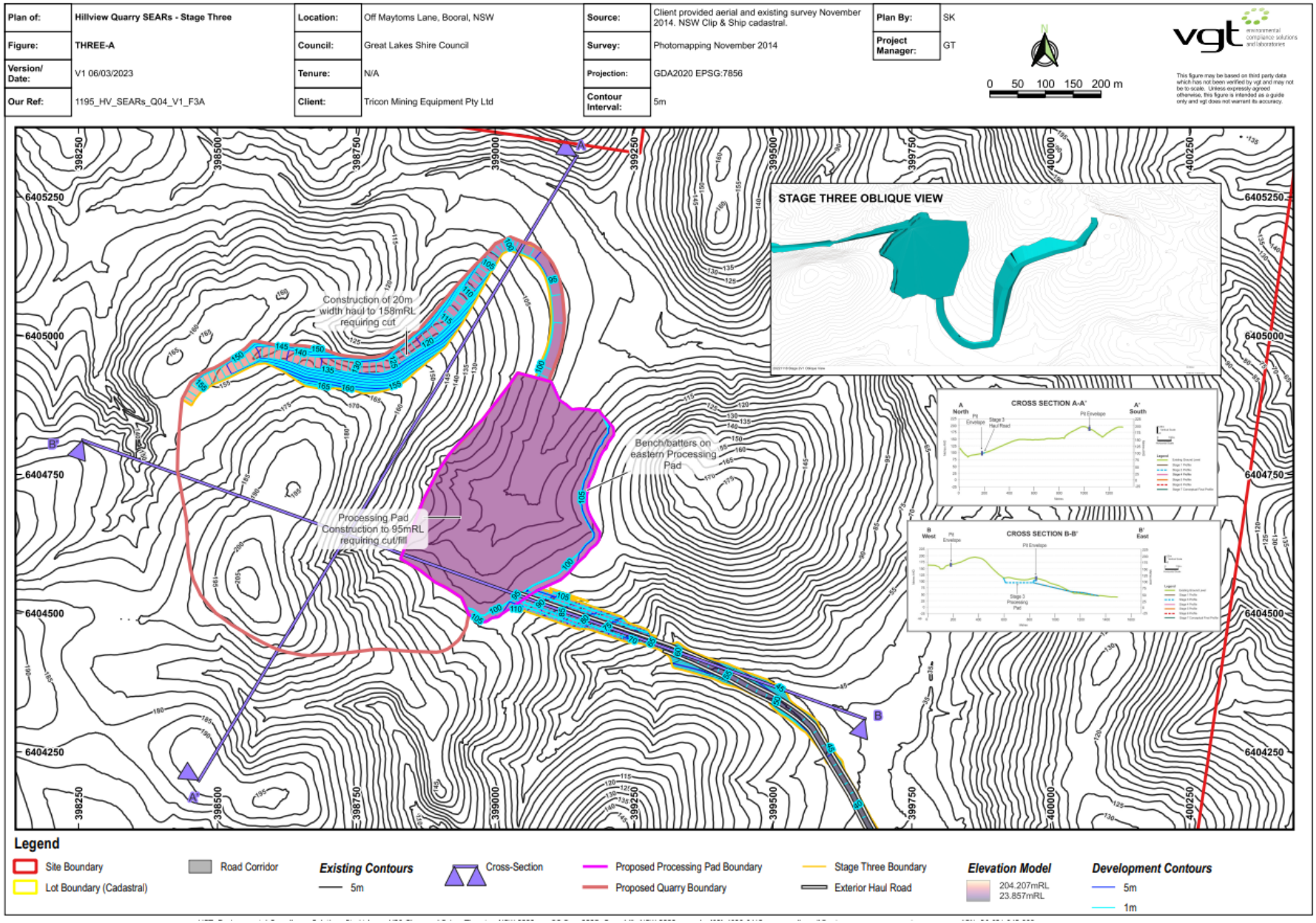

Figure 9: Indicative development activities: Stage 3

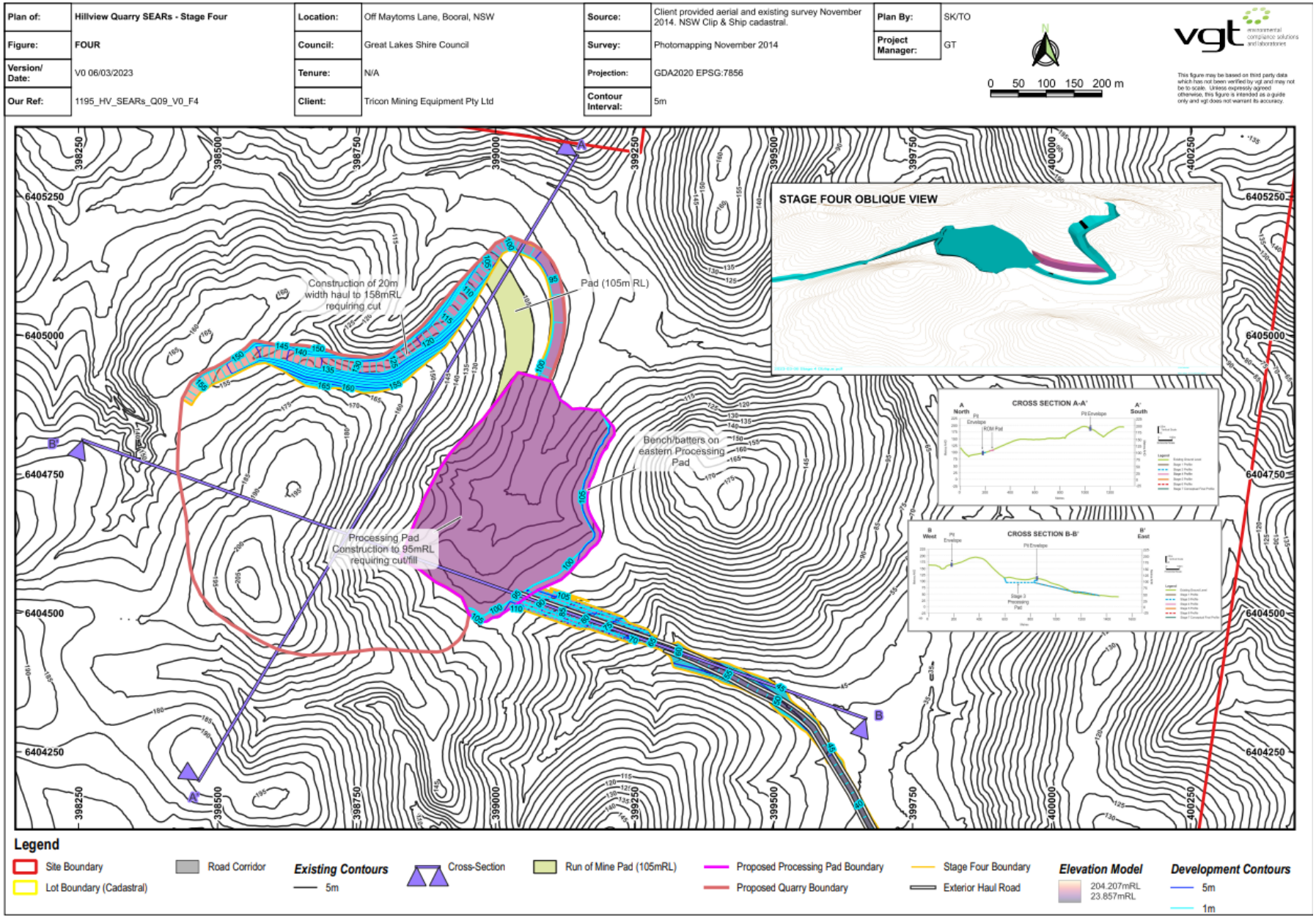

Figure 10: Indicative development activities: Stage 4

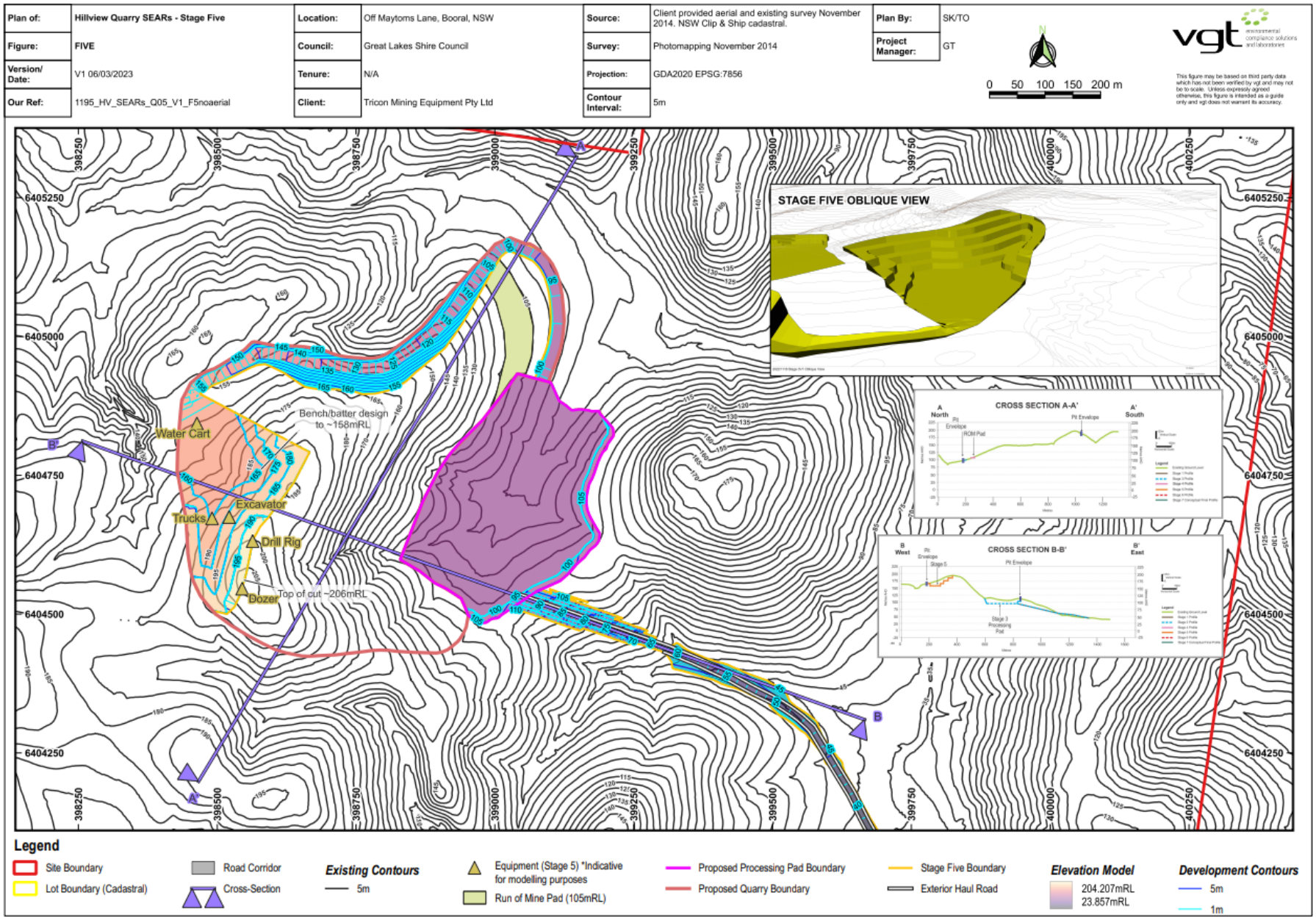

Figure 11: Indicative development activities: Stage 5

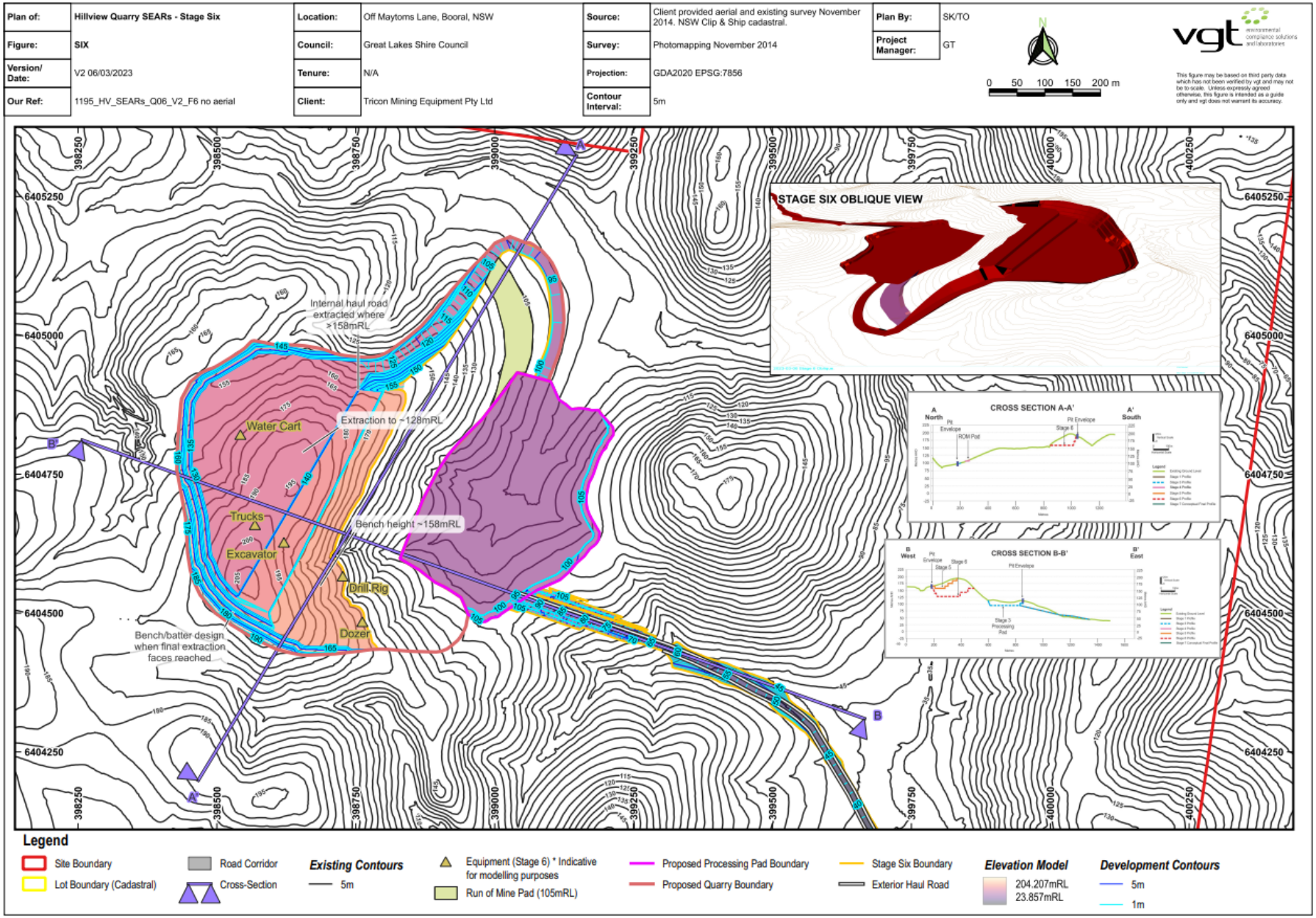

Figure 12: Indicative development activities: Stage 6

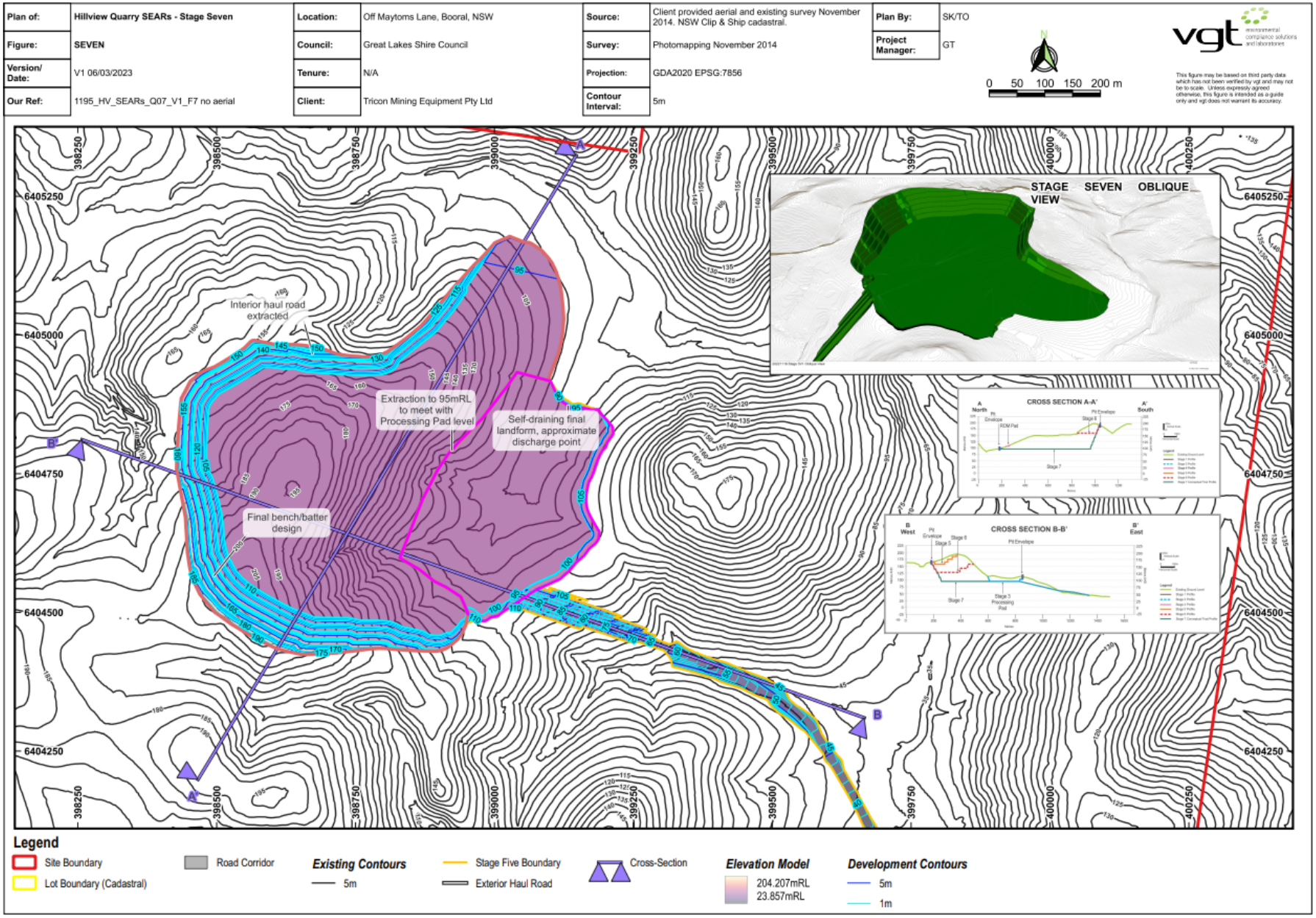

Figure 13: Indicative development activities: Stage 7

Table 19: Equipment inventory (SWL as dBA)

Description	Indicative Make and Model	Reference	Octave Band SWL, dBA								SWL
			63	125	250	500	1k	2k	4k	8k	Tot-A
Site Development and Operations											
Dozer	CAT D10t	Advitech[1]	99	110	108	106	110	107	105	99	116
Excavator	Komatsu PC360	DEFRA[2]	79	92	98	101	104	104	99	90	110
Excavator	Komatsu PC450	DEFRA[2]	81	93	102	104	105	104	99	89	109
Grader	CAT 14M	Advitech[1]	106	109	108	105	105	104	99	92	114
Haul Truck	Komatsu HM400	DEFRA[2]	81	92	94	102	102	107	97	86	110
Water Cart	Komatsu HM400	DEFRA[2]	81	92	94	102	102	107	97	86	110
Blast Drill	Premier	DEFRA[2]	87	103	103	112	111	111	106	103	117
Mobile Jaw Crusher	Lippmann L620R	DEFRA[2]	105	108	108	116	113	110	105	96	119
Mobile Jaw Crusher	Lippmann 1300j	DEFRA[2]	105	108	108	116	113	110	105	96	119
Mobile Scalping Screen	Lippmann L620R	DEFRA[2]	101	104	105	112	110	107	102	92	116
Mobile Cone Crusher	Lippmann 400c	DEFRA[2]	101	104	105	112	110	107	102	92	116
Stockpile Conveyors	No Detail	DEFRA[2]	84	94	89	94	92	88	78	71	99
Sand Processing Plant	No Detail	Advitech[4]	91	85	80	92	99	93	88	83	102
Material Haulage	Truck & Dog	DEFRA[2]	88	92	95	100	104	104	99	91	109
Front End Loader	Komatsu WA500	Advitech[1]	98	98	92	101	104	106	96	91	110
Road Upgrades											
Dozer	CAT D10t	Advitech[1]	99	110	108	106	110	107	105	99	116
Excavator	Komatsu PC360	DEFRA[2]	79	92	98	101	104	104	99	90	109
Roller (18t)	No detail	RMS[3]	74	87	100	103	102	99	92	82	107

Description	Indicative Make and Model	Reference	Octave Band SWL, dBA								SWL
			63	125	250	500	1k	2k	4k	8k	Tot-A
Asphalt Paver + Tipper	No detail	RMS[3]	89	96	100	105	107	105	103	92	112
Asphalt Roller	No detail	RMS[3]	89	97	94	98	103	102	98	90	108

Note 1: standardised SWL testing of mining plant (for model described or functionally similar) in accordance with ISO6395-2008

Note 2: spectrum referenced from DEFRA, with adjustments that scale Total-A SWL to level reported in NIA for similar scale developments.

Note 3: Sourced with reference to NSW Roads and Maritime (2015)

Note 4: Sourced from Advitech reference library based on measurement of similar plant at existing quarries

6.1.2 Quarry Development: Stage 1

A noise model representative of the Stage 1 development was constructed using iNoise (quality assured software for calculating noise prediction for industry, based on the ISO 9613 and ISO 17534 methods). Two (2) separate model scenarios were constructed to evaluate potential impacts during this stage of the project development, including:

- Stage 1a: works to clear vegetation and cut an initial access track from the end of Maytoms Lane to the NW extent of the proposed site access road slot;
- Stage 1b: works to excavate and level an initial processing pad at the NW extent of the proposed access road slot.

An inventory of noise sources that are anticipated during initial access track formation (Stage 1a) is provided in **Table 20**, and a general arrangement of these noise sources presented in **Figure 14**.

Table 20: Noise source assumptions, initial track formation (Stage 1a)

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Dozer	CAT D10t	116	1	100%
Excavator	Komatsu PC360	109	1	100%
Excavator	Komatsu PC450	110	1	100%
Grader	CAT 14M	114	1	100%

Note 1: assumed utilisation during a typical 15-minute operating period.

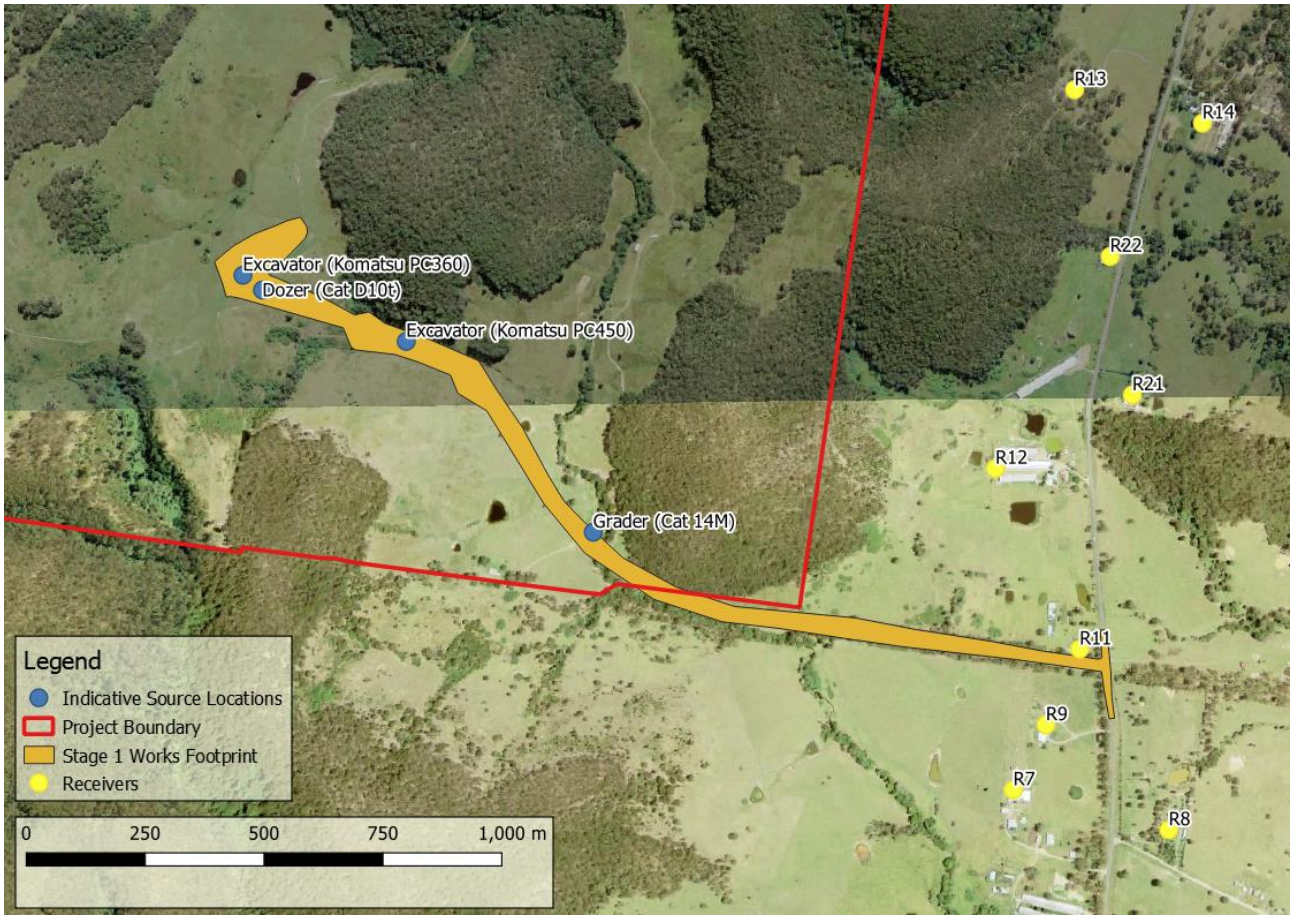

Figure 14: General arrangement of noise sources, initial access track formation (Stage 1a)

Noise propagation associated with the initial access track formation scenario presented above was evaluated under enhancing meteorological conditions as outlined in **Section 4.2**.

An inventory of noise sources that are anticipated during formation of the initial processing area and commencement of the site access road slot (Stage 1b) is provided in **Table 21**. A general arrangement of these noise sources presented in **Figure 15**.

Table 21: Noise source assumptions, initial pad formation (Stage 1b)

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Dozer	CAT D10t	116	1	100%
Excavator	Komatsu PC360	109	1	100%
Excavator	Komatsu PC450	110	1	100%
Grader	CAT 14M	114	1	100%
Mobile Jaw Crusher	Lippmann L620R	119	1	100%
Mobile Scalping Screen	Lippmann L620R	116	1	100%
Mobile Cone Crusher	Lippmann 400c	116	1	100%
Blast Drill	Premier	117	1	100%

Note 1: assumed utilisation during a typical 15-minute operating period

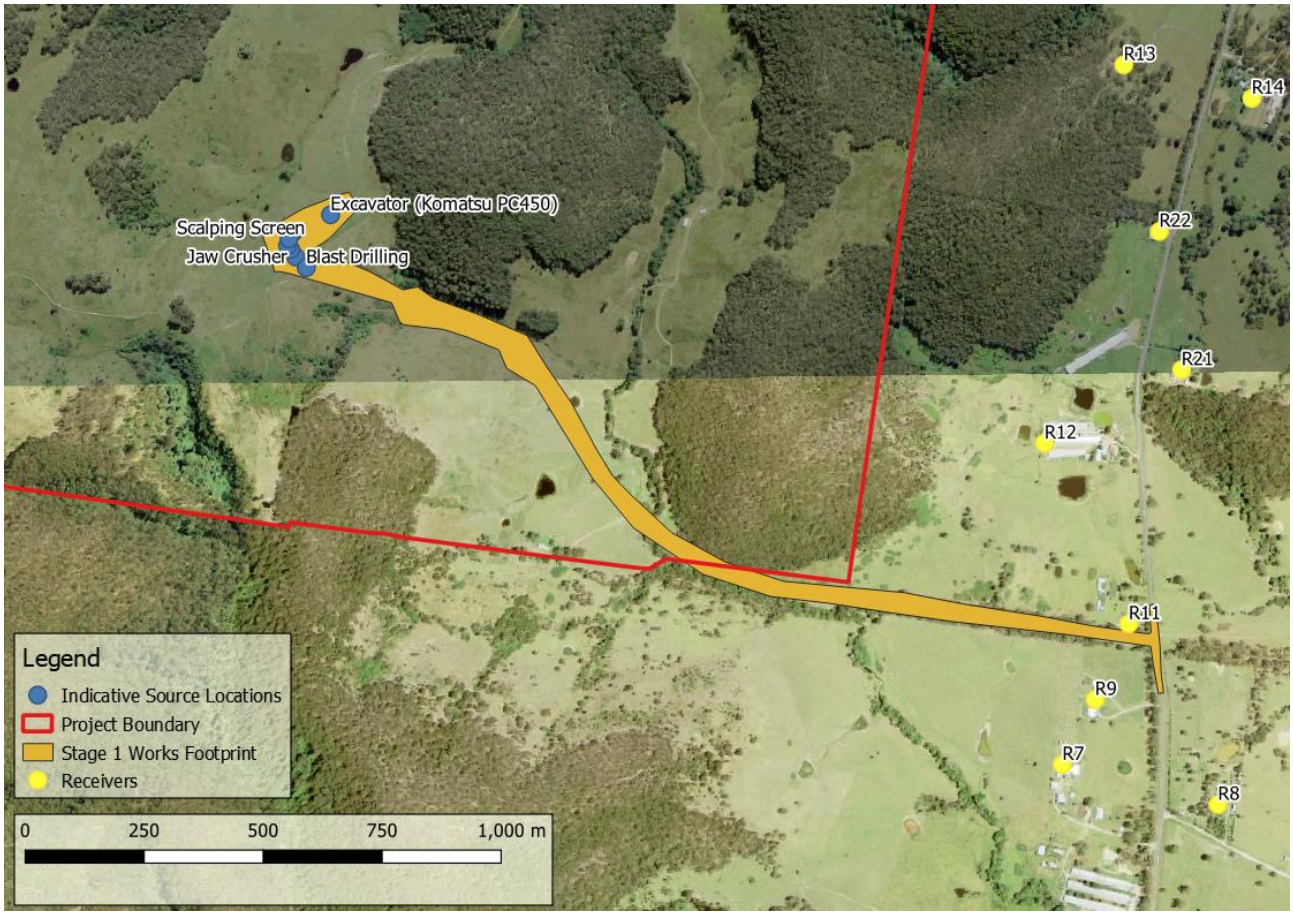

Figure 15: General arrangement of noise sources, initial processing pad formation (Stage 1b)

Noise propagation associated with the processing pad formation and initial blast drilling of the site access road slot was evaluated under enhancing meteorological conditions as outlined in **Section 4.2**.

6.1.3 Quarry Development: Stage 2

Two (2) separate model scenarios were constructed to evaluate potential impacts during Stage 2 of the project development, including:

- Stage 2a: widening of access road corridor and upgrades to Maytoms Lane;
- Stage 2b: progressive excavation of the site access road slot in a SE direction via drill and blast. Blasted material will be thrown to the north of the excavation area to minimise haulage to the processing pad (but some haulage is expected). Crushing of associated material will take place to expand RL95m processing pad in NW direction.
    - export of excess material from site may be required during this stage of the development. Excavation of the site access road slot is expected to generate a significant volume of material, and the RL95m processing pad is not expected to be developed to a point during this stage that would enable use of all of this material for fill (or stockpiling for export during later stages of the project).

An inventory of plant associated with upgrades to the road corridor on Maytoms Lane is provided in Table 22. A general arrangement of these noise sources presented in Figure 16.

Table 22: Noise source assumptions, widening and upgrades to Maytoms Lane (Stage 2a)

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Base Works				
Dozer	CAT D10t	116	1	100%
Excavator	Komatsu PC360	109	1	100%
Grader	CAT 14M	114	1	100%
Roller (18t)	No detail	107	1	100%
Sealing Works				
Asphalt Paver + Tipper	No detail	112	1	100%
Asphalt Roller	No detail	108	1	100%

Note 1: assumed utilisation during a typical 15-minute operating period!

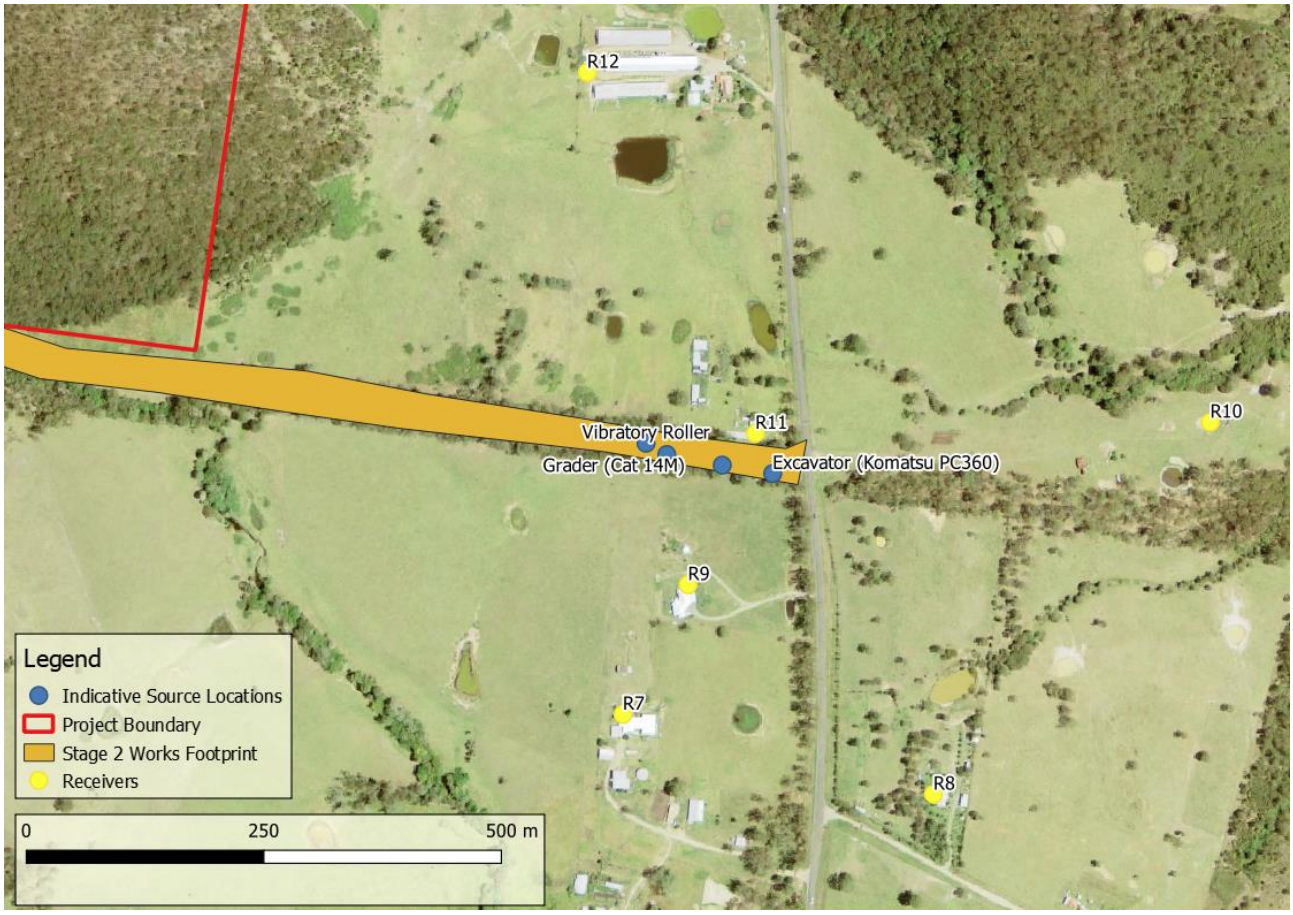

Figure 16: General arrangement of noise sources, upgrades to Maytoms Lane (Stage 2a)

Noise propagation associated with the progressive excavation of the site access road slot was evaluated under enhancing meteorological conditions as outlined in **Section 4.2**. A summary of predicted noise levels at sensitive receivers adjacent to the development is provided in **Table 34**. Two (2) separate scenarios were considered within the Maytoms Lane upgrade works, including:

- civil works associated with widening of the corridor and upgrades to the road base and drainage;
- sealing and finishing of the road upgrade.

These events are expected to occur sequentially, so separate instances of the model were constructed to represent the base works followed by sealing of the upgraded roadway. In both cases, progressive excavation of the site access road slot (described below) was assumed to be occurring simultaneously.

An inventory of plant required to progress excavation of the access road slot is provided in **Table 23**. A general arrangement of these noise sources presented in **Figure 17**.

Table 23: Noise source assumptions, progressive excavation of access road slot (Stage 2b)

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Dozer	CAT D10t	116	1	100%
Excavator	Komatsu PC360	109	1	100%
Excavator	Komatsu PC450	110	1	100%
Grader	CAT 14M	114	1	100%
Mobile Jaw Crusher	Lippmann L620R	119	1	100%

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Mobile Scalping Screen	Lippmann L620R	116	1	100%
Mobile Cone Crusher	Lippmann 400c	116	1	100%
Blast Drill	Premier	117	1	100%
Haul Truck (Off Road)	Komatsu HM400	110	2	100%
Material Haulage	Truck & Dog	109	12 movements per hour	

Note 1: assumed utilisation during a typical 15-minute operating period.

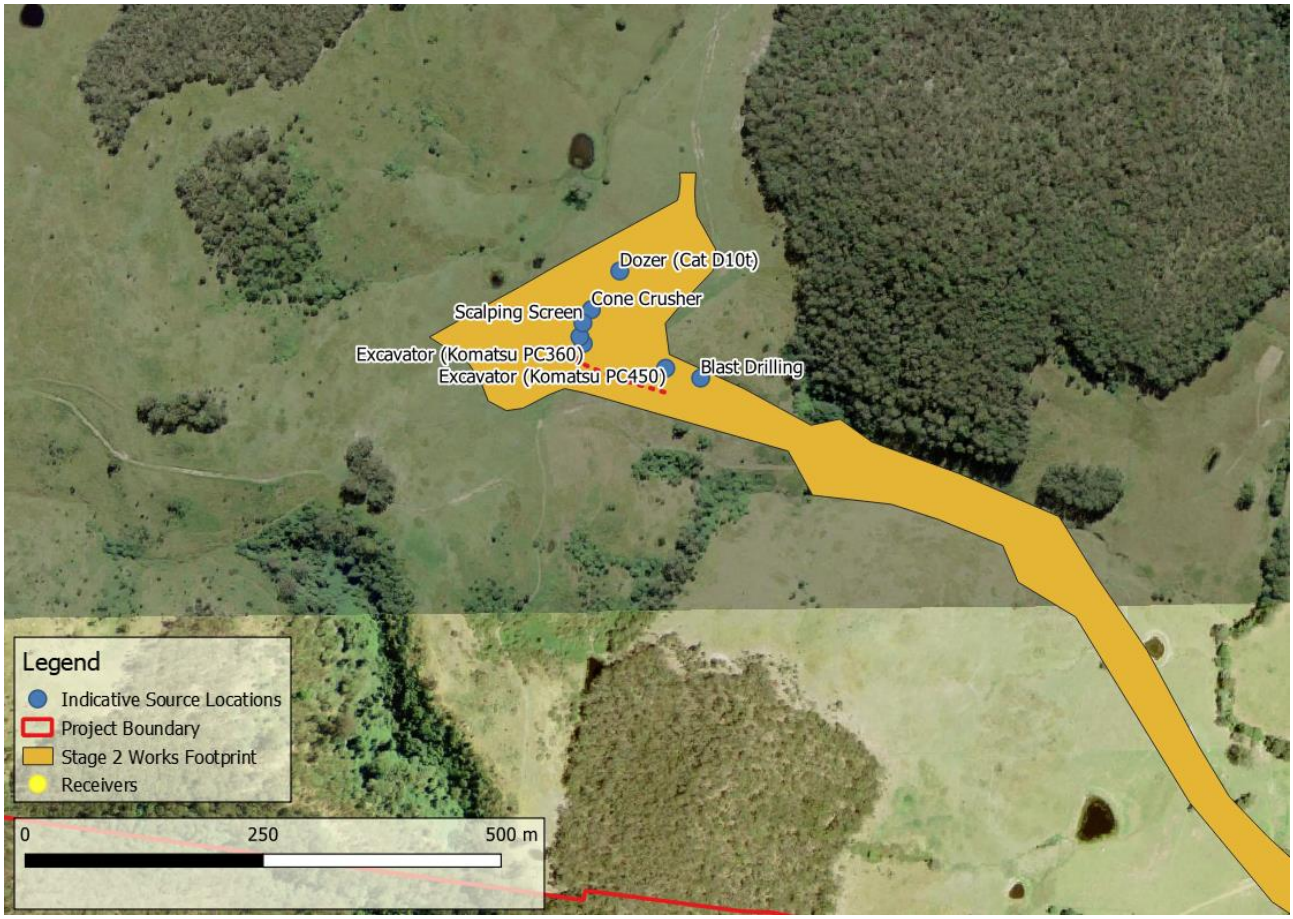

Figure 17: General arrangement of noise sources, progressive excavation of access slot (Stage 2b)

Noise propagation associated with the progressive excavation of the site access road slot was evaluated under enhancing meteorological conditions as outlined in **Section 4.2**.

6.1.4 Quarry Development: Stage 3

Three (3) separate model scenarios were constructed to evaluate potential impacts during Stage 3 of the project development, including:

- Stage 3a: breakthrough works at SE extent of access road slot, and material push to SE to form permanent access road link to Maytoms Lane. This is assumed to occur in parallel with works to upgrade the intersection of Maytoms Lane and Bucketts Way;
  - as with Stage 2 upgrades to Maytoms Lane, it is anticipated that the intersection works will involve both preparation and sealing stages. The model assumes all noise sources that would be used during both of these phases are active at the same time in order to represent the worst case impacts.
- Stage 3b: expansion of RL95 processing pad to its final design footprint, including box cut for permanent primary crusher at NW extent of the pad.
- Stage 3c: commence development of northern haul road from processing pad towards top of hill;
  - As with Stage 2, export of excess material from site may be required during this stage of the development. Forming of the northern haul road will require some fill, but development is expected to generate surplus material that would be removed from the site. The volume of exported material is not expected to approach the design production intensity, but noise associated with heavy vehicle movements has been included in this stage of the model.

An inventory of plant associated with Stage 3a is provided in **Table 24**. A general arrangement of these noise sources presented in **Figure 18** and **Figure 19**.

Table 24: Noise source assumptions, access road formation and intersection upgrade (Stage 3a)

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
SE Push of Site Access Road				
Dozer	CAT D10t	116	1	100%
Excavator	Komatsu PC360	109	1	100%
Excavator	Komatsu PC450	110	1	100%
Grader	CAT 14M	114	1	100%
Mobile Jaw Crusher	Lippmann L620R	119	1	100%
Mobile Scalping Screen	Lippmann L620R	116	1	100%
Mobile Cone Crusher	Lippmann 400c	116	1	100%
Haul Truck (Off Road)	Komatsu HM400	110	2	100%
Intersection Upgrades (Maytoms Lane and Bucketts Way)				
Dozer	CAT D10t	116	1	100%
Excavator	Komatsu PC360	109	1	100%
Grader	CAT 14M	114	1	100%
Roller (18t)	No detail	107	1	100%
Asphalt Paver + Tipper	No detail	112	1	100%
Asphalt Roller	No detail	108	1	100%

Note 1: assumed utilisation during a typical 15-minute operating period.

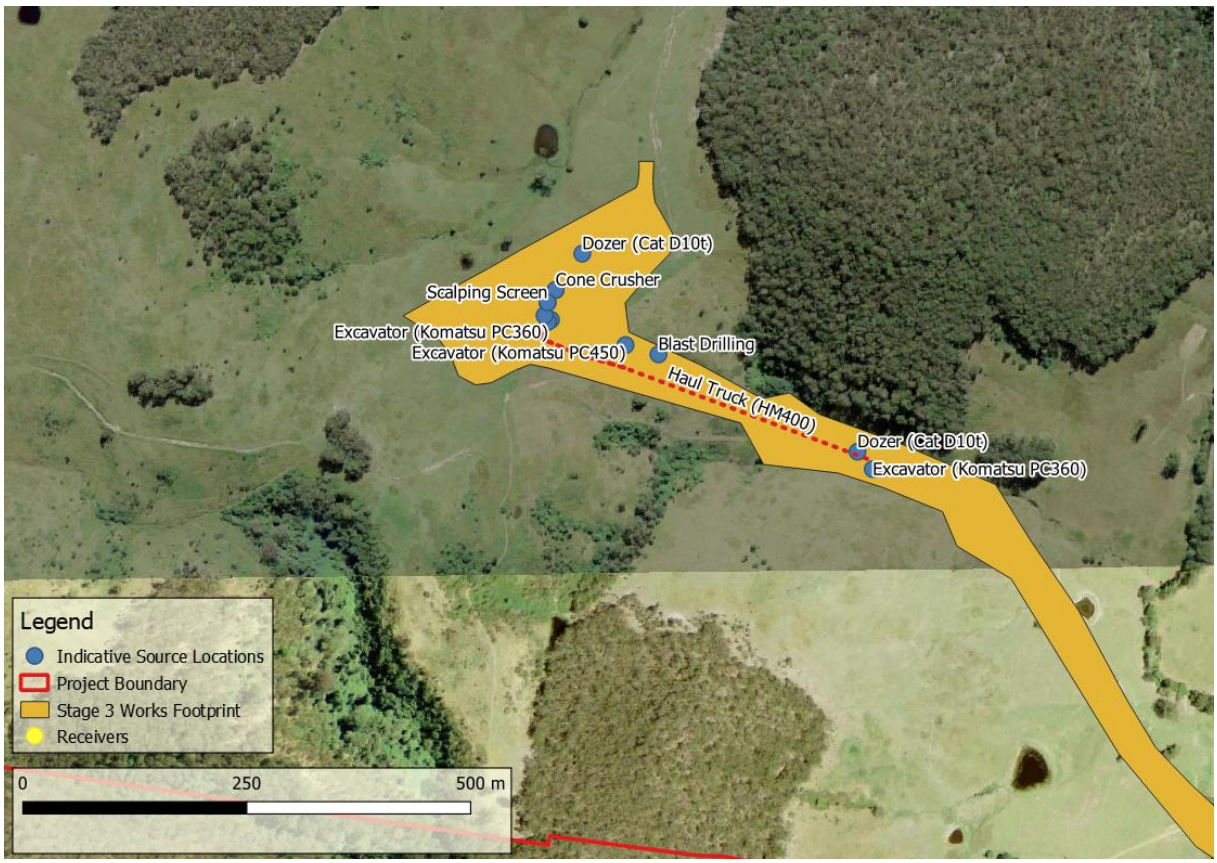

Figure 18: Access road formation (Stage 3a)

Figure 19: Stage3a intersection upgrades

An inventory of plant associated with Stage 3b is provided in **Table 25**. A general arrangement of these noise sources presented in **Figure 20**.

Table 25: Noise source assumptions, processing pad expansion (Stage 3b)

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Dozer	CAT D10t	116	1	100%
Excavator	Komatsu PC360	109	1	100%
Excavator	Komatsu PC450	110	1	100%
Grader	CAT 14M	114	1	100%
Mobile Jaw Crusher	Lippmann L620R	119	1	100%
Mobile Scalping Screen	Lippmann L620R	116	1	100%
Mobile Cone Crusher	Lippmann 400c	116	1	100%
Haul Truck (Off Road)	Komatsu HM400	110	2	100%

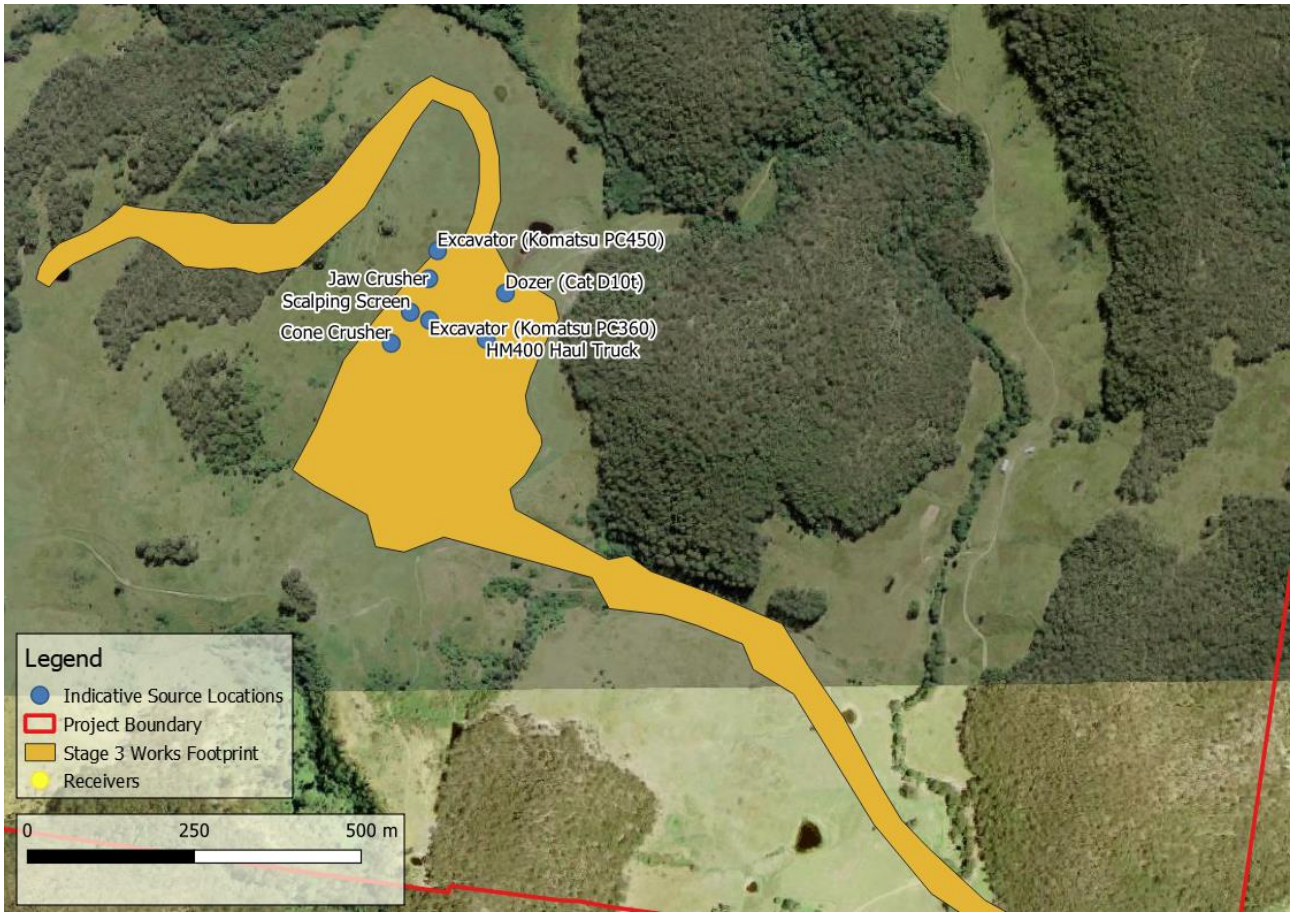

Figure 20: Processing pad expansion to final design footprint (Stage 3b)

An inventory of plant associated with Stage 3b is provided in **Table 26**. A general arrangement of these noise sources presented in **Figure 21**.

Table 26: Noise source assumptions, northern haul road development (Stage 3c)

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Dozer	CAT D10t	116	1	100%
Excavator	Komatsu PC360	109	1	100%
Excavator	Komatsu PC450	110	1	100%
Grader	CAT 14M	114	1	100%
Mobile Jaw Crusher	Lippmann L620R	119	1	100%
Mobile Scalping Screen	Lippmann L620R	116	1	100%
Mobile Cone Crusher	Lippmann 400c	116	1	100%
Haul Truck (Off Road)	Komatsu HM400	110	2	100%
Front End Loader	Komatsu WA500	110	1	100%
Material Haulage	Truck & Dog	109	12 movements per hour	

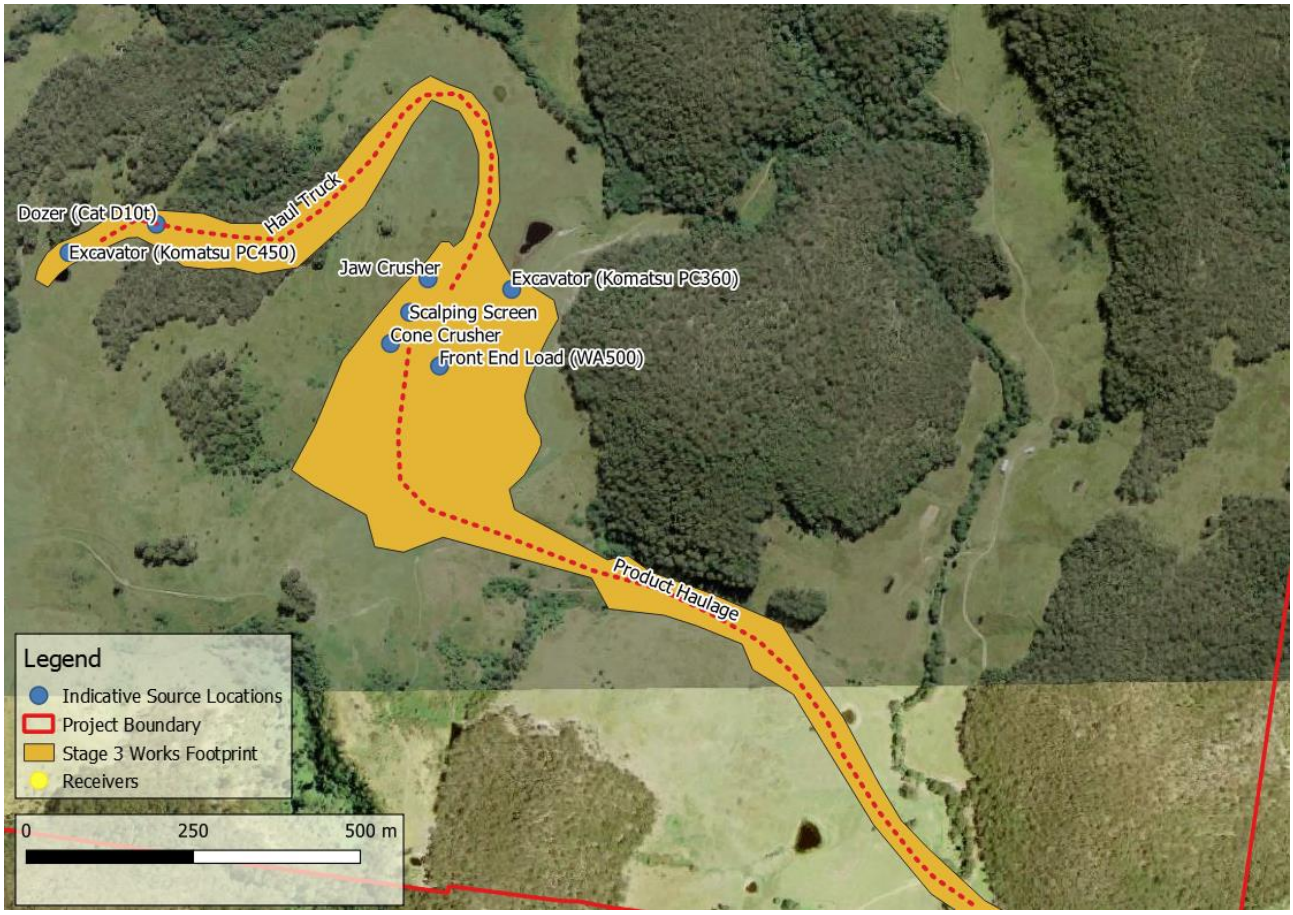

Figure 21: Northern haul road development (Stage 3c)

6.1.5 Quarry Development: Stage 4

Stage 4 involves development of a RoM pad at RL105 m. Development of pad allows RoM material to be stockpiled and reclaimed for feeding the processing plant via a front end loader. These development works would occur in parallel with northern haul road development and processing of associated material.

Preliminary assessment indicated that operation of a dozer in the RL105 m RoM pad development area may result in exceedances of the evening and night period PNTL at sensitive receivers to the north of the site. Two separate scenarios were subsequently considered:

- Stage 4a: continued development of northern haul road with associated RoM activities at RL95 m processing pad while the RL105 m RoM pad development works are carried out. The RL105 m RoM pad development would be restricted to day period only (7am to 6pm).
- Stage 4b: continued development of the northern haul road following completion of the RoM pad at RL105 m.

An inventory of plant associated with Stage 4 is provided in **Table 27**. A general arrangement of these noise sources presented in **Figure 22** and **Figure 23**.

Table 27: Noise source assumptions, Stage 4

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Dozer	CAT D10t	116	1	100%
Excavator	Komatsu PC360	109	1	100%
Excavator	Komatsu PC450	110	1	100%

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Grader	CAT 14M	114	1	100%
Mobile Jaw Crusher	Lippmann L620R	119	1	100%
Mobile Scalping Screen	Lippmann L620R	116	1	100%
Mobile Cone Crusher	Lippmann 400c	116	1	100%
Stockpile Conveyors	No Detail	99	4	100%
Sand Processing Plant	No Detail	102	1	100%
Haul Truck (Off Road)	Komatsu HM400	110	2	100%
Water Cart	Komatsu HM400	110	1	100%
Front End Loader	Komatsu WA500	110	2	100%
Material Haulage	Truck & Dog	109	25 movements per hour	

Note 1: assumed utilisation during a typical 15-minute operating period.

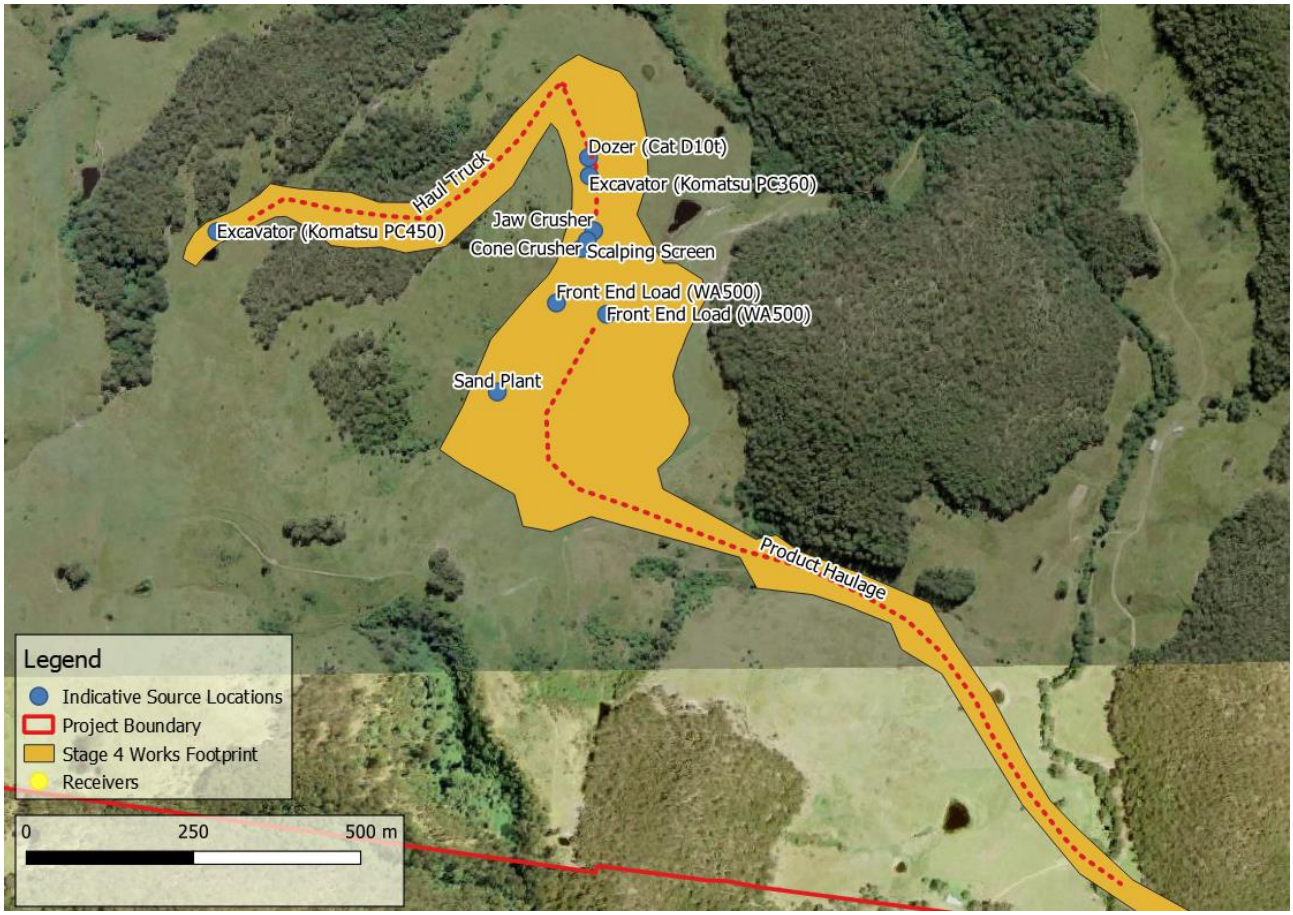

Figure 22: RoM pad development and material processing (Stage 4a)

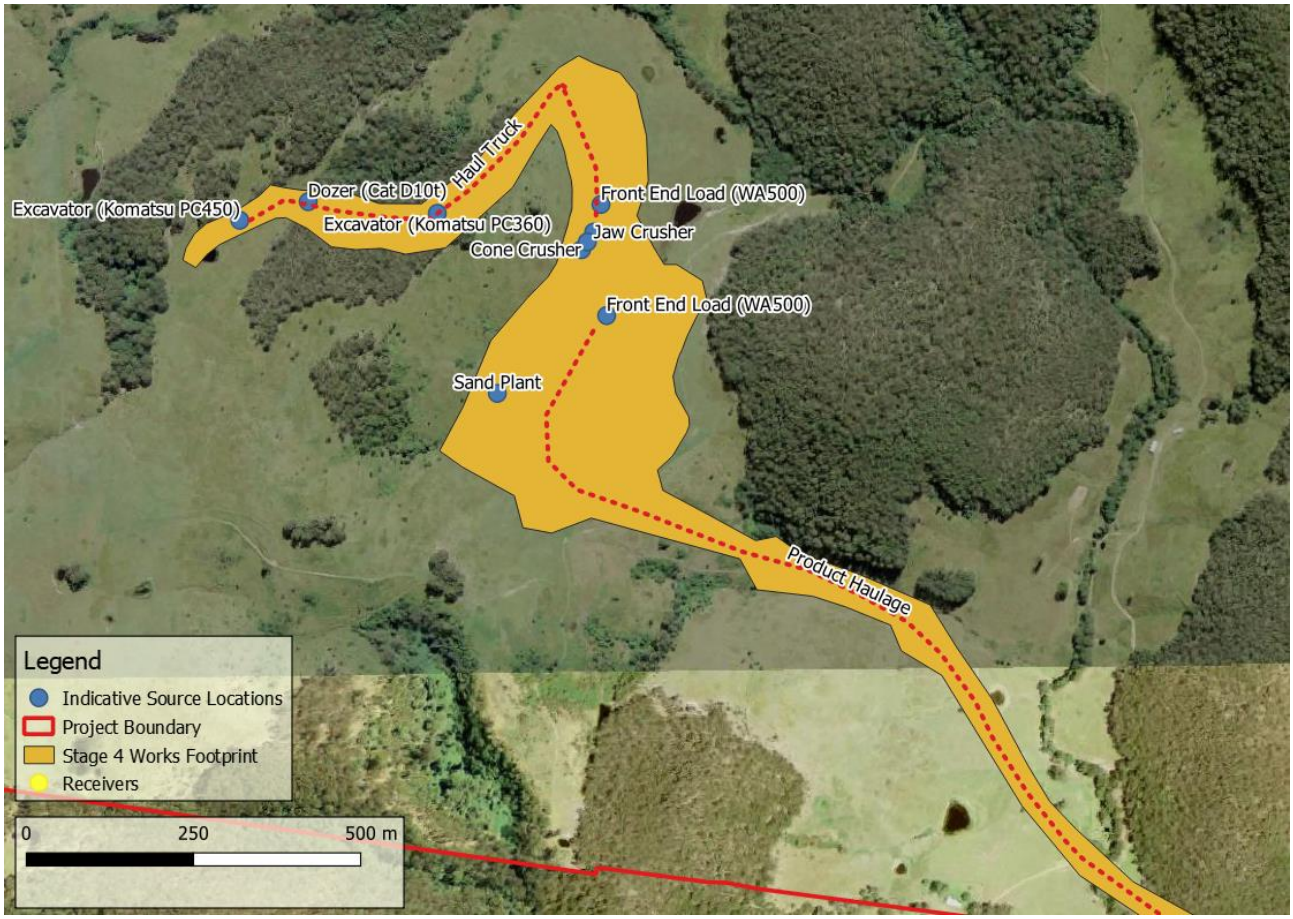

Figure 23: RoM pad developed and material processing (Stage 4b)

6.1.6 Quarry Development: Stage 5

Extraction of material from the top of the hill at approximately RL205 m commences with Stage 5 of the project development. This represents the highest elevation (and thus most exposed) extraction point within the quarry. Location of equipment (blast drilling, dozer operations) on natural terrain (i.e. prior to initial blasting and box cut) represents high potential for noise impact, and is considered as a separate scenario:

- Stage 5a: operation of quarry equipment at natural terrain level (approximately RL205 m);
- Stage 5b: operation of quarry equipment below natural terrain, following development of the first bench (approximately RL195 m).

Equipment on the processing pad will continue to operate as described for Stage 4. An inventory of plant associated with Stage 5 is provided in **Table 28**. A general arrangement of these noise sources presented in **Figure 24** and **Figure 25**.

Table 28: Noise source assumptions, Stage 5

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Quarry Equipment				
Dozer	CAT D10t	116	1	100%
Excavator	Komatsu PC360	109	1	100%
Excavator	Komatsu PC450	110	1	100%

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Haul Truck (Off Road)	Komatsu HM400	110	2	100%
Water Cart	Komatsu HM400	110	1	100%
Blast Drill	Premier	117	1	100%
Processing Equipment				
Grader	CAT 14M	114	1	100%
Jaw Crusher	Lippmann 1300j	119	1	100%
Mobile Scalping Screen	Lippmann L620R	116	1	100%
Mobile Cone Crusher	Lippmann 400c	116	1	100%
Front End Loader	Komatsu WA500	110	2	100%
Stockpile Conveyors	No Detail	99	4	100%
Sand Processing Plant	No Detail	102	1	100%
Material Haulage	Truck & Dog	109	25 movements per hour	

Note 1: assumed utilisation during a typical 15-minute operating period

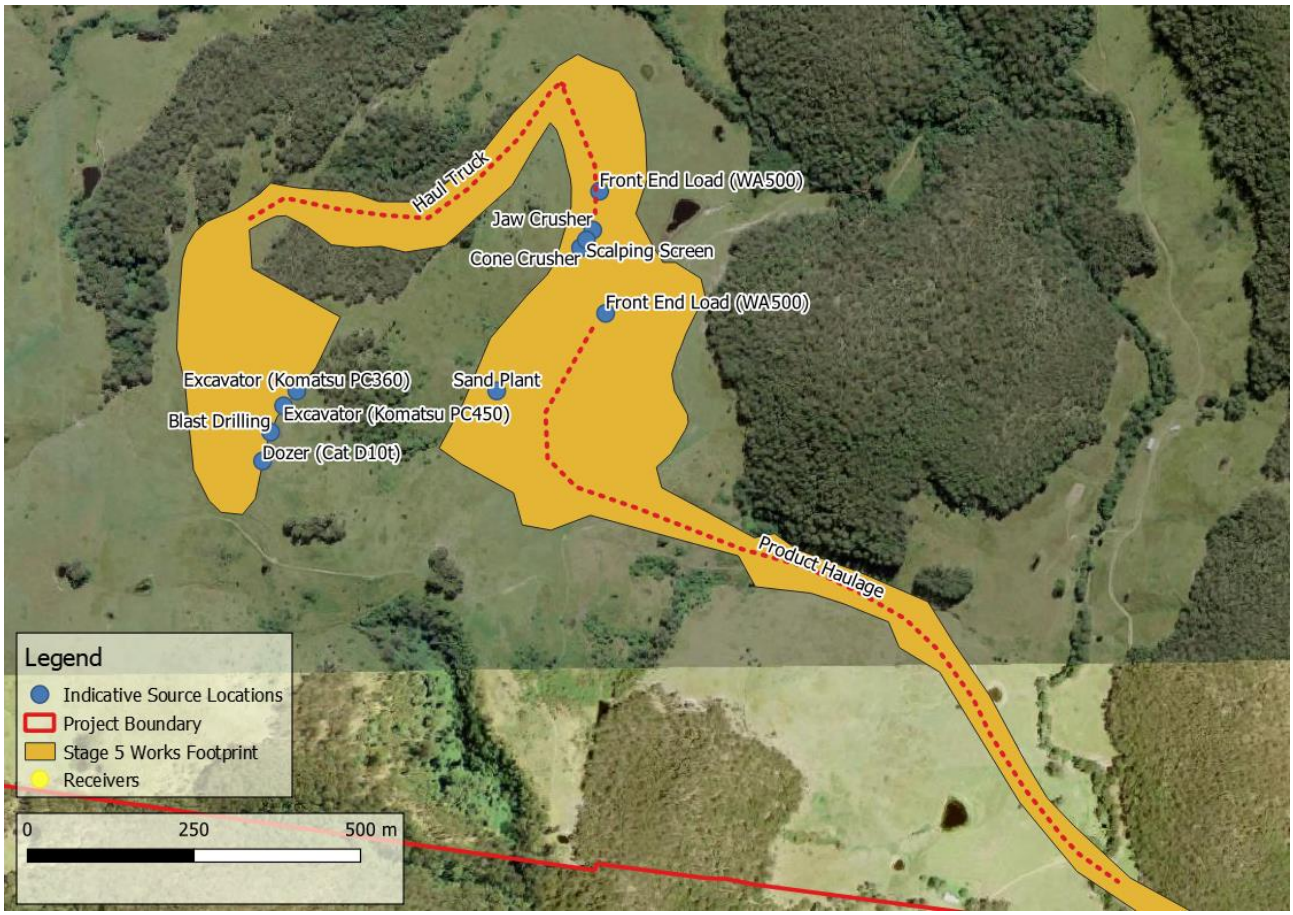

Figure 24: Quarry equipment at approx. RL205m (Stage 5a)

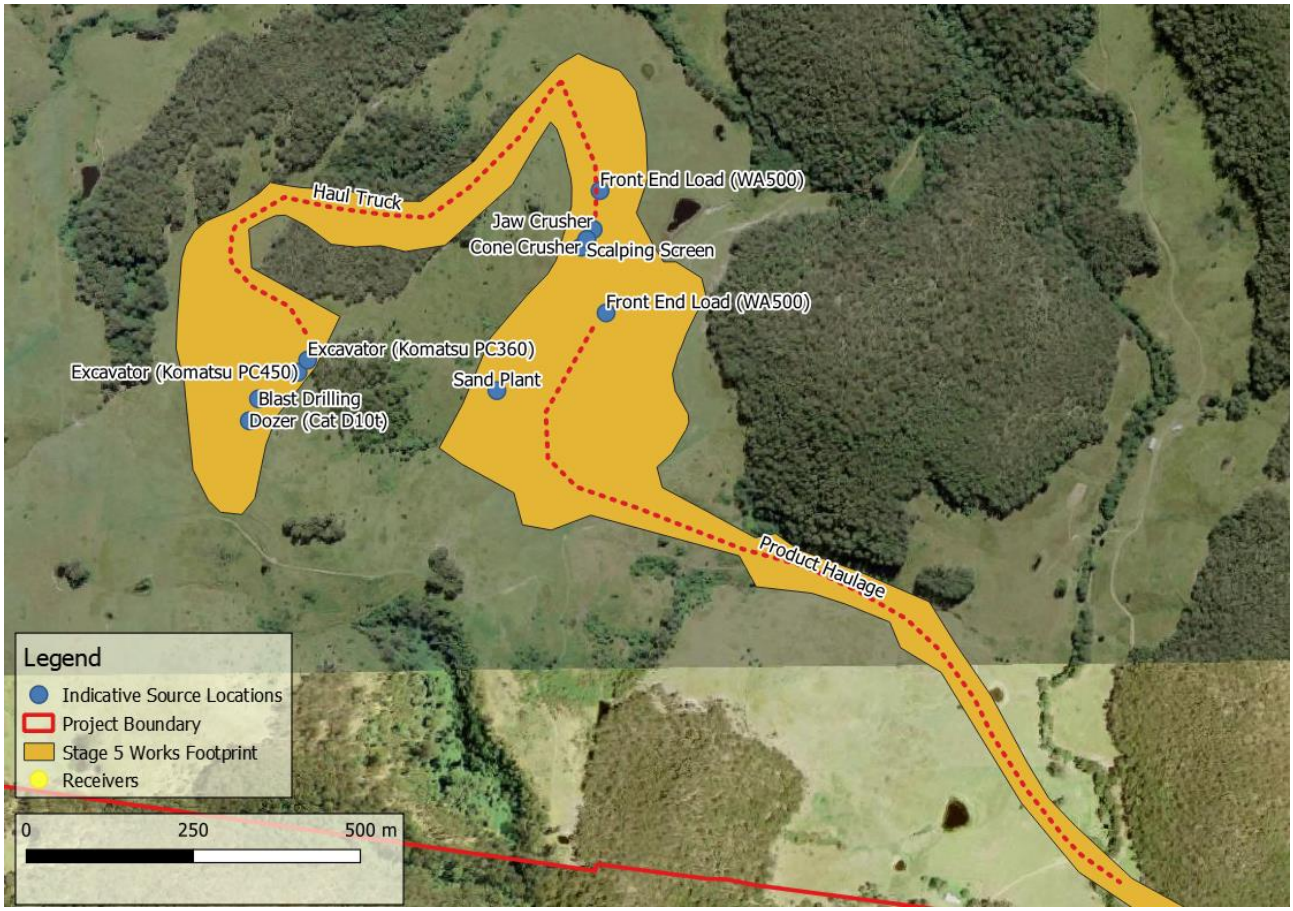

Figure 25: Quarry equipment after first bench is cut approx. RL195m (Stage 5b)

6.1.7 Quarry Development: Stage 6

Excavation of material progresses through Stage 6. The quarry progresses in a South-Easterly direction with equipment now working within the pit behind the extraction face. Stage 6 includes extraction of material from approximately RL158 m down to RL126 m. Drill and blast, processing and material haulage activities continue, and progressive works are undertaken to secure the final landform of the excavated areas.

Equipment on the processing pad will continue to operate as described for Stage 5. An inventory of plant associated with Stage 6 is provided in **Table 29**. A general arrangement of these noise sources presented in **Figure 26**.

Table 29: Noise source assumptions, Stage 6

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Quarry Equipment				
Dozer	CAT D10t	116	1	100%
Excavator	Komatsu PC360	109	1	100%
Excavator	Komatsu PC450	110	1	100%
Haul Truck (Off Road)	Komatsu HM400	110	2	100%
Water Cart	Komatsu HM400	110	1	100%

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Blast Drill	Premier	117	1	100%
Processing Equipment				
Grader	CAT 14M	114	1	100%
Jaw Crusher	Lippmann 1300j	119	1	100%
Mobile Scalping Screen	Lippmann L620R	116	1	100%
Mobile Cone Crusher	Lippmann 400c	116	1	100%
Front End Loader	Komatsu WA500	110	2	100%
Stockpile Conveyors	No Detail	99	4	100%
Sand Processing Plant	No Detail	102	1	100%
Material Haulage	Truck & Dog	109	25 movements per hour	

Note 1: assumed utilisation during a typical 15-minute operating period

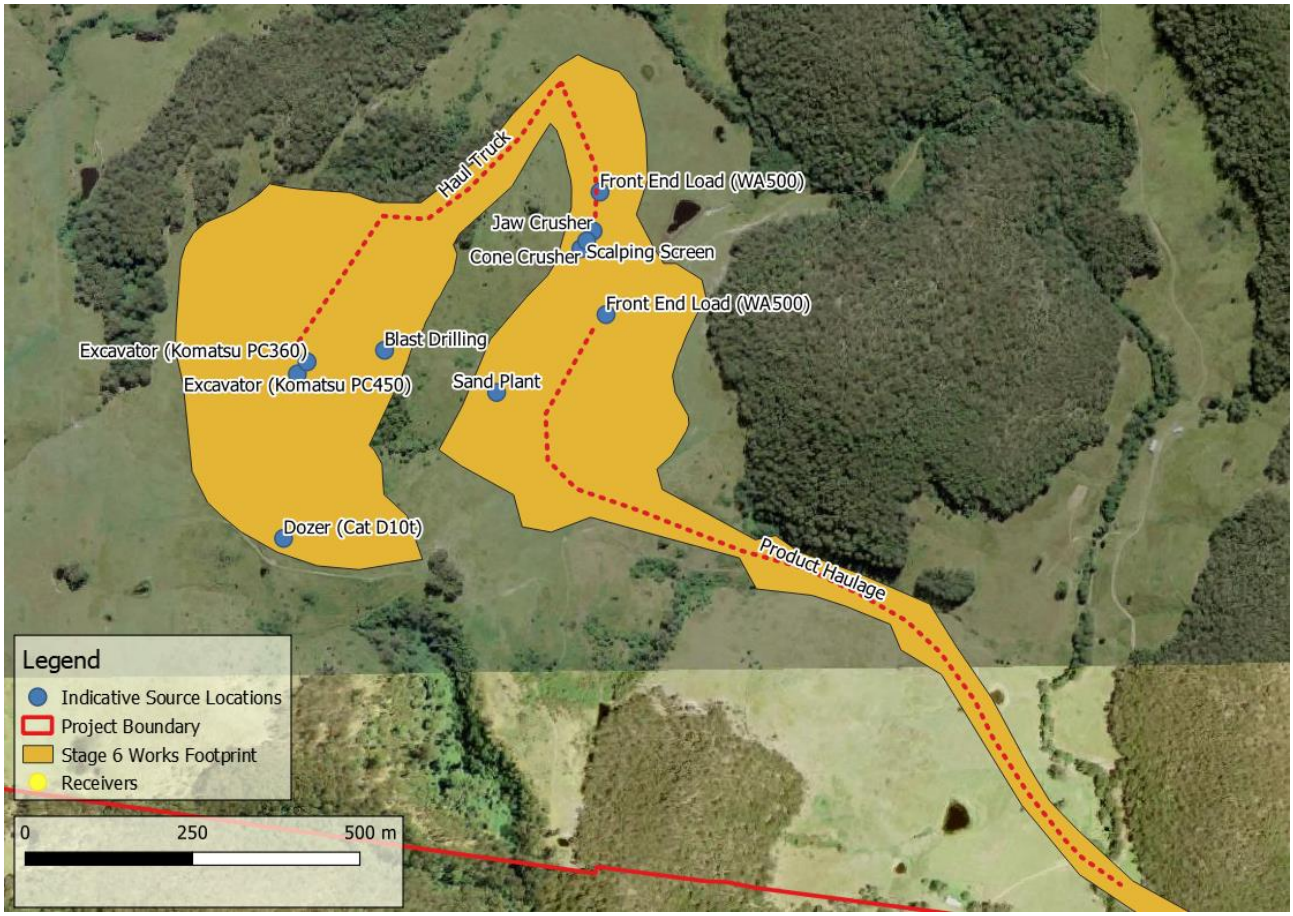

Figure 26: Quarry equipment at approx. RL158 m (Stage 6)

6.1.8 Quarry Development: Stage 7

Stage 7 represents the final phase of operations at the site. Extraction of material continues until a quarry floor is established at RL95 m; material is then mined in an easterly direction until the quarry floor joins with the processing pad at RL95 m. As with Stage 6, works are progressively undertaken to secure the final landform. An inventory of plant associated with Stage 7 is provided in **Table 30**. A general arrangement of these noise sources presented in **Figure 27**.

Table 30: Noise source assumptions, Stage 6

Description	Indicative Make and Model	SWL, dBA	Number of Plant	Utilisation[1]
Quarry Equipment				
Dozer	CAT D10t	116	1	100%
Excavator	Komatsu PC360	109	1	100%
Excavator	Komatsu PC450	110	1	100%
Haul Truck (Off Road)	Komatsu HM400	110	2	100%
Water Cart	Komatsu HM400	110	1	100%
Blast Drill	Premier	117	1	100%
Processing Equipment				
Grader	CAT 14M	114	1	100%
Jaw Crusher	Lippmann 1300j	119	1	100%
Mobile Scalping Screen	Lippmann L620R	116	1	100%
Mobile Cone Crusher	Lippmann 400c	116	1	100%
Front End Loader	Komatsu WA500	110	2	100%
Stockpile Conveyors	No Detail	99	4	100%
Sand Processing Plant	No Detail	102	1	100%
Material Haulage	Truck & Dog	109	25 movements per hour	

Note 1: assumed utilisation during a typical 15-minute operating period.

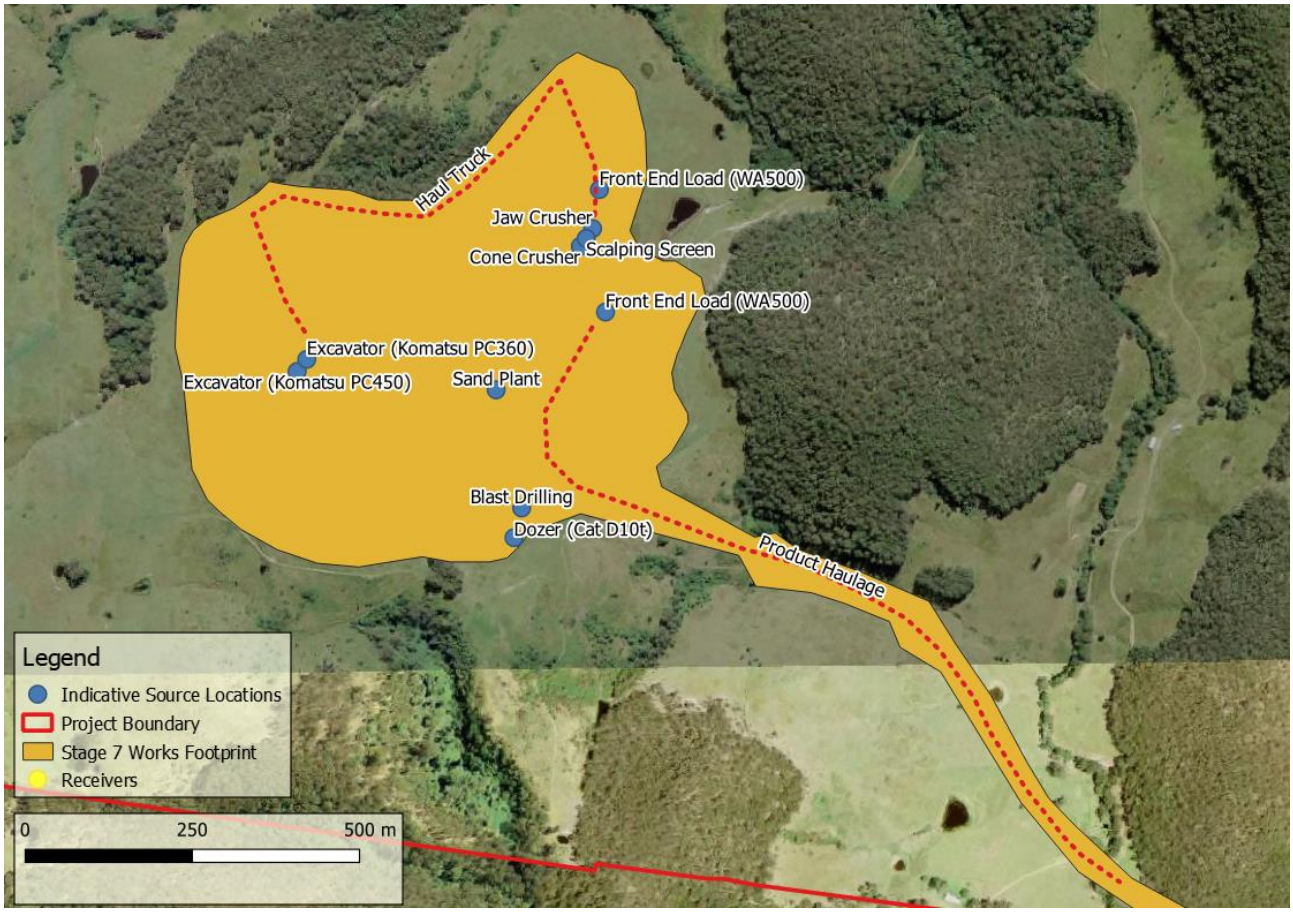

Figure 27: Quarry staging as extraction progresses from RL128m to RL95m (Stage 7)

6.2 Road Noise

Inputs to the road noise model were based on information within the Traffic Impact Assessment. This includes current and forecast 'no build' traffic volumes, along with the projected increase in road movements generated by the development. Traffic data used for modelling is shown in **Table 31**. No build' statistics are taken directly from the Traffic Impact Assessment (McLaren, 2023), while 'with build' are calculated equivalents that include the 'no build' traffic along with the additional approximately 250 heavy vehicle movements that would be associated with peak operation of the site (126 truck loads per day).

Table 31: Traffic volumes, Bucketts Way (Maytoms Lane to Pacific Motorway)

Statistics		2023		2033	
		No build	With build	No build	With build
Daily	Total volume	2 750	3 000	3 350	3 600
	Heavy vehicle %	3%	11%	3%	10%

Note: +10year volumes assume 2%pa growth BTRE 2030 projections non-urban intrastate.

The modelling process and settings for road traffic noise are summarised in **Table 32.**

Table 32: Noise modelling procedure – Road noise

Item	Setting
Modelling software	Predictor v8.11
Noise propagation model	LimA CoRTN with source height modifications as per NSW RMS *Noise Model Validation Guideline*
Terrain data	Source-to-receiver winds of 3 m/s (noise enhancing as per Fact Sheet D of the NPfI)
Receiver height	10m contour internal across study area (https://elevation.fsdf.org.au/)
Traffic speed	As signposted (100 km/h on Bucketts Way)
Application of façade correction	Receivers are modelled in free field, with an additional 2.5 dB correction applied after modelling to account for façade correction (as per Table 7 of the RNP)

6.3 Sleep Disturbance

Proposed night period operations during the Project Operational Phase are summarised in **Table 35.**

Assessment of the night period operations is addressed in **Section 7.4** of this report.

Table 33: Proposed night period operations – Project Operational Phase

Project Stage	Activity	Operating Hours
Stages 5 to 7	Extraction and processing operations	Monday to Saturday: 6 am to 10 pm
	Internal product transfers to stockpiles	Monday to Saturday: 6 am to midnight
	Maintenance activities	24 hours per day, 7 days per week

6.4 Blasting impacts

Australian Standard AS2187.2-2006 provides outline methods for evaluating potential ground vibration and air blast overpressure impacts associated with explosive blasting. A quantitative assessment of potential impacts has been prepared on the basis of minimum separation distances from the blast area to the nearest sensitive receivers to the south, east and north of blast area and preliminary blast design information. Impacts at more distant receiver locations are assumed to be acceptable where air blast and ground vibration levels comply with limits at the assessment location.

6.4.1 Estimating overpressure levels

Appendix J7 of *AS2187.2-2006 Explosives – Storage and use. Part 2: Use of explosives* provides the following method for evaluating potential airblast overpressure levels:

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

Where: P is air pressure (Pa);

R is the distance between charge and point of measurement (m);

Q is maximum instantaneous charge (charge mass per delay) (kg);

K_a,is the site constant; and

a is the site exponent.

Additional detail contained in Clause J7.3 of AS2187.2:2006 provides the following values for the site constant and site exponent for confined blasthole charges:

K_a = range between 10 to 100;

a = -1.45

Equation J5.1 in AS2187.2:2006 allows for the expression of overpressure impacts in decibels:

$$SPL = 10 \times \log_{10}\left(\frac{P}{P_0}\right)^2$$

Where: P is estimated overpressure level (μPa); and

P_0 is the reference pressure of 20 μPa.

6.4.2 Estimating ground vibration

Appendix J7 of *AS2187.2-2006 Explosives – Storage and use. Part 2: Use of explosives* provides the following method for evaluating potential ground vibration levels:

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

Where: V is ground vibration as vector peak particle velocity (mm/s);

R is the distance between charge and point of measurement (m);

Q is maximum instantaneous charge (charge mass per delay) (kg); and

K_g, B are constants related to site and rock properties for estimation purposes.

Discussion presented in Clause J7.3 of AS2187.2:2006 states that, in the absence of site-specific constants the following values may be used to estimate vibration levels (50% probability of exceedance) in average conditions:

K_g = 1140

B = -1.6

In the absence of detailed understanding of site-specific vibration propagation characteristics, the constants for average conditions are applied to this assessment.

7. Results

7.1 Construction Noise

7.1.1 Stage 1a: Access track formation

A summary of predicted construction noise levels at sensitive receivers adjacent to the development is provided in **Table 34**. Review of this analysis indicates that predicted noise levels during initial access track formation works will achieve the ICNG criteria during the proposed operating period, equating to the standard construction hours.

Table 34: Sound Pressure Level (SPL) predictions, initial track formation (Stage 1a)

Receiver ID	Predicted Noise Level	Assessment Criteria (Standard Construction Hours)	Assessment
R1	<20	45 dBA	Less than Criteria
R2	26		Less than Criteria
R3	22		Less than Criteria
R4	28		Less than Criteria
R5	35		Less than Criteria
R6	38		Less than Criteria
R7	41		Less than Criteria
R8	37		Less than Criteria
R9	39		Less than Criteria
R10	33		Less than Criteria
R11	34		Less than Criteria
R12	35		Less than Criteria
R13	23		Less than Criteria
R14	26		Less than Criteria
R15	24		Less than Criteria
R16	24		Less than Criteria
R17	<20		Less than Criteria
R18	35		Less than Criteria
R19	34		Less than Criteria
R20	<20		Less than Criteria
R21	34		Less than Criteria
R22	27		Less than Criteria

7.1.2 Stage 1b: Construct initial processing area

A summary of predicted noise levels at sensitive receivers adjacent to the development is provided in **Table 35.** Review of this analysis indicates that predicted noise levels during initial processing pad formation works and commencement of blast drilling for the site access road slot will achieve the ICNG criteria during the proposed operating period equating to the standard construction hours. It is noted that the relevant noise criterion is achieved during this initial development scenario with noise sources located on natural terrain levels.

Table 35: Sound Pressure Level (SPL) predictions, initial processing pad formation (Stage 1b)

Receiver ID	Predicted Noise Level	Assessment Criteria (Standard Construction Hours)	Assessment
R1	20	45 dBA	Less than Criteria
R2	28		Less than Criteria
R3	25		Less than Criteria
R4	25		Less than Criteria
R5	32		Less than Criteria
R6	38		Less than Criteria
R7	40		Less than Criteria
R8	36		Less than Criteria
R9	37		Less than Criteria
R10	34		Less than Criteria
R11	35		Less than Criteria
R12	36		Less than Criteria
R13	25		Less than Criteria
R14	28		Less than Criteria
R15	27		Less than Criteria
R16	27		Less than Criteria
R17	21		Less than Criteria
R18	39		Less than Criteria
R19	42		Less than Criteria
R20	<20		Less than Criteria
R21	35		Less than Criteria
R22	28		Less than Criteria

7.1.3 Stage 2a: Maytoms Lane road upgrade

Predicted noise levels presented in **Table 36** assume that equipment is located on the part of the Maytoms Lane corridor closest to the nearest sensitive receiver (R11). Review of this analysis indicates that noise associated with upgrades to Maytoms Lane may exceed the 45 dBA ICNG assessment criteria at approximately 10 receivers, R8-R14 and R21-R22.

Table 36: Sound Pressure Level (SPL) predictions, upgrades to Maytoms Lane (Stage 2b)

Receiver ID	Predicted Noise Level		Assessment Criteria (Standard Construction Hours)	Assessment
	Baseworks	Sealing		
R1	25	21	45 dBA	Less than Criteria
R2	32	30		Less than Criteria
R3	28	26		Less than Criteria
R4	31	23		Less than Criteria
R5	41	34		Less than Criteria
R6	44	39		Less than Criteria
R7	44	37		Less than Criteria
R8	**57**	**51**		Above Criteria
R9	**66**	**60**		Above Criteria
R10	**55**	**49**		Above Criteria
R11	**74**	**70**		Above Criteria
R12	**57**	**50**		Above Criteria
R13	**48**	40		Above Criteria
R14	**46**	36		Above Criteria
R15	38	30		Less than Criteria
R16	36	29		Less than Criteria
R17	35	26		Less than Criteria
R18	40	39		Less than Criteria
R19	42	41		Less than Criteria
R20	32	31		Less than Criteria
R21	**49**	42		Above Criteria
R22	**50**	43		Above Criteria

7.1.4 Stage 2b: Progressive excavation of access road slot

A summary of predicted noise levels at sensitive receivers adjacent to the development is provided in **Table 37**. Review of this analysis indicates that predicted noise levels during progressive excavation of the site access road slot will achieve the ICNG criteria during the proposed operating period equating to standard construction hours.

Table 37: Sound Pressure Level (SPL) predictions, excavation of access road slot (Stage 2b)

Receiver ID	Predicted Noise Level	Assessment Criteria (Standard Construction Hours)	Assessment
R1	20	45 dBA	Less than Criteria
R2	29		Less than Criteria
R3	26		Less than Criteria
R4	20		Less than Criteria
R5	30		Less than Criteria
R6	37		Less than Criteria
R7	34		Less than Criteria
R8	35		Less than Criteria
R9	35		Less than Criteria
R10	32		Less than Criteria
R11	32		Less than Criteria
R12	33		Less than Criteria
R13	24		Less than Criteria
R14	25		Less than Criteria
R15	25		Less than Criteria
R16	25		Less than Criteria
R17	21		Less than Criteria
R18	39		Less than Criteria
R19	41		Less than Criteria
R20	30		Less than Criteria
R21	32		Less than Criteria
R22	24		Less than Criteria

7.1.5 Stage 3a: Formation of access and intersection upgrades

A summary of predicted noise levels at sensitive receivers adjacent to the development is provided in **Table 38**. Review of this analysis indicates that predicted noise levels associated with intersection upgrade works will exceed the ICNG criteria during standard construction hours (the proposed operating period) at nine receiver locations, R7 to R13 and R21-R22.

Table 38: Sound Pressure Level (SPL) predictions, Stage 3a

Receiver ID	Predicted Noise Level	Assessment Criteria (Standard Construction Hours)	Assessment
R1	25	45 dBA	Less than Criteria
R2	30		Less than Criteria
R3	27		Less than Criteria
R4	30		Less than Criteria
R5	41		Less than Criteria
R6	45		Less than Criteria
R7	48		Above Criteria
R8	59		Above Criteria
R9	65		Above Criteria
R10	57		Above Criteria
R11	71		Above Criteria
R12	56		Above Criteria
R13	48		Above Criteria
R14	42		Less than Criteria
R15	38		Less than Criteria
R16	36		Less than Criteria
R17	34		Less than Criteria
R18	39		Less than Criteria
R19	41		Less than Criteria
R20	31		Less than Criteria
R21	49		Above Criteria
R22	50		Above Criteria

7.1.6 Stage 3b: Expansion of processing pad

A summary of predicted noise levels at sensitive receivers adjacent to the development is provided in **Table 39**. Review of this analysis indicates that predicted noise levels are expected to achieve the ICNG criteria during standard construction hours (the proposed operating period).

Table 39: Sound Pressure Level (SPL) predictions, Stage 3b

Receiver ID	Predicted Noise Level	Assessment Criteria (Standard Construction Hours)	Assessment
R1	20	45 dBA	Less than Criteria
R2	32		Less than Criteria
R3	31		Less than Criteria
R4	28		Less than Criteria
R5	33		Less than Criteria
R6	35		Less than Criteria
R7	29		Less than Criteria
R8	34		Less than Criteria
R9	32		Less than Criteria
R10	32		Less than Criteria
R11	29		Less than Criteria
R12	27		Less than Criteria
R13	25		Less than Criteria
R14	28		Less than Criteria
R15	34		Less than Criteria
R16	34		Less than Criteria
R17	26		Less than Criteria
R18	39		Less than Criteria
R19	38		Less than Criteria
R20	26		Less than Criteria
R21	25		Less than Criteria
R22	23		Less than Criteria

7.1.7 Stage 3c: Development of northern haul road

A summary of predicted noise levels at sensitive receivers adjacent to the development is provided in **Table 40**. Review of this analysis indicates that predicted noise levels are expected to achieve the ICNG criteria during standard construction hours (the proposed operating period).

Table 40: Sound Pressure Level (SPL) predictions, Stage 3c

Receiver ID	Predicted Noise Level	Assessment Criteria (Standard Construction Hours)	Assessment
R1	21	45 dBA	Less than Criteria
R2	31		Less than Criteria
R3	29		Less than Criteria
R4	27		Less than Criteria
R5	32		Less than Criteria
R6	34		Less than Criteria
R7	31		Less than Criteria
R8	34		Less than Criteria
R9	32		Less than Criteria
R10	33		Less than Criteria
R11	29		Less than Criteria
R12	29		Less than Criteria
R13	25		Less than Criteria
R14	28		Less than Criteria
R15	33		Less than Criteria
R16	33		Less than Criteria
R17	25		Less than Criteria
R18	39		Less than Criteria
R19	39		Less than Criteria
R20	26		Less than Criteria
R21	27		Less than Criteria
R22	23		Less than Criteria

7.2 Operational Noise

7.2.1 Stage 4a: Northern haul road and RL105 m RoM Pad development

A summary of predicted noise levels at sensitive receivers adjacent to the development is provided in **Table 41**. This stage of the works involves material processing at the RL95 m pad while the RL105 m RoM pad is being constructed.

This analysis indicates that predicted noise levels are expected to achieve the day period PNTL, but development works associated with the RL105 m RoM pad may result in exceedances of the evening and night period PNTL at receivers to the north of the site, R18 and R19.

Further assessment of predictions indicates that exceedance of the evening and night period PNTL may be attributed to development activities at the RL105 m RoM pad (specifically dozer operations). It is recommended that development activities at the RL105 m RoM pad be restricted to the day period only; with this control assessment indicates the evening and night period PNTL would be achieved.

Table 41: Sound Pressure Level (SPL) predictions, Stage 4a

Receiver ID	Predicted Noise Level (with Dozer on RL105 m RoM)	Predicted Noise Level (no Dozer on RL105 m RoM)	PNTL	Assessment
R1	<20	<20	Day Period 40 dBA Evening and Night Period 35 dBA	Less than Criteria
R2	31	31		Less than Criteria
R3	29	29		Less than Criteria
R4	30	29		Less than Criteria
R5	33	32		Less than Criteria
R6	35	33		Less than Criteria
R7	31	25		Less than Criteria
R8	31	30		Less than Criteria
R9	29	27		Less than Criteria
R10	31	28		Less than Criteria
R11	27	25		Less than Criteria
R12	28	25		Less than Criteria
R13	27	24		Less than Criteria
R14	33	31		Less than Criteria
R15	32	29		Less than Criteria
R16	31	30		Less than Criteria
R17	23	22		Less than Criteria
R18	38	35		Above Evening and Night PNTL[1]
R19	37	34		
R20	24	<20		Less than Criteria
R21	29	25		Less than Criteria
R22	26	22		Less than Criteria

Note 1: assessment of unmitigated impacts. Further analysis indicates that PNTL during all periods can be achieved with recommended controls

7.2.2 Stage 4b: Northern haul road development and processing via RL105 m RoM pad

A summary of predicted noise levels at sensitive receivers adjacent to the development is provided in **Table 41**. This scenario represents operations upon completion of the RL105 m RoM pad. Review of this analysis indicates that predicted noise levels are expected to achieve the day, evening and night PNTL at all receivers.

Table 42: Sound Pressure Level (SPL) predictions, Stage 4b

Receiver ID	Predicted Noise Level	PNTL	Assessment
R1	<20	Day Period 40 dBA Evening and Night Period 35 dBA	Less than Criteria
R2	31		Less than Criteria
R3	29		Less than Criteria
R4	29		Less than Criteria
R5	33		Less than Criteria
R6	34		Less than Criteria
R7	30		Less than Criteria
R8	31		Less than Criteria
R9	30		Less than Criteria
R10	31		Less than Criteria
R11	27		Less than Criteria
R12	27		Less than Criteria
R13	26		Less than Criteria
R14	32		Less than Criteria
R15	30		Less than Criteria
R16	30		Less than Criteria
R17	22		Less than Criteria
R18	35		Less than Criteria
R19	35		Less than Criteria
R20	21		Less than Criteria
R21	27		Less than Criteria
R22	23		Less than Criteria

Analysis of Stage 4a and Stage 4b works indicates that northern haul road development and associated processing activities, via both the RL95 and RL105 RoM pads (once constructed), will achieve the PNTL at all times of day. Despite this, exceedances of the evening and night period PNTL may occur during the construction of the RL105 m RoM pad. On this basis, it is recommended that development works associated with the construction of the RL105 m RoM pad are limited to the day period (7am to 6pm).

7.2.3 Stage 5a: Development of Box Cut and Extraction at RL206 m

A summary of predicted noise levels at sensitive receivers adjacent to the development is provided in **Table 43**. Review of this analysis indicates that predicted noise levels are expected to achieve the day period PNTL of 40 dBA at all adjacent sensitive receivers. Operations during this stage may exceed the evening and night period PNTL by up to 4 dBA at seven receivers adjacent to the site (R3, R6-R9, R18-R19).

Detailed assessment indicates that exceedance of evening and night period PNTL is attributable to emissions from blast preparation (drilling and dozer) at exposed locations. Re-calculation indicates that the evening and night period PNTL can be achieved if blast preparation is restricted to the day period. That is, only extraction of blasted material, haulage to the RoM pad and processing occurring after 6 pm.

Table 43: Sound Pressure Level (SPL) predictions, Stage 5a

Receiver ID	Predicted Noise Level		PNTL	Assessment
	All Activities	No Blast Drilling		
R1	29	21	Day Period 40 dBA Evening and Night Period 35 dBA	Less than Criteria
R2	34	31		Less than Criteria
R3	37	29		Above Evening and Night PNTL[1]
R4	30	28		Less than Criteria
R5	33	31		Less than Criteria
R6	36	34		Above Evening and Night PNTL[1]
R7	36	29		Above Evening and Night PNTL[1]
R8	36	30		Above Evening and Night PNTL[1]
R9	37	30		Above Evening and Night PNTL[1]
R10	32	28		Less than Criteria
R11	33	27		Less than Criteria
R12	35	28		Less than Criteria
R13	28	25		Less than Criteria
R14	34	32		Less than Criteria
R15	33	30		Less than Criteria
R16	34	30		Less than Criteria
R17	29	22		Less than Criteria
R18	39	35		Above Evening and Night PNTL[1]
R19	38	34		Above Evening and Night PNTL[1]
R20	29	22		Less than Criteria
R21	33	27		Less than Criteria
R22	30	24		Less than Criteria

Note 1: assessment of unmitigated impacts. Further analysis indicates that PNTL during all periods can be achieved with recommended controls.

7.2.4 Stage 5b: Extraction at RL195 m following initial quarry development

A summary of predicted noise levels at sensitive receivers adjacent to the development is provided in **Table 44**. Review of this analysis indicates that predicted noise levels are expected to achieve the day period PNTL of 40 dBA at all adjacent sensitive receivers. Operations during this stage may exceed the evening and night period PNTL by up to 2 dBA at two receivers adjacent to the site, R18 and R19.

As with assessment of Stage 5a operations presented in **Section 7.2.3**, exceedance of the evening and night period PNTL is attributable to emissions from blast preparation (drilling and dozer) at exposed locations. The evening and night period PNTL can be achieved if blast preparation is restricted to the day period. That is, only extraction of blasted material, haulage to the RoM and processing occurring after 6pm.

Table 44: Sound Pressure Level (SPL) predictions, Stage 5b

Receiver ID	Predicted Noise Level		PNTL	Assessment
	All Activities	No Blast Drilling		
R1	29	20	Day Period 40 dBA Evening and Night Period 35 dBA	Less than Criteria
R2	34	31		Less than Criteria
R3	34	29		Less than Criteria
R4	28	27		Less than Criteria
R5	31	30		Less than Criteria
R6	34	33		Less than Criteria
R7	28	26		Less than Criteria
R8	30	29		Less than Criteria
R9	29	27		Less than Criteria
R10	28	27		Less than Criteria
R11	26	25		Less than Criteria
R12	26	25		Less than Criteria
R13	25	25		Less than Criteria
R14	31	31		Less than Criteria
R15	29	29		Less than Criteria
R16	30	30		Less than Criteria
R17	21	21		Less than Criteria
R18	37	34		Above Evening and Night PNTL[1]
R19	36	33		Above Evening and Night PNTL[1]
R20	28	22		Less than Criteria
R21	26	25		Less than Criteria
R22	23	22		Less than Criteria

Note 1: assessment of unmitigated impacts. Further analysis indicates that PNTL during all periods can be achieved with recommended controls

7.2.5 Stage 6: Extraction from RL158 m to 126 m and Progressive Final Landform Works

A summary of predicted noise levels at sensitive receivers adjacent to the development is provided in **Table 45**. Review of this analysis indicates that predicted noise levels are expected to achieve the day period PNTL of 40 dBA at all adjacent sensitive receivers. Operations during this stage may exceed the evening and night period PNTL by up to 3 dBA at two receivers adjacent to the site, namely R18 and R19.

Detailed review indicates that exceedance of the evening and night period PNTL is attributable to emissions from blast preparation (drilling) and progressive final landforms works (dozer operations) at exposed locations. The evening and night period PNTL can be achieved if these activities are restricted to the day period. That is, only extraction of blasted material, haulage to the RoM and processing occurring after 6pm).

Table 45: Sound Pressure Level (SPL) predictions, Stage 6

Receiver ID	Predicted Noise Level		PNTL	Assessment
	All Activities	No Blast Drilling		
R1	<20	<20	Day Period 40 dBA Evening and Night Period 35 dBA	Less than Criteria
R2	32	31		Less than Criteria
R3	31	29		Less than Criteria
R4	28	27		Less than Criteria
R5	32	30		Less than Criteria
R6	35	33		Less than Criteria
R7	34	25		Less than Criteria
R8	33	29		Less than Criteria
R9	34	27		Less than Criteria
R10	32	27		Less than Criteria
R11	33	24		Less than Criteria
R12	35	25		Less than Criteria
R13	29	25		Less than Criteria
R14	34	31		Less than Criteria
R15	33	29		Less than Criteria
R16	33	30		Less than Criteria
R17	27	21		Less than Criteria
R18	37	34		Above Evening and Night PNTL[1]
R19	38	33		Above Evening and Night PNTL[1]
R20	26	<20		Less than Criteria
R21	33	25		Less than Criteria
R22	29	22		Less than Criteria

Note 1: assessment of unmitigated impacts. Further analysis indicates that PNTL during all periods can be achieved with recommended controls

7.2.6 Stage 7: Extraction down to RL95 m and final landform

A summary of predicted noise levels at sensitive receivers adjacent to the development is provided in **Table 46**. Review of this analysis indicates that predicted noise levels are expected to achieve the day period PNTL of 40 dBA at all adjacent sensitive receivers. Operations during this stage may exceed the evening and night period PNTL by up to 5 dBA at two receivers adjacent to the site, R18 and R19.

Detailed review indicates that exceedance of the evening and night period PNTL is attributable to a combination of:

- emissions from blast preparation (drilling) and dozer activities associated with final landforms works at exposed locations;
- operation of the processing plant once the RL105 m RoM pad has been mined through, and topographical protections previously provided by that terrain feature are no longer available.

Review indicates that, even where drilling and dozer activities (final landform management) at exposed locations are restricted to the day period, residual exceedances of the evening and night PNTL of up to 3 dBA associated with operation of the processing plant may be expected.

Given uncertainty relating to the design of the mine plan and details relating to the operation of processing plant and RoM areas once mining of the RL105 m RoM pad commences, it is recommended that specific amendments to the Noise Management Plan (NMP) for the site be developed and implemented following commencement of Stage 7, but prior to mining through of the RL105 m RoM pad. Mitigation and management actions specific to this issue may include:

- Monitoring and / or review of noise complaints to ascertain whether minor exceedance of the PNTL may result in material impact at receivers R18 and R19;
- Consideration of temporary noise barriers to minimise emission of noise from the processing plant;
- Commitment to carry out processing activities only during the day period (as modelling indicates that the PNTL is achieved at this time).

Table 46: Sound Pressure Level (SPL) predictions, Stage 7

Receiver ID	Predicted Noise Level		PNTL	Assessment
	All Activities	No Blast Drilling		
R1	22	21	Day Period 40 dBA Evening and Night Period 35 dBA	Less than Criteria
R2	31	31		Less than Criteria
R3	30	29		Less than Criteria
R4	28	27		Less than Criteria
R5	31	31		Less than Criteria
R6	34	33		Less than Criteria
R7	28	27		Less than Criteria
R8	30	29		Less than Criteria
R9	29	28		Less than Criteria
R10	29	28		Less than Criteria
R11	28	27		Less than Criteria

Receiver ID	Predicted Noise Level		PNTL	Assessment
	All Activities	No Blast Drilling		
R12	27	26		Less than Criteria
R13	25	25		Less than Criteria
R14	31	31		Less than Criteria
R15	32	32		Less than Criteria
R16	33	32		Less than Criteria
R17	23	21		Less than Criteria
R18	40	38		Above Evening and Night PNTL
R19	39	36		Above Evening and Night PNTL
R20	31	27		Less than Criteria
R21	27	27		Less than Criteria
R22	23	22		Less than Criteria

7.3 Road Noise

Modelled road noise levels for the day (07:00 – 22:00) and night (22:00 – 07:00) periods are compared to the relevant period criterion in **Table 47** and **Table 48** respectively.

Table 47: Modelled Road Traffic Noise Levels – Day Period

Receiver ID	2023 – No Build	2023 – With Build	2033 – No Build	2033 – With Build	Day Period Assessment Criterion [dB(A)]	Total Traffic Noise Level Increase
R5	60	62	61	63	60	< 12
R6	63	65	64	65	60	< 12
R7	58	60	59	60	60	< 12
R8	60	62	61	63	60	< 12
R9	60	62	61	62	60	< 12
R10	50	52	51	53	60	< 12
R11	63	65	64	65	60	< 12
R23	64	66	65	66	60	< 12
R24	54	56	55	57	60	< 12
R25	53	55	54	56	60	< 12
R26	54	55	54	56	60	< 12
R27	54	55	55	56	60	< 12
R28	54	56	55	57	60	< 12
R29	53	55	54	56	60	< 12
R30	53	55	54	56	60	< 12
R31	53	55	54	56	60	< 12
R32	57	58	57	59	60	< 12

Receiver ID	2023 – No Build	2023 – With Build	2033 – No Build	2033 – With Build	Day Period Assessment Criterion [dB(A)]	Total Traffic Noise Level Increase
R33	53	55	54	56	60	< 12
R34	65	67	66	68	60	< 12
R35	61	62	61	63	60	< 12
R36	64	65	64	66	60	< 12
R37	58	59	58	60	60	< 12
R38	56	57	57	58	60	< 12
R39	56	58	57	59	60	< 12
R40	55	57	56	58	60	< 12
R41	55	57	56	58	60	< 12
R42	55	57	56	58	60	< 12
R43	55	57	56	58	60	< 12
R44	54	56	55	57	60	< 12
R45	54	56	55	57	60	< 12
R46	55	56	55	57	60	< 12
R47	55	56	56	57	60	< 12
R48	55	57	56	57	60	< 12
R49	55	57	56	57	60	< 12
R50	55	57	56	58	60	< 12
R51	55	57	56	58	60	< 12
R52	56	57	56	58	60	< 12
R53	59	61	60	61	60	< 12
R54	59	60	59	61	60	< 12
R55	57	59	58	60	60	< 12
R56	58	59	58	60	60	< 12
R57	58	59	59	60	60	< 12
R58	58	60	59	61	60	< 12
R59	58	60	59	61	60	< 12
R60	59	61	60	61	60	< 12
R61	59	61	60	62	60	< 12
R62	60	61	60	62	60	< 12
R63	60	62	61	62	60	< 12
R64	61	62	61	63	60	< 12
R65	56	58	57	58	60	< 12
R66	56	57	56	58	60	< 12
R67	57	59	58	59	60	< 12
R68	59	61	60	62	60	< 12
R69	57	59	58	60	60	< 12
R70	57	58	57	59	60	< 12
R71	54	56	55	57	60	< 12
R72	58	60	59	60	60	< 12
R73	58	60	59	61	60	< 12
R74	56	58	57	59	60	< 12
R75	57	59	58	60	60	< 12
R76	53	55	54	55	60	< 12

Receiver ID	2023 – No Build	2023 – With Build	2033 – No Build	2033 – With Build	Day Period Assessment Criterion [dB(A)]	Total Traffic Noise Level Increase
R77	57	59	58	60	60	< 12
R78	57	59	58	60	60	< 12
R79	56	57	57	58	60	< 12
R80	56	58	57	59	60	< 12
R81	55	57	56	58	60	< 12
R82	58	60	59	61	60	< 12
R83	61	63	62	64	60	< 12
R84	60	62	61	63	60	< 12
R85	36	38	37	38	60	< 12
R86	61	63	62	63	60	< 12
R87	57	59	58	60	60	< 12
R88	52	54	53	55	60	< 12
R89	58	60	59	61	60	< 12
R90	53	55	54	56	60	< 12
R91	64	66	65	66	60	< 12
R92	64	66	65	67	60	< 12
R93	57	59	58	59	60	< 12
R94	67	69	68	70	60	< 12
R95	61	63	62	64	60	< 12
R96	67	69	68	69	60	< 12
R97	62	63	63	64	60	< 12
R98	52	54	53	55	60	< 12
R99	56	58	57	59	60	< 12
R100	62	64	63	65	60	< 12
R101	64	66	65	67	60	< 12
R102	54	56	55	57	60	< 12
R103	57	59	58	59	60	< 12
R104	53	55	54	56	60	< 12
R105	53	55	54	56	60	< 12
R106	60	61	61	62	60	< 12
R107	53	55	54	55	60	< 12
R108	52	54	53	55	60	< 12
R109	52	54	53	55	60	< 12
R110	64	66	65	67	60	< 12
R111	58	60	59	60	60	< 12
R112	62	64	63	64	60	< 12
R113	57	59	58	59	60	< 12
R114	60	62	61	63	60	< 12
R115	54	56	55	56	60	< 12
R116	66	68	67	68	60	< 12
R117	60	62	61	62	60	< 12
R118	67	69	68	69	60	< 12
R119	63	64	63	65	60	< 12
R120	57	59	58	60	60	< 12

Receiver ID	2023 – No Build	2023 – With Build	2033 – No Build	2033 – With Build	Day Period Assessment Criterion [dB(A)]	Total Traffic Noise Level Increase
R121	56	58	57	59	60	< 12
R122	63	65	64	66	60	< 12
R123	60	62	61	63	60	< 12
R124	55	56	56	57	60	< 12
R125	56	57	57	58	60	< 12
R126	65	67	66	68	60	< 12
R127	54	56	55	57	60	< 12
R128	55	57	56	58	60	< 12
R129	56	58	57	59	60	< 12
R130	67	68	68	69	60	< 12
R131	56	58	57	59	60	< 12
R132	70	72	71	72	60	< 12
R133	67	69	68	70	60	< 12
R134	63	64	64	65	60	< 12
R135	74	76	75	77	60	< 12
R136	58	60	59	60	60	< 12
R137	64	66	65	67	60	< 12
R138	53	54	54	55	60	< 12
R139	54	56	55	56	60	< 12
R140	53	54	54	55	60	< 12
R141	51	53	52	54	60	< 12
R142	50	52	51	53	60	< 12
R143	60	62	61	63	60	< 12
R144	60	62	61	62	60	< 12
R145	54	56	55	57	60	< 12
R146	60	61	61	62	60	< 12

Note: Predicted sound pressure levels above the criteria are presented in **red**.

Table 48: Modelled Road Traffic Noise Levels – Night Period

Receiver ID	2023 – No Build	2023 – With Build	2033 – No Build	2033 – With Build	Night Period Assessment Criterion [dB(A)]	Total Traffic Noise Level Increase
R5	51	53	52	54	55	< 12
R6	54	56	55	56	55	< 12
R7	49	51	50	51	55	< 12
R8	51	53	52	54	55	< 12
R9	51	52	52	53	55	< 12
R10	41	43	42	44	55	< 12
R11	54	56	55	56	55	< 12
R23	55	57	56	57	55	< 12
R24	45	47	46	48	55	< 12
R25	44	46	45	47	55	< 12

Receiver ID	2023 – No Build	2023 – With Build	2033 – No Build	2033 – With Build	Night Period Assessment Criterion [dB(A)]	Total Traffic Noise Level Increase
R26	45	46	45	47	55	< 12
R27	45	46	45	47	55	< 12
R28	45	47	46	48	55	< 12
R29	44	46	45	47	**55**	< 12
R30	44	46	45	47	55	< 12
R31	44	46	45	47	55	< 12
R32	48	49	48	50	55	< 12
R33	44	46	45	47	55	< 12
R34	56	58	57	59	55	< 12
R35	52	53	52	54	55	< 12
R36	54	56	55	57	55	< 12
R37	49	50	49	51	55	< 12
R38	47	48	48	49	**55**	< 12
R39	47	49	48	50	55	< 12
R40	46	48	47	49	55	< 12
R41	46	48	47	49	55	< 12
R42	46	48	47	49	55	< 12
R43	46	48	47	49	55	< 12
R44	45	47	46	48	55	< 12
R45	45	47	46	48	55	< 12
R46	45	47	46	48	55	< 12
R47	46	47	46	48	**55**	< 12
R48	46	47	47	48	55	< 12
R49	46	48	47	48	55	< 12
R50	46	48	47	49	55	< 12
R51	46	48	47	49	55	< 12
R52	47	48	47	49	55	< 12
R53	50	52	51	52	55	< 12
R54	49	51	50	52	55	< 12
R55	48	50	49	51	55	< 12
R56	48	50	49	51	**55**	< 12
R57	49	50	50	51	55	< 12
R58	49	51	50	52	55	< 12
R59	49	51	50	52	55	< 12
R60	50	52	51	52	55	< 12
R61	50	52	51	53	55	< 12
R62	51	52	51	53	55	< 12
R63	51	53	52	53	55	< 12
R64	52	53	52	54	55	< 12
R65	47	49	48	49	**55**	< 12
R66	46	48	47	49	55	< 12
R67	48	50	49	50	55	< 12
R68	50	52	51	53	55	< 12
R69	48	50	49	51	55	< 12

Receiver ID	2023 – No Build	2023 – With Build	2033 – No Build	2033 – With Build	Night Period Assessment Criterion [dB(A)]	Total Traffic Noise Level Increase
R70	48	49	48	50	55	< 12
R71	45	47	46	48	55	< 12
R72	49	51	50	51	55	< 12
R73	49	51	50	52	55	< 12
R74	47	49	48	50	**55**	< 12
R75	48	50	49	51	55	< 12
R76	44	45	45	46	55	< 12
R77	48	50	49	51	55	< 12
R78	48	50	49	51	55	< 12
R79	47	48	48	49	55	< 12
R80	47	49	48	50	55	< 12
R81	46	48	47	49	55	< 12
R82	49	51	50	52	55	< 12
R83	52	54	53	55	**55**	< 12
R84	51	53	52	54	55	< 12
R85	27	29	28	29	55	< 12
R86	52	54	53	54	55	< 12
R87	48	50	49	51	55	< 12
R88	43	45	44	46	55	< 12
R89	49	51	50	52	55	< 12
R90	44	46	45	47	55	< 12
R91	55	56	56	57	55	< 12
R92	55	57	56	58	**55**	< 12
R93	48	50	49	50	55	< 12
R94	58	60	59	61	55	< 12
R95	52	54	53	55	55	< 12
R96	58	59	59	60	55	< 12
R97	53	54	54	55	55	< 12
R98	43	45	44	46	55	< 12
R99	47	49	48	50	55	< 12
R100	53	55	54	56	55	< 12
R101	55	57	56	57	**55**	< 12
R102	45	47	46	48	55	< 12
R103	48	50	49	50	55	< 12
R104	44	46	45	47	55	< 12
R105	44	46	45	47	55	< 12
R106	51	52	52	53	55	< 12
R107	44	45	45	46	55	< 12
R108	43	45	44	46	55	< 12
R109	43	45	44	46	55	< 12
R110	55	57	56	58	**55**	< 12
R111	49	51	50	51	55	< 12
R112	53	55	54	55	55	< 12
R113	48	50	49	50	55	< 12

Receiver ID	2023 – No Build	2023 – With Build	2033 – No Build	2033 – With Build	Night Period Assessment Criterion [dB(A)]	Total Traffic Noise Level Increase
R114	51	53	52	54	55	< 12
R115	45	47	46	47	55	< 12
R116	57	59	58	59	55	< 12
R117	51	53	52	53	55	< 12
R118	58	60	59	60	55	< 12
R119	53	55	54	56	55	< 12
R120	48	50	49	51	55	< 12
R121	47	49	48	50	55	< 12
R122	54	56	55	57	55	< 12
R123	51	53	52	54	55	< 12
R124	46	47	47	48	55	< 12
R125	47	48	48	49	55	< 12
R126	56	58	57	59	55	< 12
R127	45	47	46	48	55	< 12
R128	46	48	47	49	55	< 12
R129	47	49	48	50	55	< 12
R130	58	59	58	60	55	< 12
R131	47	49	48	50	55	< 12
R132	61	63	62	63	55	< 12
R133	58	60	59	61	55	< 12
R134	54	55	55	56	55	< 12
R135	65	67	66	68	55	< 12
R136	49	50	50	51	55	< 12
R137	55	57	56	58	55	< 12
R138	44	45	45	46	55	< 12
R139	45	47	46	47	55	< 12
R140	44	45	45	46	55	< 12
R141	42	44	43	45	55	< 12
R142	41	43	42	44	55	< 12
R143	51	53	52	54	55	< 12
R144	51	52	52	53	55	< 12
R145	45	47	46	48	55	< 12
R146	51	52	52	53	55	< 12

Note: Predicted sound pressure levels above the criteria are presented in red.

Existing Road Traffic Levels – Year 2023

Modelling indicates that existing – year 2023 – road traffic noise levels already exceed the RNP criteria at approximately 27% of the assessed receivers identified along Bucketts Way between Maytoms Lane and the Pacific Motorway during the day period and 10% during the night period.

The cumulative addition of the forecast project traffic, of 300-400 movements per day, is expected to increase day period noise levels at these receivers by only up to 2 dBA, far below the relative increase criteria. The increase will result in some receivers which are currently experiencing levels below the RNP criteria to increase to a level above the RNP criteria. Under the 'with project traffic' scenario, for year 2023, the number of receivers experiencing road noise above the RNP day period criteria is expected to increase

to approximately 38% of the assessed receivers identified along Bucketts Way between Maytoms Lane and the Pacific Motorway during the day period and 17% during the night period.

Future Road Traffic Levels – Year 2033

Modelling indicates that year 2033 – at the end of the 10 year planning horizon – road traffic noise levels are predicted to exceed the RNP criteria at approximately 33% of the assessed receivers identified along Bucketts Way between Maytoms Lane and the Pacific Motorway during the day period and 14% during the night period.

The cumulative addition of the forecast project traffic, of over 300 movements per day, is expected to increase day period noise levels at these receivers by only up to 2 dBA, far below the relative increase criteria. The increase will result in some receivers which are currently experiencing levels below the RNP criteria to increase to a level above the RNP criteria. Under the 'with project traffic' scenario, for year 2023, the number of receivers experiencing road noise above the RNP day period criteria is expected to increase to approximately 44% of the assessed receivers identified along Bucketts Way between Maytoms Lane and the Pacific Motorway during the day period and 19% during the night period.

7.4 Sleep Disturbance

Proposed night period operations during the Project Operational Phase that are summarised in **Table 35** are assessed in the following sections.

7.4.1 Stage 5a: Development of Box Cut and Extraction at RL 206 m

A summary of predicted maximum noise levels at sensitive receivers adjacent to the development is provided in **Table 49**. Review of this analysis indicates that predicted maximum noise levels are expected to achieve the night period criterion of 52 dBA at all adjacent sensitive receivers.

Based on the results in **Table 43**, the applicable equivalent energy average sleep disturbance criteria of $L_{Aeq,15minute}$ 40 dB is predicted to be met during modelled Stage 5a operations.

Table 49: Maximum Sound Pressure Level (SPL) predictions, Stage 5a

Receiver ID	Predicted Noise Level		Night Period Sleep Disturbance Threshold LAFmax [dBA]	Assessment
	All Activities	No Blast Drilling		
R1	37	27	52	Less than Criteria
R2	42	39		Less than Criteria
R3	45	37		Less than Criteria
R4	38	36		Less than Criteria
R5	41	39		Less than Criteria
R6	44	42		Less than Criteria
R7	44	37		Less than Criteria
R8	44	38		Less than Criteria
R9	45	38		Less than Criteria
R10	40	36		Less than Criteria
R11	41	35		Less than Criteria
R12	43	36		Less than Criteria
R13	36	33		Less than Criteria

Receiver ID	Predicted Noise Level		Night Period Sleep Disturbance Threshold LAFmax [dBA]	Assessment
	All Activities	No Blast Drilling		
R14	42	40		Less than Criteria
R15	41	38		Less than Criteria
R16	42	38		Less than Criteria
R17	37	30		Less than Criteria
R18	47	43		Less than Criteria
R19	46	42		Less than Criteria
R20	37	30		Less than Criteria
R21	41	35		Less than Criteria
R22	38	32		Less than Criteria

7.4.2 Stage 5b: Extraction at RL195 m following initial quarry development

A summary of predicted maximum noise levels at sensitive receivers adjacent to the development is provided in **Table 50**. Review of this analysis indicates that predicted maximum noise levels are expected to achieve the night period criterion of 52 dBA at all adjacent sensitive receivers.

Based on the results in **Table 44**, the applicable equivalent energy average sleep disturbance criteria of $L_{Aeq,15minute}$ 40 dB is predicted to be met during modelled Stage 5b operations.

Table 50: Maximum Sound Pressure Level (SPL) predictions, Stage 5b

Receiver ID	Predicted Noise Level		Night Period Sleep Disturbance Threshold LAFmax [dBA]	Assessment
	All Activities	No Blast Drilling		
R1	37	28	52	Less than Criteria
R2	42	39		Less than Criteria
R3	42	37		Less than Criteria
R4	36	35		Less than Criteria
R5	39	38		Less than Criteria
R6	42	41		Less than Criteria
R7	36	34		Less than Criteria
R8	38	37		Less than Criteria
R9	29	35		Less than Criteria
R10	36	35		Less than Criteria
R11	26	33		Less than Criteria
R12	34	33		Less than Criteria

Receiver ID	Predicted Noise Level		Night Period Sleep Disturbance Threshold LAFmax [dBA]	Assessment
	All Activities	No Blast Drilling		
R13	33	33		Less than Criteria
R14	39	39		Less than Criteria
R15	37	37		Less than Criteria
R16	38	38		Less than Criteria
R17	29	29		Less than Criteria
R18	45	42		Less than Criteria
R19	44	41		Less than Criteria
R21	34	33		Less than Criteria
R22	31	30		Less than Criteria

7.4.3 Stage 6: Extraction from RL 158 m to RL 126 m and Progressive Final Landform Works

A summary of predicted maximum noise levels at sensitive receivers adjacent to the development is provided in **Table 51**. Review of this analysis indicates that predicted maximum noise levels are expected to achieve the night period criterion of 52 dBA at all adjacent sensitive receivers.

Based on the results in **Table 45**, the applicable equivalent energy average sleep disturbance criteria of $L_{Aeq,15minute}$ 40 dB is predicted to be met during modelled Stage 6 operations.

Table 51: Maximum Sound Pressure Level (SPL) predictions, Stage 6

Receiver ID	Predicted Noise Level		Night Period Sleep Disturbance Threshold LAFmax [dBA]	Assessment
	All Activities	No Blast Drilling		
R1	<28	<28	52	Less than Criteria
R2	40	39		Less than Criteria
R3	39	37		Less than Criteria
R4	36	35		Less than Criteria
R5	40	38		Less than Criteria
R6	43	41		Less than Criteria
R7	42	33		Less than Criteria
R8	41	37		Less than Criteria
R9	42	35		Less than Criteria
R10	40	35		Less than Criteria
R11	41	32		Less than Criteria
R12	43	33		Less than Criteria

Receiver ID	Predicted Noise Level		Night Period Sleep Disturbance Threshold LAFmax [dBA]	Assessment
	All Activities	No Blast Drilling		
R13	37	33		Less than Criteria
R14	42	39		Less than Criteria
R15	41	37		Less than Criteria
R16	41	38		Less than Criteria
R17	35	29		Less than Criteria
R18	45	42		Less than Criteria
R19	46	41		Less than Criteria
R20	34	<28		Less than Criteria
R21	41	33		Less than Criteria
R22	37	30		Less than Criteria

7.4.4 Stage 7: Extraction down to RL95 m and final landform

A summary of predicted maximum noise levels at sensitive receivers adjacent to the development is provided in **Table 52**. Review of this analysis indicates that predicted maximum noise levels are expected to achieve the night period criterion of 52 dBA at all adjacent sensitive receivers.

Based on the results in **Table 46**, the applicable equivalent energy average sleep disturbance criteria of $L_{Aeq,15minute}$ 40 dB is predicted to be met during modelled Stage 7 operations.

Table 52: Maximum Sound Pressure Level (SPL) predictions, Stage 7

Receiver ID	Predicted Noise Level		Night Period Sleep Disturbance Threshold LAFmax [dBA]	Assessment
	All Activities	No Blast Drilling		
R1	30	29		Less than Criteria
R2	39	39		Less than Criteria
R3	38	47		Less than Criteria
R4	36	35		Less than Criteria
R5	39	39		Less than Criteria
R6	42	41	52	Less than Criteria
R7	36	35		Less than Criteria
R8	38	37		Less than Criteria
R9	37	36		Less than Criteria
R10	37	36		Less than Criteria
R11	36	35		Less than Criteria

Receiver ID	Predicted Noise Level		Night Period Sleep Disturbance Threshold LAFmax [dBA]	Assessment
	All Activities	No Blast Drilling		
R12	35	34		Less than Criteria
R13	33	33		Less than Criteria
R14	39	39		Less than Criteria
R15	40	40		Less than Criteria
R16	41	40		Less than Criteria
R17	31	29		Less than Criteria
R18	48	46		Less than Criteria
R19	37	44		Less than Criteria
R20	39	35		Less than Criteria
R21	35	35		Less than Criteria
R22	31	28		Less than Criteria

7.5 Blasting

7.5.1 Overpressure impacts

A summary of air blast overpressure impacts based on blast design information provided by the proponent is presented in **Table 53**. The results indicate that, based on observed separation distances, air blast overpressure levels have potential to exceed the human annoyance criteria presented in the ANZEC guideline at the nearest sensitive receiver to the south (R3) where the largest anticipated MIC is used during development Stage 5 (blasting at highest point in the project area).

Further analysis of average blast design indicates that reducing the MIC would allow airblast overpressure to remain below the 115 dB annoyance threshold at this receiver. Airblast overpressure levels are expected to be below the ANZECC guidance values at all other near receivers.

Table 53: Assessment of air blast impacts at nearest receivers

Scenario	Receiver	Separation Distance	Blast Hole	MIC	Air blast overpressure	Limit
Blasting at Access Road Slot	R3	1 700 m	102 mm Diameter 5 m depth	200 kg	98 dB	115 dB
	R11	1 700 m			98 dB	
	R19	1 550 m			101 dB	
Blasting at Top of Hill (maximum expected blast)	R3	1 400 m	102 mm Diameter 10-12 m depth	500 kg	**118 dB**	
	R11	2 400 m			96 dB	
	R19	1 950 m			105 dB	
Blasting at Top of Hill (average blast)	R3	1 400 m	102 mm Diameter 10-12 m depth	200 kg	106 dB	
	R11	2 400 m			85 dB	
	R19	1 950 m			92 dB	

7.5.2 Ground Vibration Impacts

A summary of assessed ground vibration impacts is presented in **Table 54**. The results indicate that, based on the observed separation distances, ground vibration levels are unlikely to exceed the criteria for human annoyance at sensitive receivers adjacent to the blast site.

Table 54: Assessment ground vibration impacts

Scenario	Receiver	Separation Distance	Blast Hole	MIC	Ground Vibration (PPV)	Limit
Blasting at Access Road Slot	R3	1 700 m	102 mm Diameter 5 m depth	200 kg	0.5 mm/s	5 mm/s
	R11	1 700 m			0.5 mm/s	
	R19	1 550 m			0.6 mm/s	
Blasting at Top of Hill (maximum expected blast)	R3	1 400 m	102 mm Diameter 10-12 m depth	500 kg	1.5 mm/s	
	R11	2 400 m			0.6 mm/s	
	R19	1 950 m			0.9 mm/s	
Blasting at Top of Hill (average blast)	R3	1 400 m	102 mm Diameter 10-12 m depth	200 kg	0.7 mm/s	
	R11	2 400 m			0.3 mm/s	
	R19	1 950 m			0.4 mm/s	

8. Discussion and Recommendations

8.1 Assessment Conditions and Criteria

Analysis of background noise monitoring indicates that the receiving environmental adjacent to the proposed development site is rural in nature, influenced predominantly by environmental and distant transportation sources. In all cases, the PTNL were established in terms of the Intrusiveness Criteria. For

the purposes of evaluating potential impacts, it is recommended that the PTNL be adopted as the assessment criteria for the development.

Conservatively, predicted site operations were assessed under enhancing meteorological parameters applied to the assessment.

8.2 Assessment of Impacts and Recommendations for Management

8.2.1 Construction Noise

8.2.1.1 Construction and maintenance noise and vibration management measures

As the proposed construction work has the potential to exceed construction noise management levels, the project requires noise management to reduce potential environmental impacts by investigation and application of noise mitigation measures recommended within this section.

A summary of site-specific environmental safeguards is provided in **Table 55** as detailed in the *Roads and Maritime* guidance note, *Preparing a project REF guidance note (EIA-P05-G02).*

Table 55: Summary of site-specific construction noise management safeguards

Control category	Details
Noise	Works would be carried out over the Standard Construction Hours.
	Noise impacts are to be minimised. Community consultation would be ongoing for residences within close proximity to the works. The information would include details of the proposed works with the duration and nature of the works during construction.
	Alternatives to reversing alarms: • Avoid use of reversing alarms by designing site layout to avoid reversing. • Where reasonable and feasible, install less alternative typical 'beeper' alarms, whilst taking into account the requirements of the OHS legislation.
	Plan traffic flow, parking, and loading/unloading areas to minimise reversing movements within the site.
	Examine and implement (where feasible) alternative work practices and equipment use which would generate less noise, such as the use of electrical equipment instead of diesel or petrol powered equipment.
	Turn off plant and equipment when not in use.
	Ensure plant/equipment is regularly maintained and repair or replace equipment that becomes noisy.
	Equipment to be fitted with appropriate silencers and be in good working order.
	Communicate with construction workers (toolbox talks) about minimising noise and the potential to impact residents through their actions, including the use of equipment, use of radios during non-standard hours, avoiding shouting, minimal talking loudly and restrict the slamming of vehicle doors.
	Where noise is above the Highly Noise Affected 75 dB(A) the works may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: • Times identified by the community when they are less sensitive to noise (such as mid mornings or mid-afternoons for works near residents), if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
	Minimise the duration of concurrent plant/machinery operating which could lead to exceedences in the Highly Noise Affected Level.

In addition to the measures set out in **Table 55**, any project specific mitigation measures identified in the environmental impact assessment documentation (e.g. REF, submissions, or representations report) or approval or licence conditions must be implemented. Where required, available, practical, and cost-effective, the implementation of the following non-exhaustive list of noise and vibration mitigation and management options in **Table 56**, will assist in reducing impact. These and any other available options should be considered when planning work and should be implemented where practical and cost-effective.

Table 56: Comprehensive list of measures for construction and maintenance noise and vibration management

Control category	Applicable to	Details
Management Measures		
Implementation of any project specific mitigation measures required	Airborne noise Ground-borne noise and vibration	In addition to the measures set out in this table, any project specific mitigation measures identified in the environmental impact assessment documentation (e.g. REF, submissions, or representations report) or approval or licence conditions must be implemented.
Implement community consultation measures	Airborne noise Ground-borne noise and vibration	Community consultation measures (if required by approval conditions), include: • Community based forums Periodic notification (monthly letterbox drop or advertisement in local papers) • Project Info-line and Construction Response Line; • email distribution list • Signage • Specific notifications – Letterbox dropped or hand delivered to the identified stakeholders a week before events. Used to support periodic notifications, or to advertise unscheduled work • Phone calls • Individual briefings • Project specific respite offers • Alternative accommodation options.
Site inductions	Airborne noise. Ground-borne noise and vibration	All employees, contractors and subcontractors are to receive an environmental induction at least including: • all relevant project specific and standard noise and vibration mitigation measures • relevant licence and approval conditions • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • environmental incident procedures.
Behavioural practices	Airborne noise	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and door slams.
Monitoring	Airborne noise. Ground-borne noise and vibration	A noise monitoring program is to be carried out for the duration of the work where required by the Construction Noise and Vibration Management Plan and any approval and licence conditions.
Source Controls		
Time constraints and scheduling	Airborne noise. Ground-borne noise and vibration	Where feasible and reasonable, limit construction to only the standard daytime working hours or even daylight hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods. In conjunction with implementing respite periods with low noise/vibration-producing construction activities. Where possible, concentrate noisy activities at one location and move to another as quickly as possible.
Construction respite period	Ground-borne noise and vibration. Airborne noise	High noise and/or vibration generating activities may only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block.
Equipment selection and method substitution	Airborne noise. Ground-borne noise and vibration	Use quieter and less vibration emitting construction plant, equipment, and methods where feasible and reasonable. Use only necessarily sized and power rated plant items required. Ensure equipment has quality mufflers installed.

Control category	Applicable to	Details
Maximum noise levels	Airborne noise	Limit the operational noise levels of plant and equipment Sound Power Levels to be compliant with the noise emission limits used in the site Construction Noise and Vibration Management Plan (CNVMP). Noise emission limits should guide choice of any rental plant items. Implement a noise monitoring audit program to ensure equipment remains within specified limits.
Use and siting of plant	Airborne noise	Only have necessary equipment on site. Simultaneous operation of noisy plant within discernible range of a sensitive receiver is to be avoided. Maximise the offset distance between noisy plant and nearby sensitive receivers. Plant used intermittently to be throttled down or shut down when not in use. The loudest noise-emitting side of plant items should be orientated away from sensitive receivers.
Plan worksites and activities to minimise noise and vibration	Airborne noise. Ground-borne vibration	Plan traffic flow, parking, and loading/unloading areas to minimise reversing movements within the site.
Non-tonal reversing alarms	Airborne noise	Consider the use of non-tonal reversing beepers (or an equivalent mechanism such as broadband alarms) fitted and used on construction vehicles and mobile plant regularly used on site. Other alternatives include manually adjustable or ambient noise sensitive types ("smart" reversing alarms) and closed circuit TV systems.
Minimise disturbance arising from delivery of goods to construction sites	Airborne noise	Incorporate the following recommendations as part of the project Traffic Management Plan: • Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers • Dedicated loading/unloading areas to be shielded if close to sensitive receivers • Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible.
Site access	Airborne noise	Incorporate the following recommendations as part of the project Traffic Management Plan: • Vehicle movements outside construction hours, including loading and unloading operations, should be minimised, and avoided where possible. • The development site should be laid out so there is direct flow of mobile plant through the site to minimise or preclude if possible any required reversing
Equipment maintenance	Airborne noise	Ensure equipment is well maintained and fitted with adequately maintained silencers which meet the design specifications.
Quieter work practices	Airborne noise. Ground-borne vibration	For example, implement worksite induction training, educating staff on noise sensitive issues and the need to make as little noise as possible.
Path Controls		
Shielding of noise sensitive receivers	Airborne noise	Consider installing temporary construction noise barriers. Install any permanent noise barriers required to minimise road traffic noise as early as possible in the construction process. Locate equipment to take advantage of the noise barriers provided by existing site features and structures, such as embankments, storage sheds and fences. Consider site topography and line of sight when situating plant.
Enclosures	Airborne noise	Install noise-control kits for noisy mobile equipment and shrouds around stationary plant, as necessary, while ensuring WHS of workers is maintained (refer AS2436).
Increased distance	Airborne noise	Locate noisy plant as far away from noise-sensitive receptors as possible.
Receptor Controls		
Consultation	Community consultation, information, participation, and complaint responses are essential aspects of all construction noise management programs.	

Control category	Applicable to	Details
	They typically involve: • A community information program before construction and/or high risk activities are started. This usually involves a leaflet distribution and direct discussions and negotiations with affected residents, explaining the type, time, and duration of expected noise emissions. • The involvement of affected residents in the development of acceptable noise management strategies • A nominated community liaison officer with a contact telephone number. • A complaints hotline • Timely responses to complaints, providing information on planned actions and progress towards the resolution of concerns.	

8.2.2 Operational Noise

Review of noise modelling indicates that the proposed operations will generate offsite noise levels below the PTNL at all receivers, during the day period. The following control measures and operational restrictions on mechanical plant items outlined below are predicted to result in operational compliance during both the evening and night period.

8.2.2.1 Stage 4a: Northern haul road and RL105 m RoM Pad development

It is recommended that development works associated with the construction of the RL 105 m RoM pad are limited to the day period (7 am to 6 pm).

Predicted Stage 4a emitted noise levels to sensitive receivers adjacent to the development indicate compliance once dozer operations associated with development activities at the RL 105 m RoM pad are restricted to day period operations only.

8.2.2.2 Stage 5a: Development of Box Cut and Extraction at RL 206 m

The evening and night period noise goals can be achieved if blast preparation (drilling and dozer) is restricted to the day period. That is, only extraction of blasted material, haulage to the RoM pad and processing occurring after 6 pm.

8.2.2.3 Stage 5b: Extraction at RL 195 m following initial quarry development

The evening and night period PNTL can be achieved if blast preparation is restricted to the day period. That is, only extraction of blasted material, haulage to the RoM and processing occurring after 6pm.

8.2.2.4 Stage 6: Extraction from RL 158 m to RL 126 m and Progressive Final Landform Works

The evening and night period PNTL can be achieved when blast preparation (drilling) and progressive final landforms works (dozer operations) at exposed locations are restricted to the day period. That is, only extraction of blasted material, haulage to the RoM and processing occurring after 6 pm.

8.2.2.5 Stage 7: Extraction down to RL 95 m and final landform

Given uncertainty relating to the design of the mine plan and details relating to the operation of processing plant and RoM areas once mining of the RL 105 m RoM pad commences, it is recommended that specific amendments to the Noise Management Plan (NMP) for the site be developed and implemented following commencement of Stage 7, but prior to mining through of the RL 105 m RoM pad. Mitigation and management actions specific to this issue may include:

- Monitoring and / or review of noise complaints to ascertain whether minor exceedance of the PNTL may result in material impact at receivers R18 and R19;
- Consideration of temporary noise barriers to minimise emission of noise from the processing plant;
- Commitment to carry out processing activities only during the day period (as modelling indicates that the PNTL is achieved at this time).

8.2.3 Mitigation of Blast Impacts

While the assessment indicates blasting activities are likely to comply with the relevant criteria, impacts may be perceived by sensitive receivers adjacent to the site. AS2187.2-2006 provides guidance on methods to manage blasting in such a way as to minimise ground vibration and overpressure impacts, including:

- Reducing the maximum instantaneous charge and use of appropriate delays;
- Establishing blast times in accordance with prevailing meteorological conditions;
- Optimising blast design; and
- Orienting blasts away from receivers (where possible).

It is also recommended that provisions are made for notifying neighbours of planned blasts and monitoring of overpressure and ground vibration of blasts as they occur. This should aid in the establishment of mechanisms to modify blast designs and respond to any complaints as may be required.

8.3 Health Impact Assessment – Noise

The site related noise exposure levels predicted from this project for both the construction and operational phases, are unlikely to reach the permissible noise exposure limits of potential health impacts as per the relevant guideline, the NSW Workplace Noise Exposure Standard established by the NSW Work Health and Safety Regulation 85 $L_{Aeq,8hour}$ and 140 L_{Cpeak}.

Therefore, it is assumed that by meeting the required site specific criteria the project avoids noise related health impacts.

In addition to the above, the assessment has shown that predicted maximum noise levels are expected to achieve the night period criteria at the assessed sensitive receivers, therefore it is likely that there shall be no disruption to sleep patterns. Keeping noise levels within limits is likely to prevent adverse health effects associated with poor sleep quality.

9. Conclusions

Advitech Pty Limited (Advitech) was engaged by Coastwide Materials Pty Ltd c/- ADW Johnson Pty Limited to conduct an assessment of potential noise impacts of the construction and operation of a proposed Hillview hard rock quarry located at 67 Maytoms Lane, Booral, NSW. This assessment will form part of a submission to the NSW DPHI regarding construction and operation of the proposed quarry, as well as additional traffic movements along Maytoms Lane and Bucketts Way. The assessment has been conducted as per the Secretary's Environmental Assessment Requirements (SEARs), with reference to relevant policy and guidelines.

Project Tigger Noise Levels for adjacent receiving environments were reviewed, and the assessment conservatively adopted the most stringent criteria for potentially affected receivers in the project area.

Construction Noise and Vibration Management

The assessment has shown that there is the potential for construction noise management level goals to be intermittently exceeded throughout the site development at some residential receivers. Therefore, the proposed construction work shall require noise management by investigation and application of all feasible and reasonable noise mitigation work practices provided in this report to minimise impacts on surrounding receivers.

Operational Noise

Review of operational noise modelling under enhancing meteorological conditions indicates that the proposed operations will generate offsite noise levels below the PTNL at all receivers, during the day period, however, control measures and operational restrictions on mechanical plant items have been provided to result in operational compliance during both the evening and night periods.

Site activities may well be audible at some locations given the characteristics of the receiving environment. It is thus recommended that measures be put in place to ensure the timely and effective response to any concerns raised by adjacent sensitive receivers.

Blasting

Airblast overpressure levels are expected to be below the ANZECC guidance values at all receivers. The limiting charge size has been specified in the report body to result in the airblast overpressure to remain below the 115 dB annoyance threshold at modelled receivers.

The results of the assessment indicate that, based on the observed separation distances, ground vibration levels are unlikely to exceed the criteria for human annoyance at sensitive receivers adjacent to the blast site.

Appendix A

Calibration Certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM33484

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	Svantek		
Type No:	SVAN-958A	**Serial No:**	97995
Mic. Type:	40AE	**Serial No:**	448112
Pre-Amp. Type:	SV12L	**Serial No:**	118291
Filter Type:	1/3 Octave	**Test No:**	F033485

Owner: Advitech Pty Ltd
7 Riverside Drive
Mayfield West NSW 2304

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

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

CONDITIONS OF TEST:

Ambient Pressure	1006	hPa ±1 hPa	**Date of Receipt :**	02/09/2022
Temperature	23	°C ±1° C	**Date of Calibration :**	05/09/2022
Relative Humidity	46	% ±5%	**Date of Issue :**	05/09/2022

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

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
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The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.

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AVCERT10.14 Rev.2.0 14/04/2021

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34758

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	Svantek		
Type No:	Svan-971	**Serial No:**	77606
Mic. Type:	7052E	**Serial No:**	74053
Pre-Amp. Type:	SV18	**Serial No:**	32027
Filter Type:	1/3 Octave	**Test No:**	F034761

Owner: Advitech Pty Ltd
7 Riverside Drive
Mayfield West NSW 2304

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

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

CONDITIONS OF TEST:

Ambient Pressure	1001	hPa ±1 hPa	**Date of Receipt :**	10/01/2023
Temperature	24	°C ±1° C	**Date of Calibration :**	12/01/2023
Relative Humidity	46	% ±5%	**Date of Issue :**	13/01/2023

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

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

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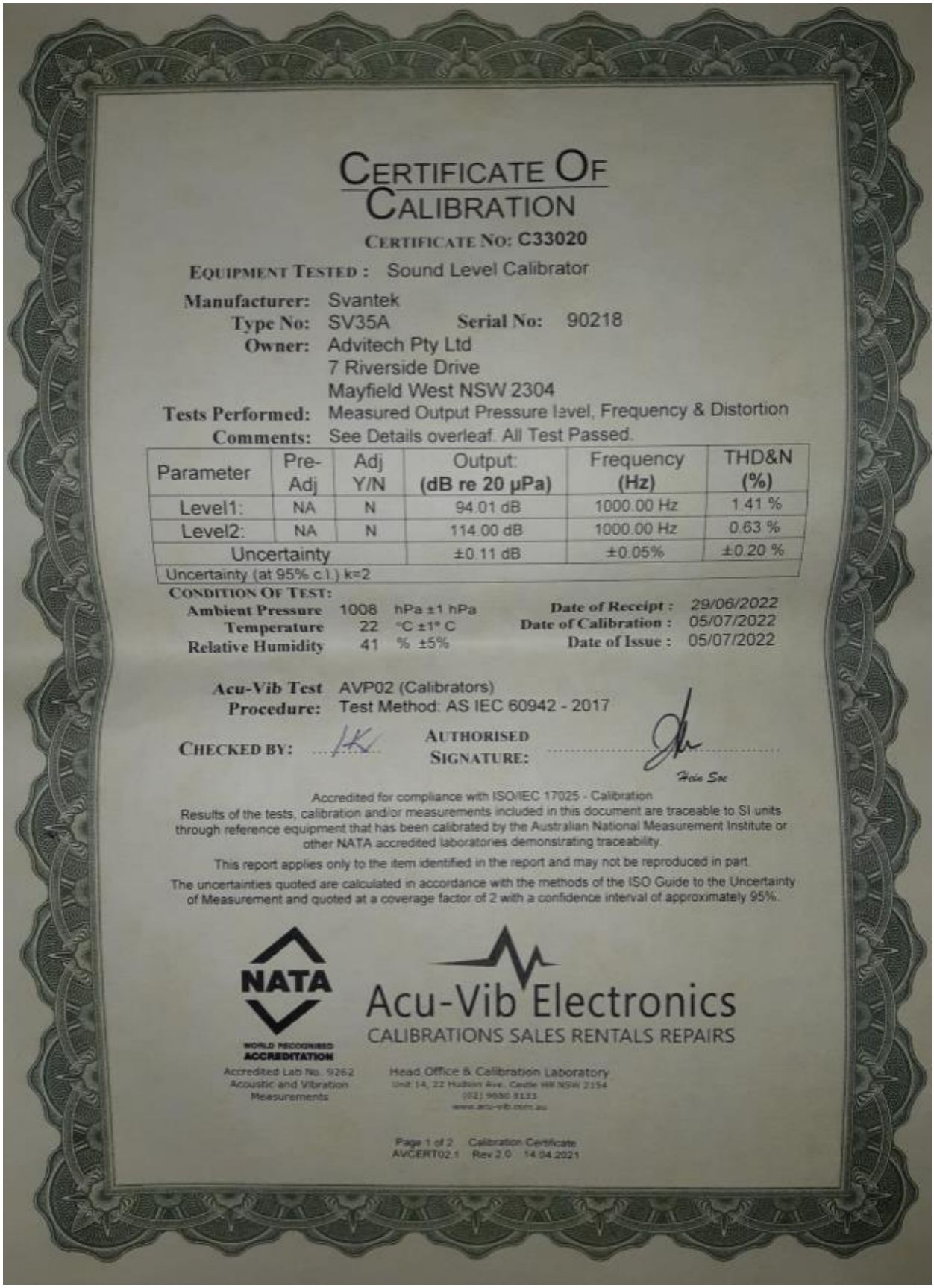
AVCERT10.3 Rev.2.0 14/04/2021



CERTIFICATE OF CALIBRATION

CERTIFICATE NO: C33020

EQUIPMENT TESTED : Sound Level Calibrator

Manufacturer: Svantek
Type No: SV35A **Serial No:** 90218
Owner: Advitech Pty Ltd
7 Riverside Drive
Mayfield West NSW 2304
Tests Performed: Measured Output Pressure level, Frequency & Distortion
Comments: See Details overleaf. All Test Passed.

Parameter	Pre-Adj	Adj Y/N	Output: (dB re 20 µPa)	Frequency (Hz)	THD&N (%)
Level1:	NA	N	94.01 dB	1000.00 Hz	1.41 %
Level2:	NA	N	114.00 dB	1000.00 Hz	0.63 %
Uncertainty			±0.11 dB	±0.05%	±0.20 %

Uncertainty (at 95% c.l.) k=2

CONDITION OF TEST:
Ambient Pressure 1008 hPa ±1 hPa
Temperature 22 °C ±1° C
Relative Humidity 41 % ±5%

Date of Receipt : 29/06/2022
Date of Calibration : 05/07/2022
Date of Issue : 05/07/2022

Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2017

CHECKED BY: .....HK..... **AUTHORISED SIGNATURE:** .....

Hoa Soc

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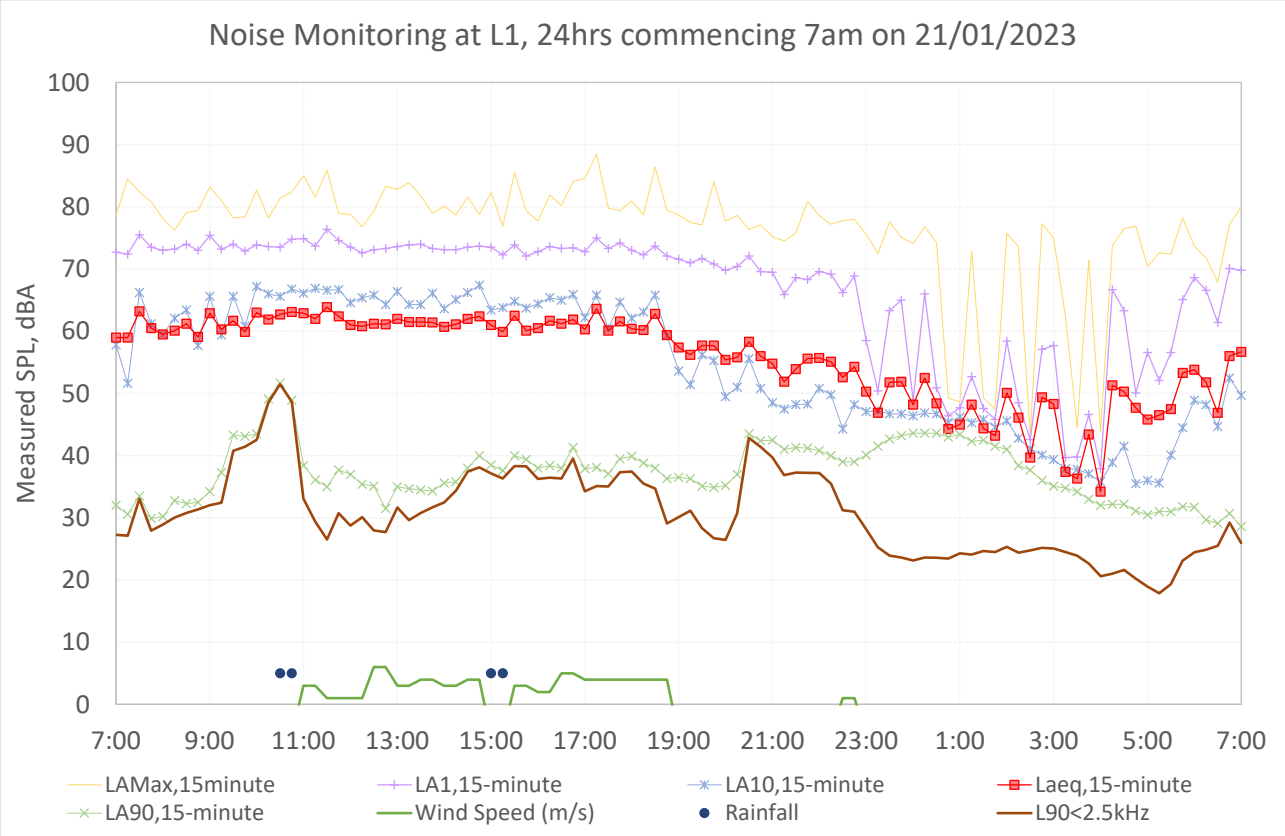
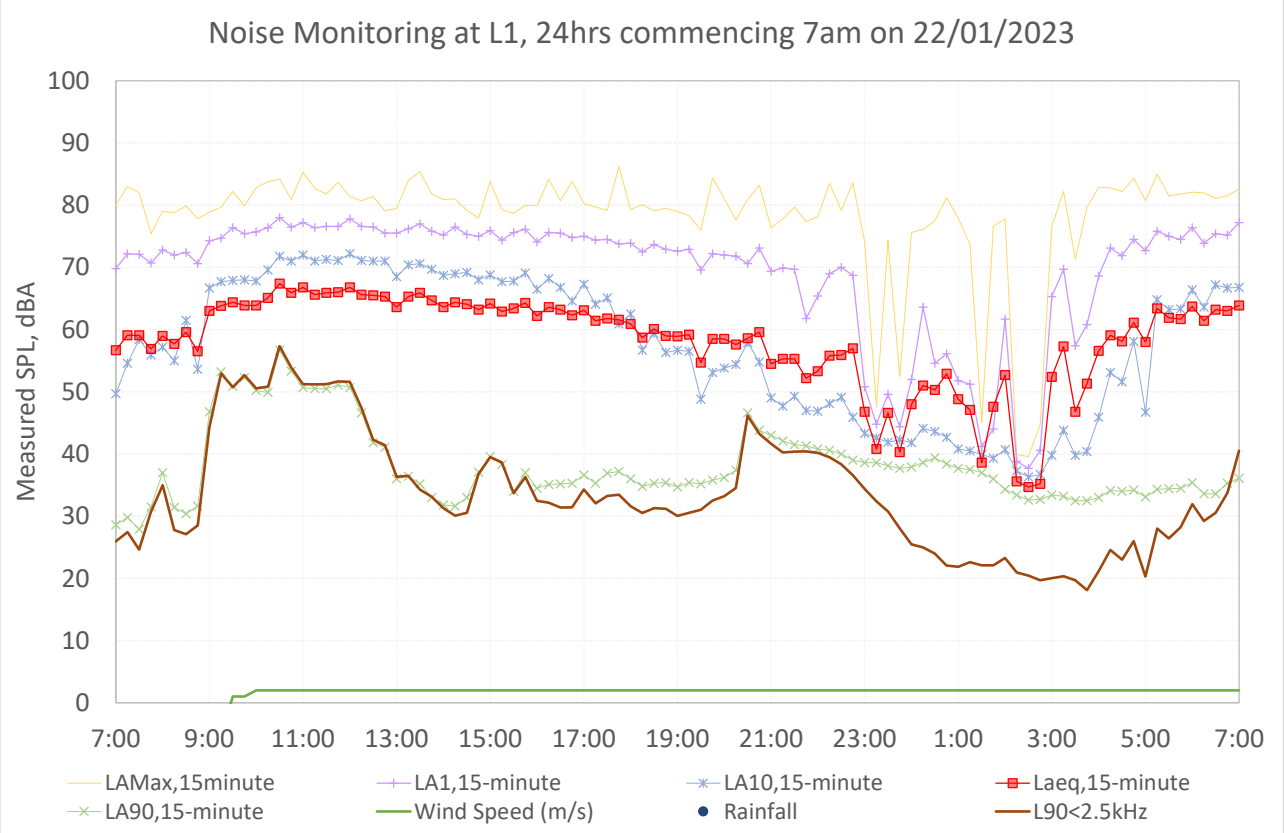
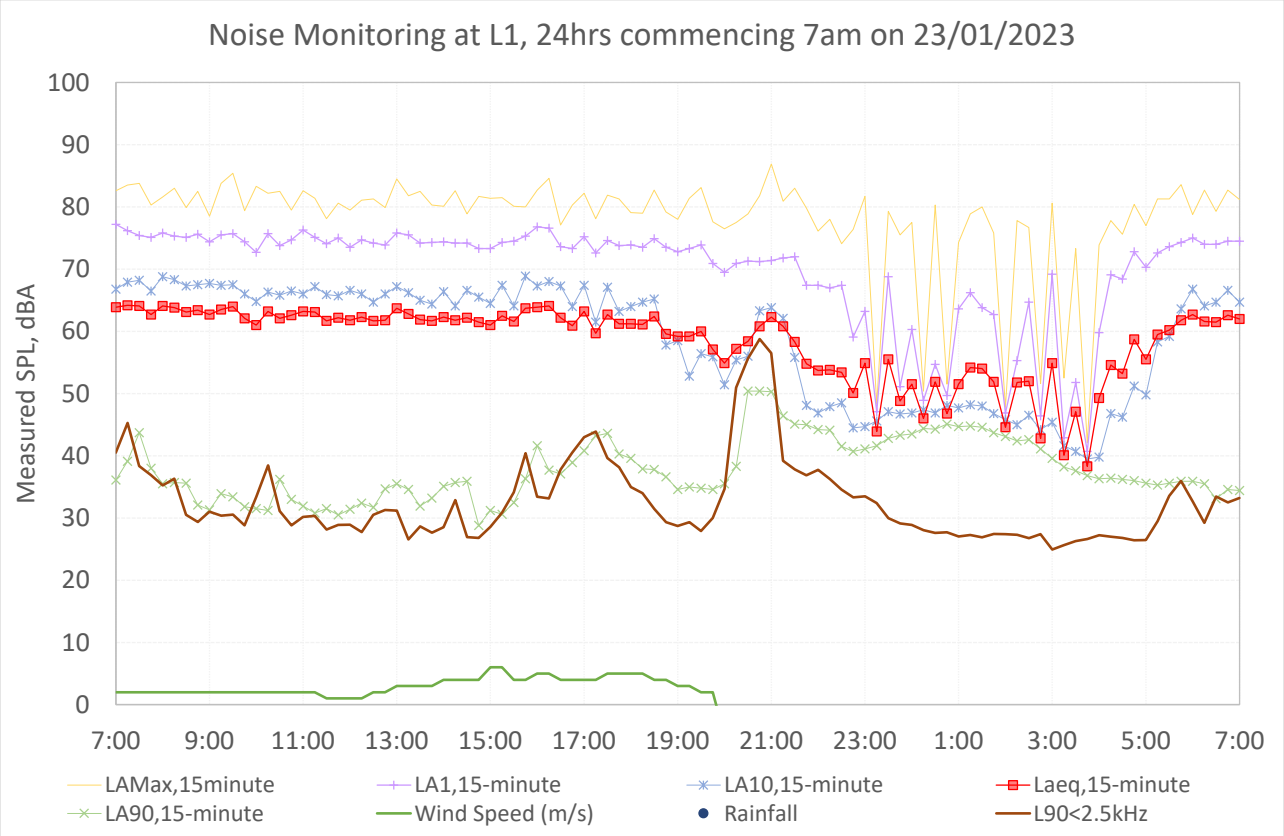
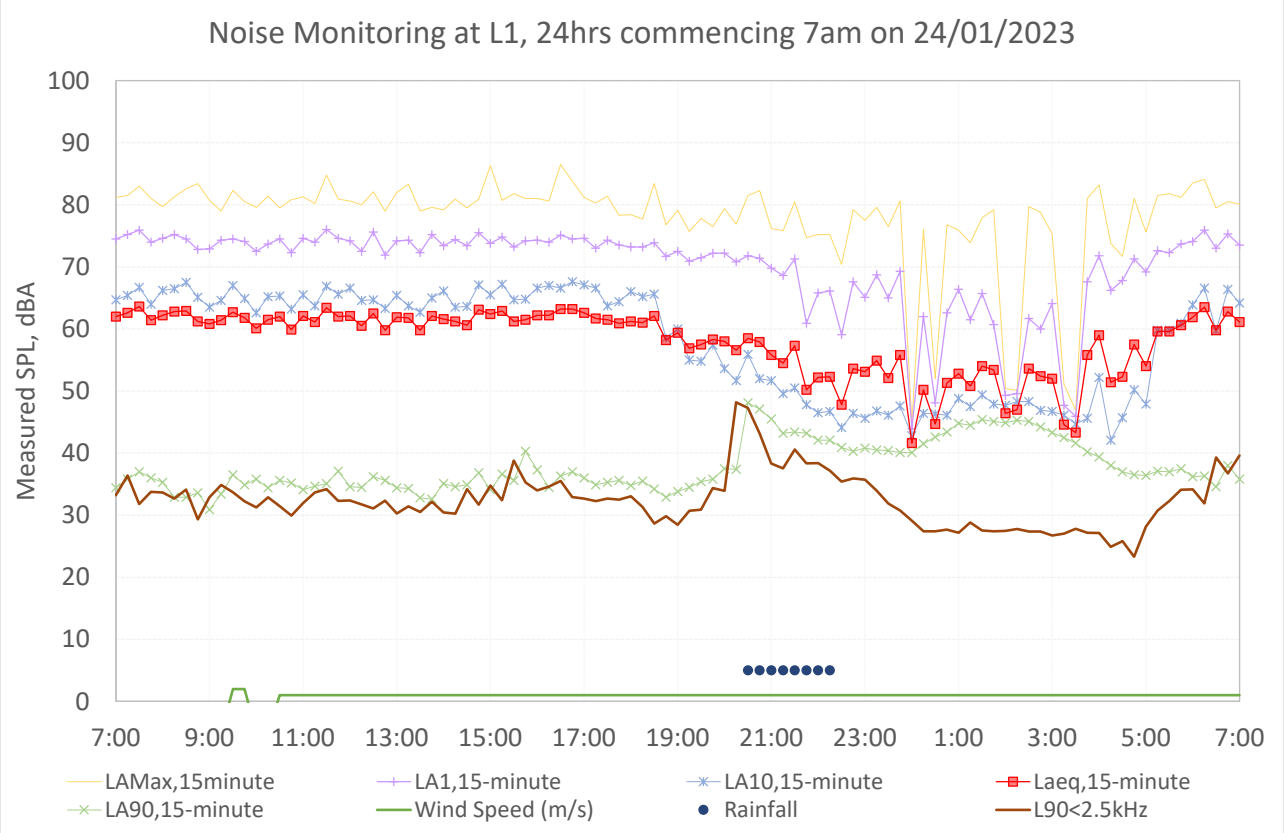
Appendix B

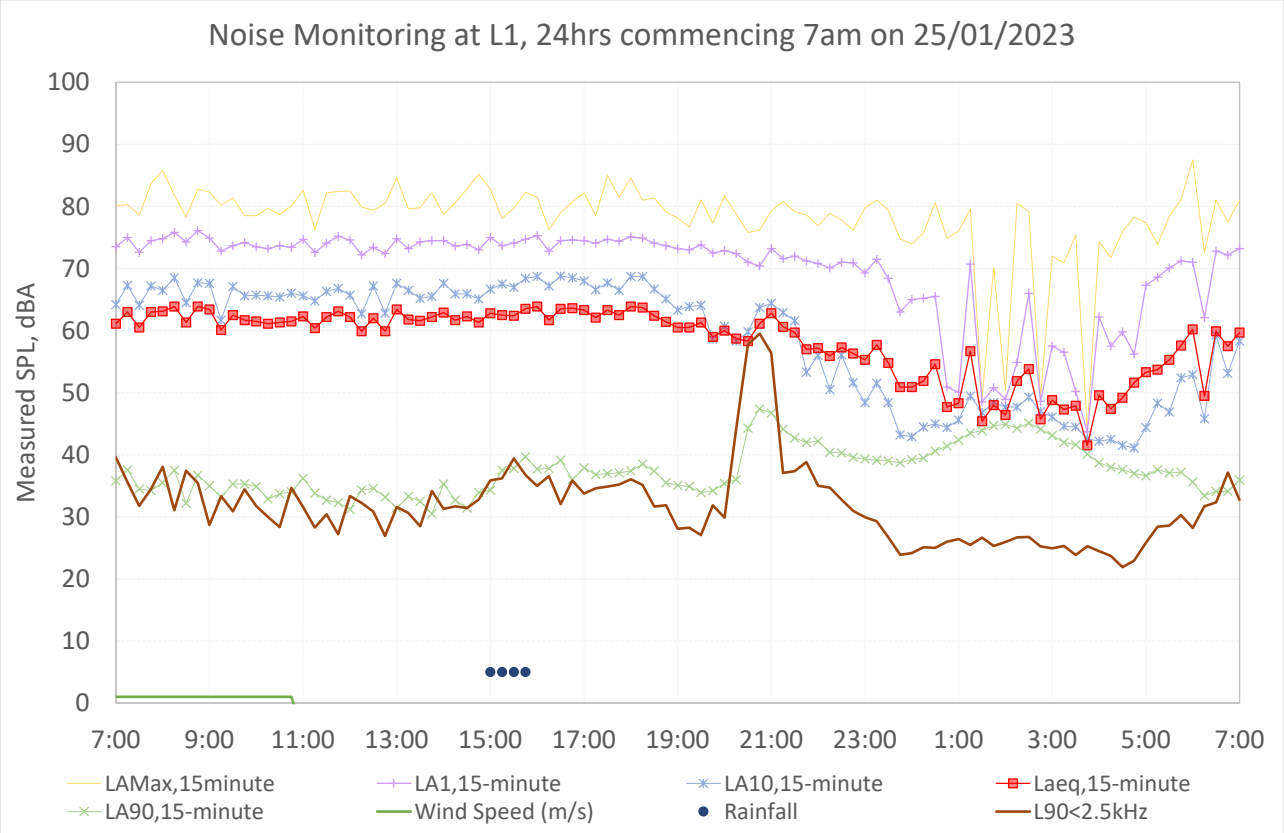
Daily noise logging results


Noise Monitoring at L1, 24hrs commencing 7am on 21/01/2023
Measured SPL, dBA
100
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz


Noise Monitoring at L1, 24hrs commencing 7am on 22/01/2023
Measured SPL, dBA
100
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz


Noise Monitoring at L1, 24hrs commencing 7am on 23/01/2023
Measured SPL, dBA
100
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz


Noise Monitoring at L1, 24hrs commencing 7am on 24/01/2023
Measured SPL, dBA
100
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz


Noise Monitoring at L1, 24hrs commencing 7am on 25/01/2023
Measured SPL, dBA
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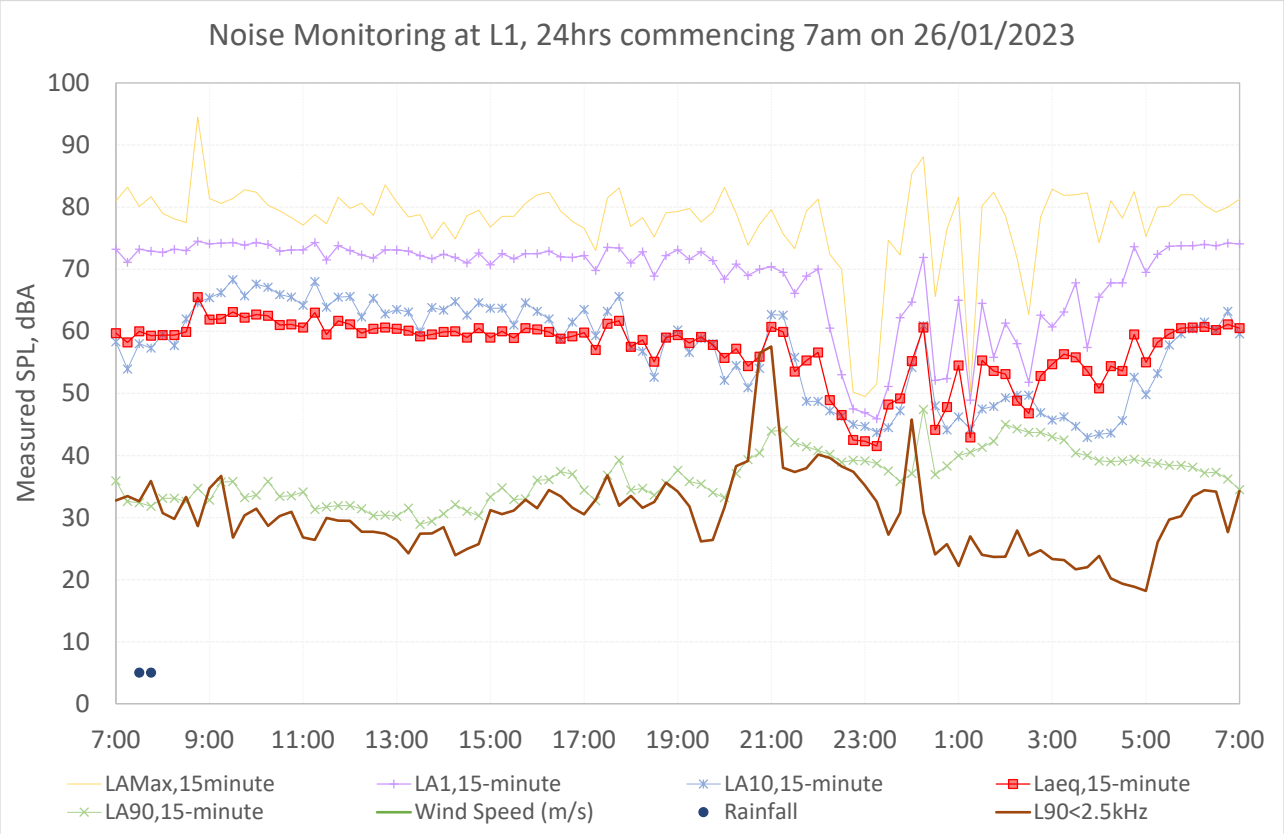
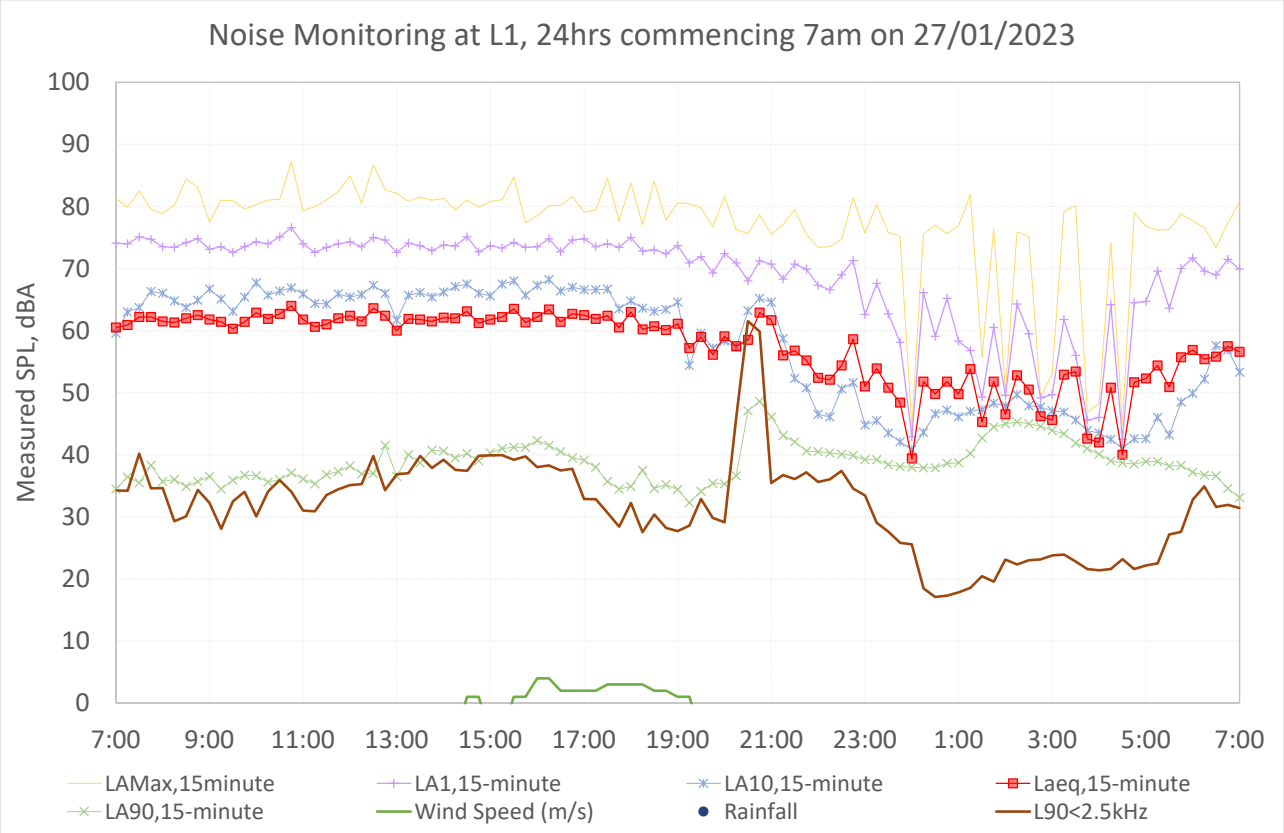
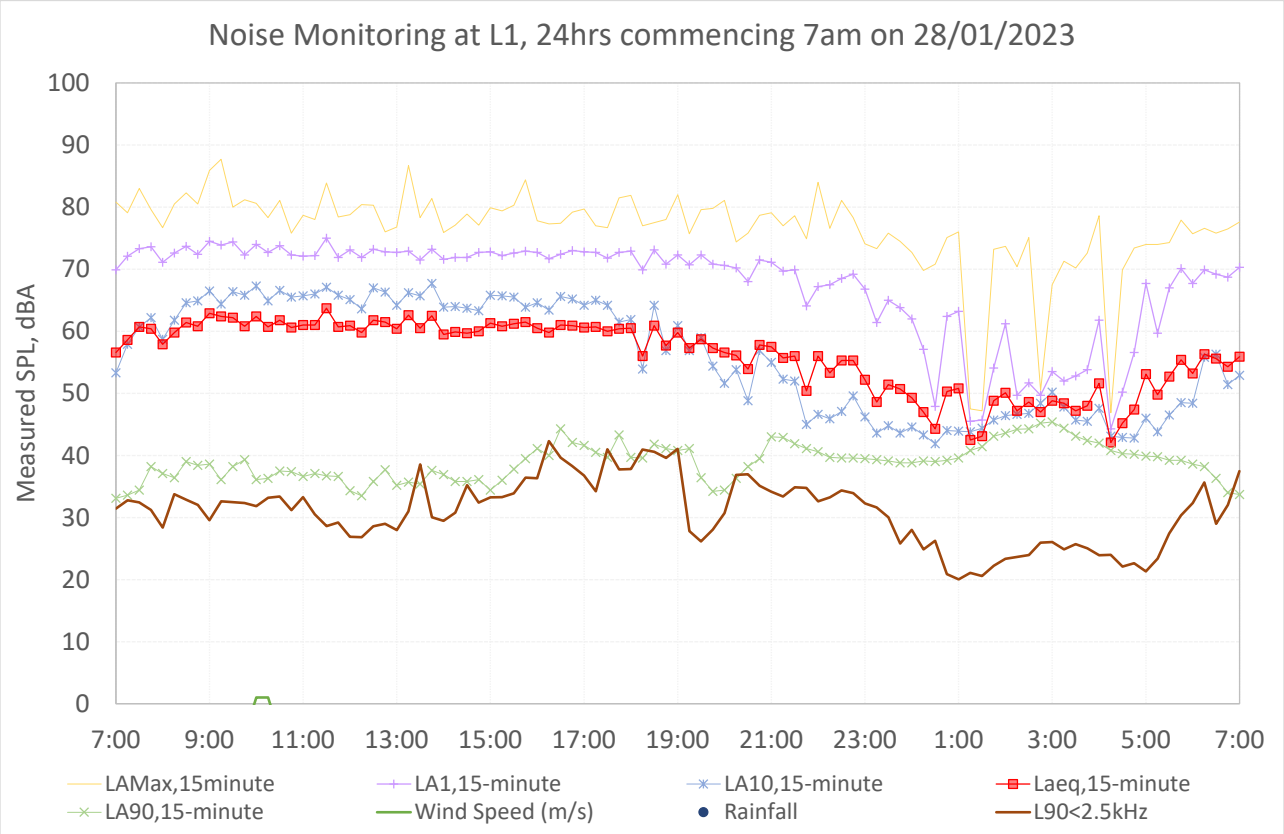
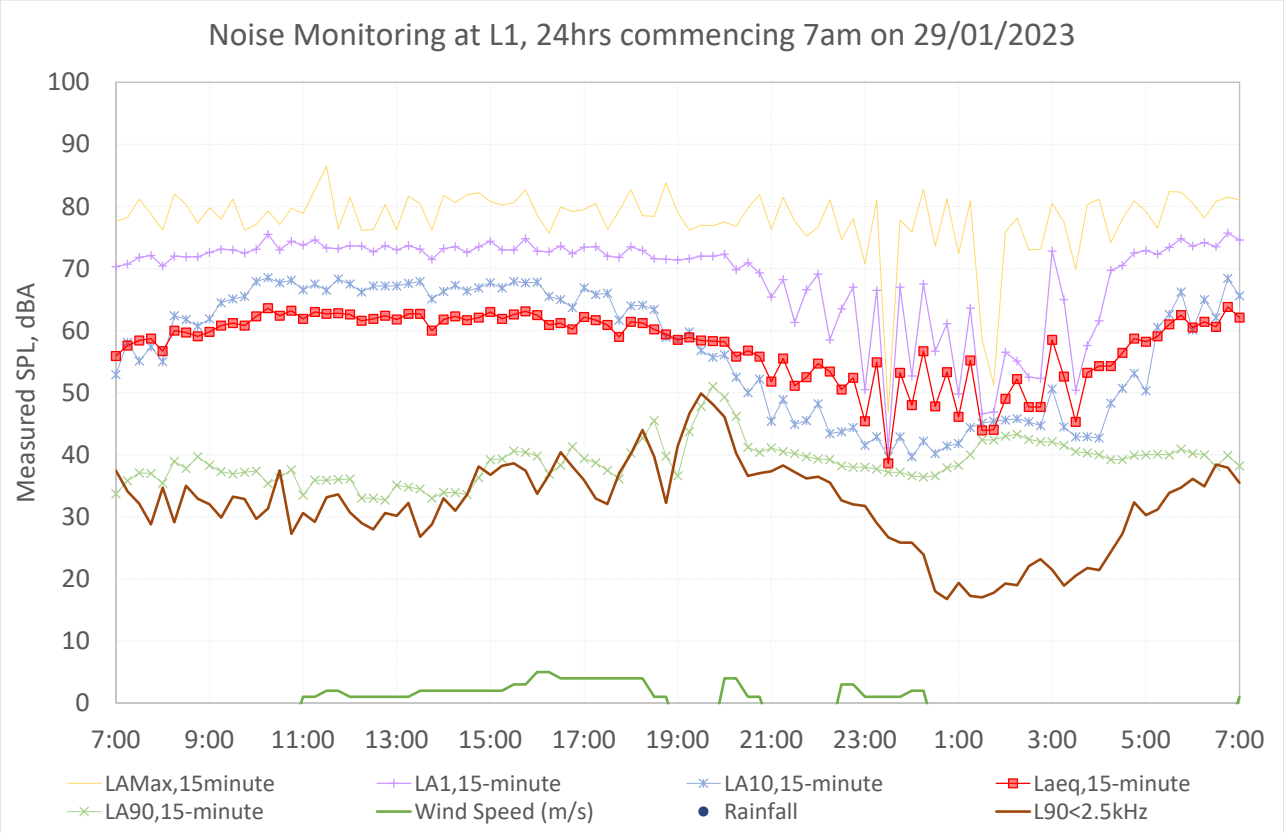
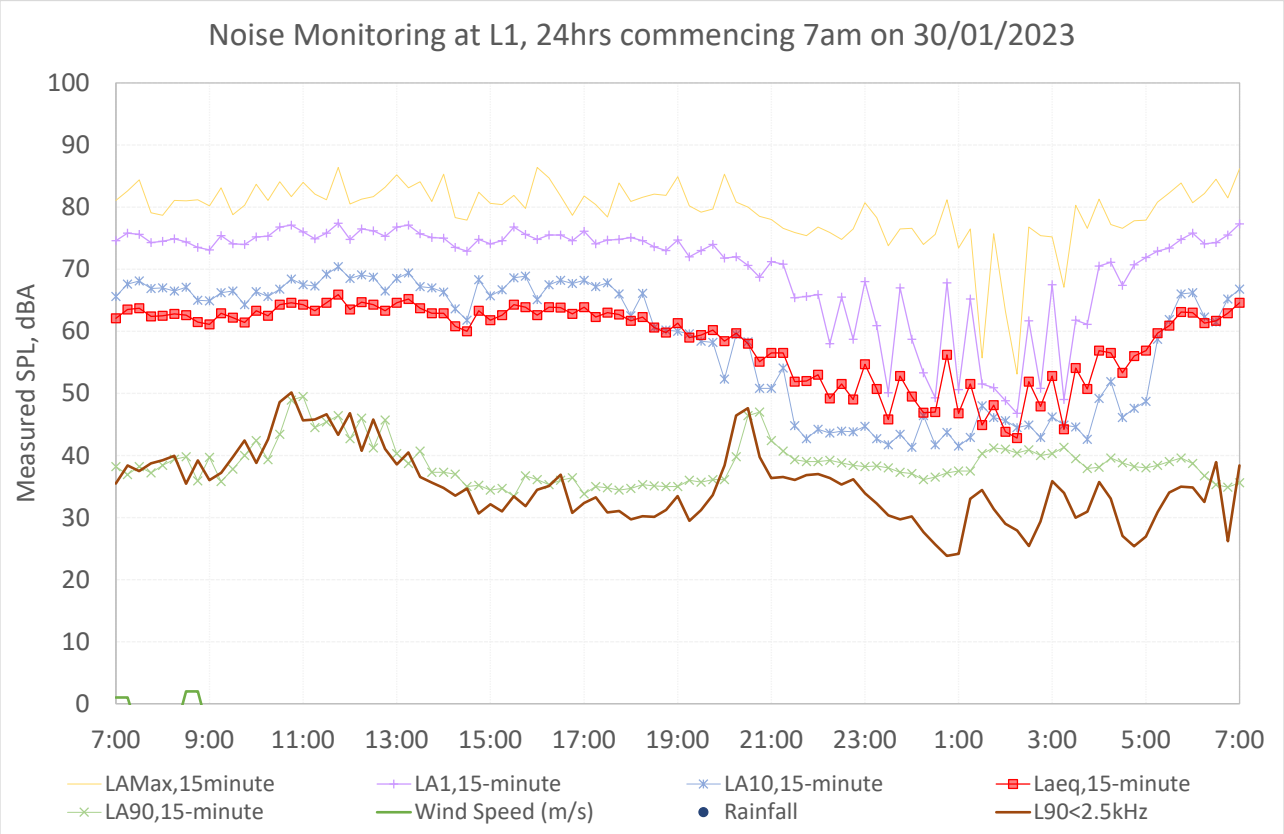
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz

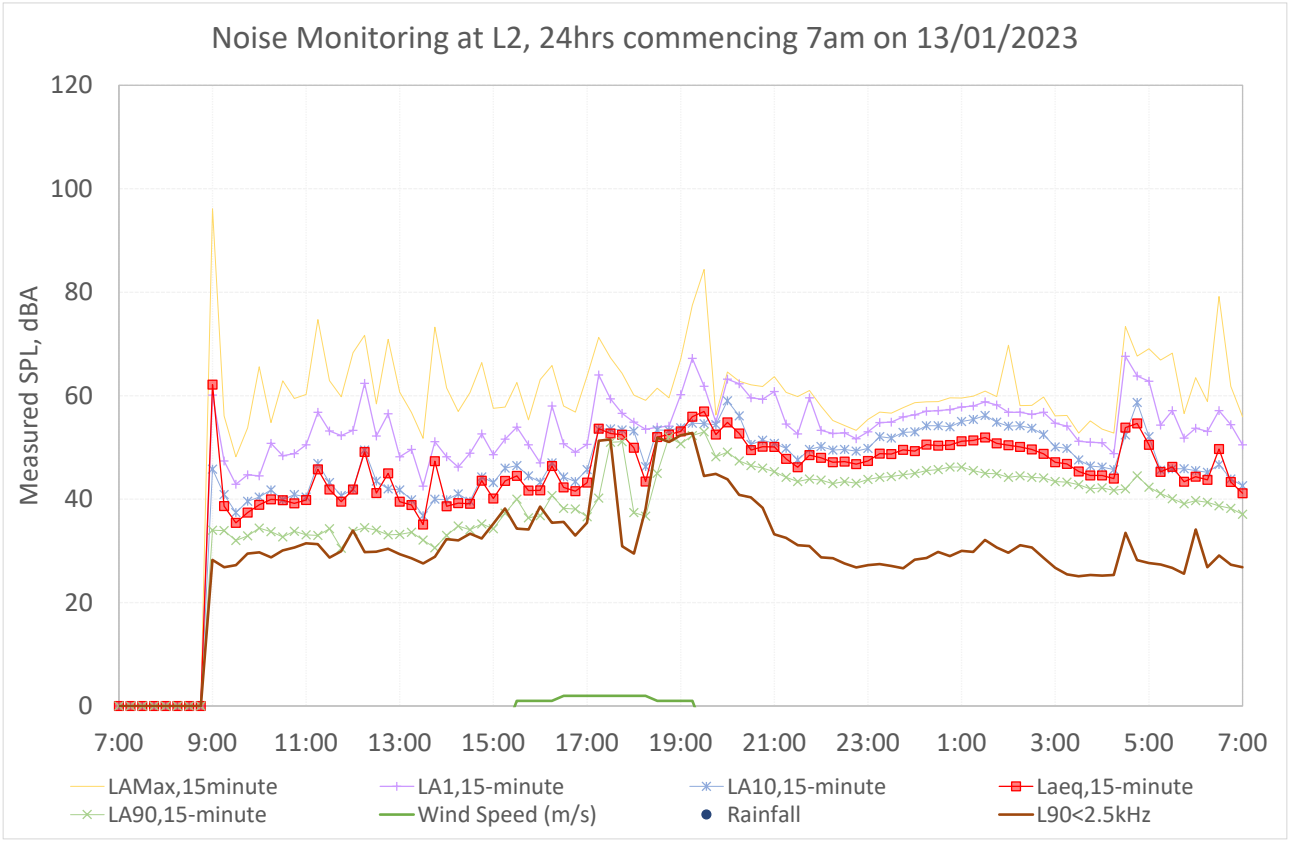

Noise Monitoring at L1, 24hrs commencing 7am on 26/01/2023
Measured SPL, dBA
100
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz

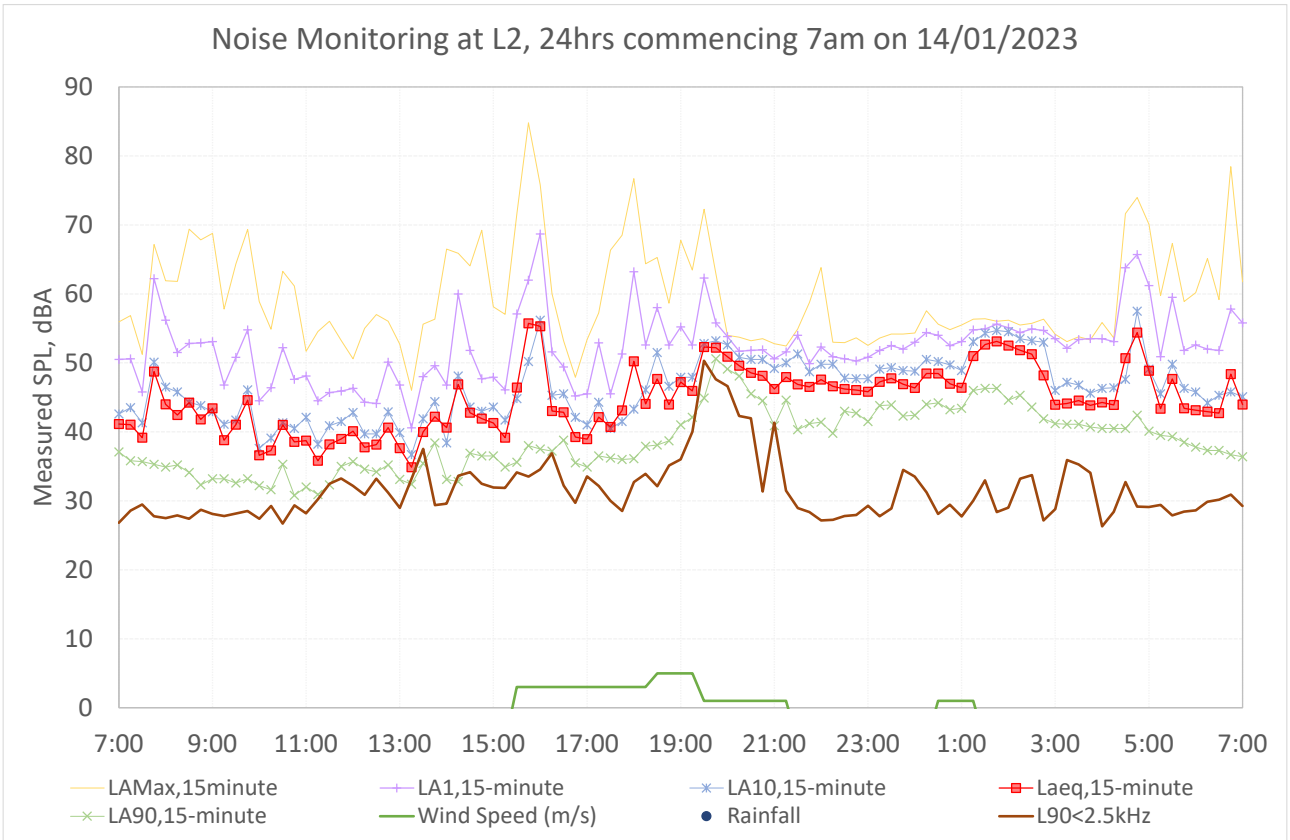

Noise Monitoring at L1, 24hrs commencing 7am on 27/01/2023
Measured SPL, dBA
100
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz

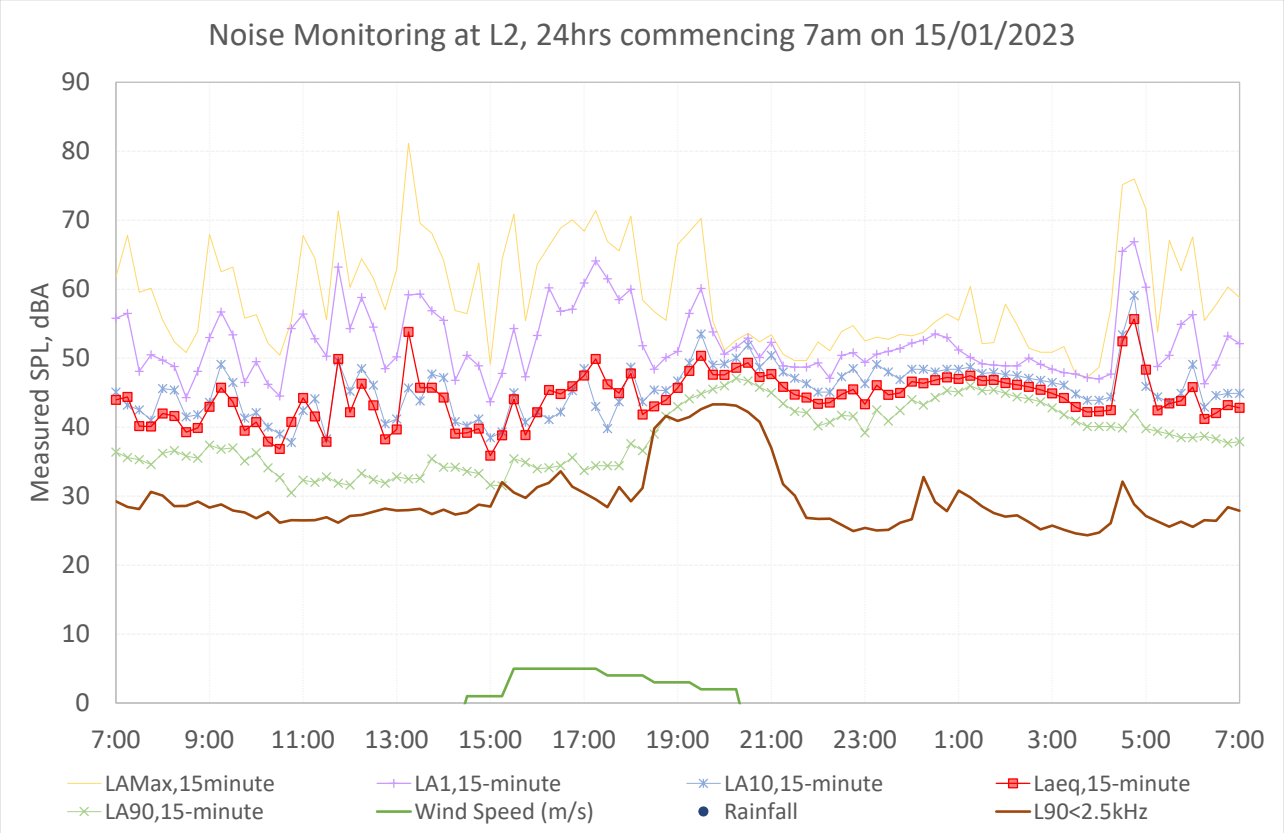

Noise Monitoring at L1, 24hrs commencing 7am on 28/01/2023
Measured SPL, dBA
100
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz

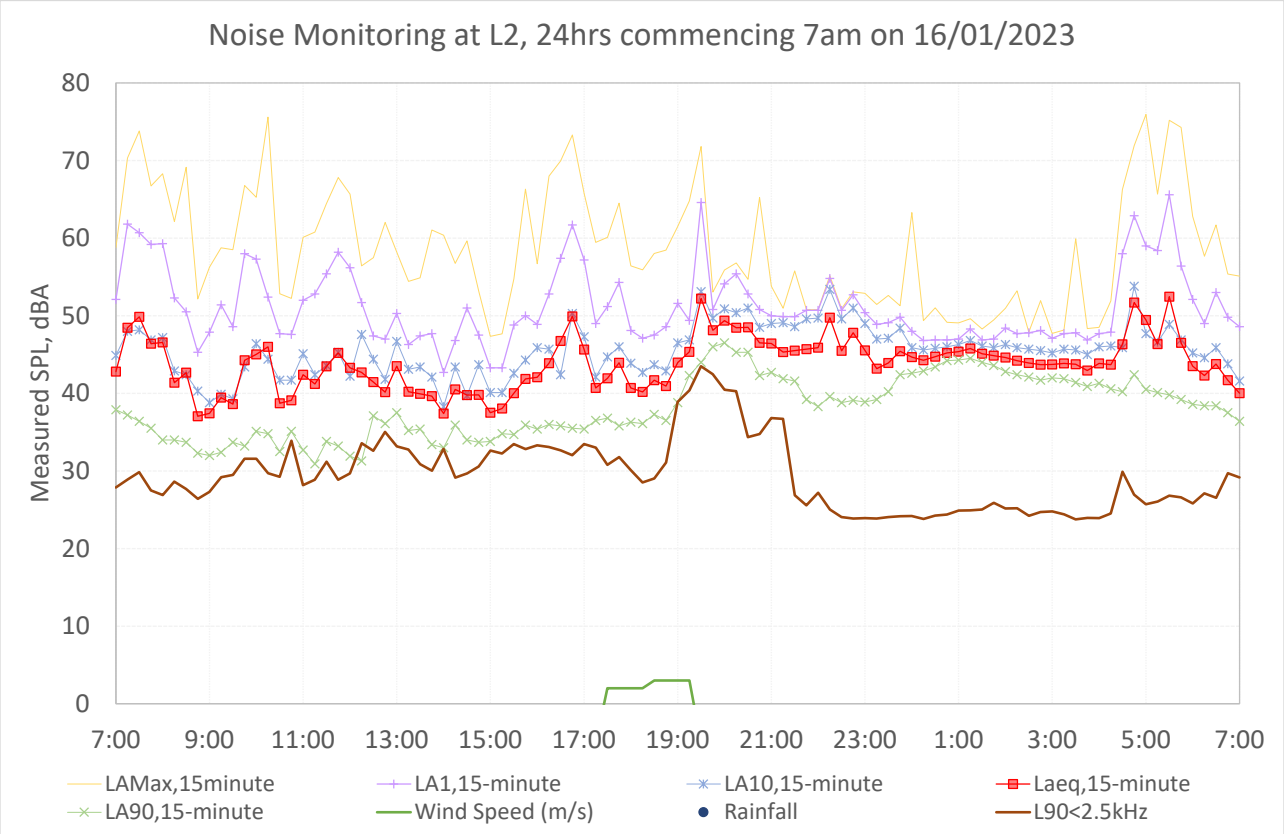

Noise Monitoring at L1, 24hrs commencing 7am on 29/01/2023
Measured SPL, dBA
100
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz

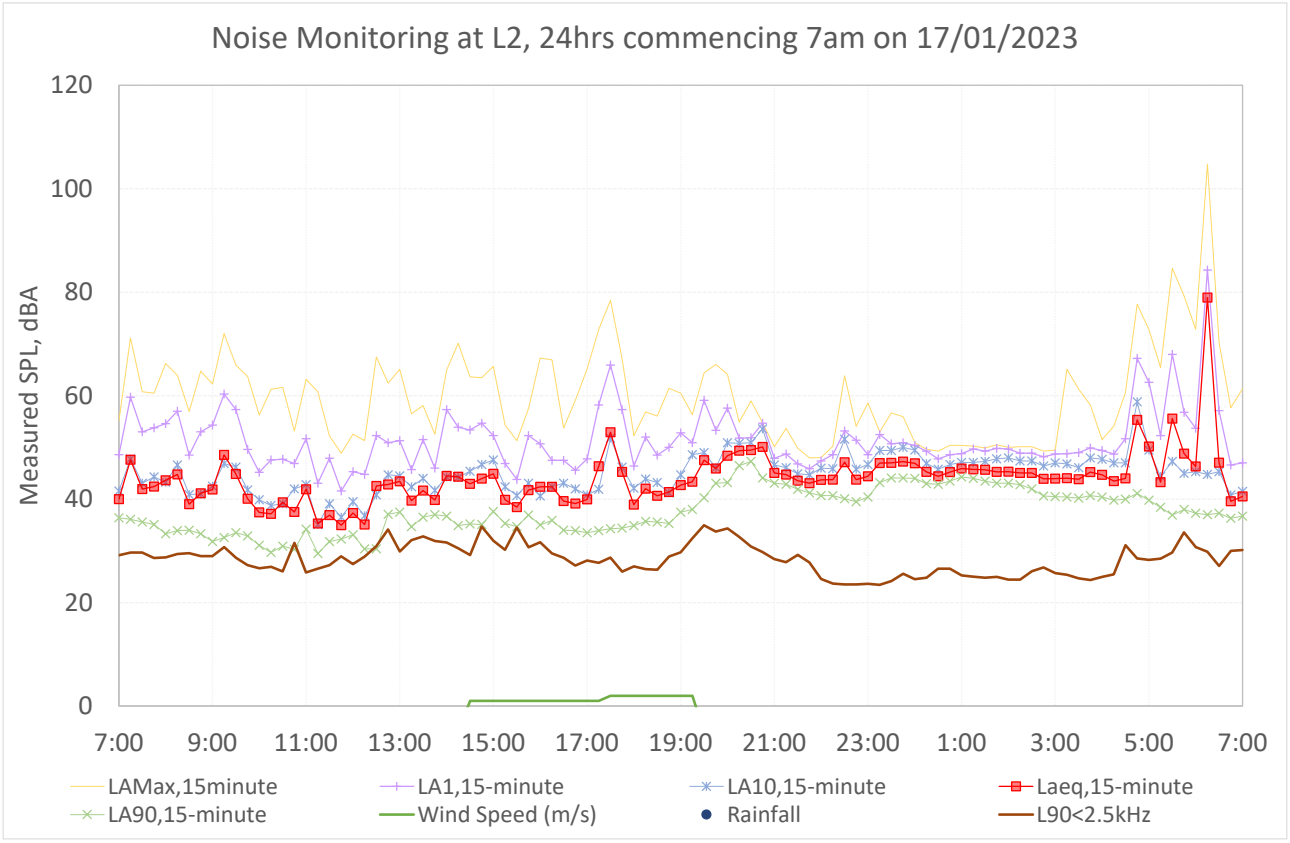

Noise Monitoring at L1, 24hrs commencing 7am on 30/01/2023
Measured SPL, dBA
100
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz

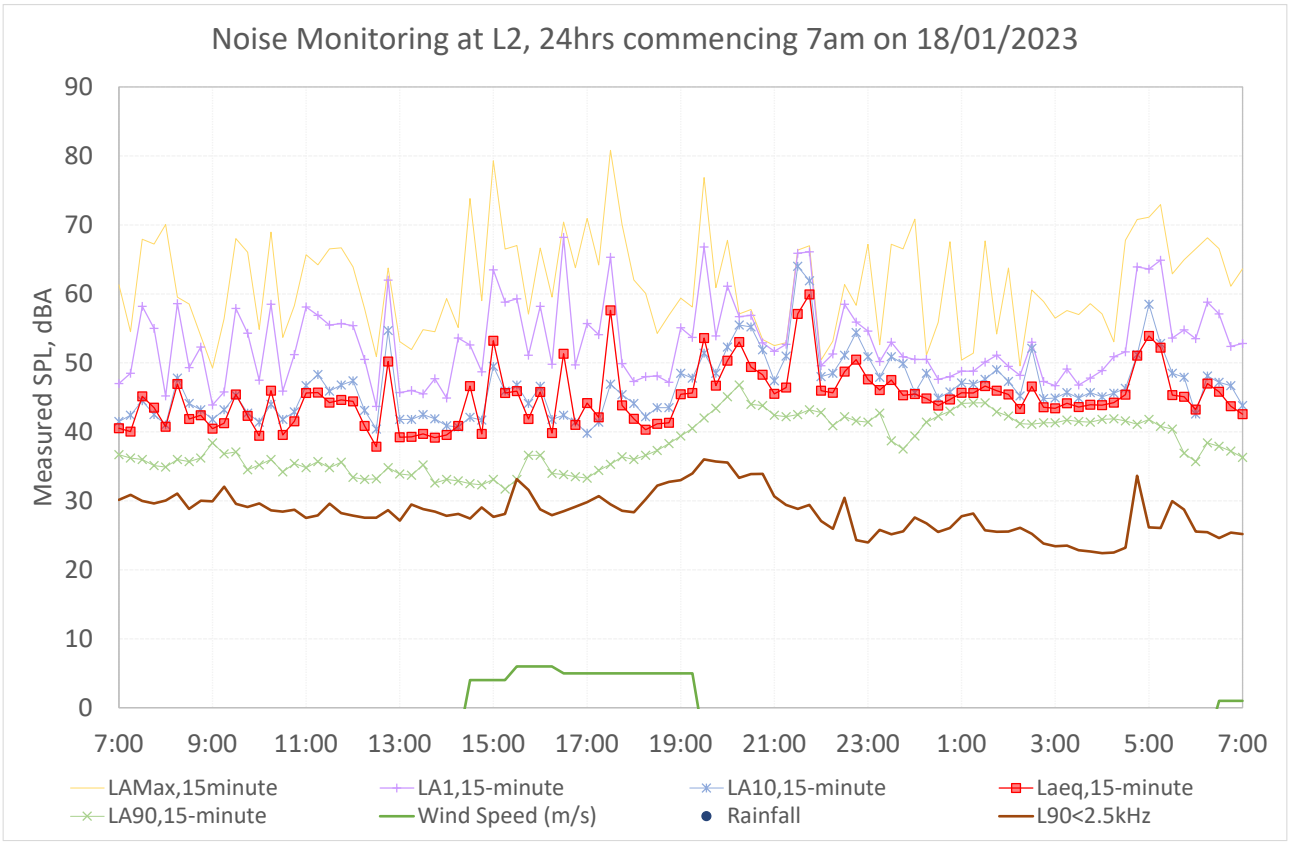

Noise Monitoring at L2, 24hrs commencing 7am on 13/01/2023
Measured SPL, dBA
120
100
80
60
40
20
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz

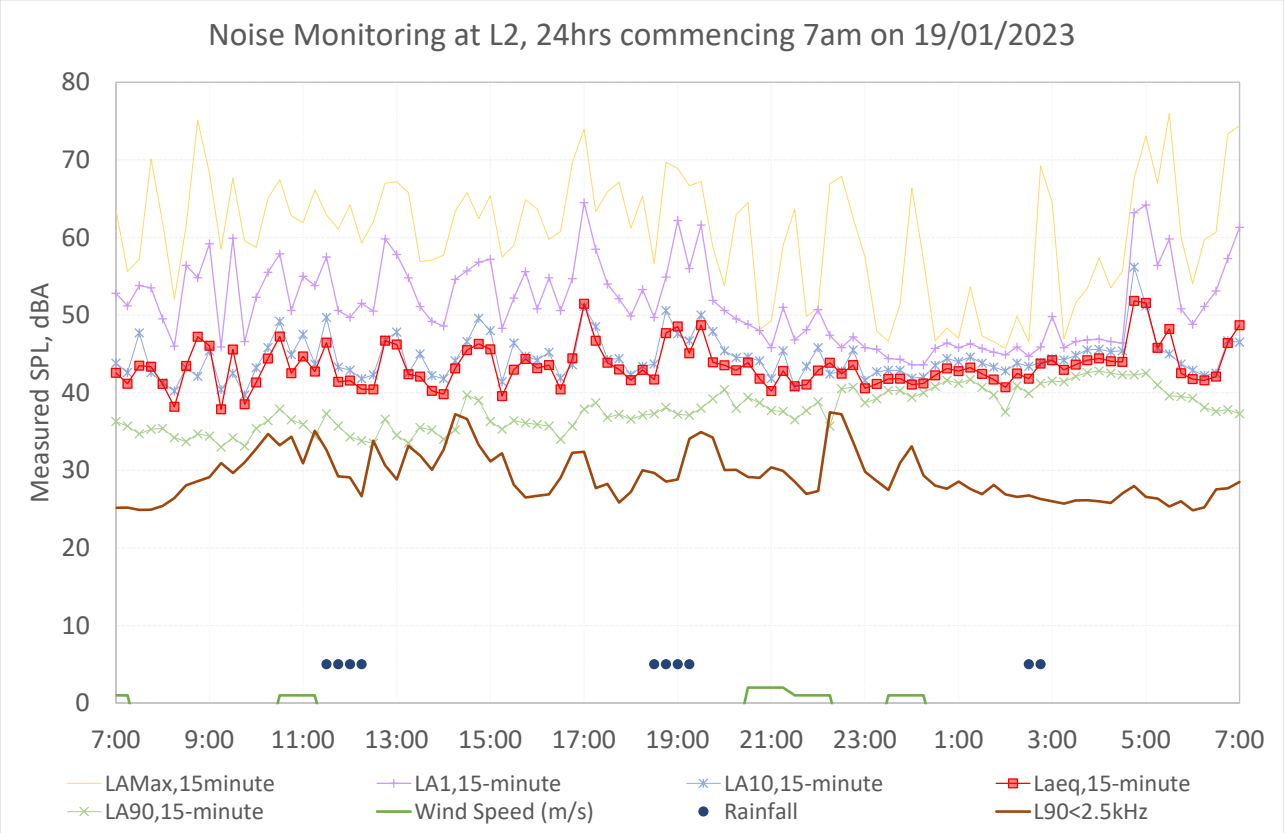

Noise Monitoring at L2, 24hrs commencing 7am on 14/01/2023
Measured SPL, dBA
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz


Noise Monitoring at L2, 24hrs commencing 7am on 15/01/2023
Measured SPL, dBA
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz


Noise Monitoring at L2, 24hrs commencing 7am on 16/01/2023
Measured SPL, dBA
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz


Noise Monitoring at L2, 24hrs commencing 7am on 17/01/2023
Measured SPL, dBA
120
100
80
60
40
20
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz


Noise Monitoring at L2, 24hrs commencing 7am on 18/01/2023
Measured SPL, dBA
90
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz


Noise Monitoring at L2, 24hrs commencing 7am on 19/01/2023
Measured SPL, dBA
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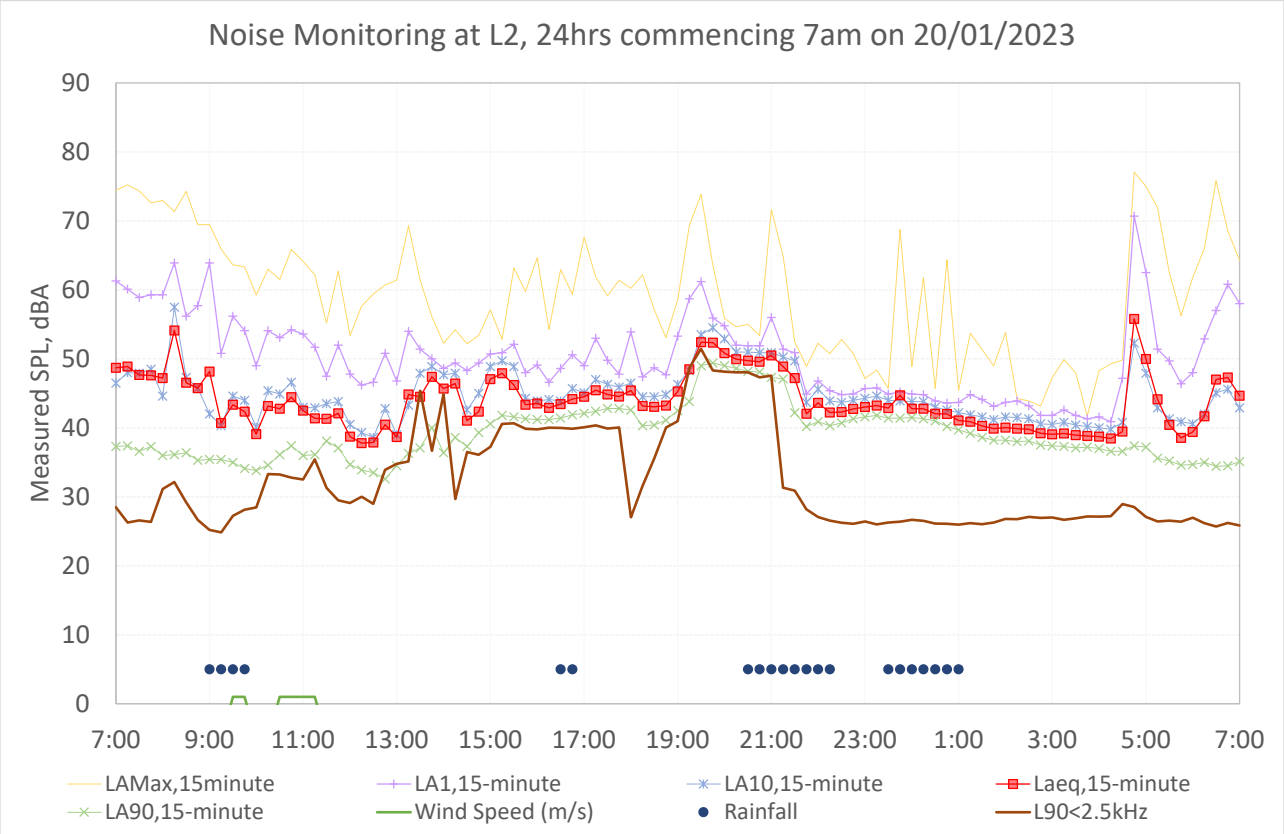
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz


Noise Monitoring at L2, 24hrs commencing 7am on 20/01/2023
Measured SPL, dBA
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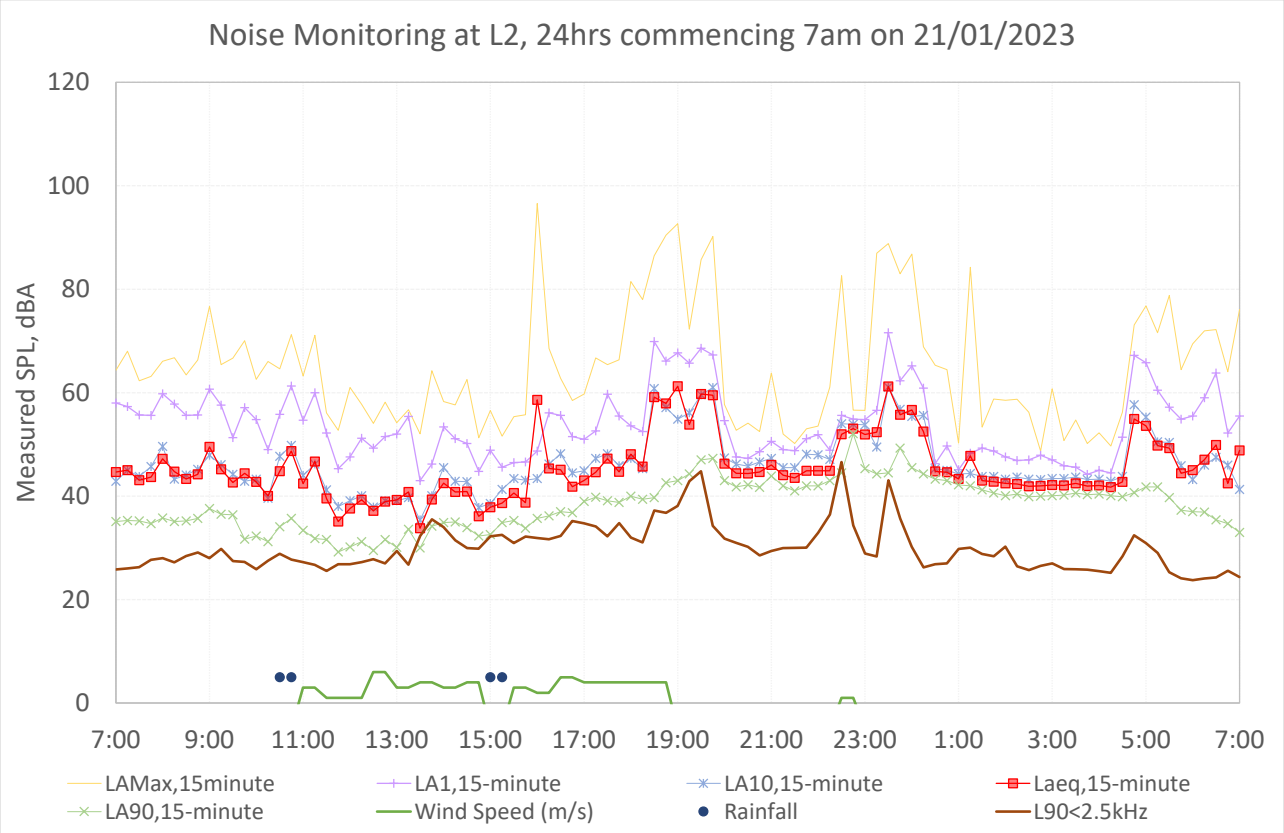
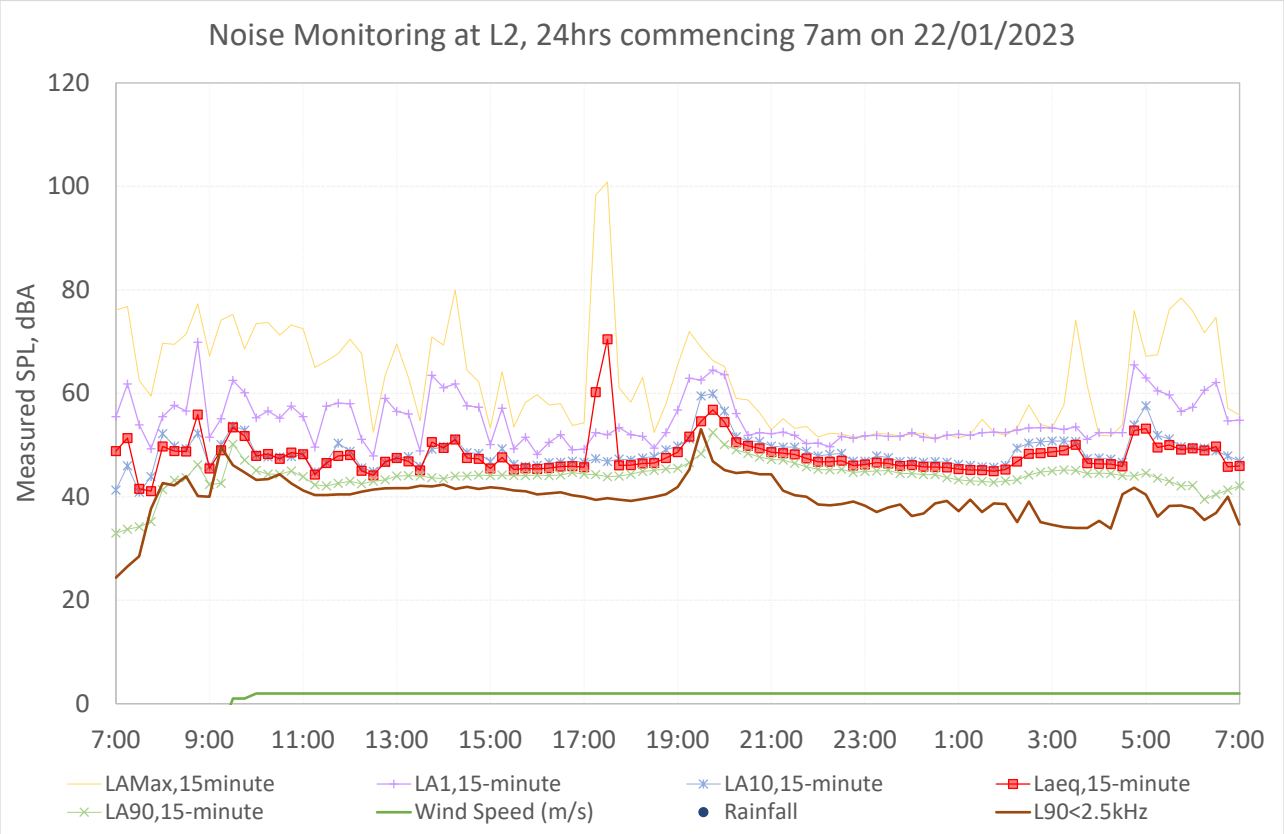
80
70
60
50
40
30
20
10
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz


Noise Monitoring at L2, 24hrs commencing 7am on 21/01/2023
Measured SPL, dBA
120
100
80
60
40
20
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz


Noise Monitoring at L2, 24hrs commencing 7am on 22/01/2023
Measured SPL, dBA
120
100
80
60
40
20
0
7:00
9:00
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
LAMax,15minute
LA1,15-minute
LA10,15-minute
Laeq,15-minute
LA90,15-minute
Wind Speed (m/s)
Rainfall
L90<2.5kHz