Cell 2 Commencement Noise Compliance Survey September 2019



Report Number 10-1672

Hanson Construction

Level 5, 75 George Street

PARRAMATTA NSW 2150

PREPARED FOR: Hanson CONSTRUCTION

PREPARED BY: VMS Australia Pty Ltd

Unit 1, 41-43 Green Street, Banksmeadow NSW 2074

ABN: 52 168 418 013

Quality Management

Reference	Status	Date	Prepared	Checked	Authorised
10-1672	Final	13 September 2019	Zul Khasmuri	Yang Liu	Zul Khasmuri

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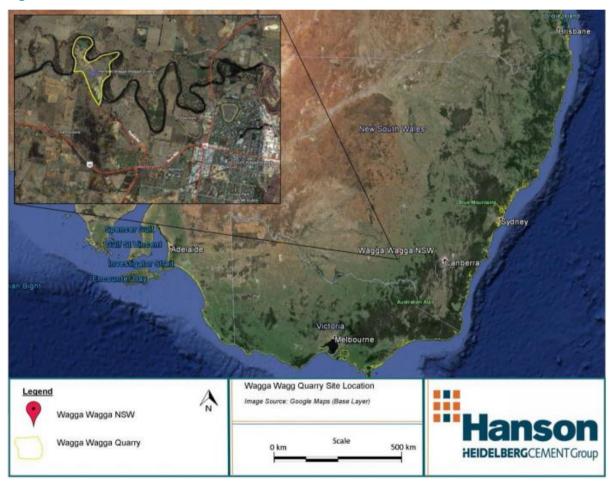
1 Introduction

VMS Australia Pty Ltd has been contracted by Hanson Construction to conduct the Noise Compliance Survey for the Wagga Wagga Quarry Extension Project (the Project) located 230 Roach Road, Wagga Wagga, in order to assess noise emission levels from the Project's operation. This report presents the findings of the operator-attended and unattended noise monitoring conducted at the nominated residential receivers during site activities between Tuesday 10 September 2019 and Tuesday 17 September 2019.

2 Background

The Wagga Wagga Quarry is located approximately 5 kilometres west of the Wagga Wagga City Centre. **Figure 1** presents the location of the Wagga Wagga Quarry relative to Sydney, Wollongong and Canberra. The Quarry has been in operation since 1986.

Figure 1 Site Location





VMS has been commissioned to undertake both operator-attended and continuous unattended operational noise compliance monitoring following the commencement of operations within Wagga Wagga Quarry Cell 2 to assess the compliance of the operations against the Noise Impact Assessment Criteria nominated in Schedule 3, Condition 1 of the Project Approval (PA) (Application Number 07-0069, approval date 22 November 2011 as modified 30 October 2018, MOD1) and Section 4 of Hanson Wagga Wagg Quarry Noise Management Plan (NMP), dated March 2017.

The Project has been approved to increase the quarry's maximum truck movements from 6 to 12 per hour (an increase in laden truck dispatches from 3 to 6 per hour), between 3:00 pm to 5:00 pm weekdays but would not alter the maximum truck movements between 5:00 pm and 6:00 pm under the modified PA 07_0069 issued by the Minister for Planning and Infrastructure.

3 Noise Assessment Criteria

Operational noise impact assessment criteria for the Project are nominated in Table 1, Schedule 3 of the PA and Table 3 of the NMP and presented in **Table 1**.

Table 1 Noise Impact Assessment Criteria

Location	LAeq(15minute) *Day
Kullaroo 2	39
Riverglen	40
All other privately-owned land	35

Notes:

- Receiver locations are as identified in the noise assessments presented in the EA.
- Noise limits are to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy.
- The noise limits do not apply if the Proponent has an agreement with the relevant owner/s of these residences/land to
 generate higher noise levels, and the Proponent has advised the Department in writing of the terms of this agreement.
- Day is defined as 6:00am to 6:00pm Mondays to Fridays, and 8:00am to 1:00pm on Saturdays, but does not include public holidays.

4 Operating Hours

The project operating hours have been limited in Table 2, Schedule 3 of the PA 07_0069 and presented in **Table 2** below.

Table 2 Project Noise Operating Hours

Activity	Day	Time
All quarrying operations	Monday-Friday (except Public Holidays)	6.00 am to 6.00 pm
	Saturdays	8.00 am to 1.00 pm
	Sundays and Public Holidays	No Activities
Transportation off-site	Monday-Friday (except Public Holidays)	6.00 am to 6.00 pm
	Saturdays	8.00 am to 1.00 pm



	Sundays and Public Holidays	No Activities
--	-----------------------------	---------------

Excerpt from Project Approval 07_0069 dated 30 October 2018.

However, the Proponent may, at any time, undertake maintenance activities and/or operate dewatering pumps, provided that the noise levels from the pumps remain below background noise levels at the most sensitive receivers.

Note: This condition does not apply to delivery of material if that delivery is required by police or other authorities for safety reasons, and/or the operation or personnel or equipment are endangered. In such circumstances, notification is to be provided to EPA and the affected residents as soon as possible, or within a reasonable period in the case of emergency.

5 Quarry Activity

The quarry has been approved to have 150,000 tonnes of product per annum transported from the site. The quarry operates primarily as sand and gravel aggregates extraction that are a basis for asphalt, road base, concrete and sundries. The quarry comprises of crushers, screen plants, connecting conveyor belts, weighbridge, office and amenities. Quarry products are dispatched and distributed to various local and regional businesses via trucks utilising Roach Road and Sturt Highway. Most notable contributors to noise impacts are as follows:

- · Quarry and rehabilitation activities,
- Processing product, particularly aggregate processing through screens,
- Transport activities, particularly reverse beepers on the mobile equipment, and
- Dewatering pumps.

A summary of the mining activity during this monitoring period is presented in Table 3.

Table 3 Quarry Activities – 10 September to 17 September 2019

Date	Plant Operation	Truck Deliveries
Tuesday, 10 September 2019	Plant commence at 12.00 and stopped at 15.00	Deliveries from 07.32 to 15.29
Wednesday, 11 September 2019	Plant commence at 09.30 and stopped at 15.30	Deliveries from 07.41 to 15.41
Thursday, 12 September 2019	Plant commence at 08.00 and stopped at 15.30	Deliveries from 07.36 to 15.41
Friday, 13 September 2019	Plant commence at 08.00 and stopped at 15.30	Deliveries from 07.36 to 15.25
Saturday, 14 September 2019	Plant commence at 10.00 and stopped at 13.00	No deliveries
Sunday, 15 September 2019	No Activity ¹	No deliveries ¹
Monday, 16 September 2019	Plant commence at 12.30 and stopped at 15.30	Deliveries from 08.20 to 15.50
Tuesday, 17 September 2019	Plant commence at 07.45 and stopped at 15.30	Deliveries from 07.34 to 14.39

Note 1: No site activities on Sundays and Public Holidays.



6 Equipment List

The following list details the equipment that were in operation for the duration of the noise monitoring period:

- Komatsu WA470 Front End Loader
- Komatsu HM400 Articulated Dump Truck
- Komatsu PC400 Excavator
- Water Cart
- Truck and Dog Trailer
- Generator
- Dewatering Pump

7 Noise Monitoring Locations

Operator-attended and unattended noise monitoring was conducted at the following nearest residential receivers.

- 111 River Road, Moorong
- 58 Poachers Lane, Gobbagombalin
- 191 Roach Road, Moorong
- 932 Sturt Highway, Yarragundry

The noise monitoring locations and Cell Pit locations are presented in Figure 2 and Figure 3, respectively.



932 Sturt Highway,
Yarragundry

111 River Road,
Gobbagombalin

191 Roach Road,
Moorong

Figure 2 Noise Monitoring Locations

Image courtesy of SixMaps



Figure 3 Cell Pit Locations

Image courtesy of Hanson

7.1 Instrumentation and Measurement Procedure

STOCKPILE AREA

The acoustic instrumentation employed during the monitoring programme complied with the requirements of AS 1259.1-1990 "Acoustics - Sound Level Meter - Non-Integrating" and IEC 61672.1-2019 "Electroacoustics - Sound Level Meters - Specifications" and carried current certificates. The schedule of noise monitoring equipment deployed during the programme and attended monitoring is presented in **Table 4**.



Table 4 Noise Monitoring Equipment

Instrumentation	Туре	Serial Number
Bruel & Kaer 2260 Sound Level Metre	Type 1	1772168
Bruel & Kaer 4231 Acoustic Calibrator	Type 1	2574227
ARL 316 Noise Logger	Type 1	16-004-004
ARL 316 Noise Logger	Type 1	16-004-021
ARL 316 Noise Logger	Type 1	16-004-023
ARL 316 Noise Logger	Type 1	16-004-018

In order to determine compliance with the noise limits nominated in **Table 1**, operator-attended 15-minute noise surveys were conducted on Tuesday 10 September 2019 at the nominated receivers.

The measurements were guided by the requirements of Australian Standard AS 1055-2018 Acoustics - Description and measurement of environmental noise.

A level calibration check was undertaken using an acoustic calibrator which emitted a 94-dBA calibration tone at 1 KHz. The calibration check was conducted prior and after the surveys with no shift noted during the calibration process. The full set of daily noise levels are presented graphically in **Appendices B, C, D** and **E.**

8 Operational Noise Compliance Monitoring Results

8.1 Operator-attended Noise Monitoring

The operator-attended noise surveys were conducted between 8:00 am and 12:30 pm, 10 September 2019 at all four monitoring locations. The measured noise emission levels from the Project operations during the daytime period are presented in **Table 5**.

Table 5 Operational Noise Compliance Monitoring Results – Daytime Period

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa)		Description of Noise Emission, Typical	Estimated Project LAeq
		LAeq	LA90	Maximum Levels LAmax (dB)	(15minute) (dB re 20 μPa)
111 River Road	10/09/2019 8:11 am Wind: Calm Temp: 7°C RH: 56 % Cloud: 0 okta	43	31	Birds: 41-56 Aircraft: 47-50 Dozer: 34-40 Reverse Alarm: 32- 34	34
111 River Road	10/09/2019 9:31 am Wind: Calm Temp: 7°C RH: 56 % Cloud: 0 okta	41	32	Birds: 41-56 Dozer: 33-39 Reverse Alarm: 35-37	33



Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 μPa)		Description of Noise Emission, Typical	Estimated Project LAeq
		LAeq	LA90	Maximum Levels LAmax (dB)	(15minute) (dB re 20 μPa)
58 Poachers Lane	10/09/2019 8:45 am Wind: 0.5 m/s NE Temp: 7°C RH: 58 % Cloud: 0 okta	53	31	Birds: 60-75 Aircraft: 42-46 Project not discernible	<21
58 Poachers Lane	10/09/2019 10:29 am Wind: Calm Temp: 7°C RH: 58 % Cloud: 0 okta	46	29	Birds: 60-67 Aircraft: 41-44 Reverse Alarm (barely audible): 30- 33	31
191 Roach Road	10/09/2019 11:18 am Wind: 2m/s NW Temp: 11°C RH: 56 % Cloud: 0 okta	46	32	Birds: 53-67 Aircraft: 35-45 Roach Road Traffic:54-55 Reverse Alarm: 32- 33 Excavator Tracking: 40-41	35
191 Roach Road	10/09/2019 11:33 am Wind: Calm Temp: 11°C RH: 56 % Cloud: 0 okta	47	33	Aircraft: 40-45 Roach Road Traffic: 46-71 (Hanson Truck) Quarry Hammering: 35-37 Reverse Alarm: 33- 35	35
932 Sturt Highway	10/09/2019 12:10 am Wind: Calm Temp: 11°C RH: 56 % Cloud: 0 okta	38	28	Birds: 47-58 Aircraft: 36-43 Insects: 37-38 Sheep: 33-38 Project not discernible	<18
932 Sturt Highway	10/09/2019 12:25 am Wind: 2m/s NE Temp: 23°C RH: 56 % Cloud: 0 okta	50	27	Birds: 41-71 Aircraft: 39-42 Insects: 37-40 Sheep: 34-36 Project not discernible	<17

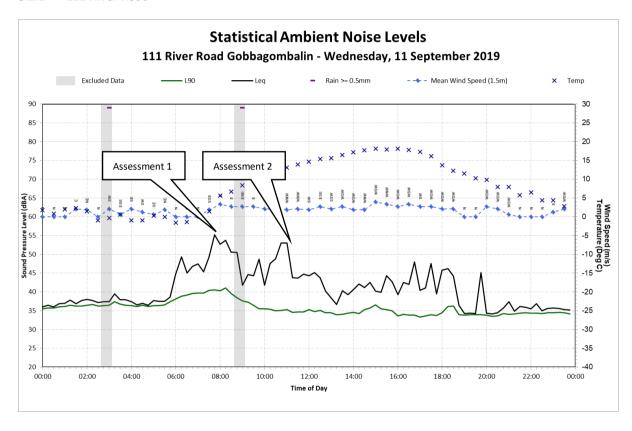
8.2 Real-time Audio Recording

Section 4.1 of the NMP stipulates the requirement of real-time audio recording to supplement the unattended noise monitoring program to aid in identifying noise sources should exceedances occur from quarry operations.

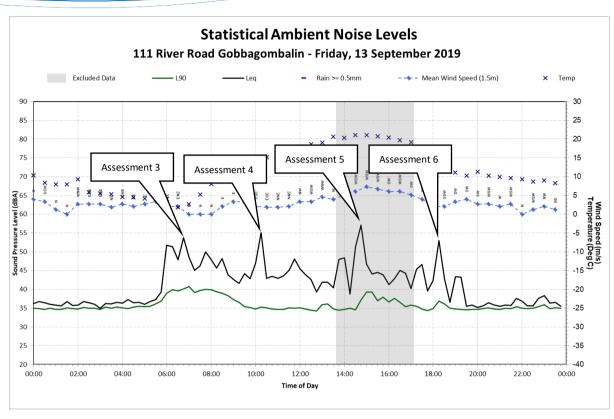


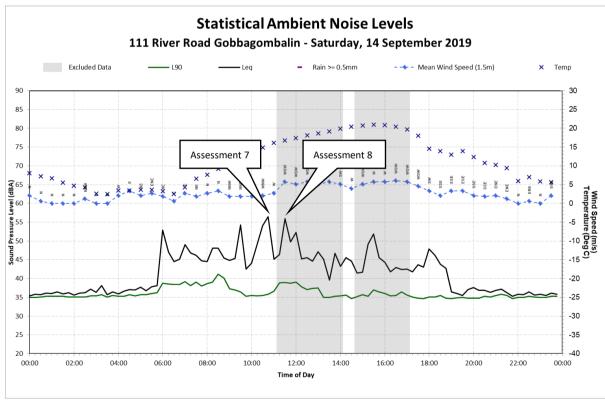
VMS deployed audio recorders in conjunction with unattended noise monitors at all four monitoring locations between Tuesday 10 September 2019 and Tuesday 17 September 2019 in order to qualify the noise emissions from quarry operations. Ten (10) audio recordings per locations have been selected and are assessed in **Section 8.2.1** to **8.2.4**.

8.2.1 111 River Road











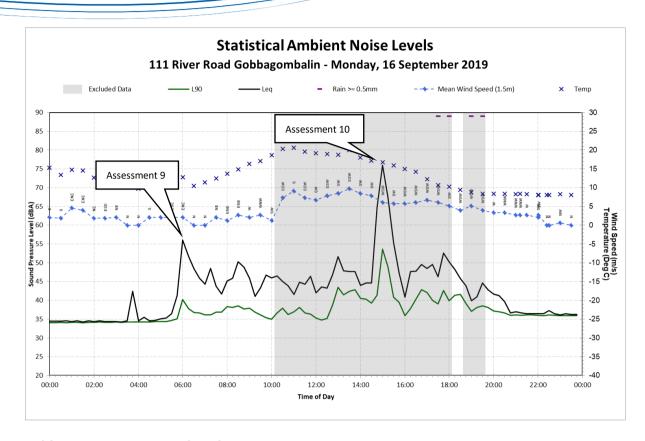
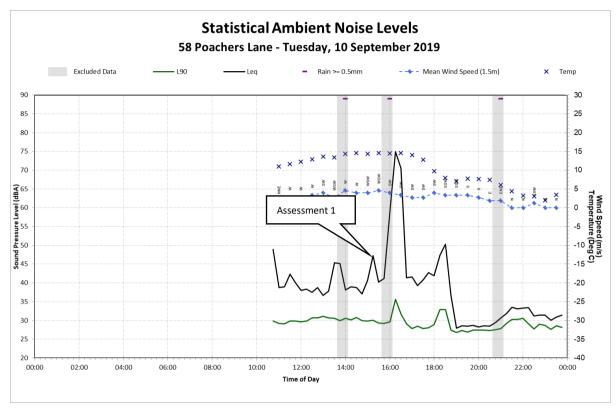


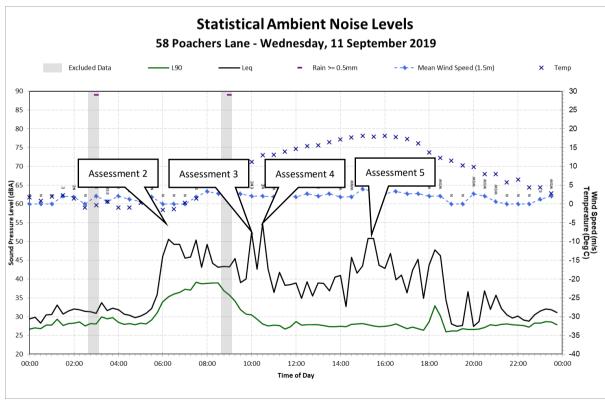
Table 6 111 River Road Audio Assessment

Assessment Number	Date/Time	Description of Noise Recording	
1	11/9/2019. 7.45am	Wildlife noise, predominantly cockatoos	
2	11/9/2019. 10.45am	Reverse alarm from quarry barely audible	
3	13/9/2019. 6.45am	Wildlife noise	
4	13/9/2019. 10.15am	Reverse alarm from quarry barely audible intermittent hammering	
5	13/9/2019. 3.15pm	Aircraft noise audible	
6	13/9/2019. 6.15pm	Road traffic noise	
7	14/9/2019. 10.45am	Aircraft Flyover	
8	14/9/2019. 11.30am	Wildlife and aircraft flyover	
9	16/9/2019. 6.00am	Wildlife noise	
10	16/9/2019. 3.00pm	Faint quarry noise and trucks compression braking	

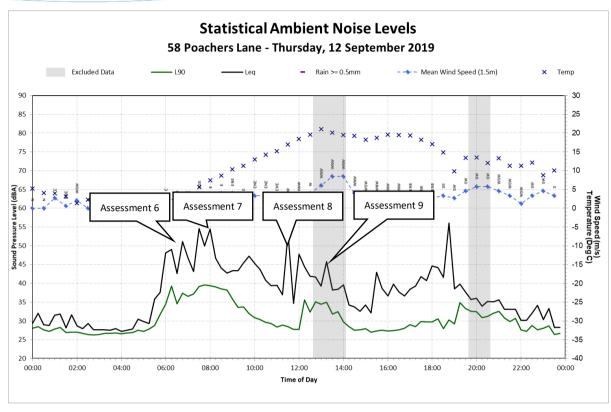


8.2.2 58 Poachers Lane









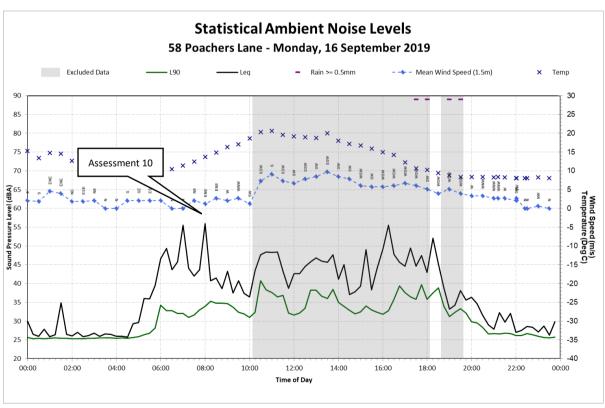
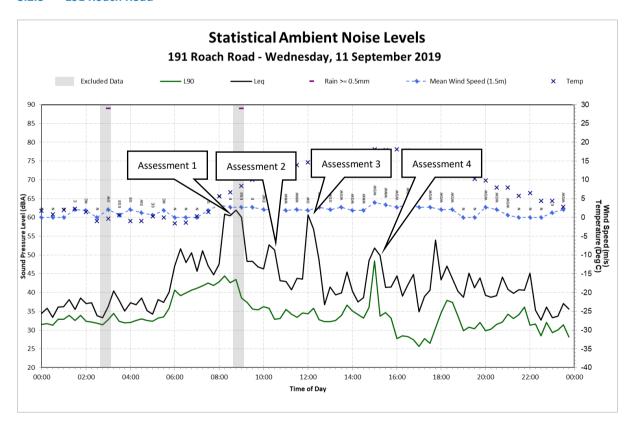




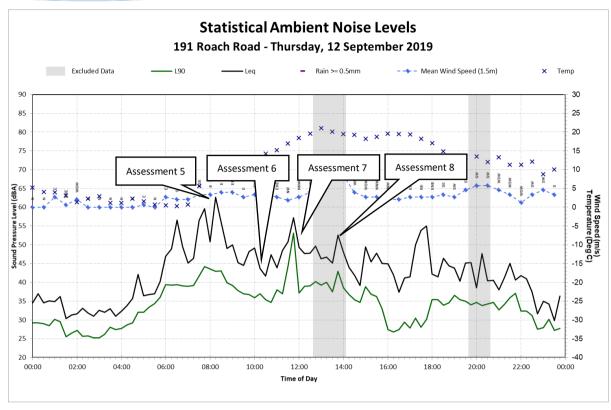
Table 7 58 Poachers Lane Audio Assessment

Assessment Number	Date/Time	Description of Noise Recording
1	10/9/2019. 3.00pm	Wildlife noise and aircraft flyover
2	11/9/2019. 6.30am	Wildlife noise
3	11/9/2019. 10.00am	Wildlife noise and aircraft flyover
4	11/9/2019. 10.30am	Road Traffic and wildlife
5	11/9/2019. 3.15pm	Aircraft flyover
6	12/9/2019. 6.45am	Wildlife noise
7	12/9/2019. 8.00am	Wildlife noise
8	12/9/2019. 11.30am	Wildlife noise and aircraft flyover
9	12/9/2019. 1.15pm	Wildlife noise and truck passby
10	16/9/2019. 8.00am	Distant lawn mowing, wildlife noise

8.2.3 191 Roach Road







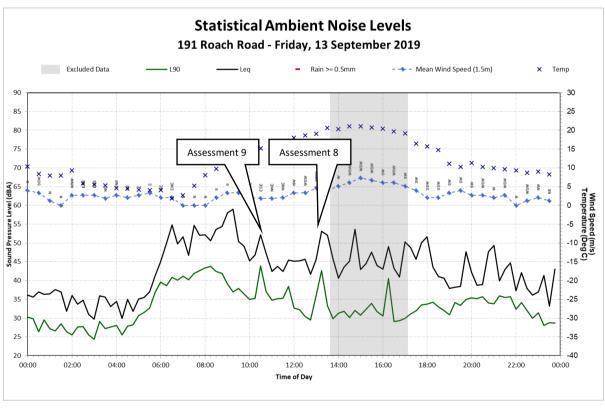
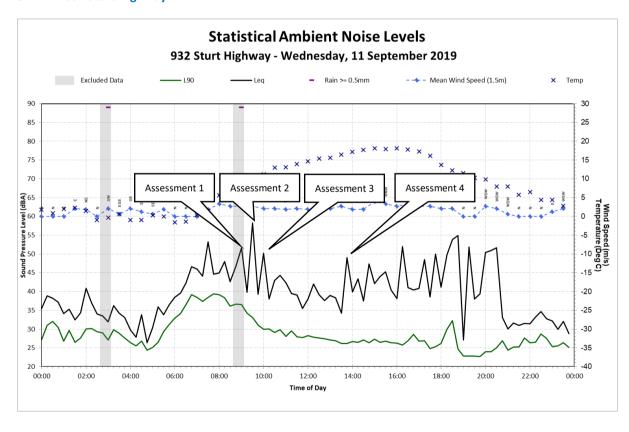




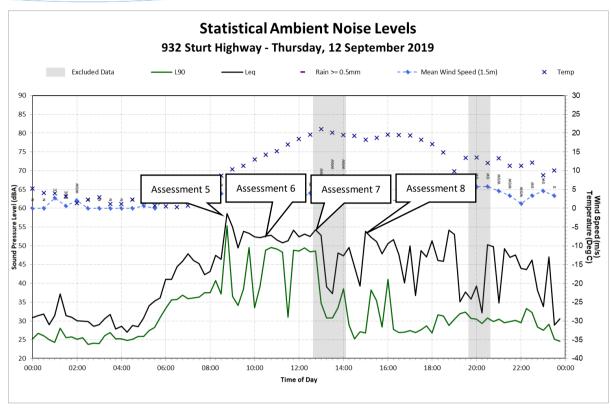
Table 8 191 Roach Road Audio Assessment

Assessment Number	Date/Time	Description of Noise Recording
1	11/9/2019. 8.15am	Wildlife noise
2	11/9/2019. 10.15am	Truck noise within boundary approx. 10 minutes
3	11/9/2019. 12.00pm	Excavator noise, reverse alarm
4	11/9/2019. 3.00pm	Truck noise within boundary
5	11/9/2019. 3.15pm	Truck noise within boundary, loading container
6	12/9/2019. 8.15am	Wildlife noise
7	12/9/2019. 12.00pm	People talking, wildlife
8	12/9/2019. 1.00pm	Vehicle movement in driveway, distant truck noise
9	13/9/2019. 10.30am	Truck noise, reverse alarm
10	13/9/2019. 1.15pm	Wildlife noise and dog barking

8.2.4 932 Sturt Highway







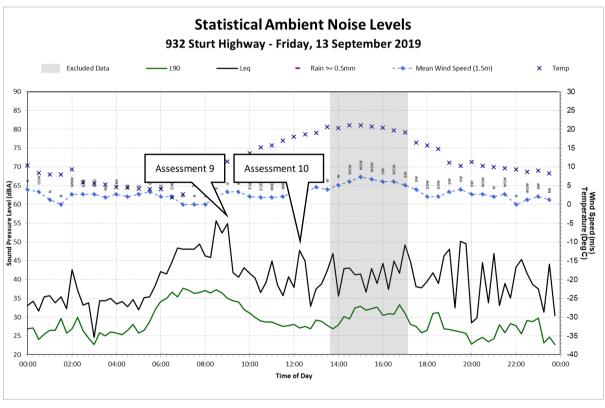




Table 9 932 Sturt Highway Audio Assessment

Assessment Number	Date/Time	Description of Noise Recording
1	11/9/2019. 8.30am	Wildlife noise
2	11/9/2019. 9.30am	Wildlife noise, dog bark
3	11/9/2019. 10.00am	Wildlife noise, sheep
4	11/9/2019. 1.45pm	Wildlife noise, aircraft flyover
5	12/9/2019. 8.45pm	Aircraft flyover, wildlife noise
6	12/9/2019. 10.45am	Road traffic noise, dog barking
7	12/9/2019. 1.00pm	Sheep. Wildlife and traffic noise
8	12/9/2019. 3.00pm	Sheep. Wildlife and traffic noise
9	13/9/2019. 9.15am	Helicopter, wildlife noise
10	13/9/2019. 12.15pm	Wildlife and sheep

9 Assessment and Findings

Based on the estimated Project noise emission contributions presented in **Table 5** and the supplemental real-time audio recordings presented in **Table 6** to **Table 9**, the estimated Project noise contributions for each location are presented in **Table 10**, together with an assessment against the corresponding PA Noise Impact Assessment Criteria.

Table 10 Project Noise Emission Assessment

Period	Location	Estimated Project Noise Level Contribution	Project Noise Impact Assessment Criteria	Project Noise Assessment
		LAeq(15min) (dB re 20 μPa)	LAeq(15min) (dB re 20 μPa)	
Day	111 River Road	34	35	Pass
	58 Poachers Lane	30	35	Pass
	191 Roach Road	35	35	Pass
	932 Sturt Highway	18	35	Pass

Based on the operator-attended noise survey results presented in **Table 5**, noise contribution from quarry activities were intermittently audible at 111 River Road, primarily from the dozer operation and its reverse alarm. Project noise at 58 Poachers Lane were not discernible during the first 15-minute measurement, however, the dozer reverse alarm noise were intermittently audible during the second measurement. Operator-attended noise survey from south of the quarry at 191 Roach Road found that excavator hammering and tracking noise were audible during both measurements but considered to be unobtrusive and intermittent with road traffic noise from Roach Road and general wildlife noise. Noise measurements from north-west of the quarry at 932 Sturt Highway registered negligible quarry contributions, however, wildlife and sheep in particular were the dominant noise sources throughout the two measurements.



In addition to the operator-attended and unattended noise surveys, real-time audio were also recorded and assessed with corresponding peaks noise levels from the daily noise charts that are presented in Section 8.2 and within **Appendix B** to **Appendix E**. Further assessment of the audio recordings shows that noise was mainly triggered by wildlife, road traffic, aircraft and general household activities. However, 191 Roach Road registered truck activities that were within the property boundary and intermittent quarry activities which correlates with the operator-attended measurements.

10 Conclusion

VMS has conducted operator-attended and unattended noise compliance monitoring for Wagga Wagga Quarry Extension project the nearest residential receivers between Tuesday 10 September 2019 and Tuesday 17 September 2019. The results from the operator-attended and unattended noise monitoring demonstrate that the Project is in compliance with the PA Noise Impact Assessment Criteria during the monitoring period.

A review of the measurements from the unattended noise logger in conjunction with real-time audio recording have found noise emissions from quarry operations were intermittently discernible at 111 River Road, 58 Poachers Land and 191 Roach Road. The Project related noise was not discernible at 932 Sturt Highway during the noise monitoring period. No further investigation or mitigation measures are required for this Project.

I trust that the above report meets your current requirements.

Yours sincerely

Zul Khasmuri

Technical Director - Acoustics

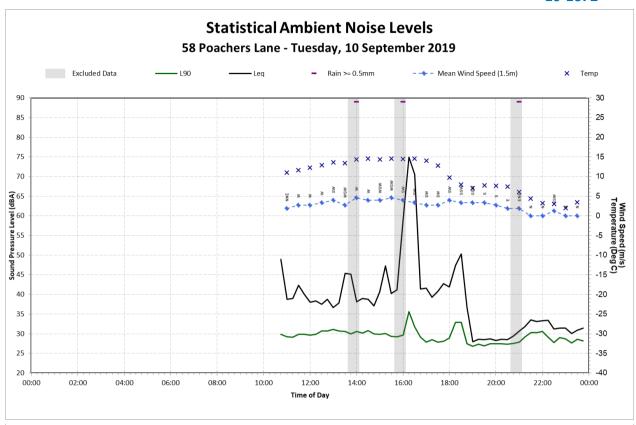


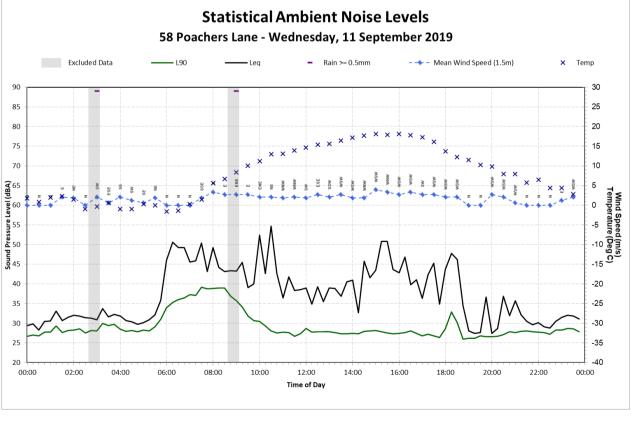
Terminology Relating to Noise and Vibration

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.		
Sound Power	Sound Power is the rate at which sound energy is emitted, reflected, transmitted, or received, per unit time. Unlike sound pressure, sound power is neither room-dependent nor distance-dependent.		
Sound Pressure Level (SPL)	The sound level is the sound pressure relative to a standard reference pressure of $20\mu Pa$ ($20x10^{-6}$ Pascals on a decibel scale.		
Sound Power Leve (SWL)	The Sound Power Level is the sound power relative to a standard reference pressure of 1pW (20x10 ⁻¹² Watts) on a decibel scale. The SWL of a simple point source may be used to calculate the SPL at a given distance (r) using the following formula:		
	SPL = SWL $-10 \times \log_{10}(4 \times \pi \times r^2)$ Note that the above formula is only valid for sound propagation in the free-field (see below).		
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu Pa$.		
A-weighting, dBA	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.		
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined according to how the averaging or statistics are carried out.		
Leq,T	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.		
Lmax,T	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.		
L90,T	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.		
L10,T	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.		
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m		
Fast/Slow Time Weighting	Averaging times used in sound level meters.		
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit.		
DnT,w	The single number quantity that characterises airborne sound insulation between rooms over a range of frequencies.		
Rw	Single number quantity that characterises the airborne sound insulating properties of a material of building element over a range of frequencies.		
Reverberation	The persistence of sound in a space after a sound source has been stopped.		
PPV	The particles of a medium are displaced from their random motion in the presence of a vibration wave. The greatest instantaneous velocity of a particle during this displacement is called the Peak Particle Velocity (PPV) and is typically measured in the units of mm/s.		
Hertz, Hz	The unit of Frequency (or Pitch) of a sound or vibration. One hertz equals one cycle per second 1 kHz = 1000 Hz, 2 kHz = 2000 Hz, etc.		
Acceleration	Acceleration is defined as the rate of change of Velocity of a particle over a period of time and is typically measured in the units of m/sec ² .		
Vibration Dose, VDV	When assessing intermittent vibration, it is necessary to use the vibration dose value (VDV), a cumulative measurement of the vibration level received over an 8-hour or 16-hour period. The VDV formulae uses the RMS Acceleration raised to the fourth power and is known as the Root-mean-quad method. This technique ensures the VDV is more sensitive to the peaks in the acceleration levels VDVs are typically measured in the units of m/s ^{1.75} .		



Appendix B Daily Noise Levels 58 Poachers Lane Gobbagombalin 10-1672



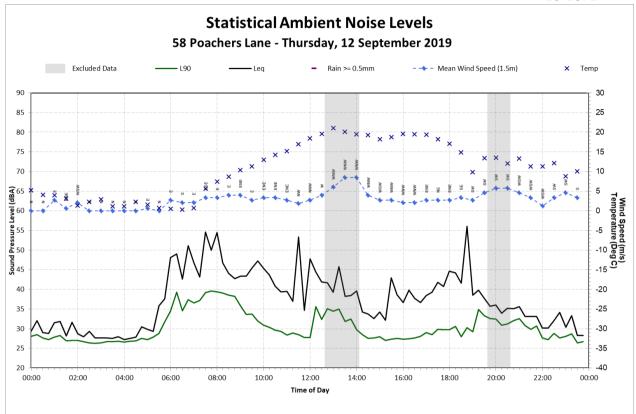


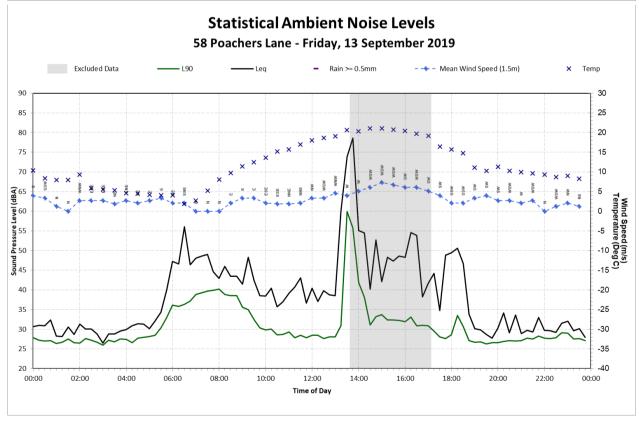


Appendix B Daily Noise Levels

58 Poachers Lane Gobbagombalin

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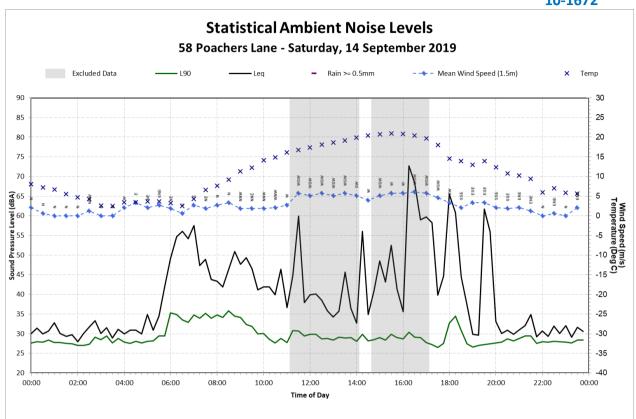


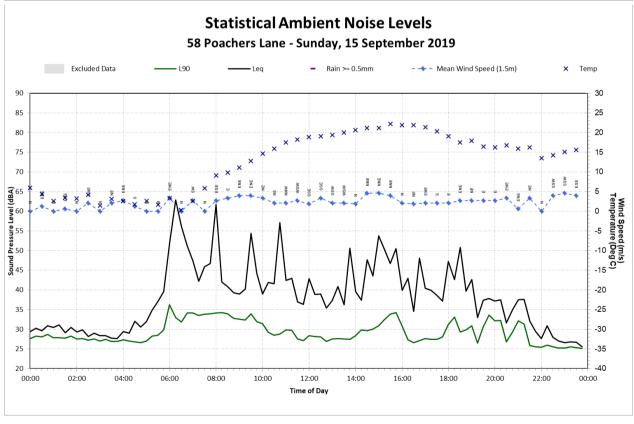




Appendix B Daily Noise Levels 58 Poachers Lane Gobbagombalin

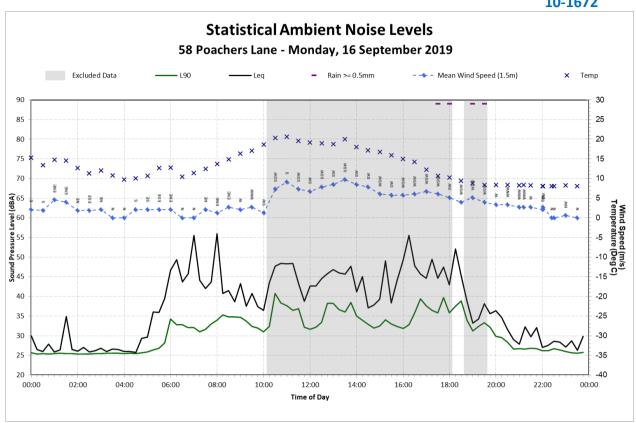
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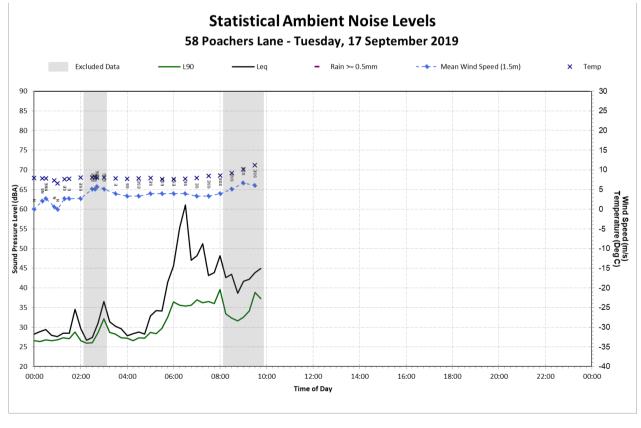




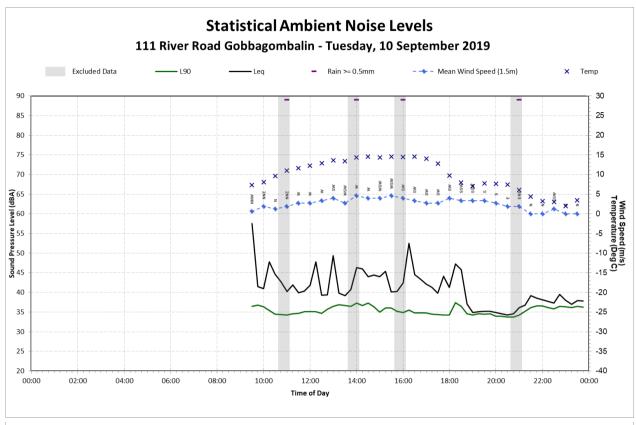


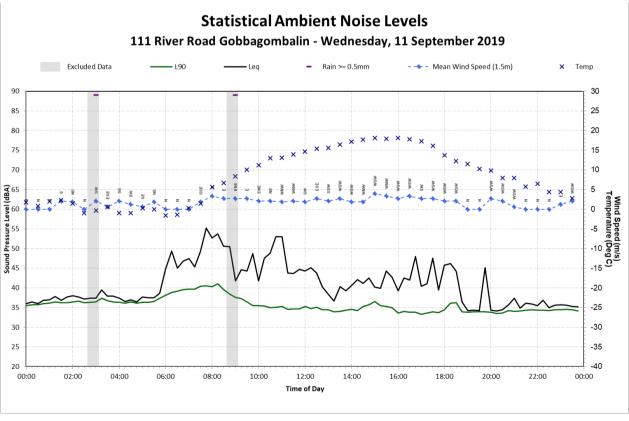
Appendix B Daily Noise Levels 58 Poachers Lane Gobbagombalin 10-1672



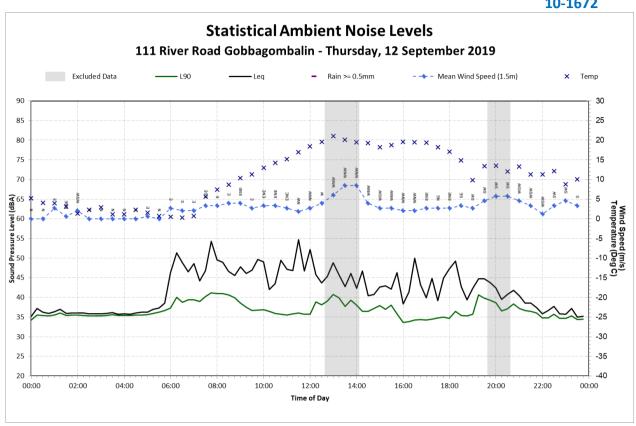


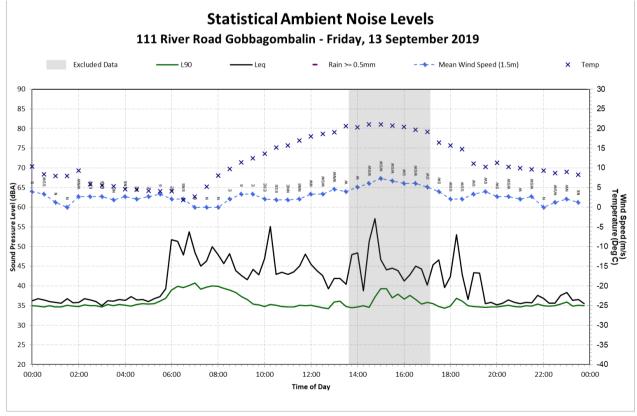




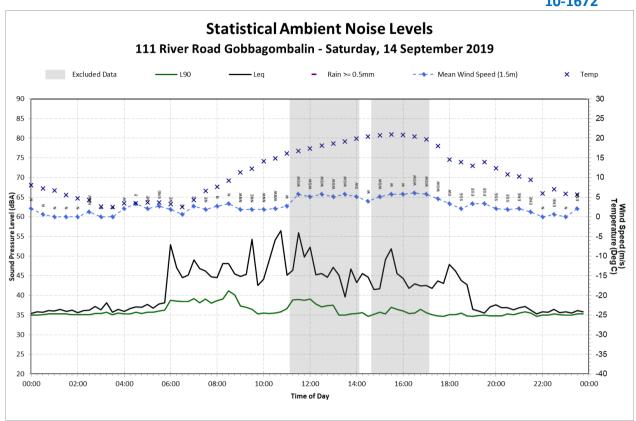


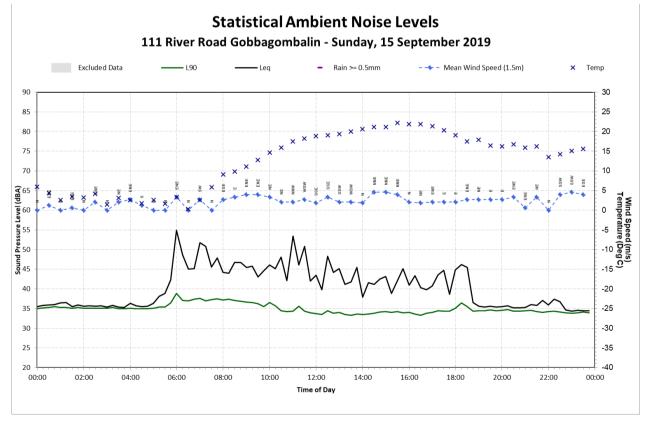




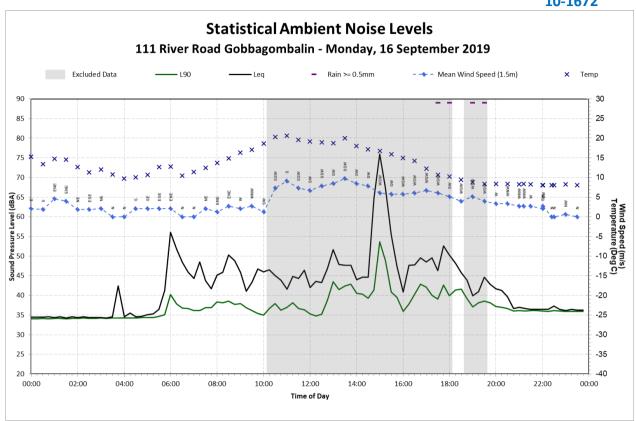


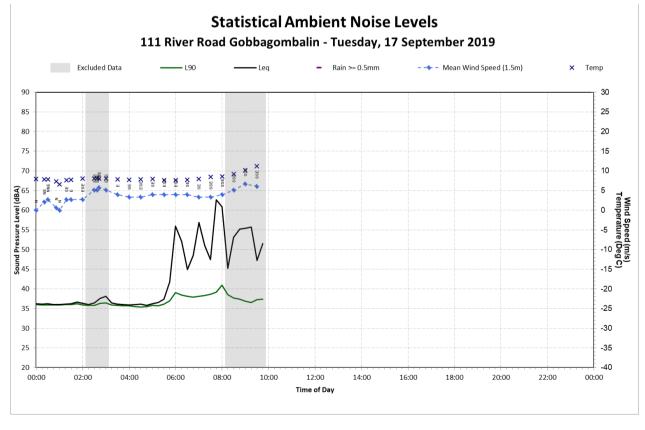






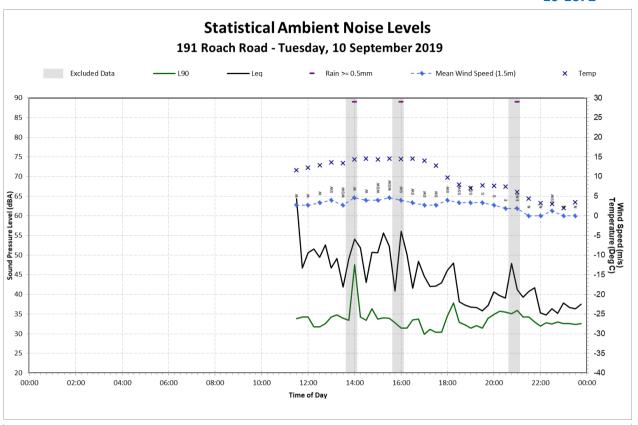


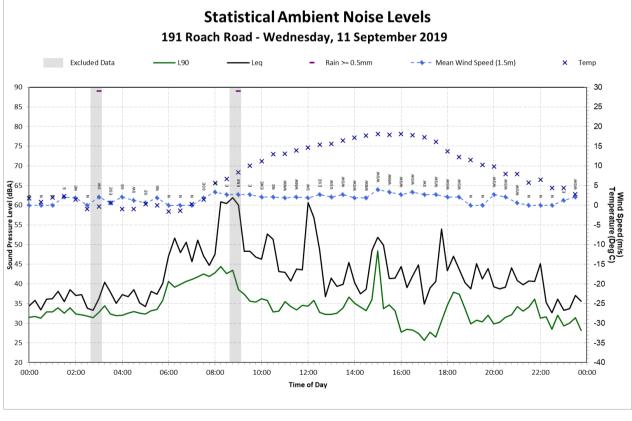






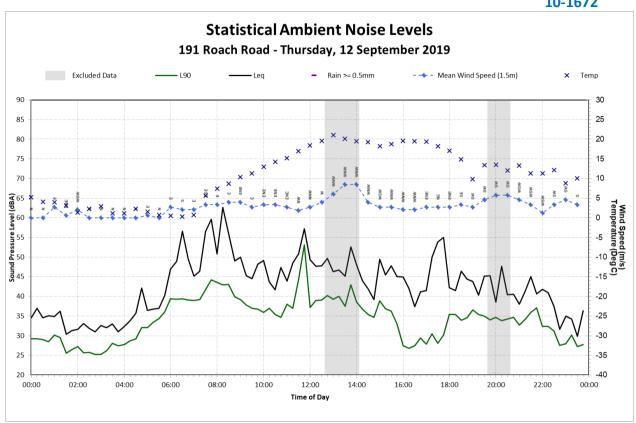
Appendix D Daily Noise Levels 191 Roach Road Moorong 10-1672

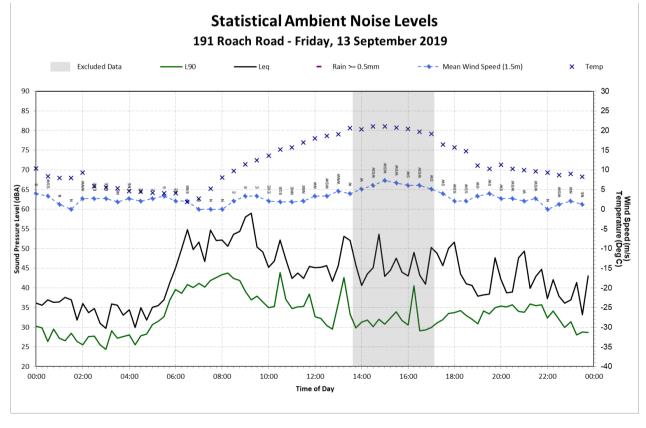






Appendix D Daily Noise Levels 191 Roach Road Moorong 10-1672

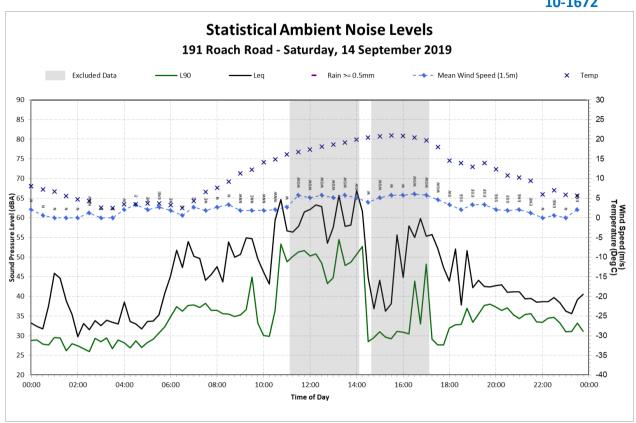


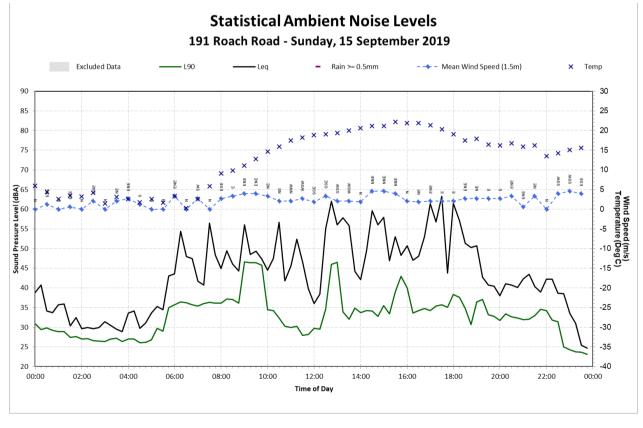




Appendix D Daily Noise Levels 191 Roach Road Moorong

10-1672

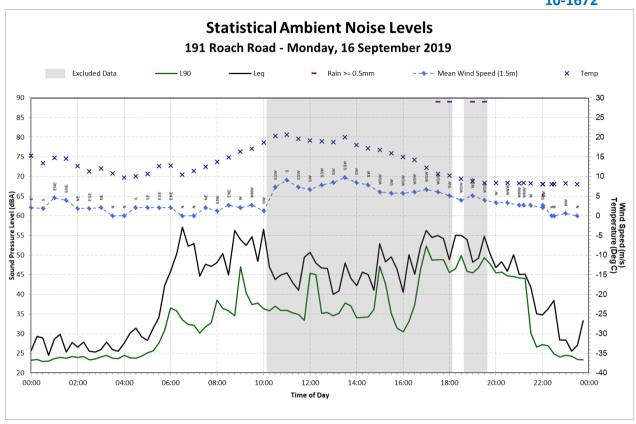


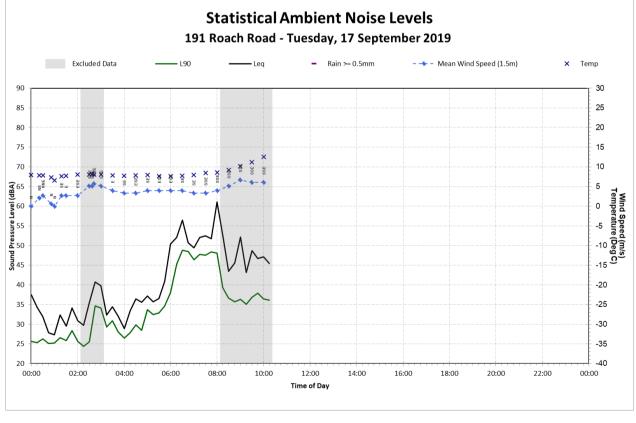




Appendix D Daily Noise Levels 191 Roach Road Moorong

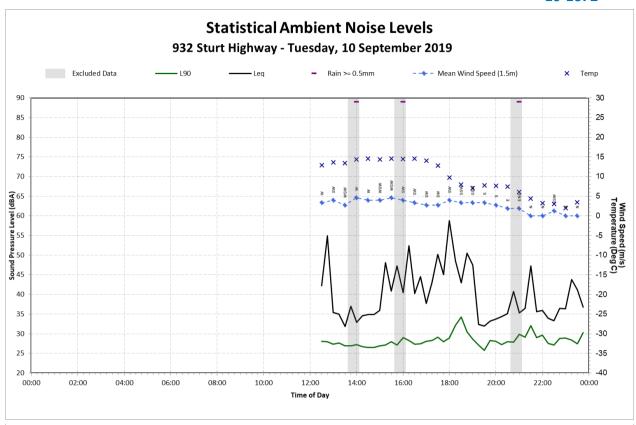
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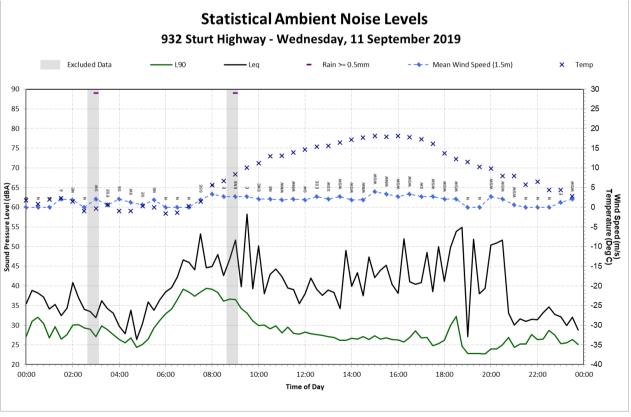






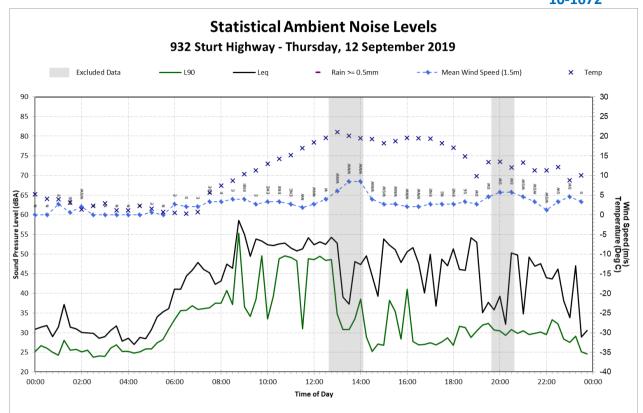
Appendix E Daily Noise Levels 935 Sturt Highway Yarragundry 10-1672

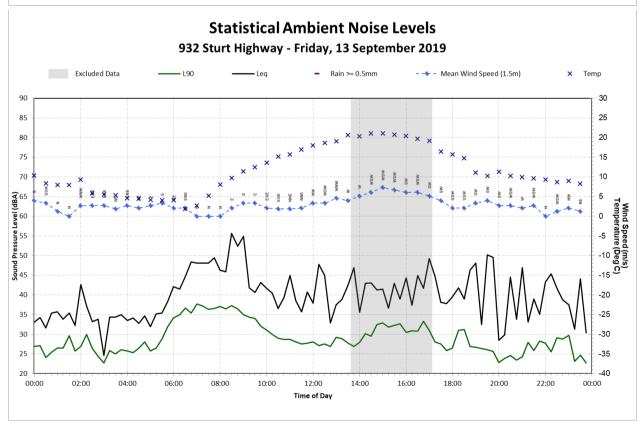






Appendix E Daily Noise Levels 935 Sturt Highway Yarragundry 10-1672

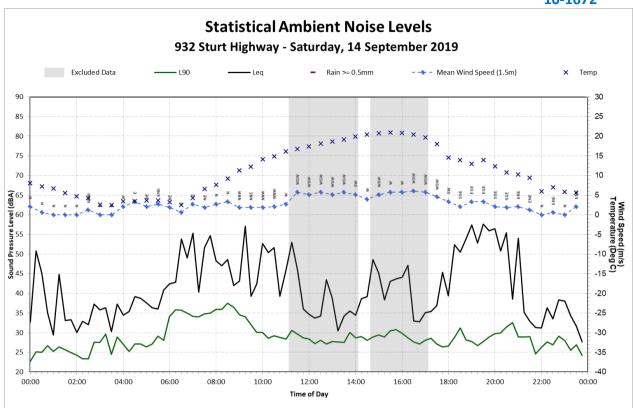


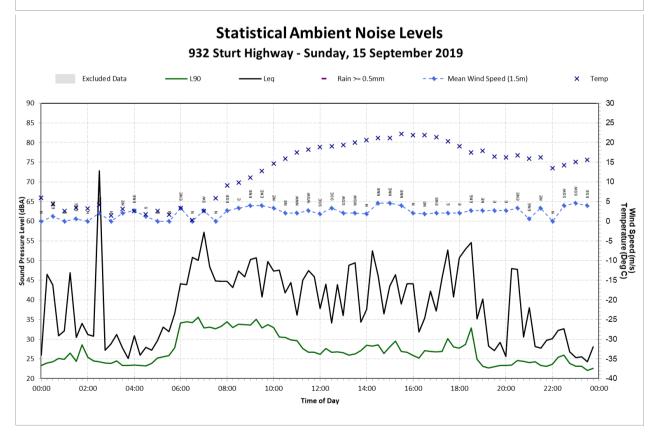




Appendix E Daily Noise Levels 935 Sturt Highway Yarragundry

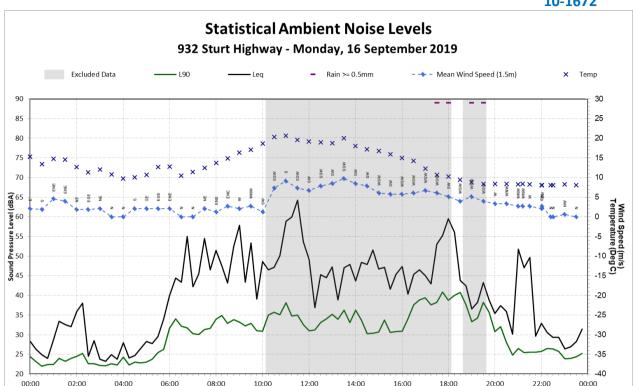
10-1672







Appendix E Daily Noise Levels 935 Sturt Highway Yarragundry 10-1672



12:00

14:00

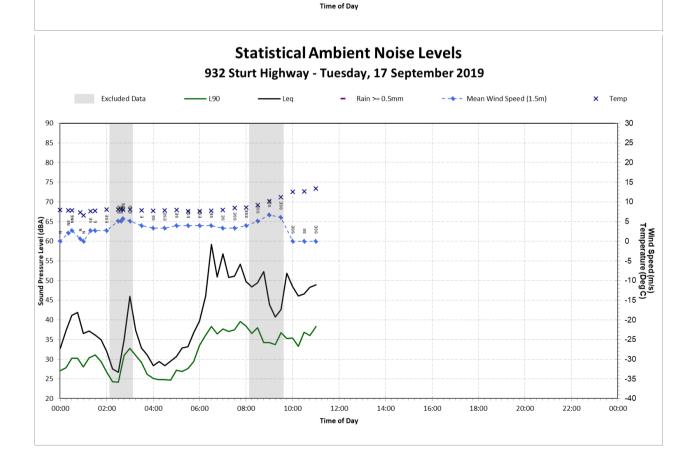
16:00

18:00

20:00

22:00

00:00





00:00

02:00

04:00

06:00

08:00