APPENDIX S

Bunbury Outer Ring Road Southern Section Traffic Noise Assessment (Lloyd George Acoustics, 2020)

Lloyd George Acoustics
PO Box 717
Hillarys WA 6923
T: 9401 7770
www.lgacoustics.com.au

Transportation Noise Assessment

Bunbury Outer Ring Road (South Section)

Reference: 19075094-02c Noise Modelling.docx

Prepared for:
BORR Team

Report: 19075094-02c Noise Modelling.docx

Lloyd George Acoustics Pty Ltd

ABN: 79 125 812 544

PO Box 717
Hillarys WA 6923

www.lgacoustics.com.au

T: 9401 7770

Contacts	Daniel Lloyd	Terry George	Matt Moyle	Olivier Mallié	Ben Hillion	Rob Connolly
E:	daniel@lgacoustics.com.au	terry@lgacoustics.com.au	matt@lgacoustics.com.au	olivier@lgacoustics.com.au	ben@lgacoustics.com.au	rob@lgacoustics.com.au
M:	0439 032 844	0400 414 197	0412 611 330	0439 987 455	0457 095 555	0410 107 440

Date:	Rev	Description	Prepared By	Verified
03-Oct-19	0	Issued to Client as Draft	Terry George	Daniel Lloyd
08-Oct-19	1	Issued to Client as Draft 1 following internal review.	Terry George	Daniel Lloyd
5-Feb-20	2	Issued to Client as Draft 2 for review.	Terry George	-
7-Feb-20	-	Issued following comments.	Terry George	Rob Connolly (GHD)
22-Apr-20	A	Extended assessment area to south	Terry George	-
7-May-20	B	Updated following client comments	Terry George	-
27-May-20	C	Updated following client comments.	Terry George	-
2-Jul-20	D	Updated following client comments	Terry George	-

Table of Contents

1 INTRODUCTION 1

2 CRITERIA 2

3 METHODOLOGY 9

3.1 Site Measurements 9

3.2 Noise Modelling 9

3.2.1 Ground Topography, Road Design & Cadastral Data 9

3.2.2 Traffic Data 10

3.2.3 Ground Attenuation 12

3.2.4 Parameter Conversion 12

4 RESULTS 16

4.1 Model Calibration 16

4.2 Noise Modelling - Future 20

5 ASSESSMENT 28

6 CONCLUSION 41

List of Tables

Table 2-1 Transport Corridor Classification and Trigger Distances 2

Table 2-2 Noise Targets for Roads 3

Table 2-3 Residences Within Project Area and Trigger Distance 4

Table 3-1 Noise Relationship Between Different Road Surfaces 10

Table 3-2 Existing Traffic Volumes 13

Table 3-3 Future (2041) Traffic Volumes 14

Table 4-1 Average Weekday Noise Measurement Results 16

Table 4-2 Comparison of Modelled and Measured $L_{Aeq(Day)}$ 17

Table 4-3 Predicted 2041 $L_{Aeq(Day)}$ Noise Levels 20

Table 5-1 Predicted 2041 $L_{Aeq(Day)}$ Noise Levels With Mitigation 28

Table 5-2 Houses to be Offered Architectural Upgrades 36

List of Figures

Figure 1-1 Road Project Locality 1
Figure 2-1 SPP 5.4 Trigger Distances (PlanWA) 3
Figure 3-1 Existing Posted Speeds 11
Figure 4-1 Existing Noise Contour Plot: Map 1 18
Figure 4-2 Existing Noise Contour Plot: Map 2 19
Figure 4-3 Future Noise Contour Plot: Map 1 22
Figure 4-4 Future Noise Contour Plot: Map 2 23
Figure 4-5 Future Noise Contour Plot: Map 3 24
Figure 4-6 Future Noise Contour Plot: Map 4 25
Figure 4-7 Future Noise Contour Plot: Map 5 26
Figure 4-8 Future Noise Contour Plot: Map 6 27
Figure 5-1 Future Noise Contour Plot With Mitigation: Map 1 30
Figure 5-2 Future Noise Contour Plot With Mitigation: Map 2 31
Figure 5-3 Future Noise Contour Plot With Mitigation: Map 3 32
Figure 5-4 Future Noise Contour Plot With Mitigation: Map 4 33
Figure 5-5 Future Noise Contour Plot With Mitigation: Map 5 34
Figure 5-6 Future Noise Contour Plot With Mitigation: Map 6 35

Appendices

A Pre-Construction Noise Monitoring Report

B Terminology

1 INTRODUCTION

The southern section of the Bunbury Outer Ring Road (BORR) is located between South Western Highway and Bussell Highway, with grade separated interchanges planned at Centenary Road and Bussell Highway (refer *Figure 1-1*).

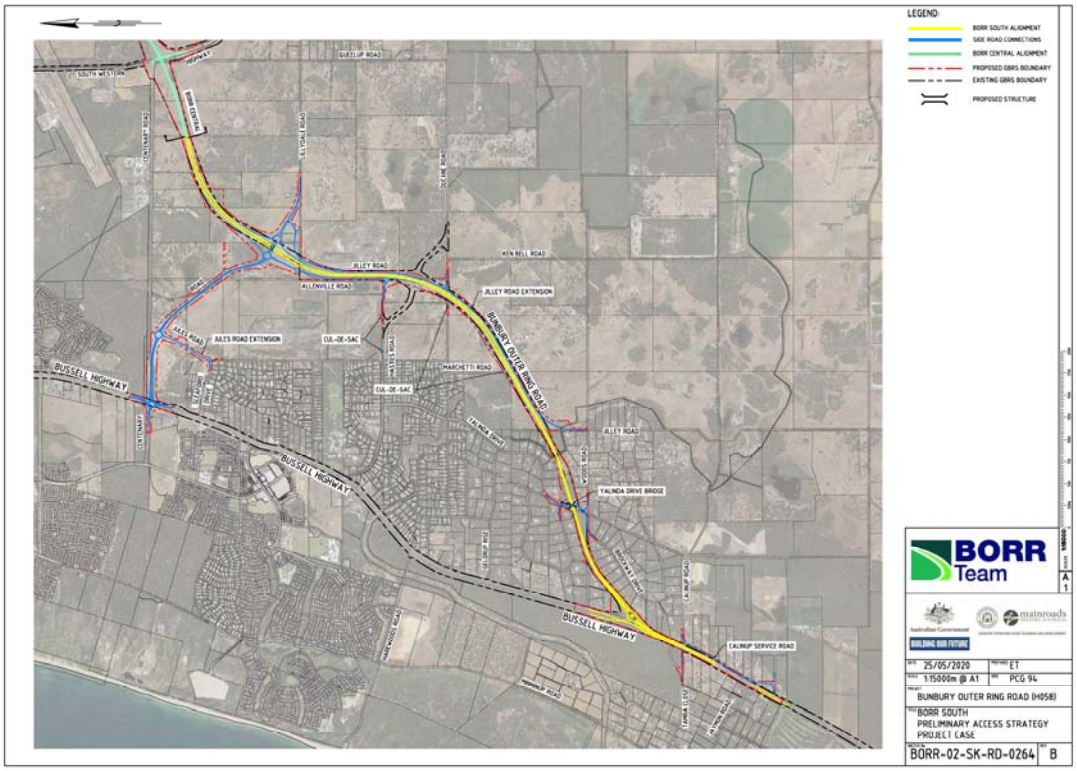


Figure 1-1 Road Project Locality

Part of the project will be to consider the noise impact to residences located adjacent to the project. To gain an understanding of existing noise levels, noise monitoring was undertaken and reported in *Pre-Construction Noise Monitoring Report, Bunbury Outer Ring Road (South Section)*; Reference: 19075094-01, hereafter referred to as the Noise Monitoring Report and provided in *Appendix A*.

As the Noise Monitoring Report provides the existing noise levels specific to five (5) locations only, a noise model is used to predict noise levels over a larger area. The Existing Noise Model is calibrated against the measured noise levels and this calibration is then used in the Future Noise Model, which includes forecast traffic volumes and the future road design. The noise modelling is the subject of this current document.

The relevant criteria for the project is taken from *State Planning Policy No. 5.4 Road and Rail Noise* (hereafter referred to as SPP 5.4) produced by the Western Australian Planning Commission (WAPC). SPP 5.4 provides different outdoor noise targets where the project is a new road (55 dB $L_{Aeq(Day)}$) or a road upgrade (60 dB $L_{Aeq(Day)}$). The approach taken in this report is where a residence is within the trigger distance of an existing major road (within 300m of Bussell Hwy), the criteria is that of a road upgrade.

Appendix B contains a description of some of the terminology used throughout this report.

2 CRITERIA

The criteria relevant to this assessment is provided in *State Planning Policy No. 5.4 Road and Rail Noise* (hereafter referred to as SPP 5.4) produced by the Western Australian Planning Commission (WAPC). The objectives of SPP 5.4 are to:

- Protect the community from unreasonable levels of transport noise;
- Protect strategic and other significant freight transport corridors from incompatible urban encroachment;
- Ensure transport infrastructure and land-use can mutually exist within urban corridors;
- Ensure that noise impacts are addressed as early as possible in the planning process; and
- Encourage best practice noise mitigation design and construction standards

SPP 5.4 provides the *Table 2-1* trigger distances at which it applies.

Table 2-1 Transport Corridor Classification and Trigger Distances

Transport Corridor Classification	Trigger Distance	Distance Measured From
Strategic freight and major traffic routes Roads as defined by Perth and Peel Planning Frameworks and/or roads with either 500 or more Class 7 to 12 Austroads vehicles per day, and/or 50,000 per day traffic volume.	300 metres	Road carriageway edge
Other significant freight/traffic routes These are generally any State administered road and/or local government road identified as being a future State administered road (red road) and other roads that meets the criteria of either ≥ 100 Class 7 to 12 Austroads vehicles daily or ≥ 23,000 daily traffic count (averaged equivalent to 25,000 vehicles passenger car units under region schemes).	200 metres	Road carriageway edge
Passenger railways	100 metres	Centreline of the closest track
Freight railways	200 metres	Centreline of the closest track

The above can also be viewed at Department of Planning, Lands and Heritage (DPLH) website https://espatial.dplh.wa.gov.au/planwa/Index.html?viewer=planwa and is also shown in *Figure 2-1*.

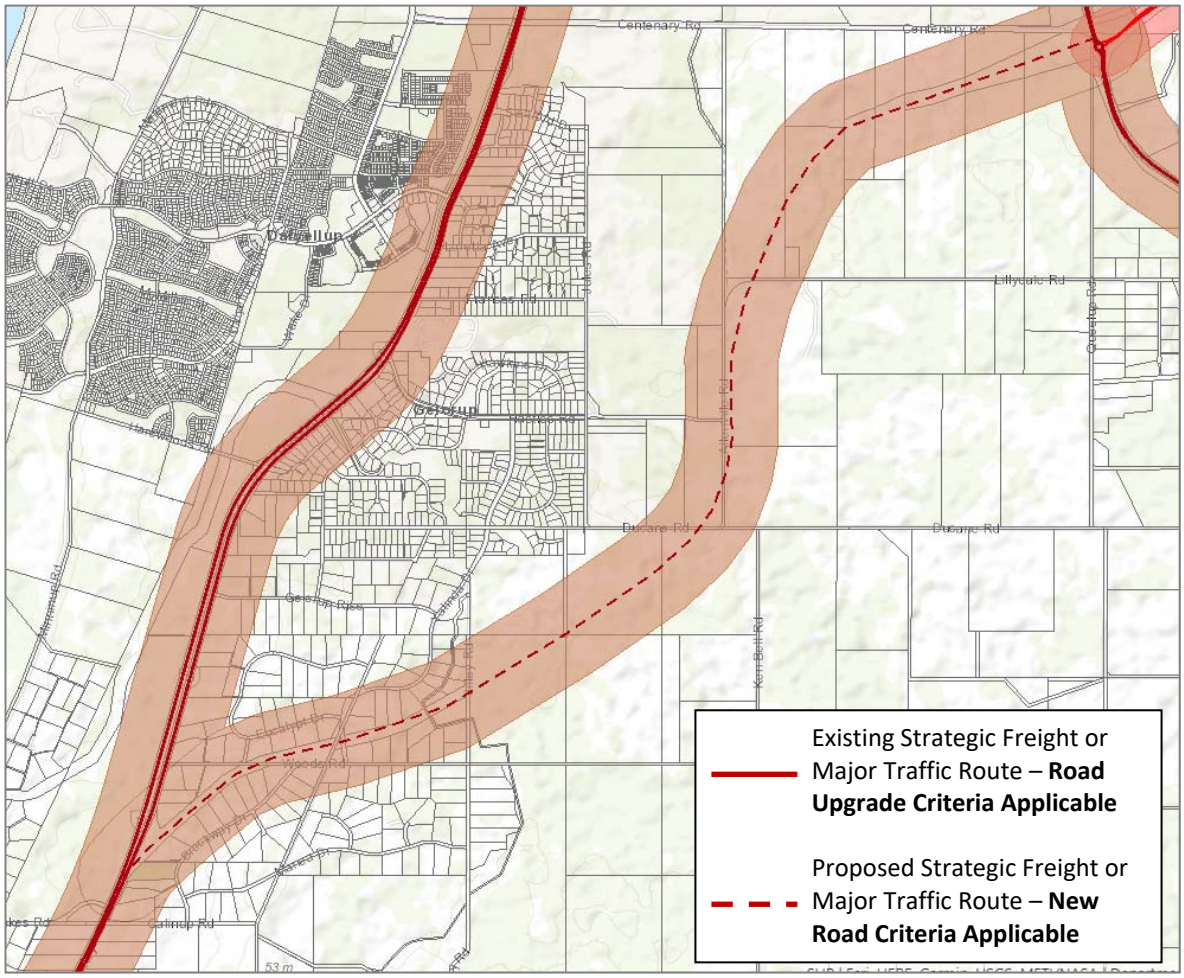


Figure 2-1 SPP 5.4 Trigger Distances (PlanWA)

Table 2-2 sets out noise targets that are to be achieved by proposals under which SPP 5.4 applies. Where the targets are exceeded, an assessment is required to determine the likely level of transport noise and management/mitigation required.

Table 2-2 Noise Targets for Roads

Scenario	Outdoor Noise Target	
New Road	55 dB $L_{Aeq(Day)}$	50 dB $L_{Aeq(Night)}$
Road Upgrade	60 dB $L_{Aeq(Day)}$	55 dB $L_{Aeq(Night)}$

Notes:

- Day period is from 6am to 10pm and night period from 10pm to 6am.
- The outdoor noise target is to be measured at 1-metre from the most exposed, habitable[1] facade of the noise sensitive building.
- Outdoor targets are to be met at all outdoor areas as far as is reasonable and practicable to do so using the various noise mitigation measures outlined in the Guidelines. For instance, it is likely unreasonable for a transport infrastructure provider to achieve the outdoor targets at more than 1 or 2 floors of an adjacent development with direct line of sight to the traffic.

[1] A habitable room is defined in State Planning Policy 3.1 as a room used for normal domestic activities that includes a bedroom, living room, lounge room, music room, sitting room, television room, kitchen, dining room, sewing room, study, playroom, sunroom, gymnasium, fully enclosed swimming pool or patio.

The application of SPP 5.4 is to consider anticipated traffic volumes for the next 20 years from when the noise assessment is undertaken.

As stated in Section 6.1 of SPP 5.4, it is recognised that in some instances, it may not be reasonable and/or practicable to meet the outdoor noise targets. Where transport noise is above the noise targets, measures are expected to be implemented that balance reasonable and practicable considerations with the need to achieve acceptable noise protection outcomes.

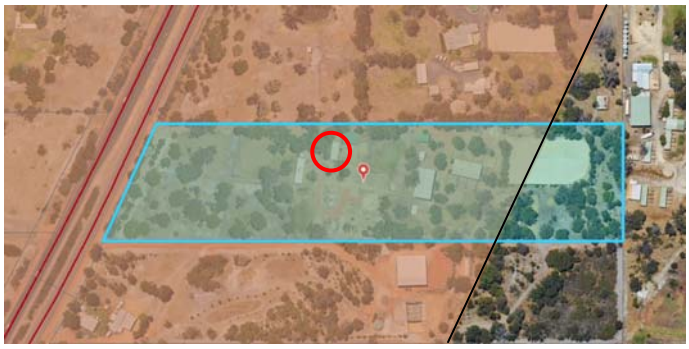
This project involves both upgrades to an existing major traffic route (Bussell Highway) and construction of a new road (BORR). Where a residence is within the trigger distance of *Table 2-1* to an existing major road, the 'Road Upgrade' criteria are applicable (60 dB $L_{Aeq(Day)}$ / 55 dB $L_{Aeq(Night)}$). Outside of this, the 'New Road' criteria are applicable (55 dB $L_{Aeq(Day)}$ / 50 dB $L_{Aeq(Night)}$).

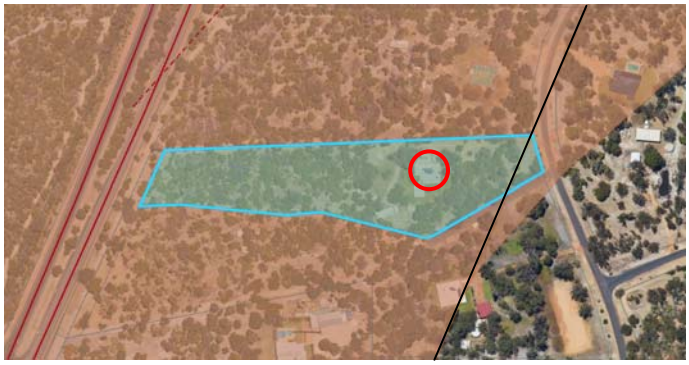
Table 2-3 provides those residences within the project area where the 'Road Upgrade' criteria will be applicable, along with the DPLH map showing the trigger distance.

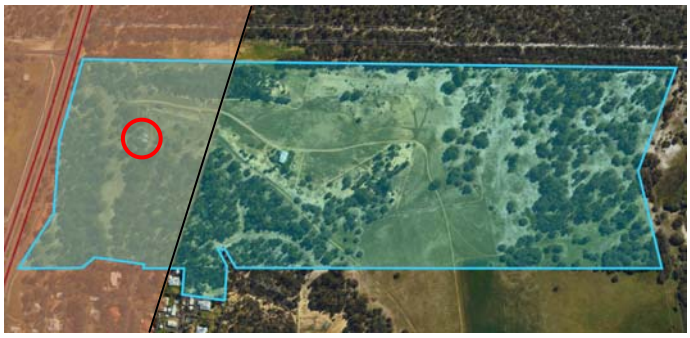
Table 2-3 Residences Within Project Area and Trigger Distance

Address	Locality
10 Tamra Close	
1269 Bussell Hwy	

Address	Locality
1267 Bussell Hwy	
1253 Bussell Hwy	
1245 Bussell Hwy	
1225 Bussell Hwy	

Address	Locality
1213 Bussell Hwy	
1205 Bussell Hwy	
1201 Bussell Hwy	
18 Calinup Rd	

Address	Locality
23 Calinup Rd	
29 Brockway Dr	
37 Brockway Dr	
49 Brockway Dr	

Address	Locality
24 Woods Rd	
6 Woods Rd	
11 Bussell Hwy	

3 METHODOLOGY

Noise measurements and modelling have been undertaken in accordance with the requirements of the Policy as described below in *Section 3.1* and *Section 3.2*.

3.1 Site Measurements

Noise monitoring was undertaken at five (5) locations in order to:

- Quantify the existing noise levels;
- Determine the differences between different acoustic parameters ($L_{A10,18hour}$, $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$); and
- Calibrate the noise model for existing conditions.

Information with regards to the noise monitoring is summarised in *Section 4.1* and provided in detail in the Noise Monitoring Report.

3.2 Noise Modelling

The computer programme *SoundPLAN 8.1* was utilised incorporating the *Calculation of Road Traffic Noise* (CoRTN) algorithms, modified to reflect Australian conditions. The modifications included the following:

- Vehicles were separated into heavy (Austroads Class 3 upwards) and non-heavy (Austroads Classes 1 & 2) with non-heavy vehicles having a source height of 0.5 metres above road level and heavy vehicles having two sources, at heights of 1.5 metres and 3.6 metres above road level, to represent the engine and exhaust respectively. By splitting the noise source into three, allows for less barrier attenuation for high level sources where barriers are to be considered.
- Note that a -8.0 dB correction is applied to the exhaust and -0.8 dB to the engine (based on Transportation Noise Reference Book, Paul Nelson, 1987), so as to provide consistent results with the CoRTN algorithms for the no barrier scenario;
- Adjustments of -0.8 dB and -1.7 dB have been applied to the predicted levels for the 'free-field' and 'at facade' cases respectively, based on the findings of *An Evaluation of the U.K. DoE Traffic Noise Prediction*; Australian Road Research Board, Report 122 ARRB – NAASRA Planning Group (March 1983).

Predictions are made at heights of 1.4 metres above ground level. Where noise levels are predicted at a residence, this is at 1.0 metre from the facade, resulting in a + 2.5 dB correction due to reflected noise.

Various input data are included in the modelling such as ground topography, road design, traffic volumes etc. These model inputs are discussed in the following sections.

3.2.1 Ground Topography, Road Design & Cadastral Data

Topographical data was provided by GHD. This data comprised ground contours at 1-metre intervals within 300 metres of the road project and 5-metre interval contours outside of this area. As some monitoring locations were outside the area or to fill areas where contours were missing, some spot heights were also obtained from *Google Earth*.

Building outlines were also provided by GHD, sourced from Landgate data. These buildings have heights equivalent to the gutter level of houses, so that these have been used within the noise model. The following five houses were removed/excluded from the future modelling scenario, as it is understood these will be acquired as part of the project:

- #1205 Bussell Highway, Stratham. Existing house will be acquired. A new house will be constructed, estimated to be around 95 metres from the existing western boundary. The new house has been included in the assessment;
- #1253 Bussell Highway, Stratham. Existing house will be acquired. A new house will be constructed, approximately 150 metres from the existing western boundary. The new house has been included in the assessment;
- #1297 Bussell Highway, Stratham;
- #259 Yalinda Drive, Gelorup; and
- #322 Lillydale Road, North Boyanup.

The BORR south road design was provided by GHD, dated 9 December 2019, in the form of 3D strings. The above are combined in order to construct a 3D noise model.

3.2.2 Traffic Data

Traffic data includes:

- Road Surface – The noise relationship between different road surface types is shown below in *Table 3-1*.

Table 3-1 Noise Relationship Between Different Road Surfaces

Road Surfaces						
Chip Seal			Asphalt			
14mm	10mm	5mm	Dense Graded	Novachip	Stone Mastic	Open Graded
+3.5 dB	+2.5 dB	+1.5 dB	0.0 dB	-0.2 dB	-1.5 dB	-2.5 dB

The following existing road surfaces were assumed:

- Bunbury Outer Ring Road (East of South Western Highway) – 14mm Chip Seal;
- South Western Highway (South of Bunbury Outer Ring Road) – 14mm Chip Seal;
- Bussell Highway (South of Centenary Road) – Worn Chip Seal (assume 10mm for modelling purposes as this will be conservative);
- Bussell Highway (South of Calinup Road) – Worn Chip Seal (assume 10mm Northbound (NB) and 5mm Southbound (SB) for modelling purposes to be conservative, with the SB surface observed to be smoother than the NB).

The future BORR is initially assumed to be 14mm Chip Seal.

- Vehicle Speed – The following existing posted speeds were modelled (refer *Figure 3-1*):
    - Bunbury Outer Ring Road (East of South Western Highway) – 100km/hr reduced to 80km/hr approximately 350 metres from each roundabout;
    - South Western Highway (South of Bunbury Outer Ring Road) – 110km/hr approximately 600 metres south of the BORR roundabout;
    - Bussell Highway (South of Centenary Road) – 80km/hr through to 350 metres north of Gelorup Rise. Speed then changes to 110km/hr.

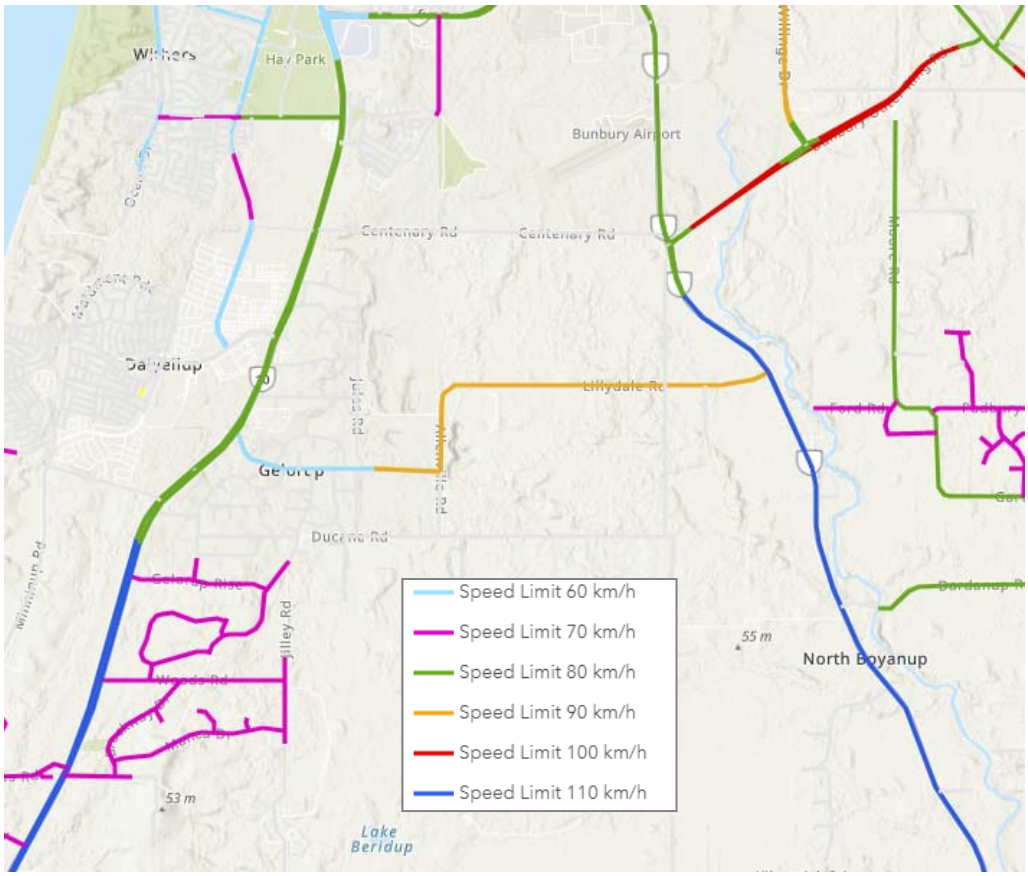


Figure 3-1 Existing Posted Speeds

The following future posted speeds were assumed:

- Bunbury Outer Ring Road – 110km/hr with on/off ramps at 80km/hr;
- Jules Road – 60 km/hr;
- Lillydale Road – 90 km/hr;
- Centenary Road – 50 km/hr west of Bussell Highway, 80 km/hr elsewhere;
- South Western Highway – as per existing;
- Bussell Highway – as per existing.

- Traffic Volumes – Existing and forecast traffic volumes were provided by the BORR team, which included 24 hour volumes as well as the day (6am to 10pm) and night (10pm and 6am) volumes along with percentage heavy vehicles. These are provided in *Table 3-2* and *Table 3-3*.

3.2.3 Ground Attenuation

Ground attenuation is present in all modelling scenarios and has been assumed to be 0.0 (0%) for the existing roads of BORR, SWH and Bussell Highway. The future BORR has been modelled with a ground absorption of 0.2 (20%) as the area encompassed the road and the cut/fill batters. The remainder of the study area has ground absorption of 0.7, considered a reasonable average for the area. Note 0.0 represents hard reflective surfaces such as water and 1.00 represents absorptive surfaces such as grass.

3.2.4 Parameter Conversion

The CoRTN algorithms used in the *SoundPLAN* modelling package were originally developed to calculate the $L_{A10,18hour}$ noise level. The WAPC Policy however uses $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$. The relationship between the parameters varies depending on the composition of traffic on the road (volumes in each period and percentage heavy vehicles). *SoundPLAN* automatically converts the $L_{A10,18hour}$ parameter to $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ based on the TRL Limited study (*Converting the UK Traffic Noise Index $L_{A10,18h}$ to EU Noise Indices for Noise Mapping, 2002).*

Table 3-2 Existing Traffic Volumes

Road	Section	Total Traffic Volumes		Average Hourly Traffic Volumes				Percentage Heavy Vehicles (%)			
				Day (6am to 10pm)		Night (10pm to 6am)		Day (6am to 10pm)		Night (10pm to 6am)	
		NB/EB[2]	SB/WB[2]	NB/EB[2]	SB/WB[2]	NB/EB[2]	SB/WB[2]	NB/EB[2]	SB/WB[2]	NB/EB[2]	SB/WB[2]
BORR[1]	W of Boyanup-Picton Road	1636	1693	94	92	17	28	17.2	20.1	28.6	5.3
	W of Willinge Drive	2385	1841	131	106	36	18	25.5	30.4	16.3	51.8
South Western Highway	N of Lillydale Road	4657	4845	259	278	88	27	15.6	10.3	10.6	14.3
	S of Lillydale Road	3402	3459	202	202	21	29	16.5	13.0	15.5	40.2
Bussell Highway	N of Centenary Road	14075	14903	820	889	120	85	11	11	13	19
	S of Centenary Road	14075	14903	820	889	120	85	11	11	13	19
	S of Hasties Road	7943	8212	470	488	53	50	10	11	15	22

1. Obtained from Main Roads WA Traffic Map
2. NB = Northbound, EB = Eastbound, SB = Southbound and WB = Westbound.

Table 3-3 Future (2041) Traffic Volumes

Road	Section	Total Traffic Volumes		Average Hourly Traffic Volumes				Percentage Heavy Vehicles (%)			
				Day (6am to 10pm)		Night (10pm to 6am)		Day (6am to 10pm)		Night (10pm to 6am)	
		NB/EB[2]	SB/WB[2]	NB/EB[2]	SB/WB[2]	NB/EB[2]	SB/WB[2]	NB/EB[2]	SB/WB[2]	NB/EB[2]	SB/WB[2]
BORR	W of Boyanup-Picton Road[1]	14454	14109	824	832	159	99	15	15	24	25
	W of Willinge Drive	14454	14109	824	832	159	99	15	15	24	25
	W of Centenary Road	9519	9644	563	574	64	58	15	15	15	22
	W of Allenville Road Exit	9623	9644	569	574	64	58	15	15	15	22
	NB off ramp to Allenville Road	105	-	6	-	1	-	15	-	15	-
South Western Highway	N of Lillydale Road	1921	2153	103	128	35	13	16	10	11	14
	S of Lillydale Road	4929	5015	293	293	30	42	16	13	15	40
Bussell Highway	N of Centenary Road	16674	17572	971	1048	143	100	11	11	13	19
	S of Centenary Road	18336	16257	1068	970	157	93	11	11	13	19
	N of BORR Interchange	3789	3778	224	225	25	23	10	11	15	22
	S of BORR Interchange	13413	13422	793	798	90	81	15	15	15	22

Road	Section	Total Traffic Volumes		Average Hourly Traffic Volumes				Percentage Heavy Vehicles (%)			
				Day (6am to 10pm)		Night (10pm to 6am)		Day (6am to 10pm)		Night (10pm to 6am)	
		NB/EB[2]	SB/WB[2]	NB/EB[2]	SB/WB[2]	NB/EB[2]	SB/WB[2]	NB/EB[2]	SB/WB[2]	NB/EB[2]	SB/WB[2]
Centenary Road	W of BORR	5993	5654	311	345	127	17	8	12	3	14
	W of Jules Road	6199	5778	322	352	132	17	8	12	3	14
	W of Bussell Hwy	139	2696	7	164	3	8	8	12	3	14
Lillydale Road	E of BORR	1141	1168	60	71	23	4	14	15	6	8
Jules Road	S of Centenary Road	1069	1151	55	70	23	3	8	12	3	14

1. Not provided so assumed same as W of Willinge Road
2. NB = Northbound, EB = Eastbound, SB = Southbound and WB = Westbound

4 RESULTS

4.1 Model Calibration

The results of the noise monitoring are summarised below in *Table 4-1* and these are utilised, where applicable, in the model calibration process (refer *Appendix A* for full details).

Table 4-1 Average Weekday Noise Measurement Results

Location	Average Weekday Noise Level, dB			
	$L_{A10,18hour}$	$L_{Aeq,24hour}$	$L_{Aeq\ (Day)}$	$L_{Aeq\ (Night)}$
1. Lot 104 (#421) Willinge Drive, Davenport	60.9	58.0	59.1	54.2
2. Lot 100 South Western Highway, Davenport	60.9	57.9	59.2	53.3
3. Lot 500 (#538) Bussell Highway, Dalyellup	65.5	62.8	64.0	58.5
4. Lot 47 (#1213) Bussell Highway, Stratham	62.2	59.2	60.5	54.0
5. Lot 41 (#133) Woods Road, Gelorup	41.6	42.0	43.2	36.3

Location 5 represents noise levels at a residence away from existing roads but close to the future road and as such, is not useful for model calibration and therefore no longer considered.

Alongside the existing section of BORR (Location 1), the difference between the $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ is 4.9 dB. At the other three locations, the difference ranges 5.5 to 6.5 dB. With reference to *Section 2*, where the daytime noise is at least 5 dB higher than night, the $L_{Aeq(Day)}$ parameter will dictate compliance. Given that Location 1 is very close to a 5 dB differential, it is the $L_{Aeq(Day)}$ parameter that is most critical for existing noise levels.

Comparing the future BORR traffic volumes with those of the existing volumes, it is considered that BORR, between Willinge Drive and Centenary Road, is similar in percentage heavy vehicles and day/night split to the existing northern section of Bussell Highway, near Location 3. The remaining section of BORR is similar in percentage heavy vehicles and day/night split to the existing southern section of Bussell Highway near Location 4. As such, the difference between the $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ for both existing and future roads is considered to be at least 5 dB and it is the $L_{Aeq(Day)}$ parameter that will dictate compliance and therefore only this parameter is discussed in further sections of this report.

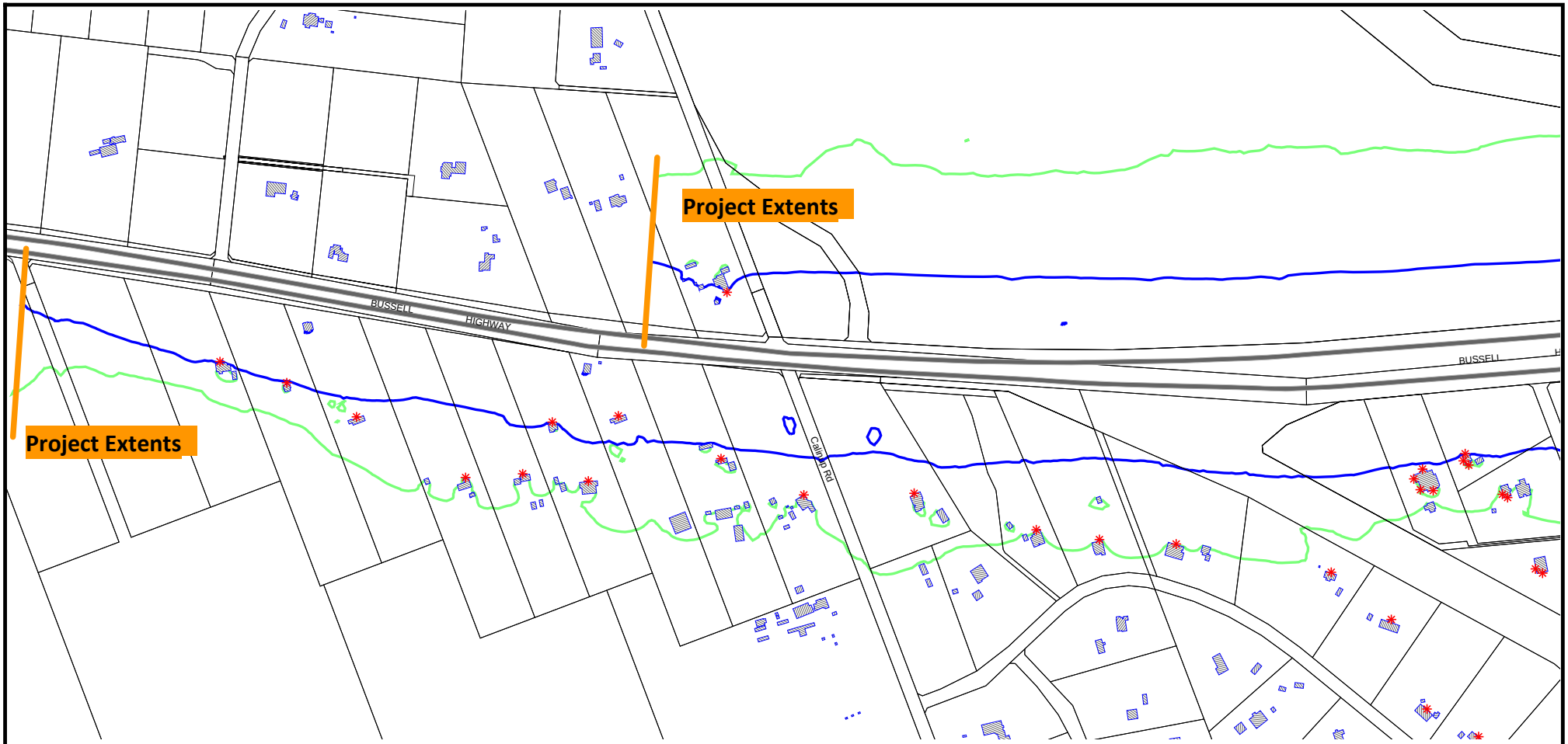
Table 4-2 shows the comparison of the modelled $L_{Aeq(Day)}$ and the measured $L_{Aeq(Day)}$.

Table 4-2 Comparison of Modelled and Measured $L_{Aeq(Day)}$

Location	$L_{Aeq\ (Day)}$, dB		
	Measured	Modelled	Difference
1. Lot 104 (#421) Willinge Drive, Davenport	59.1	62.4	+ 3.3
2. Lot 100 South Western Highway, Davenport	59.2	62.2	+3.0
3. Lot 500 (#538) Bussell Highway, Dalyellup	64.0	66.7	+2.7
4. Lot 47 (#1213) Bussell Highway, Stratham	60.5	64.9	+4.4

From the above, it can be seen that the model is over-predicting at all locations. In order to be conservative, a -2.7 dB calibration factor is applied to existing and future scenarios, aligning with the lowest measured-modelled noise level difference of *Table 4-2*.

Figure 4-1 and *Figure 4-2* show the predicted noise contours for the existing scenario.



Bunbury Outer Ring Road (South Section) - Existing Noise Level Contours - Map 01

$L_{Aeq(Day)}$ Noise Level Contours Based on Existing Conditions
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

22 April 2020

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

Length Scale 1:9000

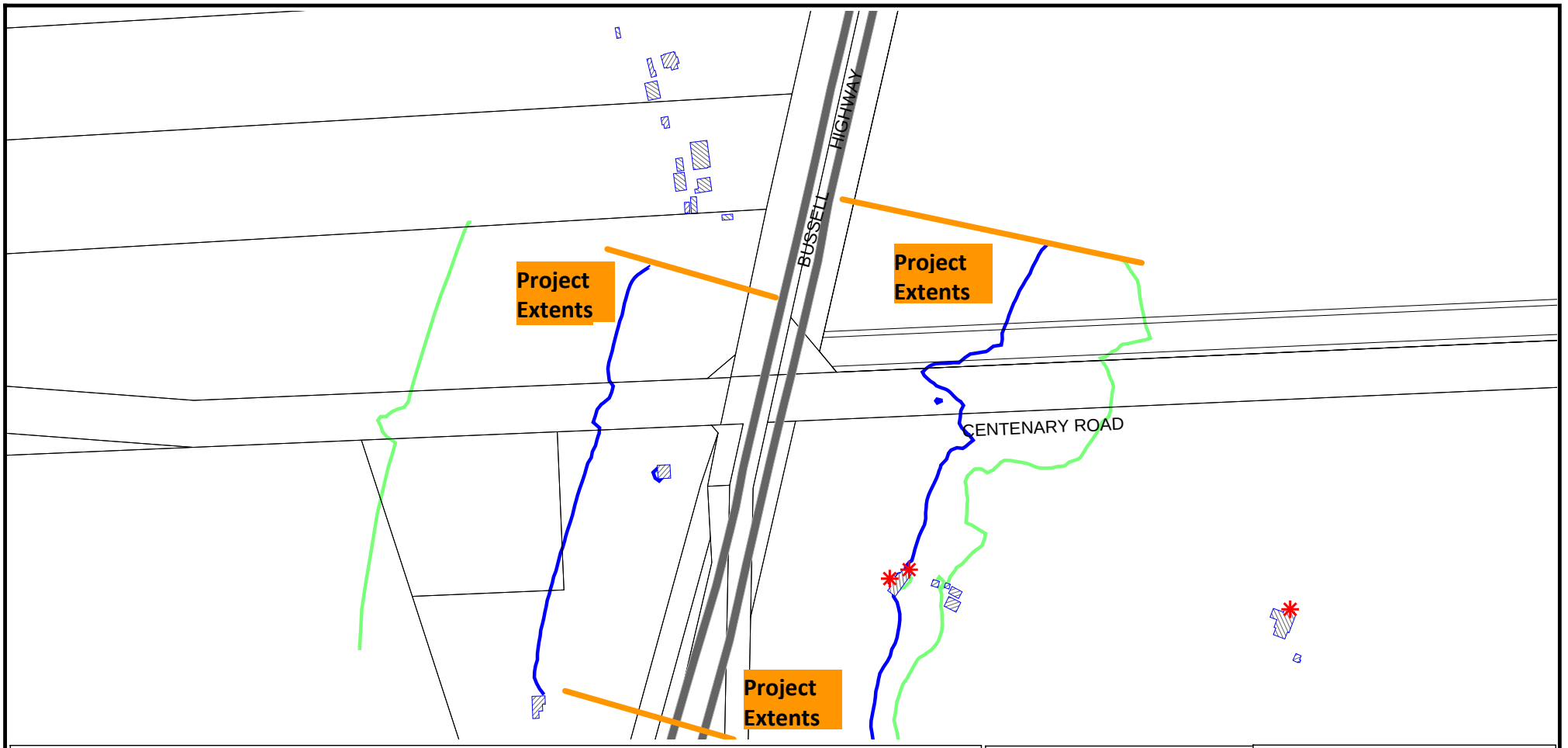
0 45 90 180 270 360 m

Figure 4-1

Signs and symbols
- Road
- Building
- Receiver

Noise levels
$L_{Aeq(Day)}$ dB
- = 55 New Road Target
- = 60 Road Upgrade Target

SPP 5.4 (Sep 2019)



Bunbury Outer Ring Road (South Section) -
Existing Noise Level Contours - Map 02

$L_{Aeq(Day)}$ Noise Level Contours Based on Existing Conditions
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

22 April 2020

Signs and symbols
- Road
- Building
- Receiver

Noise levels
$L_{Aeq(Day)}$ dB
- = 55 New Road Target
- = 60 Road Upgrade Target

SPP 5.4 (Sep 2019)

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

Length Scale 1:5000
0 25 50 100 150 200 m

Figure 4-2

4.2 Noise Modelling - Future

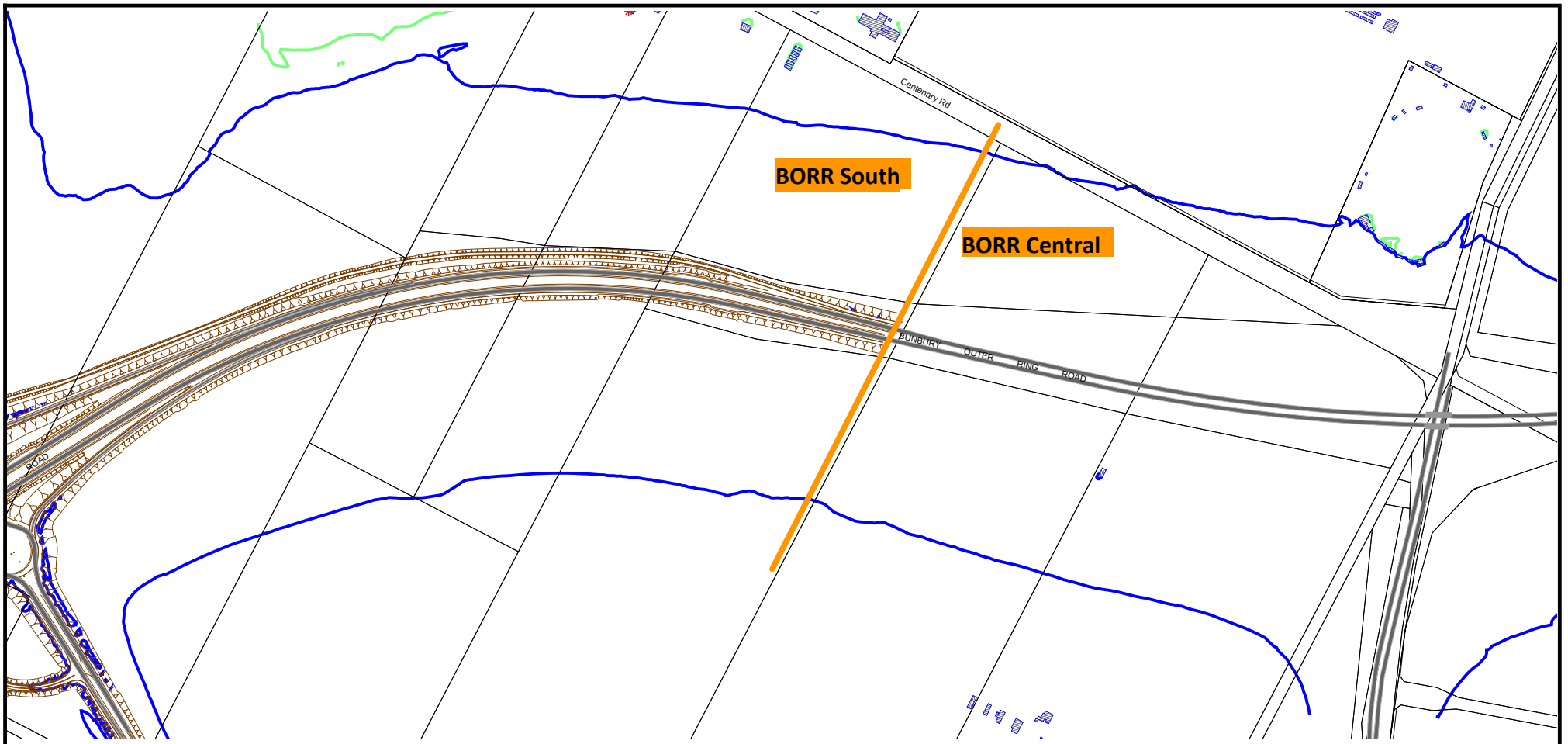
Future 2041 predicted $L_{Aeq(Day)}$ noise levels are provided by way of single point calculations to specific residences (refer *Table 4-4*) and over the general area by way of noise contour plots (refer *Figure 4-3* to *Figure 4-8*). In some cases, a dwelling may have more than one receiver listed representing different sides of the dwelling, or an additional dwelling on the same property. Where the predicted noise level is above the relevant outdoor noise target, values are shown in red.

Table 4-3 Predicted 2041 $L_{Aeq(Day)}$ Noise Levels

Address	$L_{Aeq(Day)}$, dB	Address	$L_{Aeq(Day)}$, dB	Address	$L_{Aeq(Day)}$, dB
10 Tamra Close*	66	137 Woods Rd	61	179 Yalinda Dr	60
1269 Bussell Hwy*	66	161 Woods Rd	62	187 Yalinda Dr	63
1267 Bussell Hwy*	65	46 Jilley Rd	59	199 Yalinda Dr	64
1253 Bussell Hwy*	64	91 Marchetti Rd	57	205 Yalinda Dr	64
1245 Bussell Hwy*	62	272 Ducane Rd	60	213 Yalinda Dr	60
1225 Bussell Hwy*	63	272 Ducane Rd	59	221 Yalinda Dr	60
1213 Bussell Hwy*	66	Centenary Rd 1	58	229 Yalinda Dr	58
1205 Bussell Hwy*	66	223 Ducane Rd	57	17 Eucalypt Dr	62
1201 Bussell Hwy*	64	223 Ducane Rd	60	17 Eucalypt Dr	63
18 Calinup Rd*	63	176 Ducane Rd	55	27 Eucalypt Dr	63
23 Calinup Rd*	63	27 Marchetti Rd	55	45 Eucalypt Dr	63
23 Calinup Rd*	64	27 Marchetti Rd	55	57 Eucalypt Dr	70
29 Brockway Dr*	60	1 Zanadu Ct	55	39 Woods Rd	60
37 Brockway Dr*	60	3 Zanadu Ct	55	39 Woods Rd	60
49 Brockway Dr*	59	5 Zanadu Ct	54	28 Woods Rd	64
67 Brockway Dr	64	7 Zanadu Ct	53	28 Woods Rd	65
77 Brockway Dr	64	7 Tarrock Ct	54	22 Woods Rd	61
91 Brockway Dr	61	46 Yalinda Dr	53	22 Woods Rd	61
97 Brockway Dr	61	110 Yalinda Dr	53	24 Woods Rd	63
107 Brockway Dr	61	118 Yalinda Dr	53	24 Woods Rd*	64
115 Brockway Dr	61	136 Yalinda Dr	54	24 Woods Rd*	63

Address	$L_{Aeq(Day)}$, dB	Address	$L_{Aeq(Day)}$, dB	Address	$L_{Aeq(Day)}$, dB
129 Brockway Dr	63	131 Yalinda Dr	55	6 Woods Rd	59
94 Woods Rd	59	131 Yalinda Dr	56	6 Woods Rd*	59
94 Woods Rd	56	151 Yalinda Dr	56	6 Woods Rd*	58
110 Woods Rd	54	151 Yalinda Dr	56	22 Jules Rd	53
128 Woods Rd	55	169 Yalinda Dr	57	22 Jules Rd	52
133 Woods Rd	60	171 Yalinda Dr	59	11 Bussell Hwy	56
137 Woods Rd	59	179 Yalinda Dr	61	11 Bussell Hwy*	61
		179 Yalinda Dr	60	11 Bussell Hwy*	64

* Allowable outdoor noise target at these residences is 60 dB $L_{Aeq(Day)}$ since these residences are within 300 metres of an existing major road such that the road upgrade criteria is applicable – refer *Section 2*.



Bunbury Outer Ring Road (South Section) - Future (2041) Noise Level Contours - Map 01

$L_{Aeq(Day)}$ Noise Level Contours Based on Future Conditions
BORR & Centenary 14mm Chip
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

7 February 2020

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

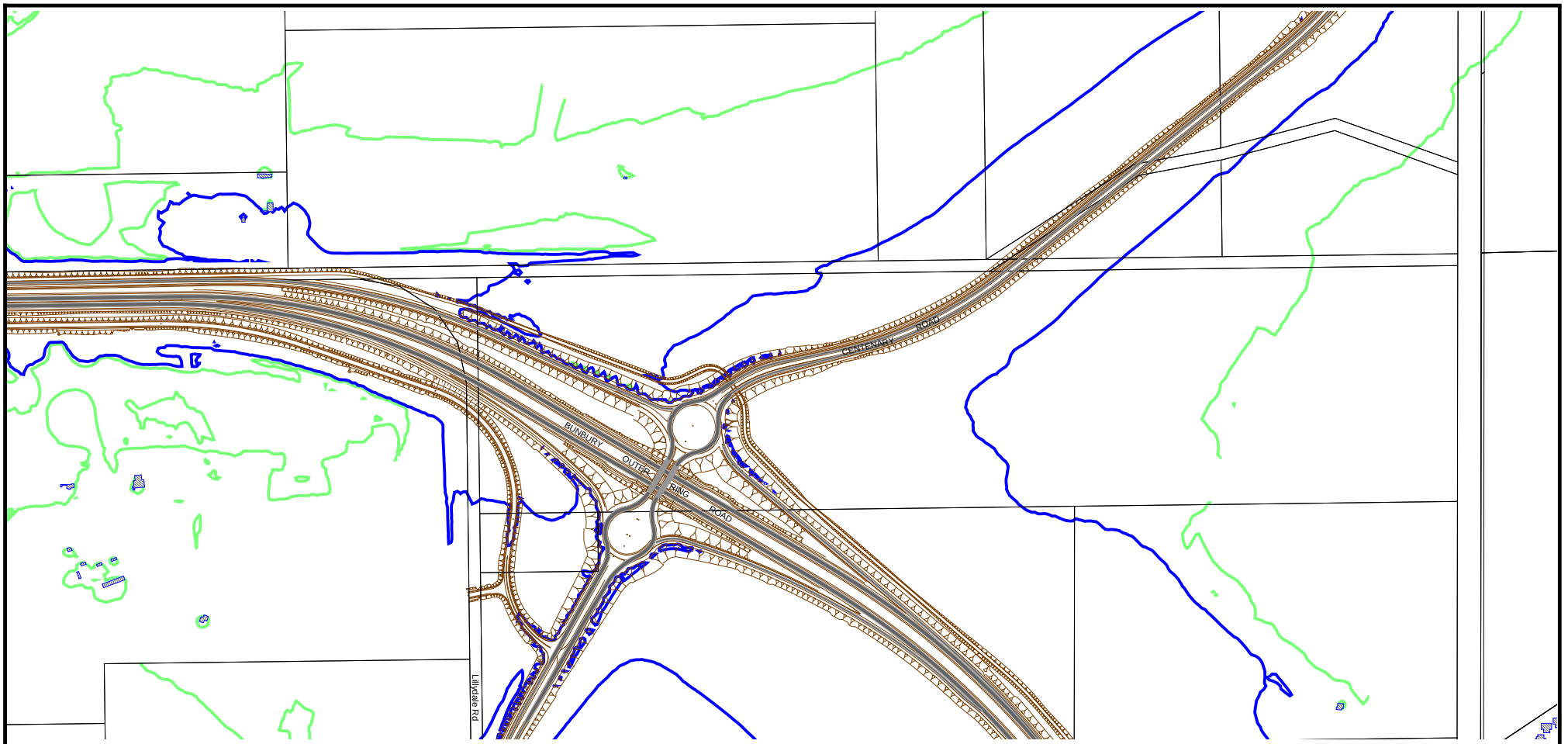
Length Scale 1:10000
0 50 100 200 300 400 m

Figure 4-3

Signs and symbols
- Road
- Building
- Receiver
- BORR South Design

Noise levels
$L_{Aeq(Day)}$ dB
- = 55 New Road Target
- = 60 Road Upgrade Target

SPP 5.4 (Sep 2019)



Bunbury Outer Ring Road (South Section) - Future (2041) Noise Level Contours - Map 02

$L_{Aeq(Day)}$ Noise Level Contours Based on Future Conditions
BORR & Centenary 14mm Chip
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

7 February 2020

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

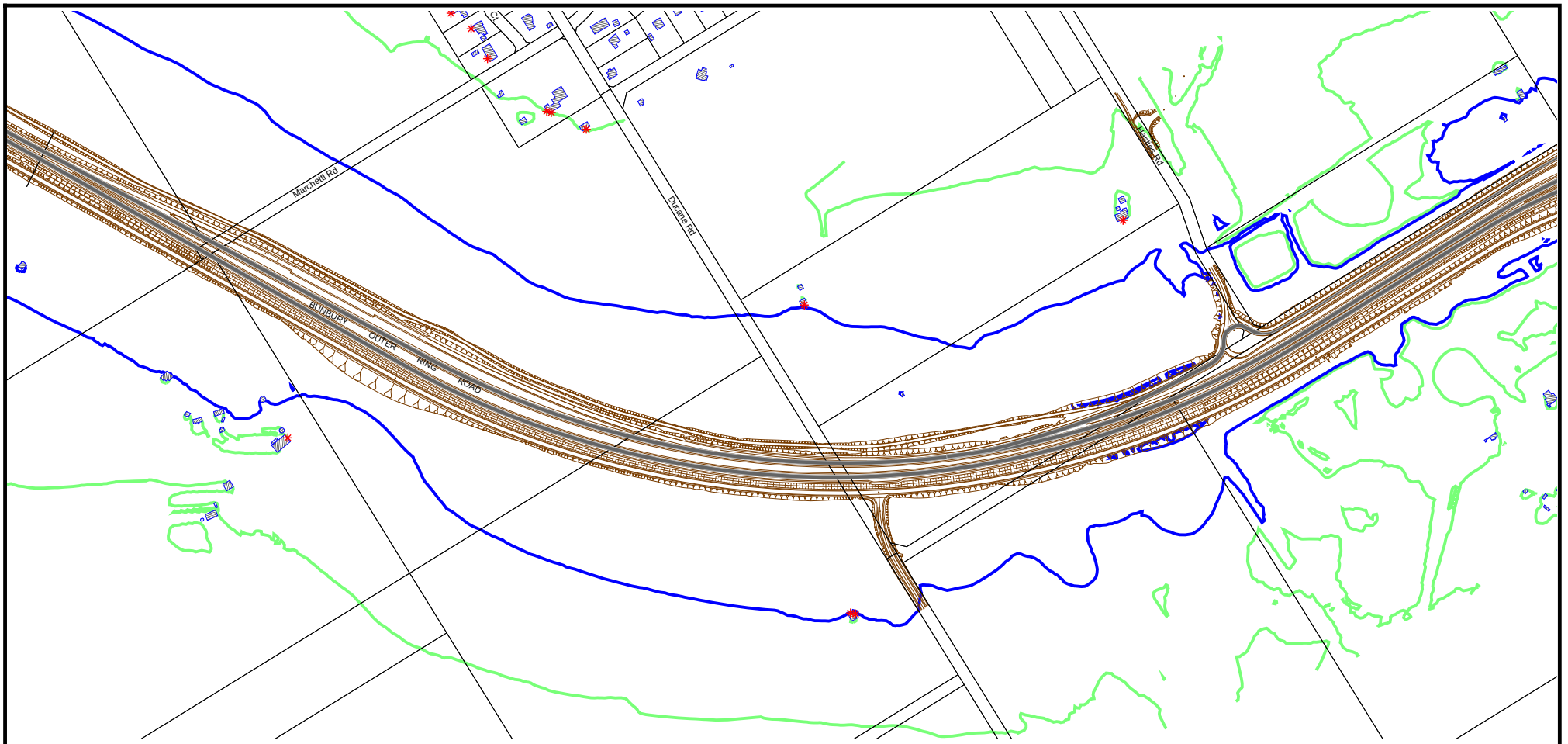
Length Scale 1:10000
0 50 100 200 300 400 m

Figure 4-4

Signs and symbols
- Road
- Building
- Receiver
- BORR South Design

Noise levels
$L_{Aeq(Day)}$ dB
- = 55 New Road Target
- = 60 Road Upgrade Target

SPP 5.4 (Sep 2019)



Bunbury Outer Ring Road (South Section) - Future (2041) Noise Level Contours - Map 03

$L_{Aeq(Day)}$ Noise Level Contours Based on Future Conditions
BORR & Centenary 14mm Chip
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

7 February 2020

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

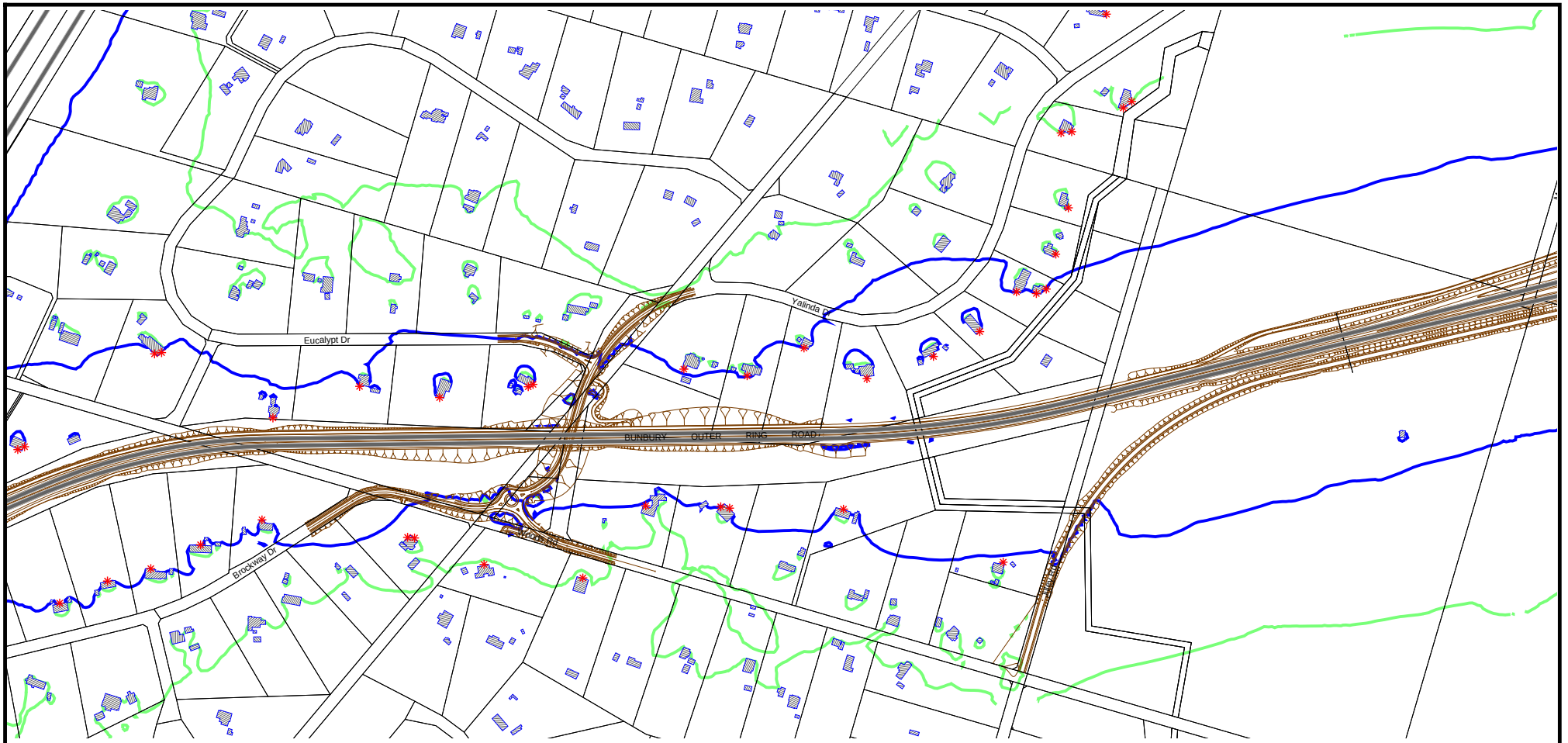
Length Scale 1:10000
0 50 100 200 300 400 m

Figure 4-5

Signs and symbols
- Road
- Building
- Receiver
- BORR South Design

Noise levels
$L_{Aeq(Day)}$ dB
- = 55 New Road Target
- = 60 Road Upgrade Target

SPP 5.4 (Sep 2019)



Bunbury Outer Ring Road (South Section) - Future (2041) Noise Level Contours - Map 04

$L_{Aeq(Day)}$ Noise Level Contours Based on Future Conditions
BORR & Centenary 14mm Chip
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

7 February 2020

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

Length Scale 1:10000

0 50 100 200 300 400 m

Figure 4-6

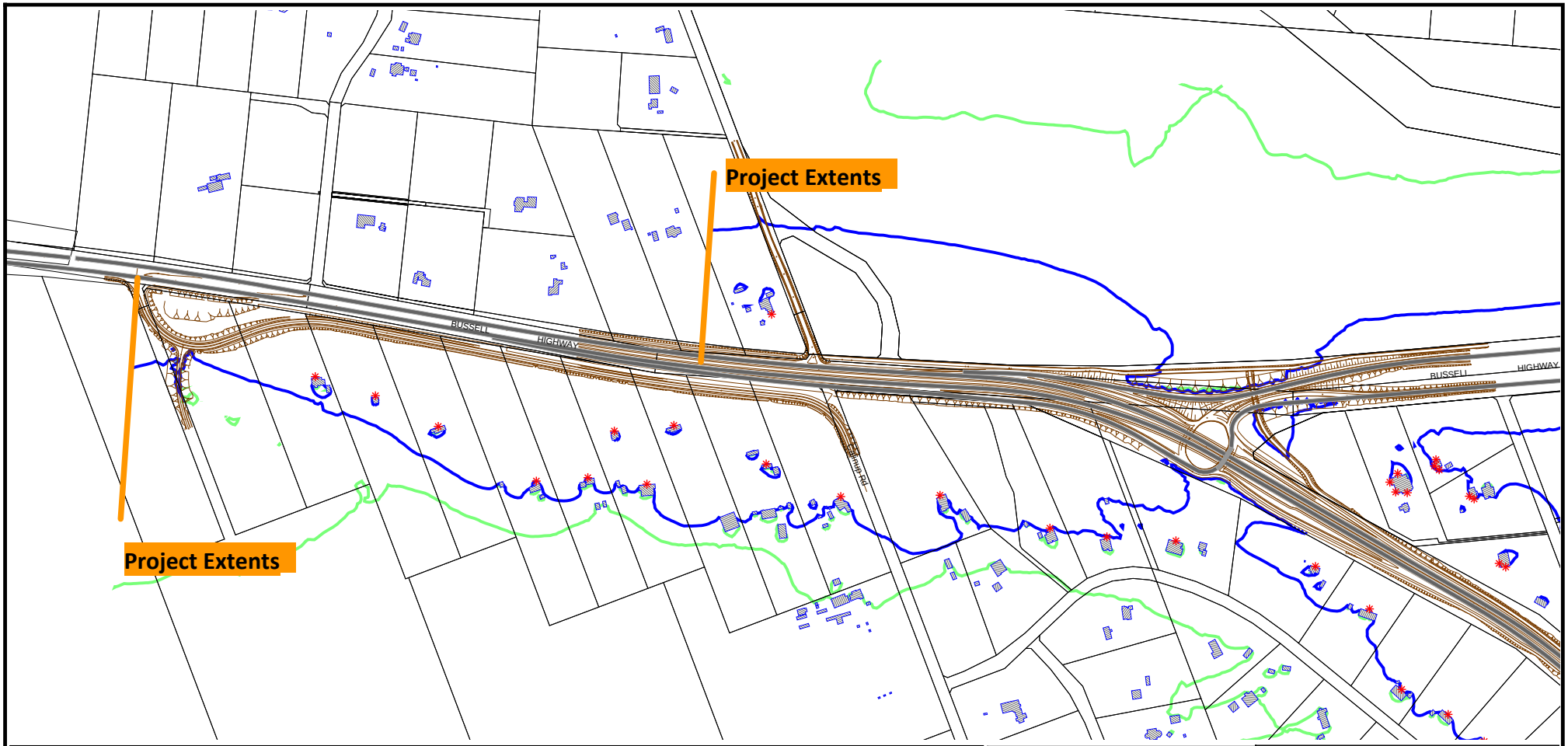
Signs and symbols

- Road
- Building
- Receiver
- BORR South Design

Noise levels $L_{Aeq(Day)}$ dB

- = 55 New Road Target
- = 60 Road Upgrade Target

SPP 5.4 (Sep 2019)



Bunbury Outer Ring Road (South Section) - Future (2041) Noise Level Contours - Map 05

$L_{Aeq(Day)}$ Noise Level Contours Based on Future Conditions
BORR & Centenary 14mm Chip
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

22 May 2020

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

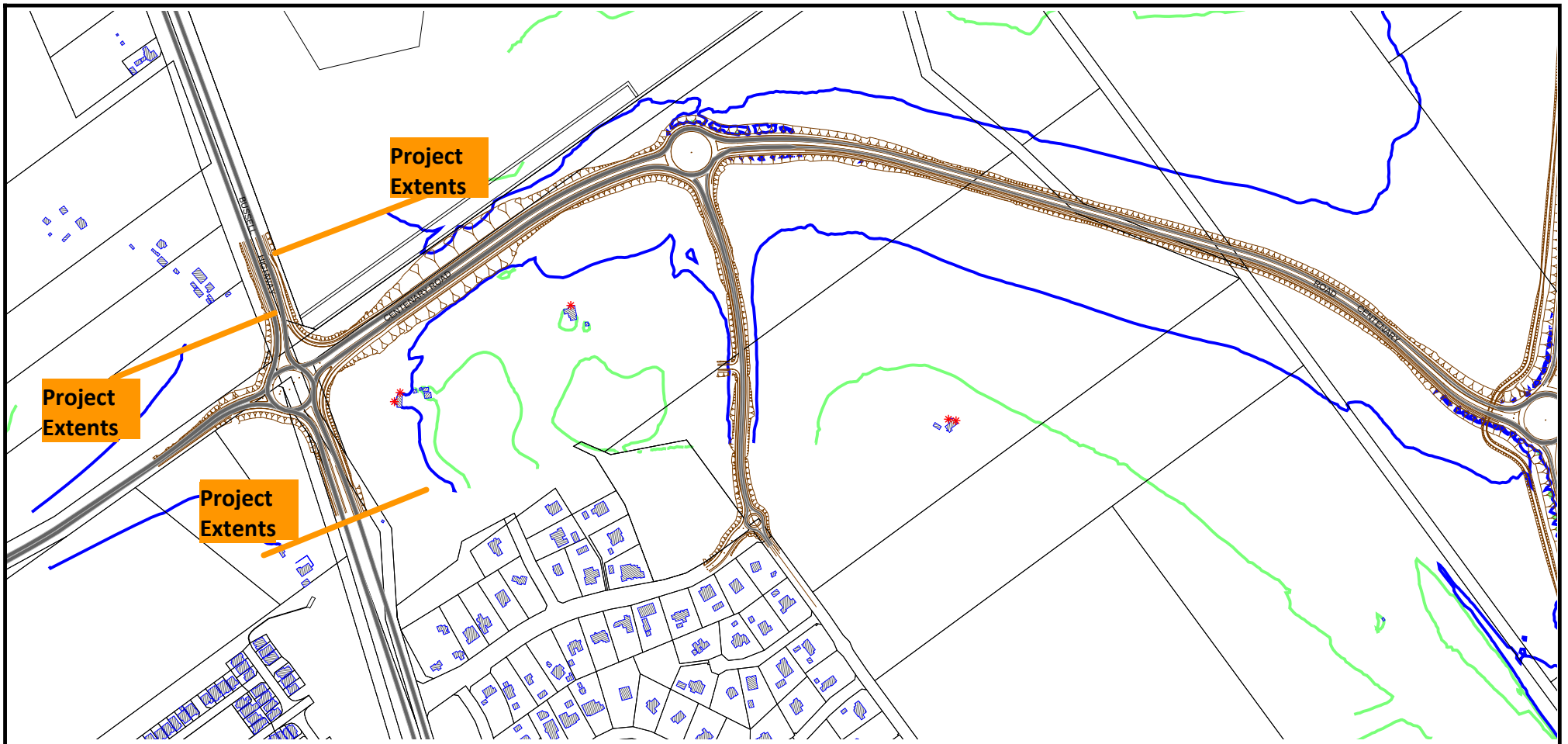
Length Scale 1:10000
0 50 100 200 300 400 m

Figure 4-7

Signs and symbols
- Road
- Building
- Receiver
- BORR South Design

Noise levels
$L_{Aeq(Day)}$ dB
- = 55 New Road Target
- = 60 Road Upgrade Target

SPP 5.4 (Sep 2019)



Bunbury Outer Ring Road (South Section) - Future (2041) Noise Level Contours - Map 06

$L_{Aeq(Day)}$ Noise Level Contours Based on Future Conditions
BORR & Centenary 14mm Chip
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

7 February 2020

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

Length Scale 1:10000

0 50 100 200 300 400 m

Figure 4-8

Signs and symbols

- Road
- Building
- Receiver
- BORR South Design

Noise levels
$L_{Aeq(Day)}$ dB

- = 55 New Road Target
- = 60 Road Upgrade Target

SPP 5.4 (Sep 2019)

5 ASSESSMENT

From the results presented in *Section 4-2*, it can be seen that future noise levels at the majority of residences are expected to be above the relevant outdoor noise target, noting that this is 60 dB $L_{Aeq(Day)}$ for those residences identified in *Table 2-3* and 55 dB $L_{Aeq(Day)}$ for the remainder, being the majority of residences.

Noise control can be in the form of:

- Quieter road surface;
- Noise walls;
- Architectural upgrades to dwellings;
- Combinations of the above.

Quieter road surfaces and noise walls are commonly used where residences are more densely populated, such as those in Gelorup, between Jilley Road and Bussell Highway. For this project, the road surface in this area is to be improved to stone mastic asphalt (SMA) and noise walls provided, with a maximum 5 metre height. The road surface for Centenary Road, between Bussell Highway and Jules Road, will be acoustically improved to dense graded asphalt.

The locations of walls, wall heights (relative to road design provided) and road surface changes are shown in *Figure 5-1* to *Figure 5-6* with the predicted noise contours for the study area.

Table 5-1 provides the predicted noise level to each residence in the study area with noise mitigation. As per *Table 4-3*, a dwelling may have more than one receiver listed representing different sides of the dwelling or, an additional dwelling on the same property. Where the predicted noise level is above the relevant outdoor noise target, values are shown in red.

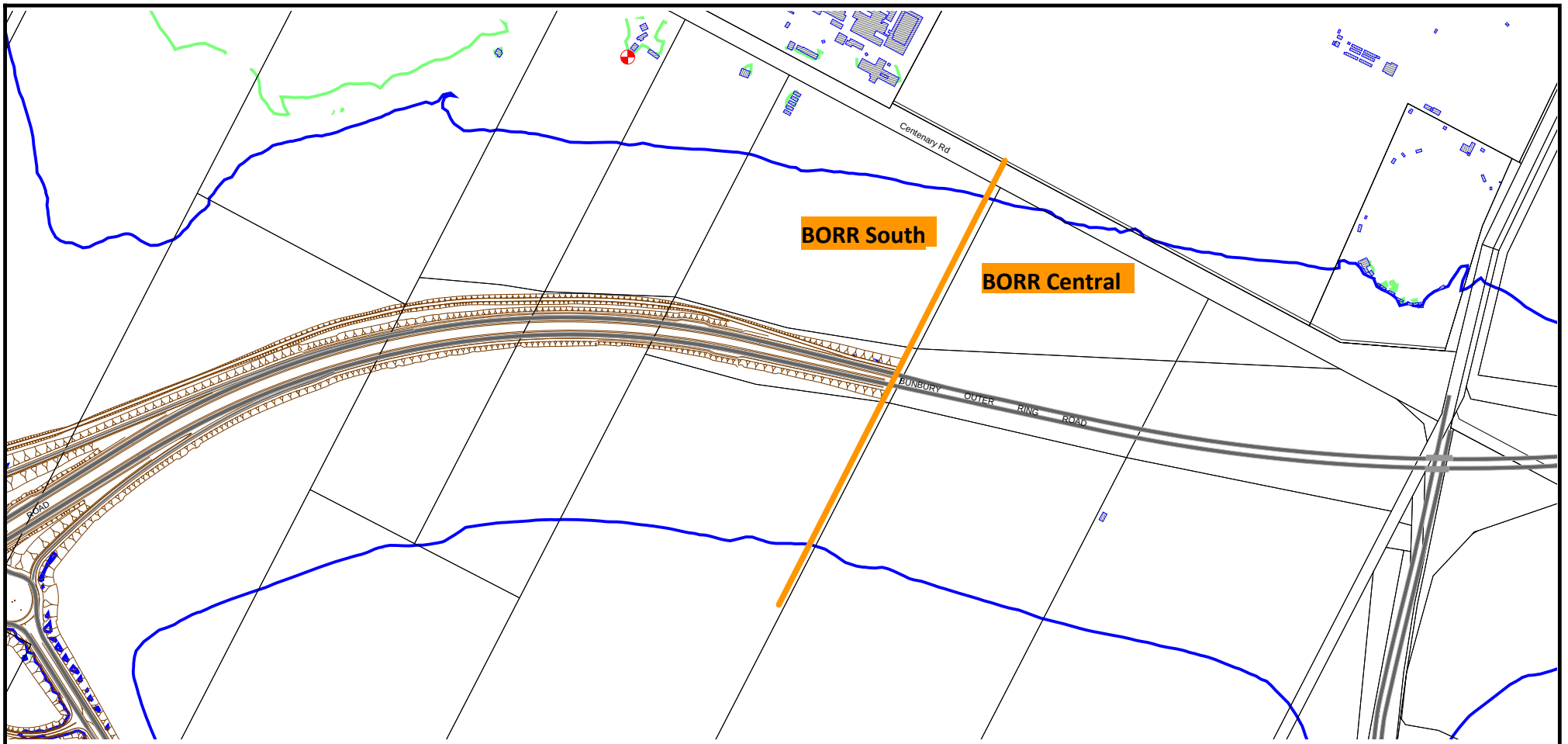
Table 5-1 Predicted 2041 $L_{Aeq(Day)}$ Noise Levels With Mitigation

Address	$L_{Aeq(Day)}$, dB	Address	$L_{Aeq(Day)}$, dB	Address	$L_{Aeq(Day)}$, dB
10 Tamra Close*	66	137 Woods Rd	55	179 Yalinda Dr	51
1269 Bussell Hwy*	66	161 Woods Rd	55	187 Yalinda Dr	55
1267 Bussell Hwy*	65	46 Jilley Rd	55	199 Yalinda Dr	54
1253 Bussell Hwy*	64	91 Marchetti Rd	57	205 Yalinda Dr	55
1245 Bussell Hwy*	62	272 Ducane Rd	60	213 Yalinda Dr	52
1225 Bussell Hwy*	63	272 Ducane Rd	59	221 Yalinda Dr	54
1213 Bussell Hwy*	66	Centenary Rd 1	58	229 Yalinda Dr	53
1205 Bussell Hwy*	66	223 Ducane Rd	57	17 Eucalypt Dr	54

Address	$L_{Aeq(Day)}$, dB	Address	$L_{Aeq(Day)}$, dB	Address	$L_{Aeq(Day)}$, dB
1201 Bussell Hwy*	63	223 Ducane Rd	60	17 Eucalypt Dr	55
18 Calinup Rd*	63	176 Ducane Rd	55	27 Eucalypt Dr	54
23 Calinup Rd*	63	27 Marchetti Rd	55	45 Eucalypt Dr	54
23 Calinup Rd*	63	27 Marchetti Rd	55	57 Eucalypt Dr	56
29 Brockway Dr*	59	1 Zanadu Ct	54	39 Woods Rd	54
37 Brockway Dr*	58	3 Zanadu Ct	54	39 Woods Rd	55
49 Brockway Dr*	57	5 Zanadu Ct	53	28 Woods Rd	55
67 Brockway Dr	55	7 Zanadu Ct	52	28 Woods Rd	55
77 Brockway Dr	55	7 Tarrock Ct	53	22 Woods Rd	53
91 Brockway Dr	54	46 Yalinda Dr	52	22 Woods Rd	53
97 Brockway Dr	55	110 Yalinda Dr	51	24 Woods Rd	55
107 Brockway Dr	55	118 Yalinda Dr	51	24 Woods Rd*	55
115 Brockway Dr	53	136 Yalinda Dr	52	24 Woods Rd*	55
129 Brockway Dr	55	131 Yalinda Dr	53	6 Woods Rd	53
94 Woods Rd	54	131 Yalinda Dr	53	6 Woods Rd*	53
94 Woods Rd	52	151 Yalinda Dr	53	6 Woods Rd*	56
110 Woods Rd	50	151 Yalinda Dr	52	22 Jules Rd	53
128 Woods Rd	50	169 Yalinda Dr	53	22 Jules Rd	52
133 Woods Rd	55	171 Yalinda Dr	54	11 Bussell Hwy	54
137 Woods Rd	52	179 Yalinda Dr	52	11 Bussell Hwy*	60
		179 Yalinda Dr	55	11 Bussell Hwy*	63

* Allowable outdoor noise target at these residences is 60 dB $L_{Aeq(Day)}$ since these residences are within 300 metres of an existing major road such that the road upgrade criteria is applicable – refer *Section 2*.

From *Table 5-1*, it is evident that some residences will be above their relevant outdoor noise target. For these dwellings, architectural upgrades will be offered (refer *Table 5-2*). The requirements and practicality of upgrades will be assessed on a house by house basis, separate to this study. The exception to this is 57 Eucalypt Drive, which shows a 1 dB exceedance. Post construction noise monitoring will be undertaken at this property to confirm noise levels.



Bunbury Outer Ring Road (South Section) - Future (2041) Noise Level Contours - Map 01

$L_{Aeq(Day)}$ Noise Level Contours Based on Future Conditions With Walls
BORR 14mm Chip & SMA / Centenary 14mm Chip & DGA
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

07 February 2020

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

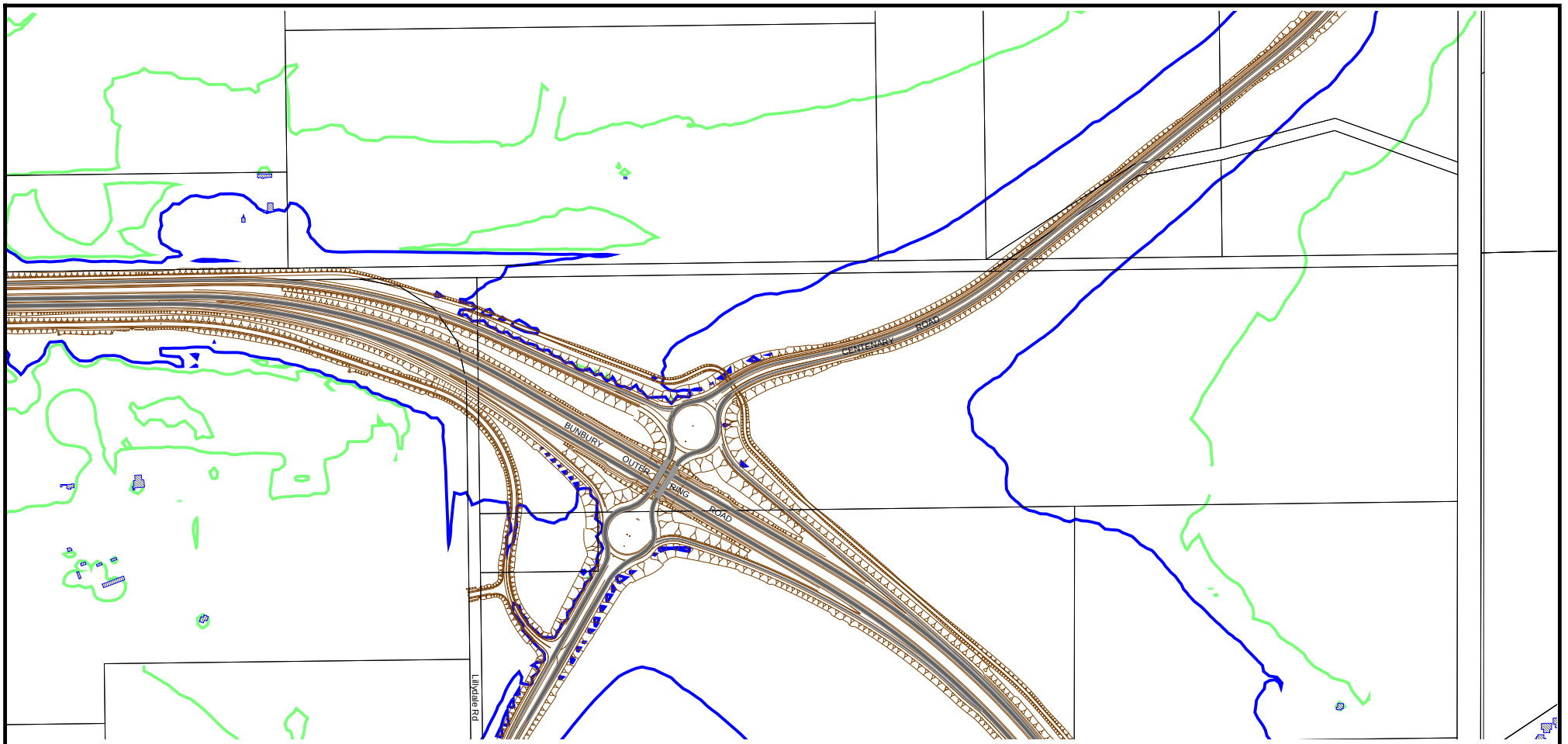
Length Scale 1:10000
0 50 100 200 300 400 m

Figure 5-1

Signs and symbols
- Road
- Building
- Architectural Treatment
- BORR South Design
- Wall

Noise levels
$L_{Aeq(Day)}$ dB
- = 55 New Road Target
- = 60 Road Upgrade Target

SPP 5.4 (Sep 2019)



Bunbury Outer Ring Road (South Section) - Future (2041) Noise Level Contours - Map 02

$L_{Aeq(Day)}$ Noise Level Contours Based on Future Conditions With Walls
BORR 14mm Chip & SMA / Centenary 14mm Chip & DGA
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

07 February 2020

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

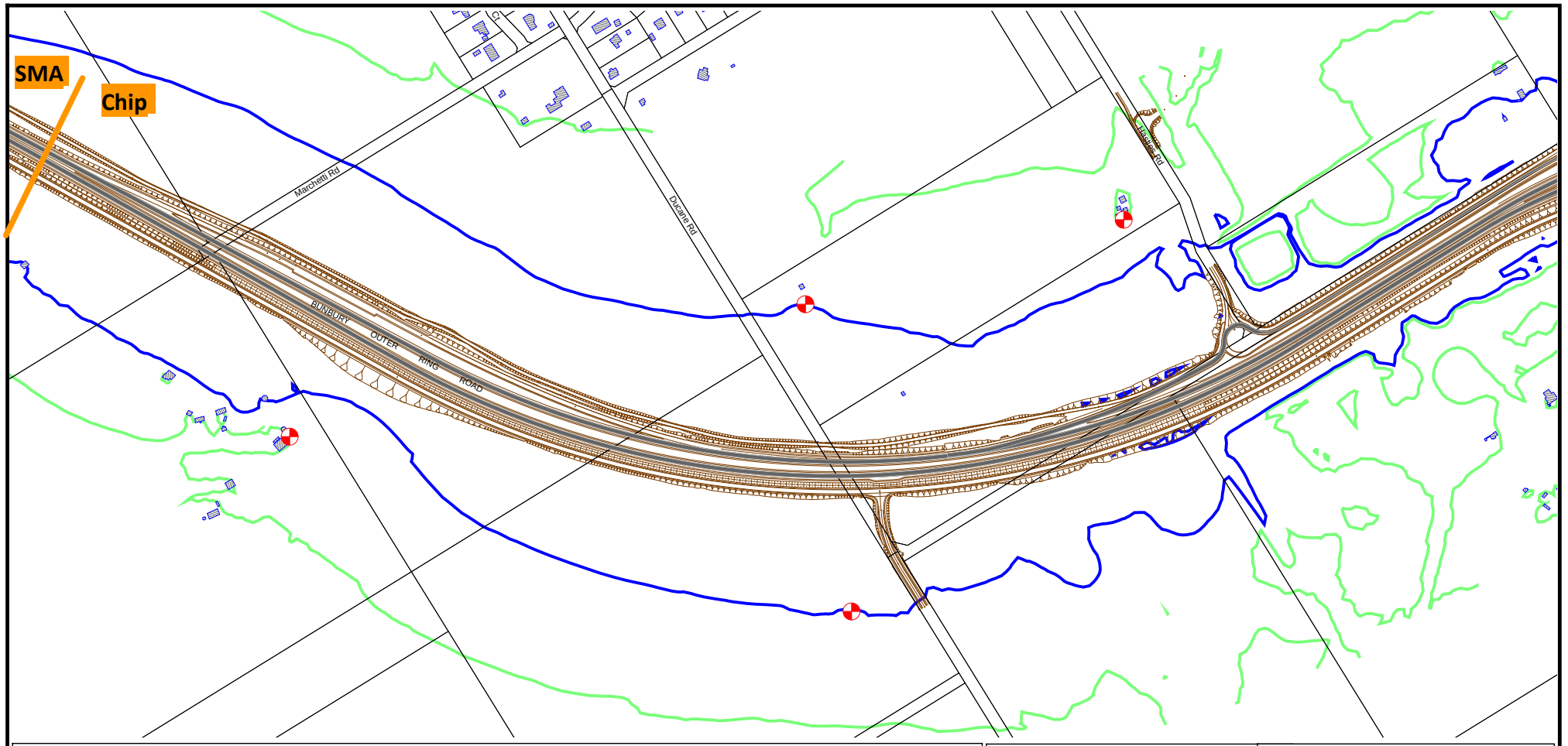
Length Scale 1:10000
0 50 100 200 300 400 m

Figure 5-2

Signs and symbols
- Road
- Building
- Architectural Treatment
- BORR South Design
- Wall

Noise levels
$L_{Aeq(Day)}$ dB
- = 55 New Road Target
- = 60 Road Upgrade Target

SPP 5.4 (Sep 2019)



Bunbury Outer Ring Road (South Section) - Future (2041) Noise Level Contours - Map 03

$L_{Aeq(Day)}$ Noise Level Contours Based on Future Conditions With Walls
BORR 14mm Chip & SMA / Centenary 14mm Chip & DGA
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

07 February 2020

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

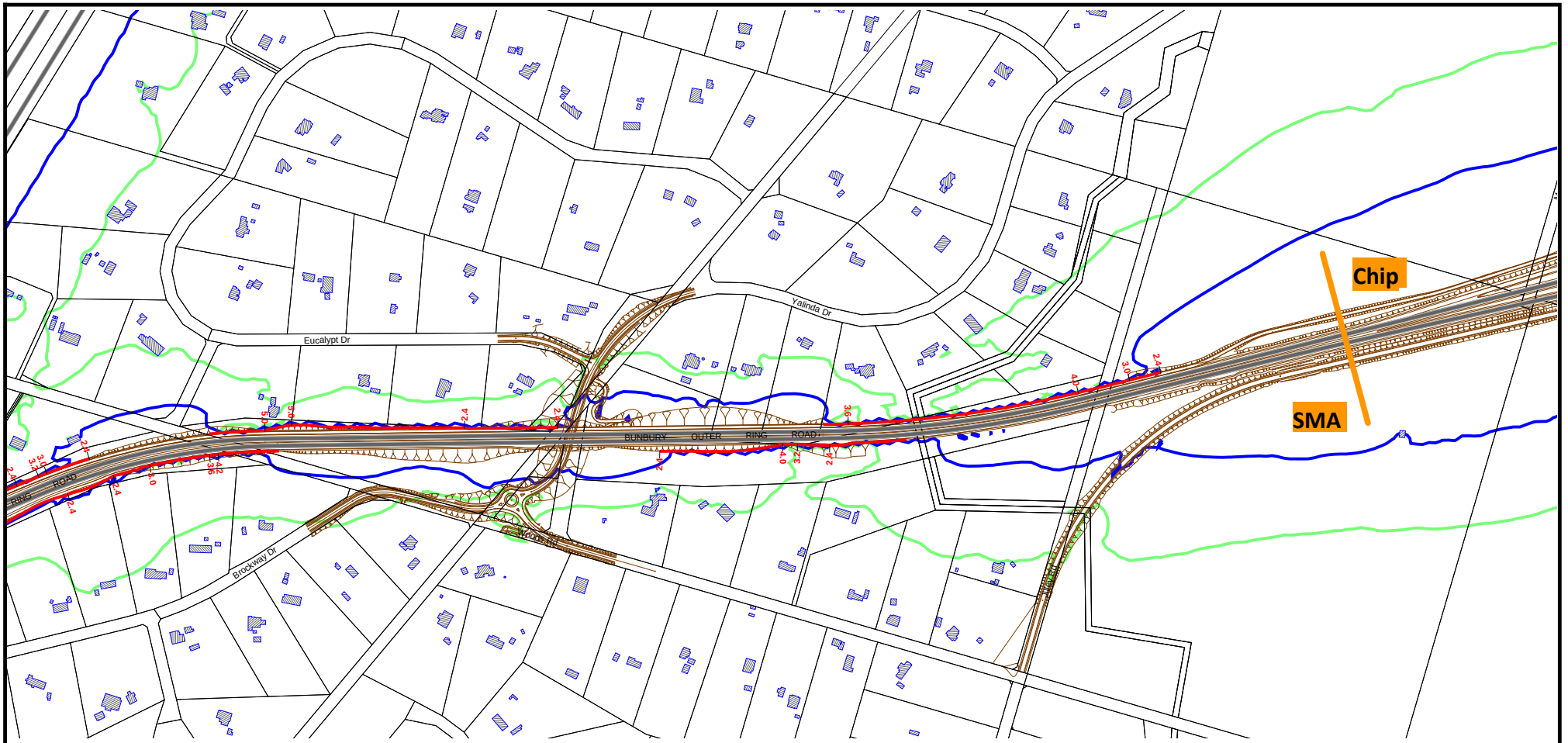
Length Scale 1:10000
0 50 100 200 300 400 m

Figure 5-3

Signs and symbols
- Road
- Building
- Architectural Treatment
- BORR South Design
- Wall

Noise levels
$L_{Aeq(Day)}$ dB
- = 55 New Road Target
- = 60 Road Upgrade Target

SPP 5.4 (Sep 2019)



Bunbury Outer Ring Road (South Section) - Future (2041) Noise Level Contours - Map 04

$L_{Aeq(Day)}$ Noise Level Contours Based on Future Conditions With Walls
BORR 14mm Chip & SMA / Centenary 14mm Chip & DGA
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

2 July 2020

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

Length Scale 1:10000

0 50 100 200 300 400 m

Figure 5-4

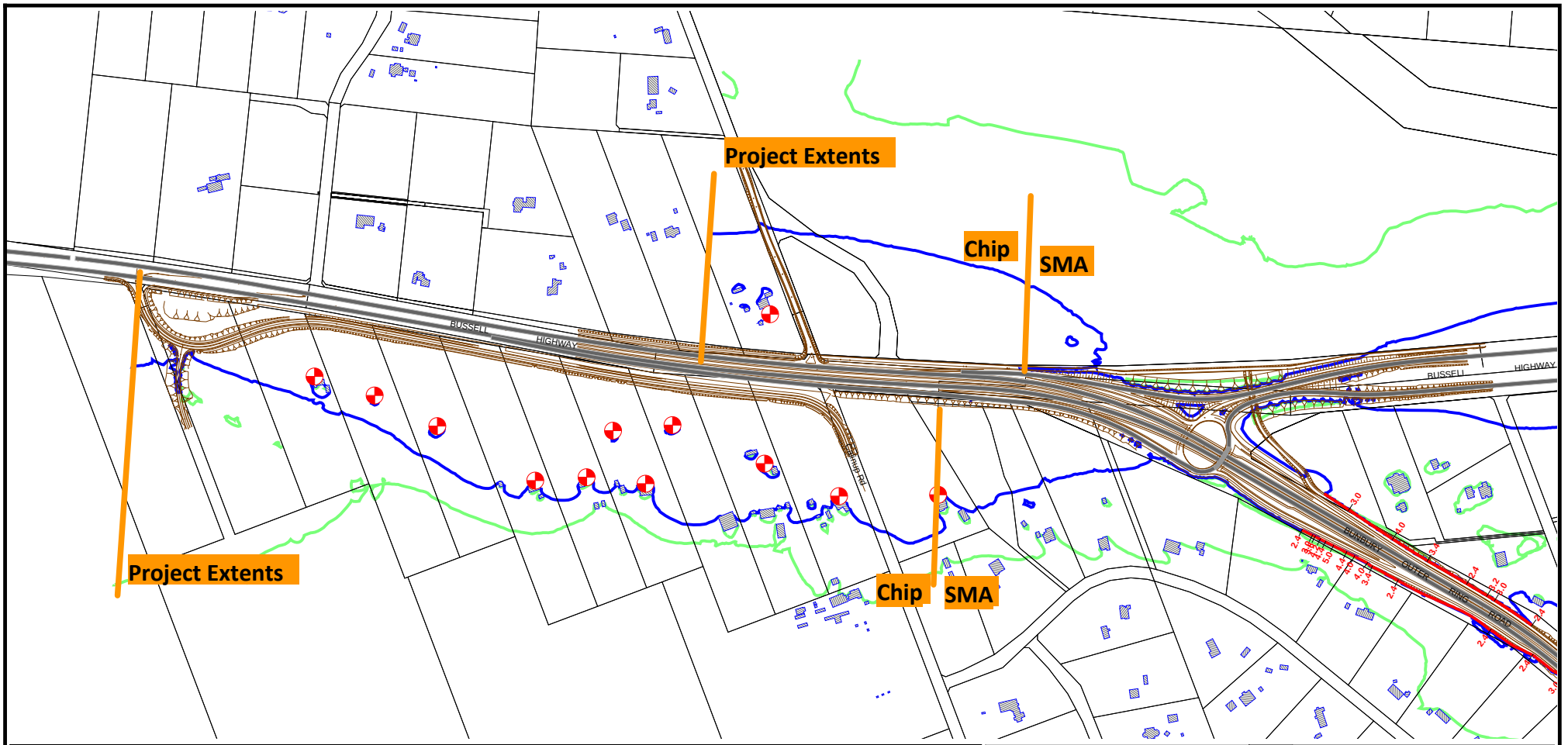
Signs and symbols

- Road
- Building
- Architectural Treatment
- BORR South Design
- Wall

Noise levels $L_{Aeq(Day)}$ dB

= 55 New Road Target
= 60 Road Upgrade Target

SPP 5.4 (Sep 2019)



Bunbury Outer Ring Road (South Section) -
Future (2041) Noise Level Contours - Map 05

$L_{Aeq(Day)}$ Noise Level Contours Based on Future Conditions With Walls
BORR 14mm Chip & SMA / Centenary 14mm Chip & DGA
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

22 May 2020

Signs and symbols
- Road
- Building
- Architectural Treatment
- BORR South Design
- Wall

Noise levels
$L_{Aeq(Day)}$ dB

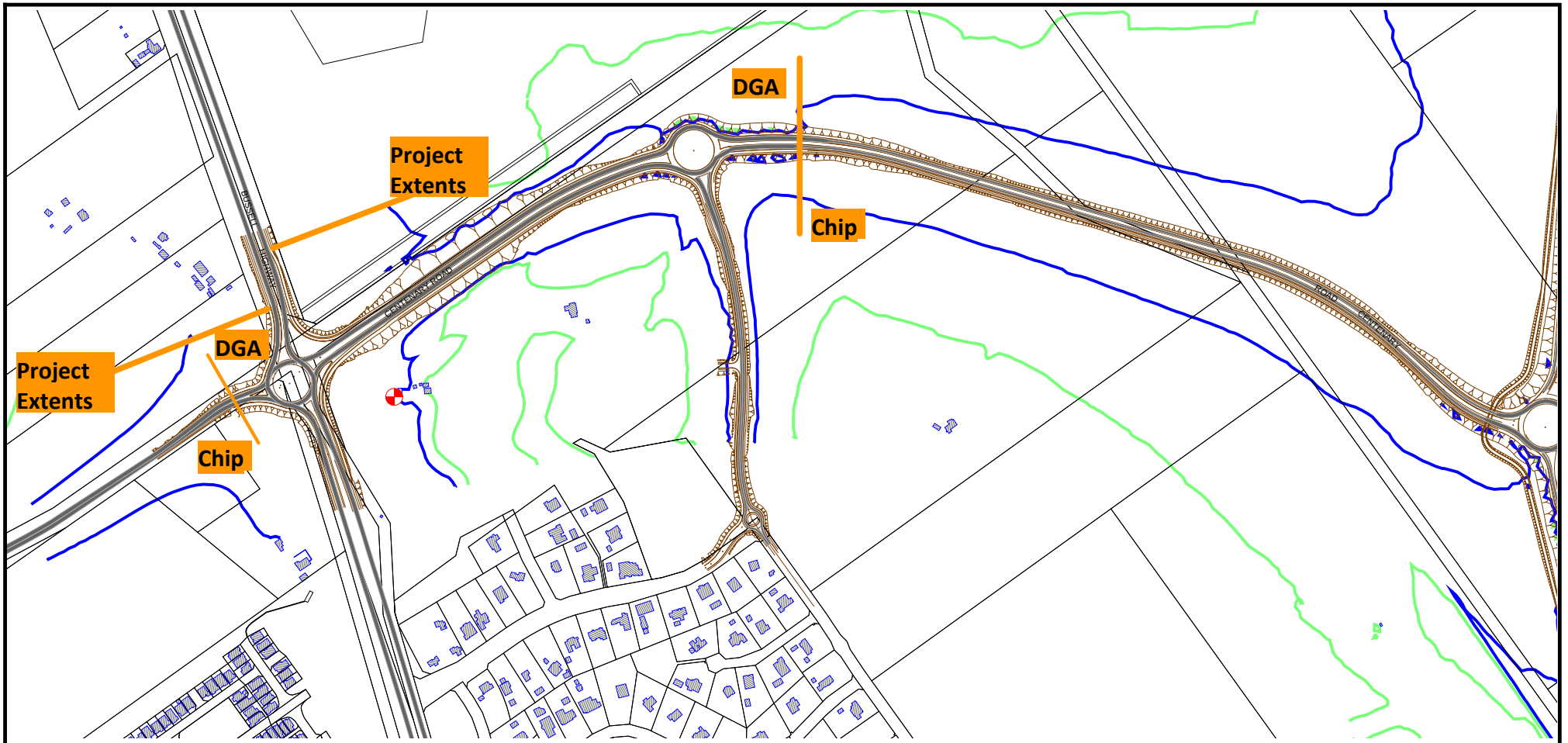
= 55 New Road Target
= 60 Road Upgrade Target

SPP 5.4 (Sep 2019)

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

Length Scale 1:10000
0 50 100 200 300 400 m

Figure 5-5



Bunbury Outer Ring Road (South Section) - Future (2041) Noise Level Contours - Map 06

$L_{Aeq(Day)}$ Noise Level Contours Based on Future Conditions With Walls
BORR 14mm Chip & SMA / Centenary 14mm Chip & DGA
Ground Floor Level

SoundPLAN v8.1
CoRTN Algorithms

2 July 2020

Lloyd George Acoustics
PO Box 717
HILLARYS WA 6923
(08) 9401 7770

Length Scale 1:10000

0 50 100 200 300 400 m

Figure 5-6

Signs and symbols

- Road
- Building
- Architectural Treatment
- BORR South Design
- Wall

Noise levels
$L_{Aeq,Day}$ dB

- = 55 New Road Target
- = 60 Road Upgrade Target

SPP 5.4 (Sep 2019)

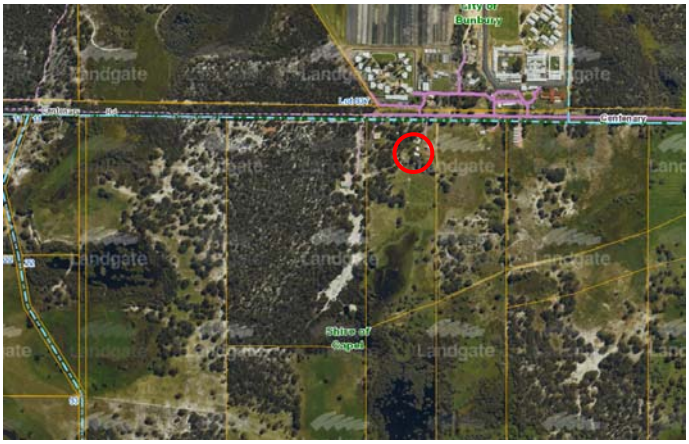
Table 5-2 Houses to be Offered Architectural Upgrades

Address	Predicted Noise Level, dB $L_{Aeq(Day)}$	Locality Image
10 Tamra Close	66 6 dB above outdoor noise target	
1269 Bussell Hwy	66 6 dB above outdoor noise target	
1267 Bussell Hwy	65 5 dB above outdoor noise target	

Address	Predicted Noise Level, dB $L_{Aeq(Day)}$	Locality Image
1253 Bussell Hwy	64 4 dB above outdoor noise target	
1245 Bussell Hwy	62 2 dB above outdoor noise target	
1225 Bussell Hwy	63 3 dB above outdoor noise target	
1213 Bussell Hwy	63-66 3-6 dB above outdoor noise target	

Address	Predicted Noise Level, dB $L_{Aeq(Day)}$	Locality Image
1205 Bussell Hwy	66 6 dB above outdoor noise target	
1201 Bussell Hwy	63 3 dB above outdoor noise target	
18 Calinup Rd	63 3 dB above outdoor noise target	

Address	Predicted Noise Level, dB $L_{Aeq(Day)}$	Locality Image
23 Calinup Rd	63 3 dB above outdoor noise target	
91 Marchetti Rd	57 2 dB above outdoor noise target	
272 Ducane Rd	60 5 dB above outdoor noise target	

Address	Predicted Noise Level, dB $L_{Aeq(Day)}$	Locality Image
Centenary Rd 1	58 3 dB above outdoor noise target	
223 Ducane Rd	57-60 2-5 dB above outdoor noise target	
11 Bussell Hwy	63 3 dB above outdoor noise target	

6 CONCLUSION

To satisfy State Planning Policy 5.4, this report recommends the following noise controls:

1. The road surface of Bunbury Outer Ring Road is to be upgraded from chip seal to stone mastic asphalt in the more densely populated area, as shown on *Figure 5-4* and *Figure 5-5*.
2. Centenary Road surface to be upgraded from chip seal to dense graded asphalt as shown on *Figure 5-6*.
3. Noise walls to be constructed as shown on *Figure 5-4* and *Figure 5-5*. Heights shown are relative to the road design (as provided by GHD) at the location of the wall. All walls are to be solid, free of gaps and of a material having a minimum surface mass of 15 kg/m^2.
4. Architectural upgrades to be offered for residential dwellings discussed in *Table 5-2* and shown on *Figure 5-1* to *Figure 5-6*.

Appendix A

Pre-Construction Noise Monitoring Report

Lloyd George Acoustics
PO Box 717
Hillarys WA 6923
T: 9401 7770
www.lgacoustics.com.au

Pre-Construction Noise Monitoring Report

Bunbury Outer Ring Road (South Section)

Reference: 19075094-01 (Draft) Pre-Construction Monitoring.docx

Prepared for:
BORR Team

Association of Australasian Acoustical Consultants

Report: 19075094-01 (Draft) Pre-Construction Monitoring.docx

Lloyd George Acoustics Pty Ltd

ABN: 79 125 812 544

PO Box 717
Hillarys WA 6923

www.lgacoustics.com.au

T: 9401 7770

Contacts	Daniel Lloyd	Terry George	Matt Moyle	Olivier Mallié	Ben Hillion
E:	daniel@lgacoustics.com.au	terry@lgacoustics.com.au	matt@lgacoustics.com.au	olivier@lgacoustics.com.au	ben@lgacoustics.com.au
M:	0439 032 844	0400 414 197	0412 611 330	0439 987 455	0457 095 555

Date:	Rev	Description	Prepared By	Verified
24-Aug-19	0	Issued to Client	Terry George	Daniel Lloyd

Table of Contents

1 INTRODUCTION _____ 1

2 METHODOLOGY _____ 2

3 RESULTS _____ 4

3.1 Lot 104 (#421) Willenge Drive _____ 4

3.2 Lot 100 South Western Highway _____ 5

3.3 Lot 500 (#538) Bussell Highway _____ 5

3.4 Lot 47 (#1213) Bussell Highway _____ 6

3.5 Lot 41 (#133) Woods Road _____ 7

Appendices

A Noise Monitoring Data Sheets

B Terminology

1 INTRODUCTION

The southern section of the Bunbury Outer Ring Road (BORR) is located between South Western Highway and Bussell Highway, with grade separated interchanges planned at Centenary Road and Bussell Highway (refer *Figure 1-1*).

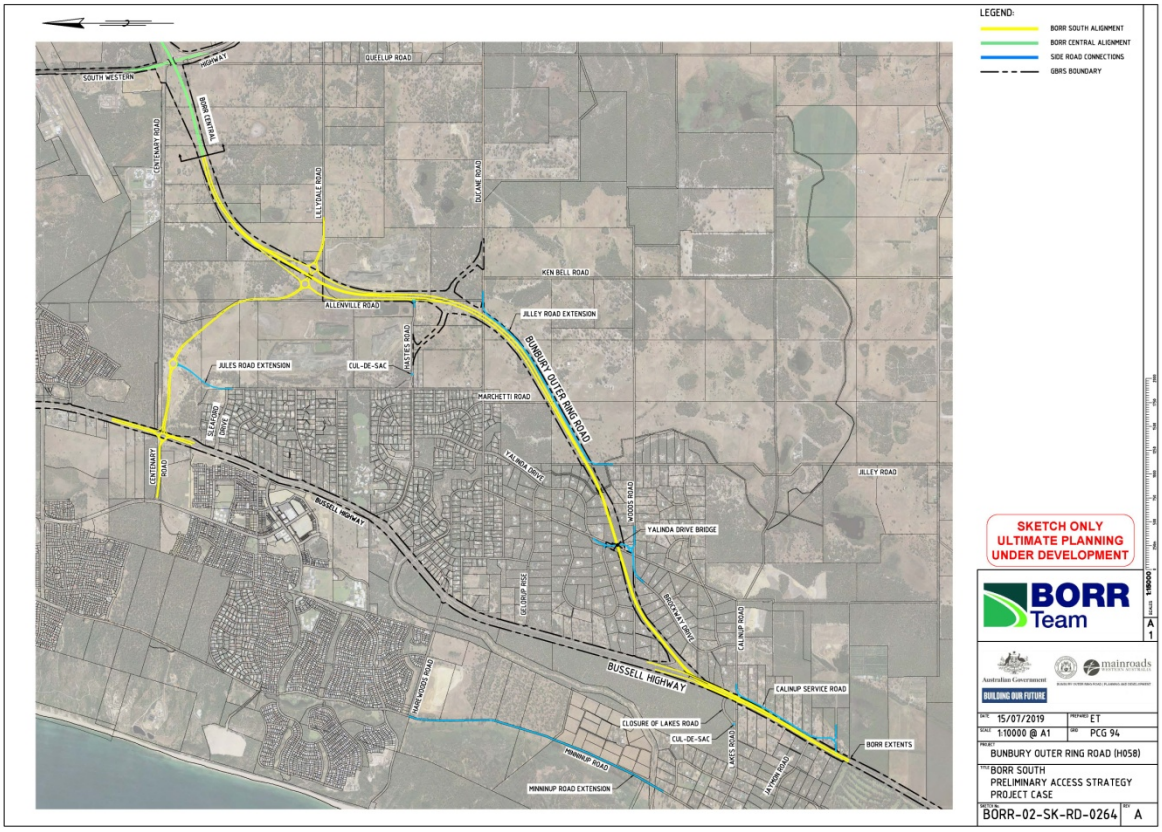


Figure 1-1 Road Project Locality

Part of the project will be to consider the noise impact to residences. To gain an understanding of existing noise levels and to enable noise model calibration for existing conditions, noise monitoring has been undertaken and is the subject of this report.

Appendix B contains a description of some of the terminology used throughout this report.

2 METHODOLOGY

Noise monitoring was undertaken at five (5) locations in order to:

- Quantify the existing noise levels;
- Determine the differences between different acoustic parameters ($L_{A10,18hour}$, $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$).

The instruments used were Acoustic Research Laboratories (ARL) noise data loggers, either Ngara Type or Type 316, with the microphones located approximately 1.5 metres above ground level. The loggers were programmed to record hourly L_{A1}, L_{A10}, L_{A90}, and L_{Aeq} levels. These loggers comply with the instrumentation requirements of *Australian Standard 2702-1984 Acoustics – Methods for the Measurement of Road Traffic Noise* and were field calibrated before and after the measurement session and found to be accurate to within +/- 1 dB. Lloyd George Acoustics also holds current laboratory calibration certificate for the loggers. *Table 2-1* shows the details for each noise logger, with *Figure 2-1* providing their general locations.

Table 2-1 Noise Logging Details

Location	Logger No.	Set-up	Collection
1. Lot 104 (#421) Willenge Drive, Davenport	87802F	01-August-2019	16-August-2019
2. Lot 100 South Western Highway, Davenport	15-301-468	01-August-2019	16-August-2019
3. Lot 500 (#538) Bussell Highway, Dalyellup	16-004-041	01-August-2019	16-August-2019
4. Lot 47 (#1213) Bussell Highway, Stratham	87803E	01-August-2019	16-August-2019
5. Lot 41 (#133) Woods Road, Gelorup	87803A	01-August-2019	16-August-2019

Note: Battery changeover occurred on 08-August-2019

The noise data collected was verified by inspection and professional judgement. Where hourly data was considered atypical, an estimated value was inserted and highlighted by bold italic lettering.

The weather conditions during the measurement period were obtained from the Bureau of Meteorology Bunbury measurement station. This data was compared against the Main Roads WA specifications for measurement conditions and comments provided.

Detailed logger measurement data is provided in *Appendix A*.

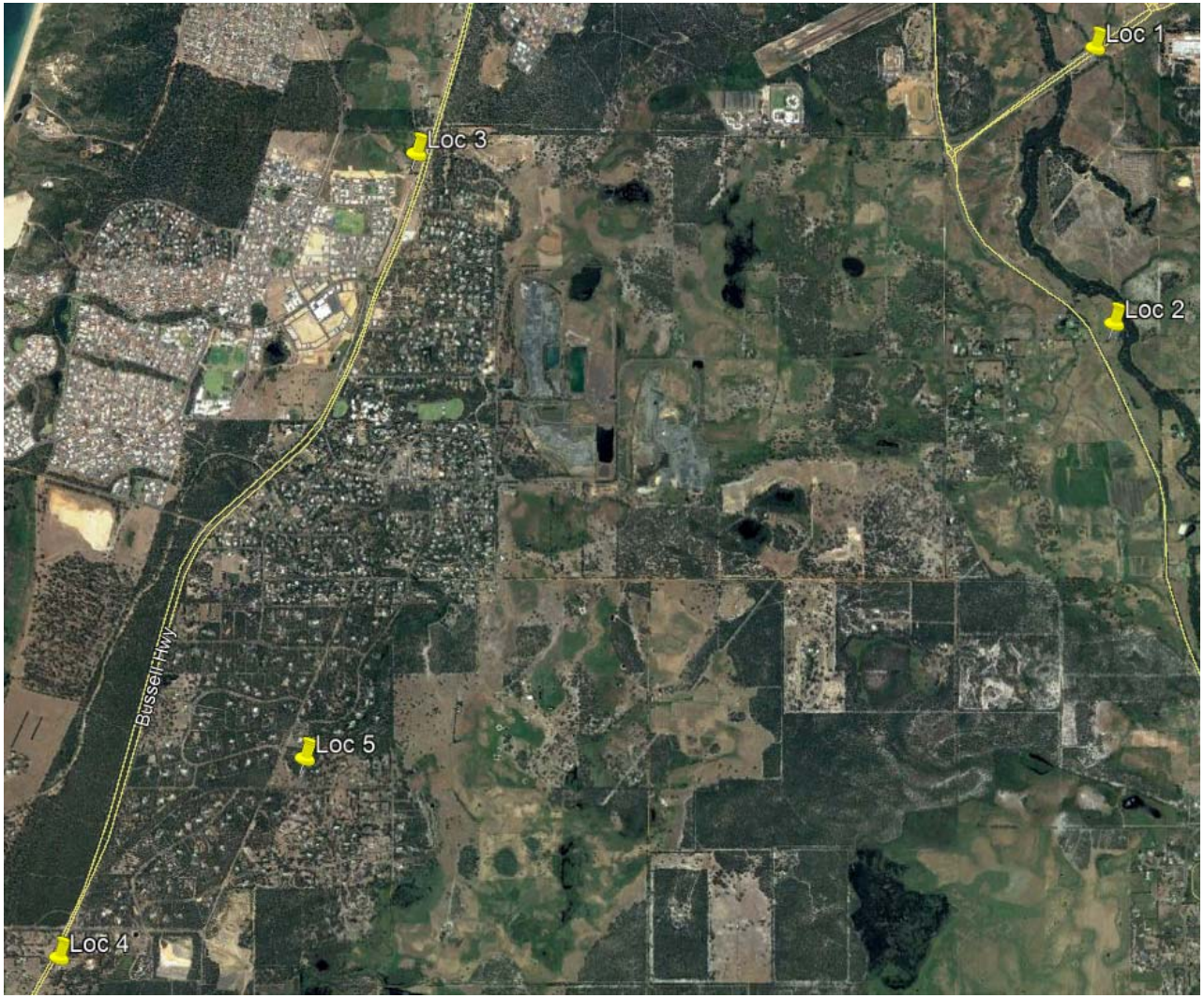


Figure 2-1 BORR South Noise Logger Locations

3 RESULTS

Table 3-1 provides the results summary of the noise monitoring undertaken during this assessment. Full details of the results of are presented in *Appendix A* with *Section 3.1* to *Section 3.5* discussing each monitoring location.

Table 3-1 Average Weekday Noise Measurement Results

Location	Average Weekday Noise Level, dB			
	$L_{A10,18hour}$	$L_{Aeq,24hour}$	$L_{Aeq\ (Day)}$	$L_{Aeq\ (Night)}$
1. Lot 104 (#421) Willenge Drive, Davenport	60.9	58.0	59.1	54.2
2. Lot 100 South Western Highway, Davenport	60.9	57.9	59.2	53.3
3. Lot 500 (#538) Bussell Highway, Dalyellup	65.5	62.8	64.0	58.5
4. Lot 47 (#1213) Bussell Highway, Stratham	62.2	59.2	60.5	54.0
5. Lot 41 (#133) Woods Road, Gelorup	41.6	42.0	43.2	36.3

3.1 Lot 104 (#421) Willenge Drive

The locality of the noise logger and photograph of the set-up is shown in *Figure 3-1*.

Figure 3-1 Lot 104 (#421) Willenge Drive logger Location

Noise at the logger was dominated by road traffic on Bunbury Outer Ring Road (Central Section). Of the approximate 4,000 vehicles per day on BORR, 90% occur during the day and 10% at night, with 28% heavy vehicles during both the day and night periods.

The 14-August-2019 data was removed from the weekday average as winds were being predominantly negative (from the logger to the road), so that the noise levels were lower on this day. The existing weekday average noise levels at this property are determined to be 59.1 dB $L_{Aeq(Day)}$ and 54.2 dB $L_{Aeq(Night)}$. That is, there is a 4.9 dB difference between the $L_{Aeq(Day)}$ and the $L_{Aeq(Night)}$ values. The $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ had a range of 1.5 dB to 1.2 dB respectively over the monitoring period.

Whilst not presented in this report, for information, the weekend $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ averages are 3.5 dB and 3.4 dB less than the weekday averages respectively.

Data was not recorded after midday on 4-August-2019 until the battery changeover at 9.00 a.m. 8-August-2019, however sufficient data was obtained.

3.2 Lot 100 South Western Highway

The locality of the noise logger and photograph of the set-up is shown in *Figure 3-2*.

Figure 3-2 Lot 100 South Western Highway Logger Location

Noise at the logger was dominated by road traffic on South Western Highway. Of the approximate 7,000 vehicles per day on South Western Highway, 94% occur during the day and 6% at night with around 15% heavy vehicles during the day and 30% during the night.

Whilst there were some days of negative winds (from the house to the road), these did not appear to significantly affect the measured noise levels. The existing weekday average noise levels at this property are determined to be 59.2 dB $L_{Aeq(Day)}$ and 53.3 dB $L_{Aeq(Night)}$. That is, there is a 5.9 dB difference between the $L_{Aeq(Day)}$ and the $L_{Aeq(Night)}$ values. The $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ had a range of 3.5 dB to 2.8 dB respectively over the monitoring period.

Whilst not presented in this report, for information, the weekend $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ averages are 2.8 dB and 1.8 dB less than the weekday averages respectively.

3.3 Lot 500 (#538) Bussell Highway

The locality of the noise logger and photograph of the set-up is shown in *Figure 3-3*.

Noise at the logger was dominated by road traffic on Bussell Highway. Of the approximate 16,000 vehicles per day on Bussell Highway, 94% occur during the day and 6% at night with around 11% heavy vehicles during the day and 16% during the night.

The 13-August-2019 data was removed from the weekday average, as winds were predominantly negative (from the house to the road), so that the noise levels were lower on this day. The existing weekday average noise levels at this property are determined to be 64.0 dB $L_{Aeq(Day)}$ and 58.5 dB $L_{Aeq(Night)}$. That is, there is a 5.5 dB difference between the $L_{Aeq(Day)}$ and the $L_{Aeq(Night)}$ values. The $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ had a range of 2.7 dB to 4.2 dB respectively over the monitoring period.

Figure 3-3 Lot 500 (#538) Bussell Highway Logger Location

Whilst not presented in this report, for information, the weekend $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ averages are 0.9 dB and 2.1 dB less than the weekday averages respectively.

3.4 Lot 47 (#1213) Bussell Highway

The locality of the noise logger and photograph of the set-up is shown in *Figure 3-4*.

Figure 3-4 Lot 47 (#1213) Bussell Highway Logger Location

Noise at the logger was dominated by road traffic on Bussell Highway. Of the approximate 16,000 vehicles per day on Bussell Highway, 95% occur during the day and 5% at night with around 11% heavy vehicles during the day and 18% during the night.

Whilst there were some days of negative winds (from the house to the road), these did not appear to significantly affect the measured noise levels. The existing weekday average noise levels at this property are determined to be 60.5 dB $L_{Aeq(Day)}$ and 54.0 dB $L_{Aeq(Night)}$. That is, there is a 6.5 dB difference between the $L_{Aeq(Day)}$ and the $L_{Aeq(Night)}$ values. The $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ had a range of 1.4 dB to 2.7 dB respectively over the monitoring period.

Whilst not presented in this report, for information, the weekend $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ averages are 1.3 dB and 1.9 dB less than the weekday averages respectively.

3.5 Lot 41 (#133) Woods Road

The locality of the noise logger and photograph of the set-up is shown in *Figure 3-5*.

Figure 3-5 Lot 41 (#133) Woods Road Logger Location

The noise logger represents residences that are not affected by existing road traffic noise such that measured noise levels are influenced by wind, wildlife, household noise and the like with only distant road traffic.

The existing weekday average noise levels at this property are determined to be 43.2 dB $L_{Aeq(Day)}$ and 36.3 dB $L_{Aeq(Night)}$. The $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ had a range of 3.5 dB to 2.8 dB respectively over the monitoring period.

Whilst not presented in this report, for information, the weekend $L_{Aeq(Day)}$ is 4.2 dB higher than during the week with the weekend $L_{Aeq(Night)}$ being 3.6 dB quieter than during the week.

Data was not recorded after 6.00pm on 14-August 2019 due to battery failure, however sufficient data was obtained.

Appendix A

NOISE MONITORING DATA SHEETS

Table A1 – Pre-Construction Noise Measurement Summary at Lot 104 (#421) Willenge Drive, Davenport

Date	$L_{A10,18hour}$, dB	$L_{Aeq,24hour}$, dB	$L_{Aeq(Day)}$, dB	$L_{Aeq(Night)}$, dB
Friday 02-August-2019	61.5	58.4	59.4	54.9
Friday 09-August-2019	59.9	57.0	58.0	53.7
Monday 12-August-2019	61.4	58.2	59.4	53.9
Tuesday 13-August-2019	60.8	58.1	59.3	54.1
Wednesday 14-August-2019	*59.3*	*57.4*	*58.5*	*53.5*
Thursday 15-August-2019	60.9	58.2	59.4	54.1
Weekday Average	**60.9**	**58.0**	**59.1**	**54.2**

Note: Italics indicates data not included in the average.

Traffic Noise Measurement Data

Item	Details
LOCATION	
Project	BORR South Section
Street address	Lot 104 Willenge Drive
Locality	Davenport
Occupier	MRWA
Dates	01 August to 16 August 2019
Category	*Main Roads to provide this information*
SITE	
Distance from the microphone to the kerb	50m
Height of the road in relation to the ground	+1m
Road surface type	Chip Seal
Speed zone	100km/hr
Absorbing ground	70%
Angle of view	140
Road gradient	Flat
Traffic flow	4,226
Heavy vehicles	28% Day and 28% Night
House-Road orientation.	Northwest
Carriageways & lanes.	2 cwys, 2 lanes EB, 2 lanes WB
COMMENT	
Comment	Microphone located 1-metre in free-field Microphone height 1.4m above ground level. Battery failure from midday on 4-Aug-19 to 8-Aug-19 9.00am
REFERENCES	
AMG Z50 E/N	*Main Roads to provide this information*
Road name	*Bunbury Outer Ring Road (Central)*
EXCEL file	Lot 104 Willenge Drive S1.xls
Raw data file	borr lot 100 1st_Sta.csv & Lot 100 SWH Week 2_Sta.csv
EQUIPMENT	
Analyser number	87802F
Microphone number	87802F
Calibrator number	34883971
Calibrator values	94.0 / 94.1
Operator	Lloyd George Acoustics Pty Ltd - Daniel Lloyd
WEATHER	
Wind	Wind analysis based on Bunbury Data 02 Aug 2019 - Variable, light to moderate winds. 05 Aug 2019 - Some Rain. Variable, light to moderate winds. 06 Aug 2019 - Generally negative, moderate to strong winds. 07 Aug 2019 - Variable, light to moderate winds 08 Aug 2019 - Variable, light to moderate 09 Aug 2019 - Variable and light winds 12 Aug 2019 - Variable, light to moderate winds. 13 Aug 2019 - Generally positive, light to strong winds. 14 Aug 2019 - Some Rain. Negative, light to moderate. 15 Aug 2019 - Generally positive, light to moderate winds.

Hourly Noise Level Data

Lot 104 Willenge Drive

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
02-Aug-19	1:00	62.1	49.6	50.5	45.3	0.0	80	11.2
02-Aug-19	2:00	63.2	49.7	53.4	45.0	0.0	80	7.6
02-Aug-19	3:00	64.1	49.7	51.6	44.3	0.0	80	9.4
02-Aug-19	4:00	69.5	52.5	55.0	44.7	0.0	120	1.8
02-Aug-19	5:00	70.2	56.2	56.6	46.0	0.0	80	5.4
02-Aug-19	6:00	70.6	61.9	58.9	48.2	0.0	50	3.6
02-Aug-19	7:00	70.4	64.6	60.6	50.1	0.0	190	5.4
02-Aug-19	8:00	71.1	65.6	61.7	51.7	0.0	50	5.4
02-Aug-19	9:00	71.1	65.0	61.1	50.7	0.0	50	9.4
02-Aug-19	10:00	70.1	63.0	59.3	48.8	0.0	40	9.4
02-Aug-19	11:00	71.9	63.2	60.3	47.3	0.0	40	11.2
02-Aug-19	12:00	68.9	61.0	57.8	45.6	0.0	50	11.2
02-Aug-19	13:00	70.0	63.7	59.5	45.0	0.0	20	11.2
02-Aug-19	14:00	68.6	62.8	58.6	44.7	0.0	30	7.6
02-Aug-19	15:00	69.7	63.5	59.4	45.0	0.0	340	7.6
02-Aug-19	16:00	69.6	63.7	59.7	43.1	0.0	300	7.6
02-Aug-19	17:00	67.5	62.5	58.3	45.1	0.0	0	0
02-Aug-19	18:00	71.3	66.1	61.8	48.4	0.0	280	3.6
02-Aug-19	19:00	68.9	63.8	59.2	47.2	0.0	0	0
02-Aug-19	20:00	68.4	60.3	57.3	46.7	0.0	0	0
02-Aug-19	21:00	67.7	57.8	56.1	46.9	0.0	70	3.6
02-Aug-19	22:00	64.2	54.1	52.7	46.8	0.0	0	0
02-Aug-19	23:00	65.7	54.4	53.5	46.4	0.0	0	0
02-Aug-19	0:00	65.0	51.9	53.6	46.3	0.0	0	0
05-Aug-19	1:00					0.8	290	16.6
05-Aug-19	2:00					0.0	230	3.6
05-Aug-19	3:00					0.0	340	1.8
05-Aug-19	4:00					0.0	10	3.6
05-Aug-19	5:00					0.0	40	1.8
05-Aug-19	6:00					0.0	290	13
05-Aug-19	7:00					0.0	290	13
05-Aug-19	8:00					1.4	240	11.2
05-Aug-19	9:00					0.2	0	0
05-Aug-19	10:00					0.0	0	0
05-Aug-19	11:00					0.0	100	5.4
05-Aug-19	12:00					0.0	160	9.4
05-Aug-19	13:00					0.0	170	11.2
05-Aug-19	14:00					1.0	90	3.6
05-Aug-19	15:00					0.0	80	1.8
05-Aug-19	16:00					0.0	20	1.8
05-Aug-19	17:00					0.0	320	7.6
05-Aug-19	18:00					0.0	330	9.4
05-Aug-19	19:00					0.0	200	5.4
05-Aug-19	20:00					0.2	150	9.4
05-Aug-19	21:00					0.0	130	11.2
05-Aug-19	22:00					0.0	130	9.4
05-Aug-19	23:00					0.0	130	14.8
05-Aug-19	0:00					0.0	120	14.8

Reference: 19075094

Hourly Noise Level Data

Lot 104 Willenge Drive

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
06-Aug-19	1:00					0.0	120	11.2
06-Aug-19	2:00					0.0	140	9.4
06-Aug-19	3:00					0.0	140	14.8
06-Aug-19	4:00					0.0	130	16.6
06-Aug-19	5:00					0.0	150	13
06-Aug-19	6:00					0.0	150	13
06-Aug-19	7:00					0.0	150	9.4
06-Aug-19	8:00					0.0	140	13
06-Aug-19	9:00					0.0	150	13
06-Aug-19	10:00					0.0	140	13
06-Aug-19	11:00					0.0	130	14.8
06-Aug-19	12:00					0.0	160	14.8
06-Aug-19	13:00					0.0	150	13
06-Aug-19	14:00					0.0	170	14.8
06-Aug-19	15:00					0.0	210	16.6
06-Aug-19	16:00					0.0	240	16.6
06-Aug-19	17:00					0.0	220	20.5
06-Aug-19	18:00					0.0	210	18.4
06-Aug-19	19:00					0.0	190	5.4
06-Aug-19	20:00					0.0	0	0
06-Aug-19	21:00					0.0	0	0
06-Aug-19	22:00					0.0	50	1.8
06-Aug-19	23:00					0.0	160	5.4
06-Aug-19	0:00					0.4	0	0
07-Aug-19	1:00					0.0	190	3.6
07-Aug-19	2:00					0.0	180	5.4
07-Aug-19	3:00					0.0	200	3.6
07-Aug-19	4:00					0.0	0	0
07-Aug-19	5:00					0.0	0	0
07-Aug-19	6:00					0.0	0	0
07-Aug-19	7:00					0.0	0	0
07-Aug-19	8:00					0.0	0	0
07-Aug-19	9:00					0.2	0	0
07-Aug-19	10:00					0.0	0	0
07-Aug-19	11:00					0.0	190	3.6
07-Aug-19	12:00					0.0	190	14.8
07-Aug-19	13:00					0.0	200	16.6
07-Aug-19	14:00					0.0	240	13
07-Aug-19	15:00					0.0	230	16.6
07-Aug-19	16:00					0.0	230	16.6
07-Aug-19	17:00					0.0	190	18.4
07-Aug-19	18:00					0.0	210	16.6
07-Aug-19	19:00					0.0	210	13
07-Aug-19	20:00					0.0	0	0
07-Aug-19	21:00					0.0	190	1.8
07-Aug-19	22:00					0.0	0	0
07-Aug-19	23:00					0.0	0	0
07-Aug-19	0:00					0.0	0	0

Reference: 19075094

Hourly Noise Level Data

Lot 104 Willenge Drive

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
08-Aug-19	1:00					0.0	0	0
08-Aug-19	2:00					0.0	0	0
08-Aug-19	3:00					0.0	10	1.8
08-Aug-19	4:00					0.0	0	0
08-Aug-19	5:00					0.0	0	0
08-Aug-19	6:00					0.0	150	5.4
08-Aug-19	7:00					0.0	0	0
08-Aug-19	8:00					0.0	70	1.8
08-Aug-19	9:00					0.0	0	0
08-Aug-19	10:00	69.7	62.5	58.8	44.1	0.0	0	0
08-Aug-19	11:00	68.6	61.5	57.7	43.9	0.0	240	9.4
08-Aug-19	12:00	69.3	61.3	57.9	43.2	0.0	270	5.4
08-Aug-19	13:00	69.2	62.1	58.5	44.2	0.0	250	13
08-Aug-19	14:00	67.9	61.9	58.1	45.5	0.0	260	13
08-Aug-19	15:00	68.2	62.3	58.4	46.6	0.0	240	13
08-Aug-19	16:00	67.2	61.9	57.7	46.2	0.0	230	13
08-Aug-19	17:00	68.5	62.9	60.1	48.4	0.0	240	14.8
08-Aug-19	18:00	67.3	62.7	58.8	47.2	0.0	220	13
08-Aug-19	19:00	66.2	60.2	55.8	40.7	0.0	200	7.6
08-Aug-19	20:00	64.2	54.3	52.4	40.2	0.0	190	5.4
08-Aug-19	21:00	64.8	53.0	51.9	39.5	0.0	190	9.4
08-Aug-19	22:00	65.1	53.7	52.5	40.0	0.0	200	7.6
08-Aug-19	23:00	65.5	54.1	52.9	38.8	0.0	160	3.6
08-Aug-19	0:00	66.9	50.7	53.3	36.3	0.0	190	3.6
09-Aug-19	1:00	60.9	48.4	49.1	39.2	0.0	0	0
09-Aug-19	2:00	63.6	49.8	51.8	44.8	0.0	130	3.6
09-Aug-19	3:00	60.3	51.0	49.9	42.8	0.0	0	0
09-Aug-19	4:00	66.8	50.0	52.9	44.3	0.0	0	0
09-Aug-19	5:00	68.0	54.5	54.9	45.1	0.0	0	0
09-Aug-19	6:00	70.7	61.0	58.7	48.3	0.0	80	1.8
09-Aug-19	7:00	70.0	63.4	60.0	51.7	0.0	0	0
09-Aug-19	8:00	70.9	65.1	61.4	52.2	0.0	110	3.6
09-Aug-19	9:00	69.7	63.4	59.8	49.0	0.0	0	0
09-Aug-19	10:00	68.4	61.1	57.6	46.3	0.0	130	5.4
09-Aug-19	11:00	67.9	60.4	56.9	44.3	0.0	190	3.6
09-Aug-19	12:00	67.9	60.7	57.3	46.0	0.0	110	9.4
09-Aug-19	13:00	68.4	61.2	57.3	43.6	0.0	130	7.6
09-Aug-19	14:00	68.5	62.1	58.2	42.6	0.0	190	5.4
09-Aug-19	15:00	67.6	60.9	57.0	43.2	0.0	330	9.4
09-Aug-19	16:00	67.3	62.2	57.7	42.1	0.0	270	7.6
09-Aug-19	17:00	67.0	62.0	57.5	43.5	0.0	280	5.4
09-Aug-19	18:00	67.6	63.3	58.9	43.6	0.0	250	3.6
09-Aug-19	19:00	69.3	64.1	59.0	41.9	0.0	240	3.6
09-Aug-19	20:00	66.5	57.4	54.4	38.5	0.0	0	0
09-Aug-19	21:00	65.3	53.9	52.7	41.1	0.0	200	1.8
09-Aug-19	22:00	64.8	54.0	53.3	43.5	0.0	0	0
09-Aug-19	23:00	62.6	52.1	52.1	46.6	0.0	210	3.6
09-Aug-19	0:00	61.9	50.8	51.4	47.3	0.0	190	3.6

Reference: 19075094

Hourly Noise Level Data

Lot 104 Willenge Drive

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
12-Aug-19	1:00	57.5	47.5	47.7	42.6	0.0	80	11.2
12-Aug-19	2:00	53.6	47.6	46.6	42.9	0.0	70	13
12-Aug-19	3:00	65.4	48.4	52.1	43.1	0.0	80	11.2
12-Aug-19	4:00	67.0	49.7	53.0	44.0	0.0	80	11.2
12-Aug-19	5:00	69.4	54.9	55.8	45.1	0.0	80	7.6
12-Aug-19	6:00	70.8	61.6	58.8	47.0	0.0	70	7.6
12-Aug-19	7:00	72.2	65.6	61.8	49.6	0.0	70	5.4
12-Aug-19	8:00	71.3	65.2	61.2	49.7	0.0	70	3.6
12-Aug-19	9:00	71.0	64.6	60.6	49.2	0.0	70	5.4
12-Aug-19	10:00	70.6	63.5	59.7	47.2	0.0	60	11.2
12-Aug-19	11:00	71.2	63.3	59.7	46.5	0.0	30	14.8
12-Aug-19	12:00	69.7	62.3	58.7	46.9	0.0	10	16.6
12-Aug-19	13:00	69.6	61.8	58.3	46.4	0.0	10	16.6
12-Aug-19	14:00	68.5	60.8	57.2	45.3	0.0	10	16.6
12-Aug-19	15:00	69.5	63.7	59.5	47.4	0.0	360	18.4
12-Aug-19	16:00	69.8	64.9	60.7	48.1	0.0	10	16.6
12-Aug-19	17:00	68.6	64.6	60.6	48.3	0.0	320	13
12-Aug-19	18:00	68.8	64.2	60.0	46.3	0.0	350	5.4
12-Aug-19	19:00	69.9	64.0	59.5	44.9	0.0	10	3.6
12-Aug-19	20:00	67.6	59.2	56.1	37.5	0.0	0	0
12-Aug-19	21:00	68.2	59.6	56.3	40.1	0.0	0	0
12-Aug-19	22:00	65.3	53.3	52.8	42.7	0.0	90	3.6
12-Aug-19	23:00	68.7	52.4	***52.8***	44.4	0.0	90	3.6
12-Aug-19	0:00	65.0	51.3	52.8	46.5	0.0	90	1.8
13-Aug-19	1:00	64.3	48.3	51.5	44.3	0.0	0	0
13-Aug-19	2:00	57.7	47.8	49.3	44.3	0.0	70	3.6
13-Aug-19	3:00	65.0	48.4	51.8	43.2	0.0	50	5.4
13-Aug-19	4:00	69.0	53.4	55.2	43.8	0.0	30	11.2
13-Aug-19	5:00	70.5	54.9	56.2	41.8	0.2	30	5.4
13-Aug-19	6:00	68.4	61.6	58.2	47.0	0.0	30	3.6
13-Aug-19	7:00	70.1	64.3	60.2	50.3	2.2	80	5.4
13-Aug-19	8:00	71.6	66.2	62.3	51.3	0.0	270	14.8
13-Aug-19	9:00	71.2	64.6	60.9	49.2	0.0	280	5.4
13-Aug-19	10:00	69.6	63.2	59.3	45.9	0.0	280	13
13-Aug-19	11:00	70.5	63.6	59.8	44.7	0.0	260	14.8
13-Aug-19	12:00	69.8	62.3	58.9	45.7	0.0	270	16.6
13-Aug-19	13:00	68.4	63.3	59.5	47.8	0.0	270	16.6
13-Aug-19	14:00	69.4	63.5	59.7	47.5	0.0	260	20.5
13-Aug-19	15:00	69.6	64.0	60.0	48.9	0.0	260	18.4
13-Aug-19	16:00	68.2	63.8	60.0	49.7	0.0	250	20.5
13-Aug-19	17:00	68.5	64.4	60.4	49.4	0.0	260	16.6
13-Aug-19	18:00	67.5	63.1	59.0	46.6	0.0	260	16.6
13-Aug-19	19:00	68.3	62.9	58.0	39.3	0.0	250	11.2
13-Aug-19	20:00	66.6	57.4	54.8	38.2	0.0	250	7.6
13-Aug-19	21:00	67.3	55.1	53.9	40.6	0.0	240	3.6
13-Aug-19	22:00	61.4	51.5	49.7	42.1	0.0	0	0
13-Aug-19	23:00	64.0	51.5	51.9	43.0	0.0	110	1.8
13-Aug-19	0:00	60.1	50.2	51.1	43.4	0.0	100	3.6

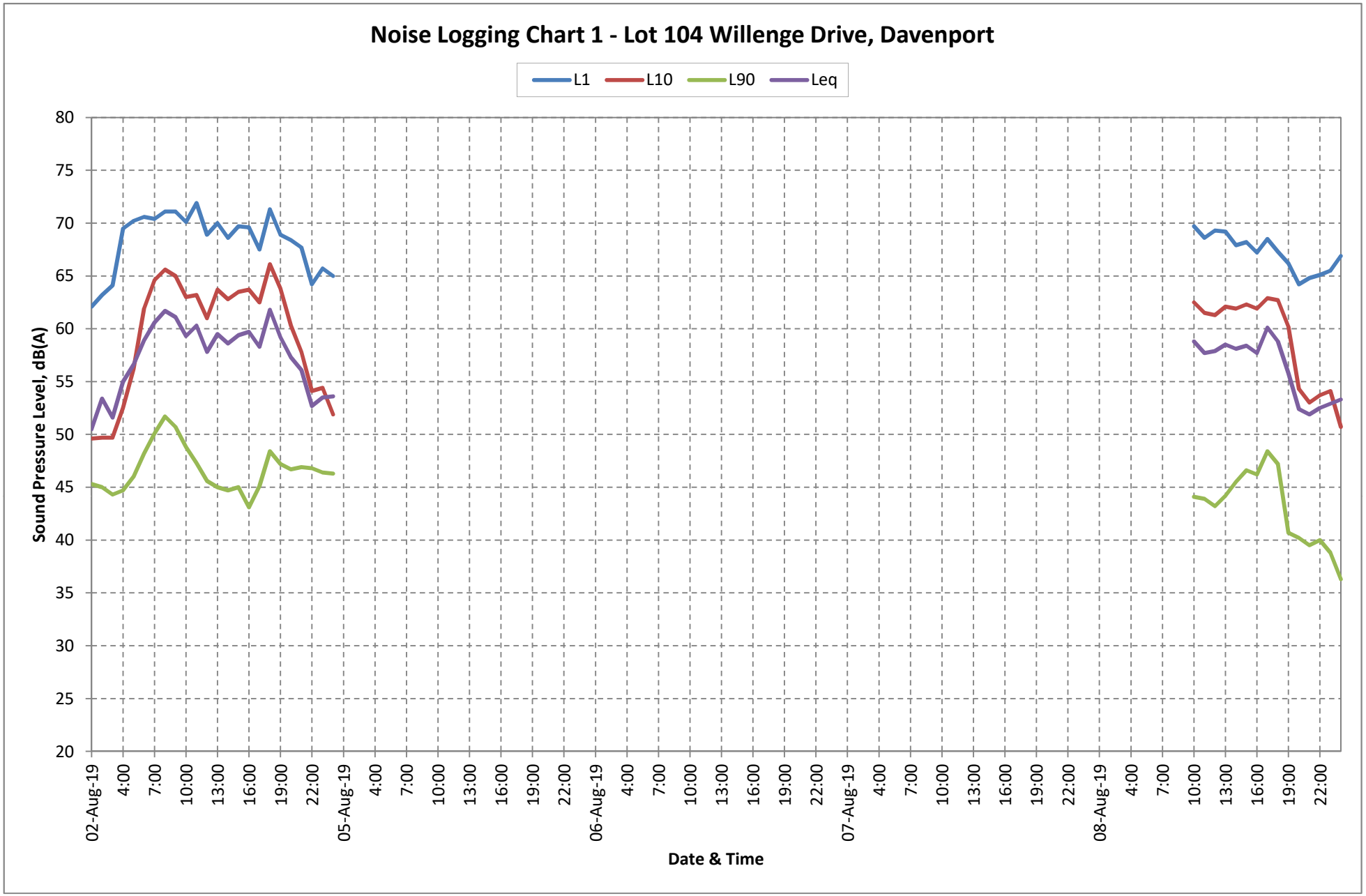
Reference: 19075094

Hourly Noise Level Data

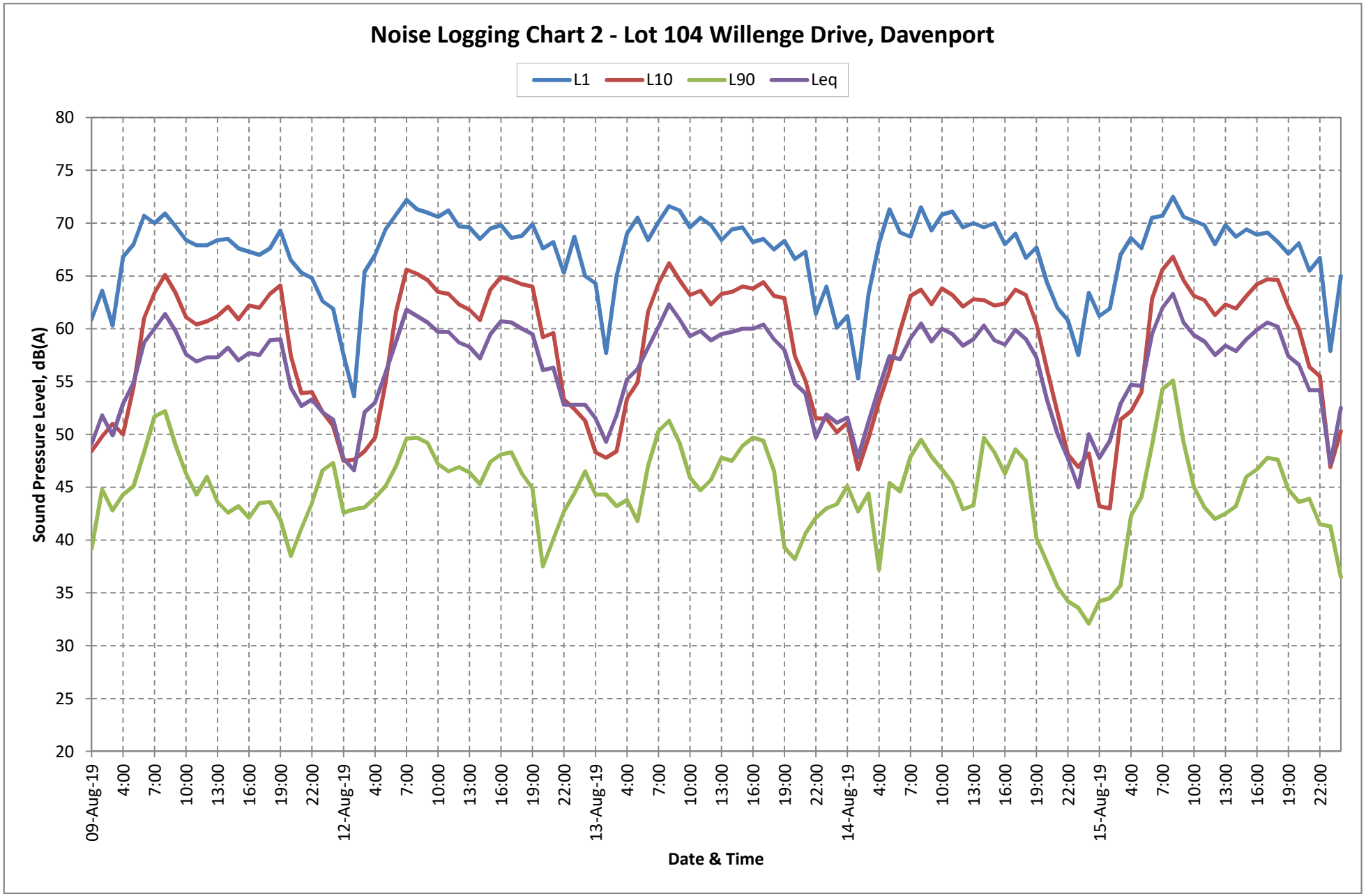
Lot 104 Willenge Drive

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
14-Aug-19	1:00	61.2	51.1	51.6	45.1	0.0	60	1.8
14-Aug-19	2:00	55.3	46.7	47.8	42.7	0.0	50	9.4
14-Aug-19	3:00	63.3	49.7	51.2	44.4	2.6	40	9.4
14-Aug-19	4:00	68.1	53.1	54.4	37.2	0.0	50	5.4
14-Aug-19	5:00	71.3	56.0	57.4	45.4	5.8	110	9.4
14-Aug-19	6:00	69.1	59.8	57.1	44.6	2.2	160	7.6
14-Aug-19	7:00	68.7	63.1	59.1	47.9	1.0	90	3.6
14-Aug-19	8:00	71.5	63.7	60.5	49.5	0.2	130	3.6
14-Aug-19	9:00	69.3	62.3	58.8	47.9	0.8	180	5.4
14-Aug-19	10:00	70.8	63.8	60.0	46.7	0.0	90	3.6
14-Aug-19	11:00	71.1	63.2	59.5	45.4	0.0	70	9.4
14-Aug-19	12:00	69.6	62.1	58.4	42.9	0.0	30	7.6
14-Aug-19	13:00	70.0	62.8	59.0	43.3	0.0	350	7.6
14-Aug-19	14:00	69.6	62.7	60.3	49.7	0.6	220	11.2
14-Aug-19	15:00	70.0	62.2	58.9	48.3	5.2	200	16.6
14-Aug-19	16:00	68.0	62.4	58.5	46.3	2.2	180	7.6
14-Aug-19	17:00	69.0	63.7	59.9	48.6	0.0	210	13
14-Aug-19	18:00	66.7	63.2	59.0	47.5	0.0	210	11.2
14-Aug-19	19:00	67.7	60.5	57.3	40.2	0.0	190	16.6
14-Aug-19	20:00	64.4	56.2	53.3	37.9	0.0	200	14.8
14-Aug-19	21:00	62.0	52.1	50.1	35.6	0.0	200	13
14-Aug-19	22:00	60.8	48.1	47.7	34.2	0.0	200	13
14-Aug-19	23:00	57.5	46.9	45.0	33.6	0.0	190	13
14-Aug-19	0:00	63.4	48.2	50.0	32.1	0.0	200	5.4
15-Aug-19	1:00	61.2	43.2	47.8	34.2	0.0	200	1.8
15-Aug-19	2:00	61.9	43.0	49.4	34.5	0.0	190	7.6
15-Aug-19	3:00	67.0	51.4	52.9	35.7	0.0	190	3.6
15-Aug-19	4:00	68.6	52.2	54.7	42.3	0.0	0	0
15-Aug-19	5:00	67.6	54.0	54.6	44.1	0.0	110	1.8
15-Aug-19	6:00	70.5	62.8	59.5	49.0	0.0	90	3.6
15-Aug-19	7:00	70.7	65.6	62.0	54.3	0.0	0	0
15-Aug-19	8:00	72.5	66.8	63.3	55.1	0.0	0	0
15-Aug-19	9:00	70.6	64.6	60.6	49.3	0.2	0	0
15-Aug-19	10:00	70.2	63.1	59.4	45.0	0.0	60	1.8
15-Aug-19	11:00	69.8	62.7	58.8	43.1	0.0	360	7.6
15-Aug-19	12:00	68.0	61.3	57.5	42.0	0.0	330	7.6
15-Aug-19	13:00	69.8	62.3	58.4	42.5	0.0	330	9.4
15-Aug-19	14:00	68.7	61.9	57.9	43.2	0.0	330	13
15-Aug-19	15:00	69.4	63.1	59.0	46.0	0.0	330	14.8
15-Aug-19	16:00	68.9	64.2	59.9	46.7	0.0	340	14.8
15-Aug-19	17:00	69.1	64.7	60.6	47.8	0.0	340	14.8
15-Aug-19	18:00	68.2	64.6	60.2	47.6	0.0	340	11.2
15-Aug-19	19:00	67.1	62.1	57.4	44.8	0.0	350	11.2
15-Aug-19	20:00	68.1	60.0	56.6	43.6	0.0	330	5.4
15-Aug-19	21:00	65.5	56.4	54.2	43.9	0.0	320	5.4
15-Aug-19	22:00	66.7	55.5	54.2	41.5	0.0	300	13
15-Aug-19	23:00	57.9	46.9	47.2	41.3	0.0	320	11.2
15-Aug-19	0:00	65.0	50.3	52.5	36.5	0.0	290	13

Reference: 19075094



Reference: 19075094



Reference: 19075094

Table A2 – Pre-Construction Noise Measurement Summary at Lot 100 South Western Highway, Davenport

Date	$L_{A10,18hour}$, dB	$L_{Aeq,24hour}$, dB	$L_{Aeq(Day)}$, dB	$L_{Aeq(Night)}$, dB
Friday 02-August-2019	61.2	57.7	58.7	54.6
Monday 05-August-2019	59.6	57.6	58.7	53.9
Tuesday 06-August-2019	62.0	59.4	60.8	52.9
Wednesday 07-August-2019	61.8	59.2	60.4	54.9
Thursday 08-August-2019	62.4	58.7	60.2	52.8
Friday 09-August-2019	60.7	57.1	58.3	53.2
Monday 12-August-2019	60.2	56.7	58.0	52.1
Tuesday 13-August-2019	62.1	59.1	60.5	52.4
Wednesday 14-August-2019	60.4	57.4	58.6	52.9
Thursday 15-August-2019	59.1	56.4	57.3	53.3
Weekday Average	**60.9**	**57.9**	**59.2**	**53.3**

Traffic Noise Measurement Data

Item	Details
LOCATION	
Project	BORR South Section
Street address	Lot 100 South Western Highway
Locality	Davenport
Occupier	Steven Monkhouse
Dates	01 August to 16 August 2019
Category	*Main Roads to provide this information*
SITE	
Distance from the microphone to the kerb	80m
Height of the road in relation to the ground	+2m
Road surface type	Chip Seal
Speed zone	110km/hr
Absorbing ground	70%
Angle of view	140
Road gradient	Slight Decline SB
Traffic flow	6,861
Heavy vehicles	15% Day and 30% Night
House-Road orientation.	West-Southwest
Carriageways & lanes.	2 cwys, 1 lane NB, 1 lane SB
COMMENT	
Comment	Microphone located 1-metre in free-field Microphone height 1.4m above ground level. 8-Aug-19 10.00am data missing due to battery change
REFERENCES	
AMG Z50 E/N	*Main Roads to provide this information*
Road name	*South Western Highway*
EXCEL file	Lot 100 South Western Highway S1.xls
Raw data file	borr lot 100 1st_Sta.csv & Lot 100 SWH Week 2_Sta.csv
EQUIPMENT	
Analyser number	15-301-468
Microphone number	15-301-468
Calibrator number	34883971
Calibrator values	94.0 / 93.9
Operator	Lloyd George Acoustics Pty Ltd - Daniel Lloyd
WEATHER	
Wind	Wind analysis based on Bunbury Data 02 Aug 2019 - Negative, light to moderate winds. 05 Aug 2019 - Some Rain. Variable, light to moderate winds. 06 Aug 2019 - Generally negative, moderate to strong winds. 07 Aug 2019 - Variable, light to moderate winds 08 Aug 2019 - Generally positive, light to moderate 09 Aug 2019 - Variable and light winds 12 Aug 2019 - Negative, light to moderate winds. 13 Aug 2019 - Generally positive, light to strong winds. 14 Aug 2019 - Some Rain. Variable, light to moderate. 15 Aug 2019 - Winds variable, light to moderate winds.

Hourly Noise Level Data

Lot 100 South Western Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
02-Aug-19	1:00	66.3	56.0	53.3	38.4	0.0	80	11.2
02-Aug-19	2:00	68.6	51.0	54.1	39.0	0.0	80	7.6
02-Aug-19	3:00	60.1	46.2	47.7	38.5	0.0	80	9.4
02-Aug-19	4:00	66.1	54.0	52.7	39.4	0.0	120	1.8
02-Aug-19	5:00	66.9	58.3	55.0	42.1	0.0	80	5.4
02-Aug-19	6:00	66.7	61.1	57.4	47.2	0.0	50	3.6
02-Aug-19	7:00	67.5	62.7	59.1	51.2	0.0	190	5.4
02-Aug-19	8:00	68.0	63.4	60.3	53.6	0.0	50	5.4
02-Aug-19	9:00	67.3	63.2	59.9	53.8	0.0	50	9.4
02-Aug-19	10:00	66.1	60.9	58.0	51.8	0.0	40	9.4
02-Aug-19	11:00	64.2	59.5	56.3	48.9	0.0	40	11.2
02-Aug-19	12:00	64.4	59.1	56.2	49.2	0.0	50	11.2
02-Aug-19	13:00	65.6	59.8	56.6	48.6	0.0	20	11.2
02-Aug-19	14:00	63.8	58.7	55.5	48.3	0.0	30	7.6
02-Aug-19	15:00	64.2	59.0	***56.6***	49.1	0.0	340	7.6
02-Aug-19	16:00	65.1	61.0	57.6	50.6	0.0	300	7.6
02-Aug-19	17:00	66.8	62.6	59.4	52.0	0.0	0	0
02-Aug-19	18:00	68.6	65.1	62.3	56.5	0.0	280	3.6
02-Aug-19	19:00	68.1	64.3	61.0	53.4	0.0	0	0
02-Aug-19	20:00	67.9	63.0	59.2	45.9	0.0	0	0
02-Aug-19	21:00	***67.8***	***62.1***	***58.0***	42.3	0.0	70	3.6
02-Aug-19	22:00	67.7	61.2	56.8	40.1	0.0	0	0
02-Aug-19	23:00	68.5	59.0	56.1	38.7	0.0	0	0
02-Aug-19	0:00	66.7	57.8	54.7	37.8	0.0	0	0
05-Aug-19	1:00	61.9	47.0	49.0	30.0	0.8	290	16.6
05-Aug-19	2:00	61.4	45.2	48.7	31.0	0.0	230	3.6
05-Aug-19	3:00	62.1	47.8	48.6	36.4	0.0	340	1.8
05-Aug-19	4:00	67.7	54.9	54.0	38.2	0.0	10	3.6
05-Aug-19	5:00	68.2	58.6	55.8	39.6	0.0	40	1.8
05-Aug-19	6:00	69.0	63.4	59.9	49.8	0.0	290	13
05-Aug-19	7:00	70.6	65.9	62.9	55.7	0.0	290	13
05-Aug-19	8:00	68.9	63.8	60.6	54.4	1.4	240	11.2
05-Aug-19	9:00	69.4	63.4	60.8	52.7	0.2	0	0
05-Aug-19	10:00	67.6	61.2	57.9	48.0	0.0	0	0
05-Aug-19	11:00	69.3	64.0	60.0	49.0	0.0	100	5.4
05-Aug-19	12:00	68.7	63.7	60.3	51.3	0.0	160	9.4
05-Aug-19	13:00	66.1	60.4	57.1	47.6	0.0	170	11.2
05-Aug-19	14:00	65.6	60.1	56.7	46.0	1.0	90	3.6
05-Aug-19	15:00	64.4	59.2	55.6	46.1	0.0	80	1.8
05-Aug-19	16:00	66.1	59.8	57.3	47.9	0.0	20	1.8
05-Aug-19	17:00	66.9	61.1	58.1	50.1	0.0	320	7.6
05-Aug-19	18:00	67.9	63.4	60.6	54.7	0.0	330	9.4
05-Aug-19	19:00	67.0	62.1	58.2	46.4	0.0	200	5.4
05-Aug-19	20:00	63.8	58.2	54.2	40.1	0.2	150	9.4
05-Aug-19	21:00	63.4	55.7	52.1	33.0	0.0	130	11.2
05-Aug-19	22:00	62.2	54.3	50.8	33.3	0.0	130	9.4
05-Aug-19	23:00	62.3	50.4	48.9	31.1	0.0	130	14.8
05-Aug-19	0:00	59.9	46.7	47.1	29.7	0.0	120	14.8

Reference: 19075094

Hourly Noise Level Data

Lot 100 South Western Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
06-Aug-19	1:00	63.1	47.0	48.5	30.0	0.0	120	11.2
06-Aug-19	2:00	59.8	44.8	45.7	30.3	0.0	140	9.4
06-Aug-19	3:00	60.9	44.9	46.7	30.9	0.0	140	14.8
06-Aug-19	4:00	64.8	53.4	51.5	30.8	0.0	130	16.6
06-Aug-19	5:00	66.4	60.7	56.1	35.2	0.0	150	13
06-Aug-19	6:00	67.1	62.7	58.4	46.3	0.0	150	13
06-Aug-19	7:00	69.3	64.7	60.9	50.7	0.0	150	9.4
06-Aug-19	8:00	69.8	65.7	62.2	54.0	0.0	140	13
06-Aug-19	9:00	70.1	65.9	62.8	55.7	0.0	150	13
06-Aug-19	10:00	67.3	63.7	59.9	51.7	0.0	140	13
06-Aug-19	11:00	68.2	63.9	60.3	51.5	0.0	130	14.8
06-Aug-19	12:00	65.8	61.9	58.2	49.6	0.0	160	14.8
06-Aug-19	13:00	67.1	62.3	58.8	50.9	0.0	150	13
06-Aug-19	14:00	69.8	64.7	61.0	51.2	0.0	170	14.8
06-Aug-19	15:00	69.9	64.9	61.4	52.1	0.0	210	16.6
06-Aug-19	16:00	70.8	66.1	63.0	55.0	0.0	240	16.6
06-Aug-19	17:00	70.5	66.6	63.5	57.0	0.0	220	20.5
06-Aug-19	18:00	70.8	66.7	63.8	57.2	0.0	210	18.4
06-Aug-19	19:00	67.1	63.2	59.5	51.7	0.0	190	5.4
06-Aug-19	20:00	66.3	60.9	57.6	47.8	0.0	0	0
06-Aug-19	21:00	65.4	58.4	55.2	43.8	0.0	0	0
06-Aug-19	22:00	61.2	53.8	50.7	39.6	0.0	50	1.8
06-Aug-19	23:00	60.7	50.5	48.2	29.1	0.0	160	5.4
06-Aug-19	0:00	64.0	52.4	50.6	28.2	0.4	0	0
07-Aug-19	1:00	67.4	52.8	52.9	28.3	0.0	190	3.6
07-Aug-19	2:00	66.6	52.8	52.4	28.2	0.0	180	5.4
07-Aug-19	3:00	67.9	54.8	54.0	28.1	0.0	200	3.6
07-Aug-19	4:00	69.5	60.1	57.1	30.6	0.0	0	0
07-Aug-19	5:00	68.1	59.0	56.4	36.2	0.0	0	0
07-Aug-19	6:00	67.9	61.5	58.5	51.5	0.0	0	0
07-Aug-19	7:00	68.8	64.0	60.8	55.0	0.0	0	0
07-Aug-19	8:00	69.1	64.2	61.2	55.0	0.0	0	0
07-Aug-19	9:00	66.6	61.1	59.4	53.1	0.2	0	0
07-Aug-19	10:00	64.4	59.8	56.2	48.2	0.0	0	0
07-Aug-19	11:00	64.8	60.4	56.7	46.8	0.0	190	3.6
07-Aug-19	12:00	68.6	64.3	60.5	51.3	0.0	190	14.8
07-Aug-19	13:00	70.3	64.4	61.0	52.3	0.0	200	16.6
07-Aug-19	14:00	69.4	63.8	60.4	51.7	0.0	240	13
07-Aug-19	15:00	68.4	63.7	60.4	52.3	0.0	230	16.6
07-Aug-19	16:00	70.1	65.5	62.3	54.6	0.0	230	16.6
07-Aug-19	17:00	70.7	66.5	63.4	56.9	0.0	190	18.4
07-Aug-19	18:00	70.2	66.5	63.5	56.0	0.0	210	16.6
07-Aug-19	19:00	70.2	64.9	61.5	50.2	0.0	210	13
07-Aug-19	20:00	66.5	61.6	58.0	45.9	0.0	0	0
07-Aug-19	21:00	66.4	60.2	56.5	39.8	0.0	190	1.8
07-Aug-19	22:00	61.1	54.9	50.9	34.7	0.0	0	0
07-Aug-19	23:00	61.1	53.1	49.6	33.6	0.0	0	0
07-Aug-19	0:00	64.4	52.6	50.5	31.1	0.0	0	0

Reference: 19075094

Hourly Noise Level Data

Lot 100 South Western Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
08-Aug-19	1:00	60.7	48.1	46.8	29.7	0.0	0	0
08-Aug-19	2:00	54.1	43.4	43.1	32.5	0.0	0	0
08-Aug-19	3:00	60.1	45.8	46.5	35.0	0.0	10	1.8
08-Aug-19	4:00	62.3	47.3	48.3	34.1	0.0	0	0
08-Aug-19	5:00	65.2	56.8	53.5	36.9	0.0	0	0
08-Aug-19	6:00	66.7	60.3	57.3	48.8	0.0	150	5.4
08-Aug-19	7:00	67.6	62.6	59.5	53.4	0.0	0	0
08-Aug-19	8:00	68.3	64.4	61.4	55.0	0.0	70	1.8
08-Aug-19	9:00	66.5	62.6	59.5	53.2	0.0	0	0
08-Aug-19	10:00					0.0	0	0
08-Aug-19	11:00	66.2	61.9	58.3	49.9	0.0	240	9.4
08-Aug-19	12:00	66.4	61.5	57.9	49.2	0.0	270	5.4
08-Aug-19	13:00	68.3	62.3	59.3	50.9	0.0	250	13
08-Aug-19	14:00	69.4	63.9	60.3	50.9	0.0	260	13
08-Aug-19	15:00	69.4	64.3	60.8	52.3	0.0	240	13
08-Aug-19	16:00	68.1	63.7	60.3	53.4	0.0	230	13
08-Aug-19	17:00	69.7	64.9	62.5	55.4	0.0	240	14.8
08-Aug-19	18:00	70.0	66.4	63.4	57.2	0.0	220	13
08-Aug-19	19:00	69.2	65.2	61.6	51.3	0.0	200	7.6
08-Aug-19	20:00	67.9	62.4	58.7	45.7	0.0	190	5.4
08-Aug-19	21:00	65.2	59.9	55.9	36.8	0.0	190	9.4
08-Aug-19	22:00	65.4	59.6	55.3	30.9	0.0	200	7.6
08-Aug-19	23:00	64.6	58.9	54.4	29.5	0.0	160	3.6
08-Aug-19	0:00	68.3	56.9	54.8	28.4	0.0	190	3.6
09-Aug-19	1:00	62.9	54.3	51.4	31.1	0.0	0	0
09-Aug-19	2:00	62.3	48.5	49.1	32.9	0.0	130	3.6
09-Aug-19	3:00	57.6	44.9	45.4	31.7	0.0	0	0
09-Aug-19	4:00	63.5	52.4	50.5	36.1	0.0	0	0
09-Aug-19	5:00	65.1	56.0	53.0	38.0	0.0	0	0
09-Aug-19	6:00	66.8	60.1	57.1	47.2	0.0	80	1.8
09-Aug-19	7:00	67.3	63.7	60.0	51.8	0.0	0	0
09-Aug-19	8:00	67.7	63.7	60.4	54.4	0.0	110	3.6
09-Aug-19	9:00	66.7	62.7	60.1	52.0	0.0	0	0
09-Aug-19	10:00	65.8	62.0	58.2	50.5	0.0	130	5.4
09-Aug-19	11:00	64.6	60.4	57.1	49.7	0.0	190	3.6
09-Aug-19	12:00	63.8	59.8	56.3	48.2	0.0	110	9.4
09-Aug-19	13:00	63.9	58.8	55.9	47.4	0.0	130	7.6
09-Aug-19	14:00	63.4	58.4	55.2	46.7	0.0	190	5.4
09-Aug-19	15:00	66.0	61.4	58.2	50.6	0.0	330	9.4
09-Aug-19	16:00	64.2	60.3	57.1	49.9	0.0	270	7.6
09-Aug-19	17:00	65.0	61.0	57.8	50.2	0.0	280	5.4
09-Aug-19	18:00	67.8	62.9	61.6	53.8	0.0	250	3.6
09-Aug-19	19:00	66.1	62.2	58.9	50.1	0.0	240	3.6
09-Aug-19	20:00	66.0	60.4	57.0	44.0	0.0	0	0
09-Aug-19	21:00	65.8	60.0	56.6	40.6	0.0	200	1.8
09-Aug-19	22:00	64.3	59.1	55.3	35.1	0.0	0	0
09-Aug-19	23:00	66.6	59.4	55.6	35.0	0.0	210	3.6
09-Aug-19	0:00	66.3	56.4	53.6	33.8	0.0	190	3.6

Reference: 19075094

Hourly Noise Level Data

Lot 100 South Western Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
12-Aug-19	1:00	59.6	44.6	47.0	36.8	0.0	80	11.2
12-Aug-19	2:00	57.0	46.1	45.5	38.2	0.0	70	13
12-Aug-19	3:00	57.3	45.3	45.5	38.6	0.0	80	11.2
12-Aug-19	4:00	61.7	50.7	48.9	39.2	0.0	80	11.2
12-Aug-19	5:00	65.2	57.3	53.6	40.6	0.0	80	7.6
12-Aug-19	6:00	66.0	60.3	56.8	45.4	0.0	70	7.6
12-Aug-19	7:00	68.8	63.0	60.0	50.5	0.0	70	5.4
12-Aug-19	8:00	68.8	64.4	61.3	53.8	0.0	70	3.6
12-Aug-19	9:00	65.2	60.8	57.8	51.9	0.0	70	5.4
12-Aug-19	10:00	64.7	59.1	56.3	48.4	0.0	60	11.2
12-Aug-19	11:00	64.7	59.6	56.2	49.0	0.0	30	14.8
12-Aug-19	12:00	64.8	59.0	55.9	48.6	0.0	10	16.6
12-Aug-19	13:00	63.7	58.1	54.9	47.1	0.0	10	16.6
12-Aug-19	14:00	63.0	57.3	54.3	47.0	0.0	10	16.6
12-Aug-19	15:00	65.5	60.1	56.8	49.2	0.0	360	18.4
12-Aug-19	16:00	64.8	60.2	57.1	50.8	0.0	10	16.6
12-Aug-19	17:00	65.0	60.2	57.3	50.7	0.0	320	13
12-Aug-19	18:00	67.8	64.6	61.0	53.2	0.0	350	5.4
12-Aug-19	19:00	68.8	63.5	60.1	50.5	0.0	10	3.6
12-Aug-19	20:00	66.9	62.2	58.4	43.3	0.0	0	0
12-Aug-19	21:00	68.1	60.1	56.9	39.5	0.0	0	0
12-Aug-19	22:00	65.6	58.8	54.8	36.0	0.0	90	3.6
12-Aug-19	23:00	64.3	57.3	53.4	35.9	0.0	90	3.6
12-Aug-19	0:00	65.1	54.7	52.1	34.6	0.0	90	1.8
13-Aug-19	1:00	64.4	47.2	50.1	34.1	0.0	0	0
13-Aug-19	2:00	59.0	46.6	47.2	33.6	0.0	70	3.6
13-Aug-19	3:00	61.3	49.0	48.2	35.7	0.0	50	5.4
13-Aug-19	4:00	64.3	49.6	50.2	36.3	0.0	30	11.2
13-Aug-19	5:00	68.1	57.9	55.4	41.4	0.2	30	5.4
13-Aug-19	6:00	66.8	60.6	57.2	46.8	0.0	30	3.6
13-Aug-19	7:00	67.9	62.5	59.3	51.9	2.2	80	5.4
13-Aug-19	8:00	69.8	64.8	62.0	56.1	0.0	270	14.8
13-Aug-19	9:00	68.0	62.6	59.7	52.7	0.0	280	5.4
13-Aug-19	10:00	69.5	64.8	61.4	53.2	0.0	280	13
13-Aug-19	11:00	69.5	64.2	60.9	51.9	0.0	260	14.8
13-Aug-19	12:00	69.4	64.7	61.2	52.6	0.0	270	16.6
13-Aug-19	13:00	69.2	64.8	61.4	53.8	0.0	270	16.6
13-Aug-19	14:00	69.6	65.1	61.4	53.8	0.0	260	20.5
13-Aug-19	15:00	69.7	64.9	61.6	53.8	0.0	260	18.4
13-Aug-19	16:00	69.8	65.5	62.3	55.4	0.0	250	20.5
13-Aug-19	17:00	68.6	65.0	61.9	56.0	0.0	260	16.6
13-Aug-19	18:00	67.6	64.0	61.2	55.4	0.0	260	16.6
13-Aug-19	19:00	65.9	61.9	58.5	50.9	0.0	250	11.2
13-Aug-19	20:00	67.1	62.2	58.4	46.5	0.0	250	7.6
13-Aug-19	21:00	63.7	59.0	55.2	43.9	0.0	240	3.6
13-Aug-19	22:00	63.0	56.1	52.5	37.1	0.0	0	0
13-Aug-19	23:00	60.9	53.5	50.0	37.6	0.0	110	1.8
13-Aug-19	0:00	62.0	51.7	49.5	33.5	0.0	100	3.6

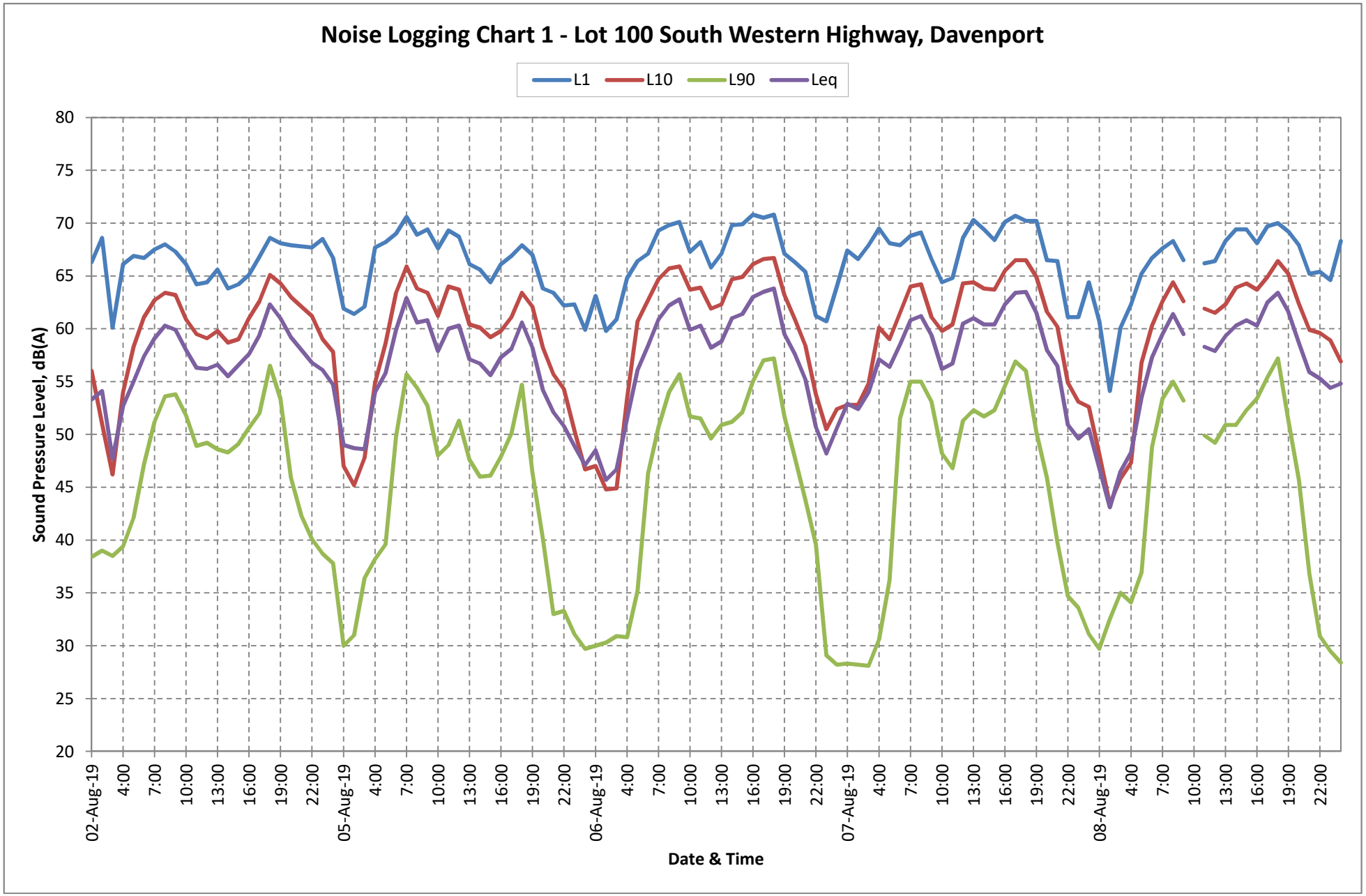
Reference: 19075094

Hourly Noise Level Data

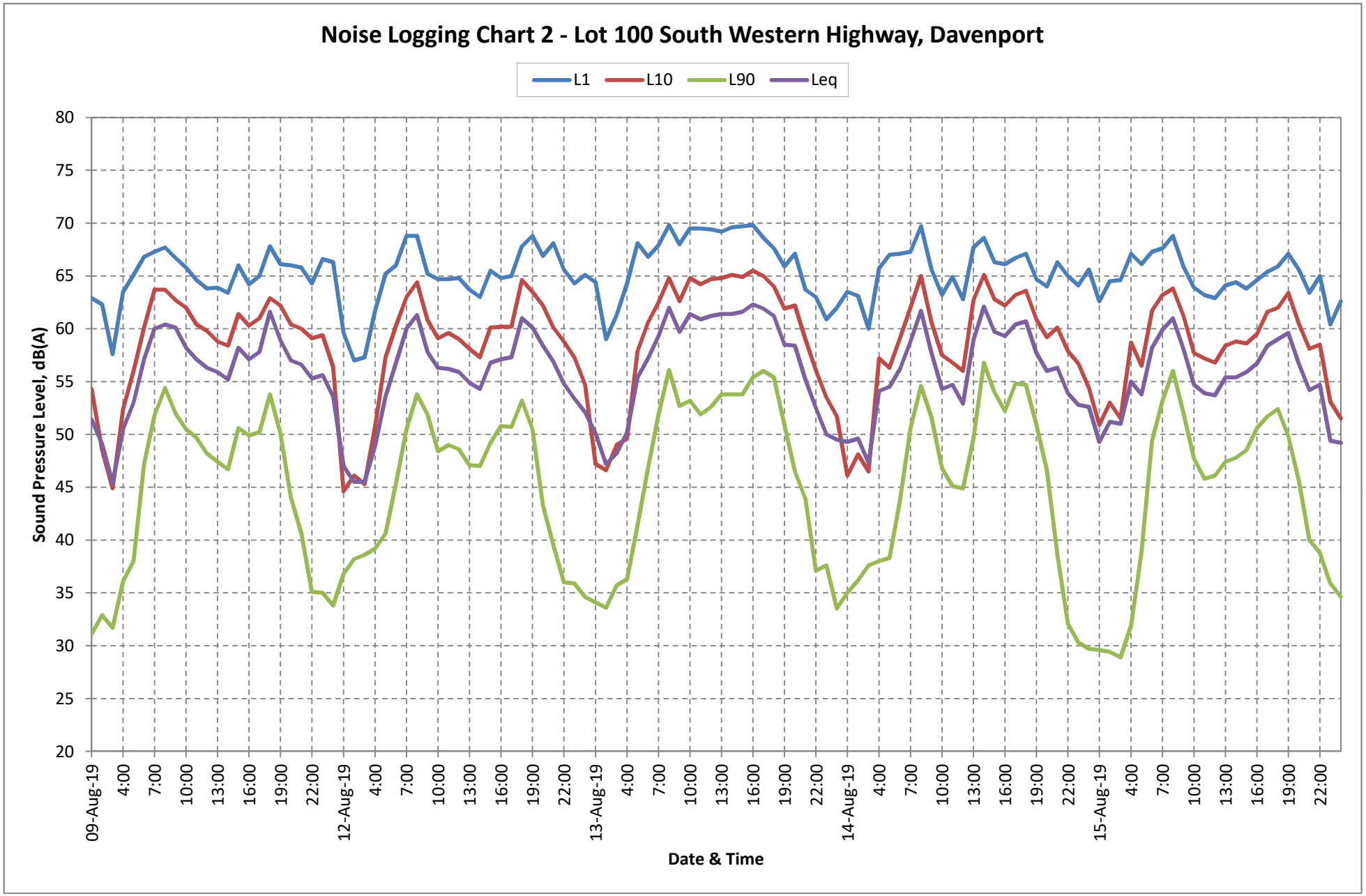
Lot 100 South Western Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
14-Aug-19	1:00	63.5	46.1	49.3	35.0	0.0	60	1.8
14-Aug-19	2:00	63.1	48.1	49.6	36.2	0.0	50	9.4
14-Aug-19	3:00	60.0	46.5	47.3	37.6	2.6	40	9.4
14-Aug-19	4:00	65.7	57.2	54.1	38.0	0.0	50	5.4
14-Aug-19	5:00	67.0	56.3	54.5	38.3	5.8	110	9.4
14-Aug-19	6:00	67.1	59.1	56.2	43.8	2.2	160	7.6
14-Aug-19	7:00	67.3	62.0	58.8	50.6	1.0	90	3.6
14-Aug-19	8:00	69.7	65.0	61.7	54.6	0.2	130	3.6
14-Aug-19	9:00	65.6	60.6	57.7	51.6	0.8	180	5.4
14-Aug-19	10:00	63.2	57.5	54.3	46.8	0.0	90	3.6
14-Aug-19	11:00	64.9	56.8	54.7	45.1	0.0	70	9.4
14-Aug-19	12:00	62.8	56.0	52.9	44.9	0.0	30	7.6
14-Aug-19	13:00	67.7	62.7	58.9	49.6	0.0	350	7.6
14-Aug-19	14:00	68.6	65.1	62.1	56.8	0.6	220	11.2
14-Aug-19	15:00	66.3	62.8	59.7	54.0	5.2	200	16.6
14-Aug-19	16:00	66.1	62.2	59.3	52.2	2.2	180	7.6
14-Aug-19	17:00	66.7	63.2	60.4	54.8	0.0	210	13
14-Aug-19	18:00	67.1	63.6	60.7	54.7	0.0	210	11.2
14-Aug-19	19:00	64.7	60.9	57.7	50.9	0.0	190	16.6
14-Aug-19	20:00	64.0	59.2	56.0	46.6	0.0	200	14.8
14-Aug-19	21:00	66.3	60.1	56.3	38.6	0.0	200	13
14-Aug-19	22:00	65.0	57.9	53.9	32.1	0.0	200	13
14-Aug-19	23:00	64.1	56.7	52.8	30.3	0.0	190	13
14-Aug-19	0:00	65.6	54.4	52.6	29.7	0.0	200	5.4
15-Aug-19	1:00	62.6	50.9	49.3	29.6	0.0	200	1.8
15-Aug-19	2:00	64.5	53.0	51.2	29.4	0.0	190	7.6
15-Aug-19	3:00	64.6	51.5	51.0	28.9	0.0	190	3.6
15-Aug-19	4:00	67.1	58.7	55.0	31.9	0.0	0	0
15-Aug-19	5:00	66.1	56.5	53.8	38.9	0.0	110	1.8
15-Aug-19	6:00	67.3	61.7	58.2	49.4	0.0	90	3.6
15-Aug-19	7:00	67.6	63.2	59.9	53.2	0.0	0	0
15-Aug-19	8:00	68.8	63.8	61.0	56.0	0.0	0	0
15-Aug-19	9:00	65.9	61.2	58.1	52.0	0.2	0	0
15-Aug-19	10:00	63.9	57.7	54.7	47.7	0.0	60	1.8
15-Aug-19	11:00	63.2	57.2	53.9	45.8	0.0	360	7.6
15-Aug-19	12:00	62.9	56.8	53.7	46.1	0.0	330	7.6
15-Aug-19	13:00	64.1	58.4	55.4	47.4	0.0	330	9.4
15-Aug-19	14:00	64.4	58.8	55.4	47.8	0.0	330	13
15-Aug-19	15:00	63.8	58.6	55.9	48.5	0.0	330	14.8
15-Aug-19	16:00	64.6	59.5	56.7	50.6	0.0	340	14.8
15-Aug-19	17:00	65.4	61.6	58.4	51.7	0.0	340	14.8
15-Aug-19	18:00	65.9	62.0	59.0	52.4	0.0	340	11.2
15-Aug-19	19:00	67.1	63.4	59.6	49.8	0.0	350	11.2
15-Aug-19	20:00	65.6	60.5	56.7	45.6	0.0	330	5.4
15-Aug-19	21:00	63.4	58.1	54.2	40.0	0.0	320	5.4
15-Aug-19	22:00	65.0	58.5	54.7	38.8	0.0	300	13
15-Aug-19	23:00	60.4	53.1	49.4	35.9	0.0	320	11.2
15-Aug-19	0:00	62.6	51.5	49.2	34.6	0.0	290	13

Reference: 19075094



Reference: 19075094



Reference: 19075094

Table A3 – Pre-Construction Noise Measurement Summary at Lot 500 (#538) Bussell Highway, Dalyellup

Date	$L_{A10,18hour}$, dB	$L_{Aeq,24hour}$, dB	$L_{Aeq(Day)}$, dB	$L_{Aeq(Night)}$, dB
Friday 02-August-2019	67.3	64.4	65.6	59.9
Monday 05-August-2019	64.7	62.2	63.4	57.4
Tuesday 06-August-2019	64.8	61.6	62.9	56.0
Wednesday 07-August-2019	65.3	62.6	63.5	60.2
Thursday 08-August-2019	64.4	61.7	62.9	58.3
Friday 09-August-2019	65.9	62.7	63.9	58.7
Monday 12-August-2019	67.1	64.1	65.4	58.9
Tuesday 13-August-2019	*63.6*	*61.0*	*61.6*	*59.3*
Wednesday 14-August-2019	65.2	62.5	63.7	57.9
Thursday 15-August-2019	65.0	63.3	64.5	58.9
Weekday Average	**65.5**	**62.8**	**64.0**	**58.5**

Note: Italics indicates data not included in the average.

Traffic Noise Measurement Data

Item	Details
LOCATION	
Project	BORR South Section
Street address	Lot 500 (#538) Bussell Highway
Locality	Dalyellup
Occupier	Robin and Betty Lammie
Dates	01 August to 16 August 2019
Category	*Main Roads to provide this information*
SITE	
Distance from the microphone to the kerb	70m
Height of the road in relation to the ground	Same
Road surface type	Worn Chip Seal
Speed zone	80km/hr
Absorbing ground	70%
Angle of view	140
Road gradient	Slight Incline NB
Traffic flow	28,978
Heavy vehicles	11% Day and 16% Night
House-Road orientation.	East-Southeast
Carriageways & lanes.	2 cwys, 2 lanes NB, 2 lanes SB
COMMENT	
Comment	Microphone located 1-metre from fence. Microphone height 1.4m above ground level. 8-Aug-19 10.00am data missing due to battery change
REFERENCES	
AMG Z50 E/N	*Main Roads to provide this information*
Road name	*Bussell Highway*
EXCEL file	Lot 500 Bussell Highway S1.xls
Raw data file	Borr 538 Bussell Hwy 1st week_Sta.csv & 538 Busso Hwy Week 2_Sta.csv
EQUIPMENT	
Analyser number	16-004-041
Microphone number	16-004-041
Calibrator number	34883971
Calibrator values	94.0 / 94.2
Operator	Lloyd George Acoustics Pty Ltd - Daniel Lloyd
WEATHER	
Wind	Wind analysis based on Bunbury Data 02 Aug 2019 - Variable, light to moderate winds. 05 Aug 2019 - Some Rain. Variable, light to moderate winds. 06 Aug 2019 - Generally positive, moderate to strong winds. 07 Aug 2019 - Generally negative, light to moderate 08 Aug 2019 - Generally negative, light to moderate 09 Aug 2019 - Variable and light winds 12 Aug 2019 - Variable, light to moderate winds. 13 Aug 2019 - Generally negative, light to strong winds. 14 Aug 2019 - Some Rain. Generally positive, light to moderate. 15 Aug 2019 - Winds generally negative, light to moderate speed.

Hourly Noise Level Data

Lot 500 (#538) Bussell Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
02-Aug-19	1:00	68.1	59.9	56.3	33.0	0.0	80	11.2
02-Aug-19	2:00	67.2	59.4	55.7	34.3	0.0	80	7.6
02-Aug-19	3:00	67.7	59.9	56.0	35.8	0.0	80	9.4
02-Aug-19	4:00	68.0	61.8	57.4	36.2	0.0	120	1.8
02-Aug-19	5:00	69.0	64.6	60.5	45.6	0.0	80	5.4
02-Aug-19	6:00	70.8	67.6	64.6	57.3	0.0	50	3.6
02-Aug-19	7:00	72.4	70.3	67.5	62.0	0.0	190	5.4
02-Aug-19	8:00	72.6	70.8	68.3	63.8	0.0	50	5.4
02-Aug-19	9:00	73.1	71.2	68.8	64.8	0.0	50	9.4
02-Aug-19	10:00	71.4	69.2	66.6	62.0	0.0	40	9.4
02-Aug-19	11:00	70.8	68.2	65.6	60.5	0.0	40	11.2
02-Aug-19	12:00	70.8	68.5	65.7	60.5	0.0	50	11.2
02-Aug-19	13:00	71.0	68.1	65.5	60.7	0.0	20	11.2
02-Aug-19	14:00	71.3	67.3	64.3	57.9	0.0	30	7.6
02-Aug-19	15:00	67.6	64.9	62.1	57.2	0.0	340	7.6
02-Aug-19	16:00	68.1	64.6	62.0	56.1	0.0	300	7.6
02-Aug-19	17:00	69.3	66.7	63.9	58.1	0.0	0	0
02-Aug-19	18:00	71.2	68.9	65.9	60.5	0.0	280	3.6
02-Aug-19	19:00	69.8	67.9	65.5	61.7	0.0	0	0
02-Aug-19	20:00	70.9	67.6	64.9	59.9	0.0	0	0
02-Aug-19	21:00	69.3	65.7	62.8	56.8	0.0	70	3.6
02-Aug-19	22:00	68.3	65.2	62.2	55.5	0.0	0	0
02-Aug-19	23:00	68.1	64.3	60.9	51.4	0.0	0	0
02-Aug-19	0:00	68.2	62.6	58.9	44.5	0.0	0	0
05-Aug-19	1:00	61.9	51.1	49.5	28.1	0.8	290	16.6
05-Aug-19	2:00	67.2	57.0	54.1	28.5	0.0	230	3.6
05-Aug-19	3:00	67.0	59.2	55.5	27.4	0.0	340	1.8
05-Aug-19	4:00	66.9	61.0	56.6	29.6	0.0	10	3.6
05-Aug-19	5:00	68.7	64.7	60.9	48.3	0.0	40	1.8
05-Aug-19	6:00	67.7	64.7	61.4	52.3	0.0	290	13
05-Aug-19	7:00	68.1	65.2	61.9	54.9	0.0	290	13
05-Aug-19	8:00	72.0	70.0	67.3	60.7	1.4	240	11.2
05-Aug-19	9:00	72.2	69.5	66.9	62.1	0.2	0	0
05-Aug-19	10:00	70.3	67.5	64.9	59.3	0.0	0	0
05-Aug-19	11:00	70.0	67.0	64.2	57.8	0.0	100	5.4
05-Aug-19	12:00	68.1	65.5	62.5	56.8	0.0	160	9.4
05-Aug-19	13:00	71.2	67.6	64.8	58.9	0.0	170	11.2
05-Aug-19	14:00	69.6	66.3	63.3	57.1	1.0	90	3.6
05-Aug-19	15:00	68.2	64.5	61.6	55.7	0.0	80	1.8
05-Aug-19	16:00	69.0	65.9	62.9	57.1	0.0	20	1.8
05-Aug-19	17:00	68.6	65.9	62.7	57.3	0.0	320	7.6
05-Aug-19	18:00	68.8	66.3	63.4	57.8	0.0	330	9.4
05-Aug-19	19:00	66.4	63.8	60.9	54.3	0.0	200	5.4
05-Aug-19	20:00	66.5	62.8	59.4	51.1	0.2	150	9.4
05-Aug-19	21:00	66.6	61.3	58.1	48.9	0.0	130	11.2
05-Aug-19	22:00	63.7	59.1	55.5	43.0	0.0	130	9.4
05-Aug-19	23:00	66.5	59.1	55.3	38.1	0.0	130	14.8
05-Aug-19	0:00	67.3	58.0	55.2	33.1	0.0	120	14.8

Reference: 19075094

Hourly Noise Level Data

Lot 500 (#538) Bussell Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
06-Aug-19	1:00	62.0	53.6	50.2	30.4	0.0	120	11.2
06-Aug-19	2:00	63.7	55.2	51.6	32.1	0.0	140	9.4
06-Aug-19	3:00	65.1	56.5	52.8	32.0	0.0	140	14.8
06-Aug-19	4:00	65.5	58.3	54.1	35.4	0.0	130	16.6
06-Aug-19	5:00	65.7	60.5	56.3	39.1	0.0	150	13
06-Aug-19	6:00	69.0	64.6	61.4	52.6	0.0	150	13
06-Aug-19	7:00	68.4	65.7	62.7	56.3	0.0	150	9.4
06-Aug-19	8:00	70.1	67.5	64.8	59.2	0.0	140	13
06-Aug-19	9:00	70.6	68.2	65.9	61.8	0.0	150	13
06-Aug-19	10:00	69.8	66.9	64.0	58.1	0.0	140	13
06-Aug-19	11:00	69.4	65.6	62.7	57.0	0.0	130	14.8
06-Aug-19	12:00	68.3	65.3	62.5	56.7	0.0	160	14.8
06-Aug-19	13:00	67.5	63.9	61.2	55.0	0.0	150	13
06-Aug-19	14:00	68.8	63.5	60.9	55.0	0.0	170	14.8
06-Aug-19	15:00	67.3	63.5	60.8	55.4	0.0	210	16.6
06-Aug-19	16:00	68.3	64.6	61.9	56.7	0.0	240	16.6
06-Aug-19	17:00	67.4	65.2	62.4	57.5	0.0	220	20.5
06-Aug-19	18:00	69.1	66.8	63.8	58.7	0.0	210	18.4
06-Aug-19	19:00	69.3	66.8	64.2	59.2	0.0	190	5.4
06-Aug-19	20:00	69.6	65.9	62.9	56.3	0.0	0	0
06-Aug-19	21:00	69.5	65.6	62.3	54.7	0.0	0	0
06-Aug-19	22:00	67.5	63.3	59.6	49.5	0.0	50	1.8
06-Aug-19	23:00	66.6	59.4	56.0	41.1	0.0	160	5.4
06-Aug-19	0:00	65.5	58.0	54.2	34.0	0.4	0	0
07-Aug-19	1:00	67.6	55.9	53.9	29.0	0.0	190	3.6
07-Aug-19	2:00	65.5	57.4	54.0	27.1	0.0	180	5.4
07-Aug-19	3:00	67.5	60.1	55.9	33.3	0.0	200	3.6
07-Aug-19	4:00	68.5	61.9	57.4	37.1	0.0	0	0
07-Aug-19	5:00	70.5	65.9	61.7	46.1	0.0	0	0
07-Aug-19	6:00	71.9	69.3	66.1	58.3	0.0	0	0
07-Aug-19	7:00	72.2	69.9	67.2	61.9	0.0	0	0
07-Aug-19	8:00	71.4	69.7	67.3	63.3	0.0	0	0
07-Aug-19	9:00	70.4	68.0	65.5	60.4	0.2	0	0
07-Aug-19	10:00	69.3	66.0	62.9	56.9	0.0	0	0
07-Aug-19	11:00	68.8	64.1	61.2	54.5	0.0	190	3.6
07-Aug-19	12:00	67.4	63.6	61.7	55.8	0.0	190	14.8
07-Aug-19	13:00	68.2	63.8	61.0	54.5	0.0	200	16.6
07-Aug-19	14:00	67.1	63.1	60.4	54.5	0.0	240	13
07-Aug-19	15:00	67.7	64.1	61.1	55.2	0.0	230	16.6
07-Aug-19	16:00	68.4	65.9	63.1	58.1	0.0	230	16.6
07-Aug-19	17:00	68.6	66.2	63.2	58.1	0.0	190	18.4
07-Aug-19	18:00	69.2	66.8	63.6	57.9	0.0	210	16.6
07-Aug-19	19:00	68.6	66.3	63.7	58.4	0.0	210	13
07-Aug-19	20:00	69.9	66.1	62.9	55.9	0.0	0	0
07-Aug-19	21:00	69.2	65.6	62.5	56.1	0.0	190	1.8
07-Aug-19	22:00	66.0	62.6	58.9	49.8	0.0	0	0
07-Aug-19	23:00	69.2	63.0	59.2	45.5	0.0	0	0
07-Aug-19	0:00	68.6	60.2	56.9	39.8	0.0	0	0

Reference: 19075094

Hourly Noise Level Data

Lot 500 (#538) Bussell Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
08-Aug-19	1:00	66.7	56.0	53.5	30.7	0.0	0	0
08-Aug-19	2:00	65.6	56.7	53.6	31.9	0.0	0	0
08-Aug-19	3:00	66.1	57.8	54.2	33.5	0.0	10	1.8
08-Aug-19	4:00	66.9	60.3	56.3	39.2	0.0	0	0
08-Aug-19	5:00	66.6	61.4	57.3	41.6	0.0	0	0
08-Aug-19	6:00	70.0	66.5	63.1	55.0	0.0	150	5.4
08-Aug-19	7:00	70.5	67.8	65.1	59.0	0.0	0	0
08-Aug-19	8:00	73.3	70.9	68.2	63.1	0.0	70	1.8
08-Aug-19	9:00	71.1	68.5	65.9	61.5	0.0	0	0
08-Aug-19	10:00					0.0	0	0
08-Aug-19	11:00	67.0	63.0	60.1	53.7	0.0	240	9.4
08-Aug-19	12:00	67.0	62.1	59.2	52.5	0.0	270	5.4
08-Aug-19	13:00	66.7	62.0	59.1	52.4	0.0	250	13
08-Aug-19	14:00	66.7	62.0	59.2	52.3	0.0	260	13
08-Aug-19	15:00	68.3	63.4	60.6	54.3	0.0	240	13
08-Aug-19	16:00	68.1	63.8	61.3	55.6	0.0	230	13
08-Aug-19	17:00	68.5	65.9	63.1	57.8	0.0	240	14.8
08-Aug-19	18:00	69.3	66.9	64.0	58.3	0.0	220	13
08-Aug-19	19:00	68.1	65.3	62.4	56.9	0.0	200	7.6
08-Aug-19	20:00	67.9	64.5	61.4	54.7	0.0	190	5.4
08-Aug-19	21:00	65.5	62.2	59.1	51.6	0.0	190	9.4
08-Aug-19	22:00	66.7	61.8	58.5	49.3	0.0	200	7.6
08-Aug-19	23:00	70.1	63.8	60.5	47.2	0.0	160	3.6
08-Aug-19	0:00	68.2	61.0	57.4	41.1	0.0	190	3.6
09-Aug-19	1:00	68.7	61.2	57.2	28.3	0.0	0	0
09-Aug-19	2:00	67.4	58.8	55.4	29.5	0.0	130	3.6
09-Aug-19	3:00	65.9	57.0	53.5	29.9	0.0	0	0
09-Aug-19	4:00	66.5	58.0	55.6	34.7	0.0	0	0
09-Aug-19	5:00	66.7	61.6	57.4	38.8	0.0	0	0
09-Aug-19	6:00	70.3	67.3	64.0	54.7	0.0	80	1.8
09-Aug-19	7:00	71.3	69.2	66.6	61.9	0.0	0	0
09-Aug-19	8:00	71.6	69.3	66.7	62.4	0.0	110	3.6
09-Aug-19	9:00	71.5	68.7	66.0	60.7	0.0	0	0
09-Aug-19	10:00	68.6	65.5	62.7	56.8	0.0	130	5.4
09-Aug-19	11:00	67.8	64.7	61.8	56.0	0.0	190	3.6
09-Aug-19	12:00	69.0	65.8	63.0	57.4	0.0	110	9.4
09-Aug-19	13:00	70.1	66.5	63.8	57.6	0.0	130	7.6
09-Aug-19	14:00	68.3	65.8	62.7	56.5	0.0	190	5.4
09-Aug-19	15:00	67.4	64.7	61.6	55.2	0.0	330	9.4
09-Aug-19	16:00	67.6	64.4	61.4	55.9	0.0	270	7.6
09-Aug-19	17:00	67.7	65.0	61.8	55.6	0.0	280	5.4
09-Aug-19	18:00	71.1	68.3	65.2	59.0	0.0	250	3.6
09-Aug-19	19:00	70.0	67.6	65.1	60.5	0.0	240	3.6
09-Aug-19	20:00	69.0	65.7	63.2	58.2	0.0	0	0
09-Aug-19	21:00	68.2	65.6	62.5	56.1	0.0	200	1.8
09-Aug-19	22:00	68.7	64.7	61.4	54.1	0.0	0	0
09-Aug-19	23:00	67.6	62.6	59.0	49.3	0.0	210	3.6
09-Aug-19	0:00	66.7	61.5	57.5	39.9	0.0	190	3.6

Reference: 19075094

Hourly Noise Level Data

Lot 500 (#538) Bussell Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
12-Aug-19	1:00	66.4	57.6	54.0	32.1	0.0	80	11.2
12-Aug-19	2:00	66.5	58.1	54.1	32.3	0.0	70	13
12-Aug-19	3:00	66.6	58.1	54.5	33.8	0.0	80	11.2
12-Aug-19	4:00	68.0	60.9	56.8	36.6	0.0	80	11.2
12-Aug-19	5:00	67.5	64.0	60.0	46.0	0.0	80	7.6
12-Aug-19	6:00	70.8	67.2	64.2	56.2	0.0	70	7.6
12-Aug-19	7:00	71.7	69.2	66.4	60.9	0.0	70	5.4
12-Aug-19	8:00	72.1	70.7	68.4	64.0	0.0	70	3.6
12-Aug-19	9:00	71.9	70.2	68.0	64.3	0.0	70	5.4
12-Aug-19	10:00	70.9	68.5	65.8	60.3	0.0	60	11.2
12-Aug-19	11:00	70.9	68.5	65.7	59.8	0.0	30	14.8
12-Aug-19	12:00	70.1	67.6	64.9	59.8	0.0	10	16.6
12-Aug-19	13:00	69.5	67.0	64.4	59.6	0.0	10	16.6
12-Aug-19	14:00	69.3	66.5	63.8	58.5	0.0	10	16.6
12-Aug-19	15:00	69.7	67.2	64.8	60.3	0.0	360	18.4
12-Aug-19	16:00	71.0	68.9	66.0	61.0	0.0	10	16.6
12-Aug-19	17:00	70.1	67.8	65.2	60.1	0.0	320	13
12-Aug-19	18:00	71.1	68.6	65.6	60.7	0.0	350	5.4
12-Aug-19	19:00	70.1	67.0	64.4	58.3	0.0	10	3.6
12-Aug-19	20:00	71.0	67.2	64.5	57.4	0.0	0	0
12-Aug-19	21:00	69.8	65.2	61.8	53.7	0.0	0	0
12-Aug-19	22:00	67.7	63.4	60.3	49.9	0.0	90	3.6
12-Aug-19	23:00	69.3	62.9	58.8	40.4	0.0	90	3.6
12-Aug-19	0:00	68.8	61.2	57.4	35.7	0.0	90	1.8
13-Aug-19	1:00	70.3	58.4	56.5	29.1	0.0	0	0
13-Aug-19	2:00	69.3	60.4	56.8	28.2	0.0	70	3.6
13-Aug-19	3:00	67.9	61.0	56.7	31.0	0.0	50	5.4
13-Aug-19	4:00	66.3	61.0	56.4	32.4	0.0	30	11.2
13-Aug-19	5:00	67.5	63.7	59.5	44.0	0.2	30	5.4
13-Aug-19	6:00	71.3	68.3	65.1	57.7	0.0	30	3.6
13-Aug-19	7:00	70.2	67.7	64.7	58.4	2.2	80	5.4
13-Aug-19	8:00	70.7	68.6	65.4	59.0	0.0	270	14.8
13-Aug-19	9:00	70.1	67.8	64.7	58.7	0.0	280	5.4
13-Aug-19	10:00	67.3	63.8	60.7	54.5	0.0	280	13
13-Aug-19	11:00	66.2	62.3	59.5	52.6	0.0	260	14.8
13-Aug-19	12:00	66.3	61.9	59.0	52.7	0.0	270	16.6
13-Aug-19	13:00	65.8	62.1	59.3	53.8	0.0	270	16.6
13-Aug-19	14:00	67.2	62.2	59.6	53.7	0.0	260	20.5
13-Aug-19	15:00	66.1	62.6	59.8	54.2	0.0	260	18.4
13-Aug-19	16:00	66.5	63.6	60.7	55.0	0.0	250	20.5
13-Aug-19	17:00	67.6	64.2	61.2	55.2	0.0	260	16.6
13-Aug-19	18:00	67.5	65.0	62.0	56.6	0.0	260	16.6
13-Aug-19	19:00	65.8	63.3	60.6	55.2	0.0	250	11.2
13-Aug-19	20:00	67.2	63.6	60.6	54.1	0.0	250	7.6
13-Aug-19	21:00	67.9	63.3	60.3	52.6	0.0	240	3.6
13-Aug-19	22:00	67.8	62.7	59.8	52.2	0.0	0	0
13-Aug-19	23:00	66.7	60.5	57.0	45.7	0.0	110	1.8
13-Aug-19	0:00	67.2	59.3	55.7	34.5	0.0	100	3.6

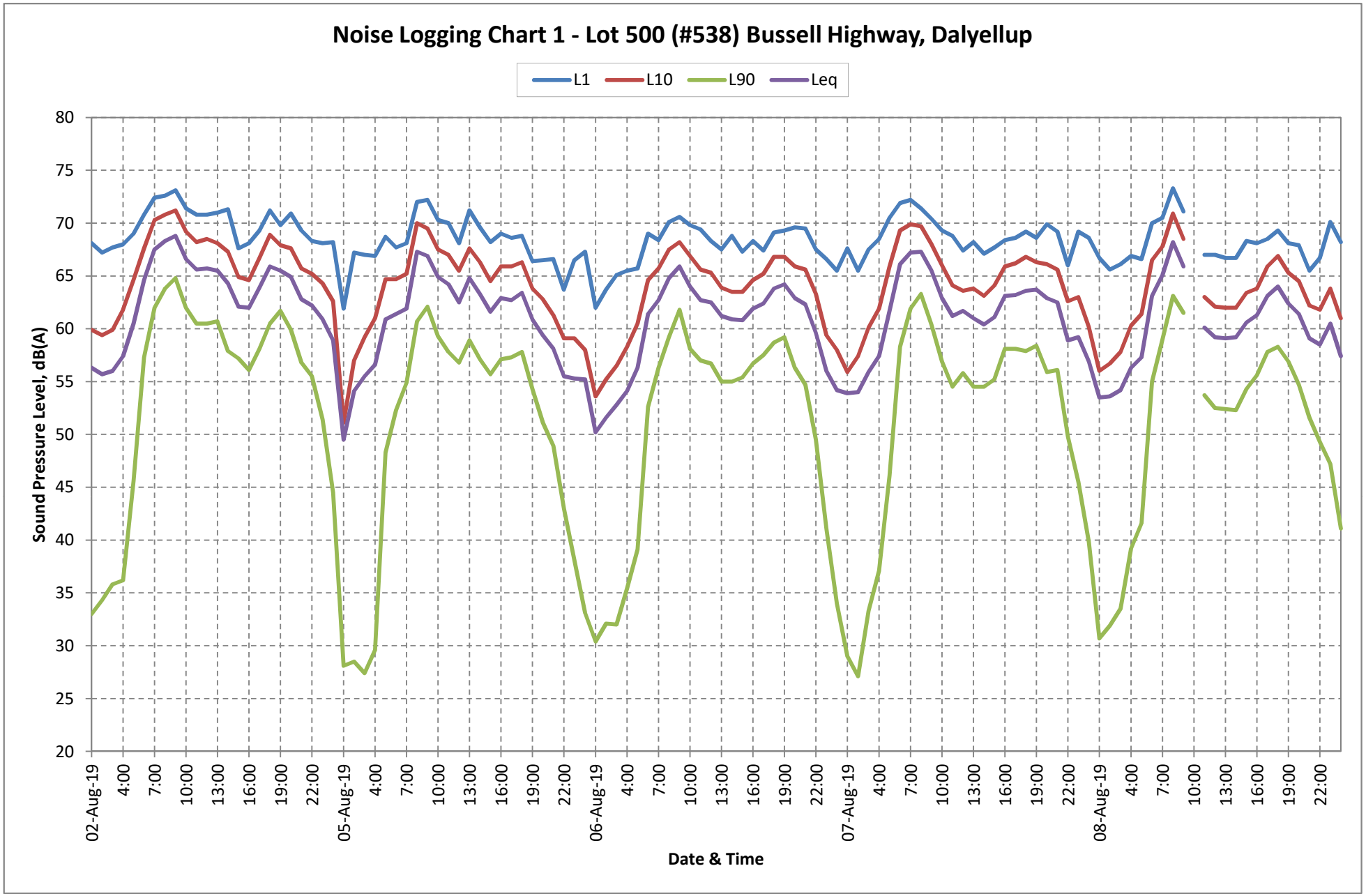
Reference: 19075094

Hourly Noise Level Data

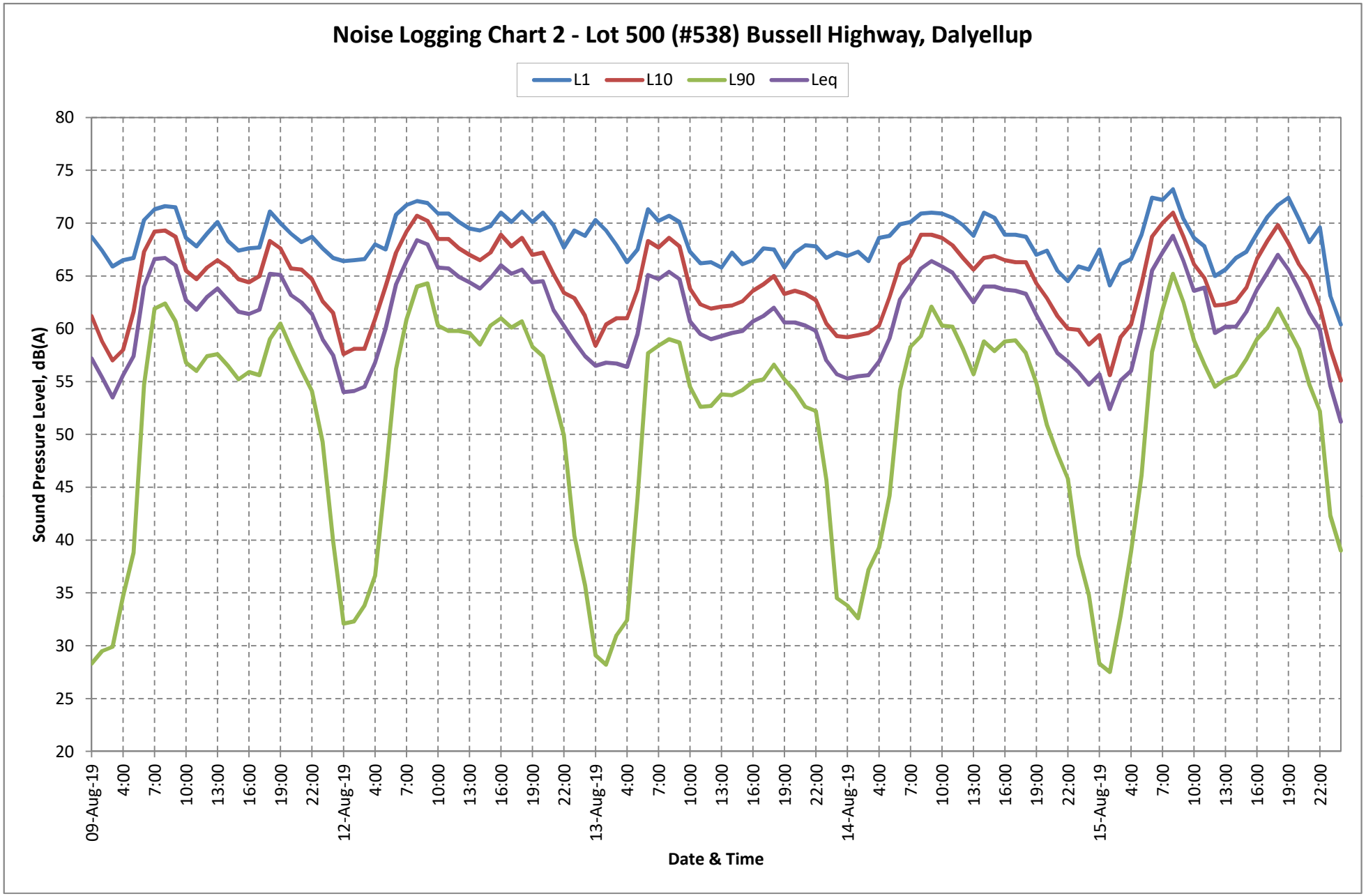
Lot 500 (#538) Bussell Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
14-Aug-19	1:00	66.9	59.2	55.3	33.8	0.0	60	1.8
14-Aug-19	2:00	67.3	59.4	55.5	32.6	0.0	50	9.4
14-Aug-19	3:00	66.4	59.6	55.6	37.2	2.6	40	9.4
14-Aug-19	4:00	68.6	60.3	56.9	39.3	0.0	50	5.4
14-Aug-19	5:00	68.8	63.0	59.1	44.2	5.8	110	9.4
14-Aug-19	6:00	69.9	66.1	62.8	54.2	2.2	160	7.6
14-Aug-19	7:00	70.1	66.9	64.2	58.3	1.0	90	3.6
14-Aug-19	8:00	70.9	68.9	65.7	59.3	0.2	130	3.6
14-Aug-19	9:00	71.0	68.9	66.4	62.1	0.8	180	5.4
14-Aug-19	10:00	70.9	68.6	65.9	60.3	0.0	90	3.6
14-Aug-19	11:00	70.5	67.9	65.3	60.2	0.0	70	9.4
14-Aug-19	12:00	69.8	66.7	63.9	58.1	0.0	30	7.6
14-Aug-19	13:00	68.8	65.6	62.5	55.7	0.0	350	7.6
14-Aug-19	14:00	71.0	66.7	64.0	58.8	0.6	220	11.2
14-Aug-19	15:00	70.5	66.9	64.0	57.9	5.2	200	16.6
14-Aug-19	16:00	68.9	66.5	63.7	58.8	2.2	180	7.6
14-Aug-19	17:00	68.9	66.3	63.6	58.9	0.0	210	13
14-Aug-19	18:00	68.7	66.3	63.3	57.7	0.0	210	11.2
14-Aug-19	19:00	67.0	64.3	61.3	54.9	0.0	190	16.6
14-Aug-19	20:00	67.4	62.9	59.5	50.9	0.0	200	14.8
14-Aug-19	21:00	65.5	61.2	57.7	48.2	0.0	200	13
14-Aug-19	22:00	64.5	60.0	56.9	45.8	0.0	200	13
14-Aug-19	23:00	65.9	59.9	55.9	38.6	0.0	190	13
14-Aug-19	0:00	65.6	58.5	54.7	34.8	0.0	200	5.4
15-Aug-19	1:00	67.5	59.4	55.7	28.3	0.0	200	1.8
15-Aug-19	2:00	64.1	55.6	52.4	27.5	0.0	190	7.6
15-Aug-19	3:00	66.1	59.2	55.1	32.8	0.0	190	3.6
15-Aug-19	4:00	66.6	60.4	56.0	38.9	0.0	0	0
15-Aug-19	5:00	68.9	64.2	60.0	46.1	0.0	110	1.8
15-Aug-19	6:00	72.4	68.7	65.5	57.8	0.0	90	3.6
15-Aug-19	7:00	72.2	70.0	67.2	61.8	0.0	0	0
15-Aug-19	8:00	73.2	71.0	68.8	65.2	0.0	0	0
15-Aug-19	9:00	70.4	68.7	66.4	62.5	0.2	0	0
15-Aug-19	10:00	68.6	66.1	63.6	58.9	0.0	60	1.8
15-Aug-19	11:00	67.8	64.8	63.9	56.6	0.0	360	7.6
15-Aug-19	12:00	65.0	62.2	59.6	54.5	0.0	330	7.6
15-Aug-19	13:00	65.6	62.3	60.2	55.2	0.0	330	9.4
15-Aug-19	14:00	66.7	62.6	60.2	55.6	0.0	330	13
15-Aug-19	15:00	67.3	63.9	61.6	57.1	0.0	330	14.8
15-Aug-19	16:00	69.0	66.6	63.7	59.0	0.0	340	14.8
15-Aug-19	17:00	70.6	68.3	65.3	60.1	0.0	340	14.8
15-Aug-19	18:00	71.7	69.8	67.0	61.9	0.0	340	11.2
15-Aug-19	19:00	72.4	68.1	65.6	60.0	0.0	350	11.2
15-Aug-19	20:00	70.4	66.1	63.7	58.1	0.0	330	5.4
15-Aug-19	21:00	68.2	64.7	61.5	54.7	0.0	320	5.4
15-Aug-19	22:00	69.6	62.1	59.9	52.2	0.0	300	13
15-Aug-19	23:00	63.1	58.1	54.6	42.3	0.0	320	11.2
15-Aug-19	0:00	60.4	55.1	51.2	39.0	0.0	290	13

Reference: 19075094



Reference: 19075094



Reference: 19075094

Table A4 – Pre-Construction Noise Measurement Summary at Lot 47 (#1213) Bussell Highway, Stratham

Date	$L_{A10,18hour}$, dB	$L_{Aeq,24hour}$, dB	$L_{Aeq(Day)}$, dB	$L_{Aeq(Night)}$, dB
Friday 02-August-2019	63.2	60.0	61.2	55.7
Monday 05-August-2019	61.4	58.6	59.9	53.5
Tuesday 06-August-2019	61.6	58.5	59.8	53.0
Wednesday 07-August-2019	62.0	59.3	60.5	55.3
Thursday 08-August-2019	62.0	58.9	60.3	53.6
Friday 09-August-2019	62.5	59.3	60.6	53.8
Monday 12-August-2019	62.0	59.0	60.4	53.1
Tuesday 13-August-2019	62.1	59.3	60.6	54.0
Wednesday 14-August-2019	62.4	59.5	60.9	54.1
Thursday 15-August-2019	62.4	59.5	60.9	53.9
Weekday Average	**62.2**	**59.2**	**60.5**	**54.0**

Traffic Noise Measurement Data

Item	Details
LOCATION	
Project	BORR South Section
Street address	Lot 47 (#1213) Bussell Highway
Locality	Stratham
Occupier	Jason & Sian Tiltman
Dates	01 August to 16 August 2019
Category	*Main Roads to provide this information*
SITE	
Distance from the microphone to the kerb	45m
Height of the road in relation to the ground	+2m
Road surface type	Worn Chip Seal
Speed zone	110km/hr
Absorbing ground	80%
Angle of view	140
Road gradient	Slight Decline SB
Traffic flow	16,155
Heavy vehicles	11% Day and 18% Night
House-Road orientation.	West-Northwest
Carriageways & lanes.	2 cwys, 2 lanes NB, 2 lanes SB
COMMENT	
Comment	Microphone located 1-metre in free-field Microphone height 1.4m above ground level. 8-Aug-19 11.00am data missing due to battery change
REFERENCES	
AMG Z50 E/N	*Main Roads to provide this information*
Road name	*Bussell Highway*
EXCEL file	Lot 47 Bussell Highway S1.xls
Raw data file	Lot 47 Week 1_Sta.csv & Lot 47 Wk 2_Sta.csv
EQUIPMENT	
Analyser number	87803e
Microphone number	87803e
Calibrator number	34883971
Calibrator values	94.0 / 93.9
Operator	Lloyd George Acoustics Pty Ltd - Daniel Lloyd
WEATHER	
Wind	Wind analysis based on Bunbury Data 02 Aug 2019 - Variable, light to moderate winds. 05 Aug 2019 - Some Rain. Variable, light to moderate winds. 06 Aug 2019 - Generally negative, moderate to strong winds. 07 Aug 2019 - Variable, light to moderate winds 08 Aug 2019 - Generally positive, light to moderate 09 Aug 2019 - Variable and light winds 12 Aug 2019 - Variable, light to moderate winds. 13 Aug 2019 - Generally positive, light to strong winds. 14 Aug 2019 - Some Rain. Negative, light to moderate. 15 Aug 2019 - Winds generally positive, light to moderate winds.

Hourly Noise Level Data

Lot 47 (#1213) Bussell Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
02-Aug-19	1:00	64.0	52.5	51.9	28.3	0.0	80	11.2
02-Aug-19	2:00	66.1	55.7	53.3	28.6	0.0	80	7.6
02-Aug-19	3:00	66.6	58.9	54.6	30.1	0.0	80	9.4
02-Aug-19	4:00	66.6	55.8	53.8	31.3	0.0	120	1.8
02-Aug-19	5:00	67.8	59.6	56.0	34.4	0.0	80	5.4
02-Aug-19	6:00	67.2	61.9	58.9	49.3	0.0	50	3.6
02-Aug-19	7:00	69.6	65.2	62.5	56.6	0.0	190	5.4
02-Aug-19	8:00	71.0	66.7	64.3	59.1	0.0	50	5.4
02-Aug-19	9:00	68.0	63.9	61.4	56.0	0.0	50	9.4
02-Aug-19	10:00	67.6	62.6	60.1	54.6	0.0	40	9.4
02-Aug-19	11:00	67.9	62.5	60.1	54.3	0.0	40	11.2
02-Aug-19	12:00	68.1	62.6	60.0	53.2	0.0	50	11.2
02-Aug-19	13:00	67.8	62.9	60.4	53.9	0.0	20	11.2
02-Aug-19	14:00	67.2	63.1	60.6	54.4	0.0	30	7.6
02-Aug-19	15:00	66.4	63.3	60.7	54.4	0.0	340	7.6
02-Aug-19	16:00	67.4	63.7	61.3	56.2	0.0	300	7.6
02-Aug-19	17:00	66.6	64.0	61.5	56.1	0.0	0	0
02-Aug-19	18:00	68.0	64.8	62.8	57.5	0.0	280	3.6
02-Aug-19	19:00	65.9	63.6	61.3	56.4	0.0	0	0
02-Aug-19	20:00	67.7	64.0	61.2	53.9	0.0	0	0
02-Aug-19	21:00	66.5	63.1	59.6	48.6	0.0	70	3.6
02-Aug-19	22:00	65.4	61.7	57.7	43.7	0.0	0	0
02-Aug-19	23:00	68.1	61.3	57.4	38.1	0.0	0	0
02-Aug-19	0:00	66.6	59.4	55.7	32.4	0.0	0	0
05-Aug-19	1:00	61.8	47.6	48.6	29.2	0.8	290	16.6
05-Aug-19	2:00	63.0	51.3	50.8	29.7	0.0	230	3.6
05-Aug-19	3:00	66.0	52.8	52.0	28.2	0.0	340	1.8
05-Aug-19	4:00	64.8	55.1	52.7	30.0	0.0	10	3.6
05-Aug-19	5:00	65.8	58.5	55.0	32.8	0.0	40	1.8
05-Aug-19	6:00	67.1	61.2	58.1	45.8	0.0	290	13
05-Aug-19	7:00	68.6	63.7	60.8	53.0	0.0	290	13
05-Aug-19	8:00	70.3	65.4	63.0	57.4	1.4	240	11.2
05-Aug-19	9:00	68.3	64.6	61.8	55.9	0.2	0	0
05-Aug-19	10:00	67.7	63.2	60.1	51.7	0.0	0	0
05-Aug-19	11:00	67.1	62.8	60.0	52.7	0.0	100	5.4
05-Aug-19	12:00	68.1	62.9	60.3	53.6	0.0	160	9.4
05-Aug-19	13:00	69.0	63.7	60.8	52.9	0.0	170	11.2
05-Aug-19	14:00	67.1	62.6	59.5	50.6	1.0	90	3.6
05-Aug-19	15:00	67.1	62.6	59.7	51.9	0.0	80	1.8
05-Aug-19	16:00	66.5	63.1	60.3	53.3	0.0	20	1.8
05-Aug-19	17:00	66.4	63.4	60.8	54.5	0.0	320	7.6
05-Aug-19	18:00	66.8	63.4	60.8	53.9	0.0	330	9.4
05-Aug-19	19:00	64.4	61.1	57.5	47.3	0.0	200	5.4
05-Aug-19	20:00	68.5	59.6	56.4	41.5	0.2	150	9.4
05-Aug-19	21:00	64.1	58.9	54.7	38.3	0.0	130	11.2
05-Aug-19	22:00	63.0	56.5	52.6	33.1	0.0	130	9.4
05-Aug-19	23:00	63.1	54.2	52.0	29.0	0.0	130	14.8
05-Aug-19	0:00	63.3	52.7	50.8	26.2	0.0	120	14.8

Reference: 19075094

Hourly Noise Level Data

Lot 47 (#1213) Bussell Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
06-Aug-19	1:00	59.7	43.1	47.2	25.0	0.0	120	11.2
06-Aug-19	2:00	62.1	46.5	49.0	28.3	0.0	140	9.4
06-Aug-19	3:00	62.8	50.9	49.8	29.9	0.0	140	14.8
06-Aug-19	4:00	64.4	54.4	52.2	29.2	0.0	130	16.6
06-Aug-19	5:00	65.6	55.6	53.2	31.1	0.0	150	13
06-Aug-19	6:00	66.2	60.5	57.1	45.6	0.0	150	13
06-Aug-19	7:00	68.4	63.1	60.1	51.9	0.0	150	9.4
06-Aug-19	8:00	67.9	63.5	60.9	54.4	0.0	140	13
06-Aug-19	9:00	68.2	63.6	61.1	55.1	0.0	150	13
06-Aug-19	10:00	68.7	63.0	60.4	53.2	0.0	140	13
06-Aug-19	11:00	67.5	62.6	60.0	53.6	0.0	130	14.8
06-Aug-19	12:00	67.5	62.2	59.6	52.7	0.0	160	14.8
06-Aug-19	13:00	66.7	62.0	59.5	53.6	0.0	150	13
06-Aug-19	14:00	67.2	62.7	60.2	54.3	0.0	170	14.8
06-Aug-19	15:00	67.5	62.4	60.0	54.1	0.0	210	16.6
06-Aug-19	16:00	65.9	63.2	60.7	55.5	0.0	240	16.6
06-Aug-19	17:00	65.7	63.6	61.3	56.6	0.0	220	20.5
06-Aug-19	18:00	67.3	63.7	61.2	56.3	0.0	210	18.4
06-Aug-19	19:00	64.5	61.8	58.6	50.8	0.0	190	5.4
06-Aug-19	20:00	67.1	60.9	57.9	49.3	0.0	0	0
06-Aug-19	21:00	64.7	59.8	56.2	45.8	0.0	0	0
06-Aug-19	22:00	65.5	58.9	55.1	41.3	0.0	50	1.8
06-Aug-19	23:00	64.0	56.0	53.0	31.8	0.0	160	5.4
06-Aug-19	0:00	67.8	56.3	54.4	28.4	0.4	0	0
07-Aug-19	1:00	64.5	52.4	51.4	25.1	0.0	190	3.6
07-Aug-19	2:00	65.2	51.5	51.6	25.3	0.0	180	5.4
07-Aug-19	3:00	64.3	55.7	52.9	27.2	0.0	200	3.6
07-Aug-19	4:00	66.6	56.6	54.2	29.4	0.0	0	0
07-Aug-19	5:00	66.6	59.1	56.1	39.8	0.0	0	0
07-Aug-19	6:00	68.8	63.4	60.4	52.0	0.0	0	0
07-Aug-19	7:00	68.8	64.7	62.1	56.8	0.0	0	0
07-Aug-19	8:00	69.3	65.4	63.3	58.7	0.0	0	0
07-Aug-19	9:00	68.8	64.4	62.0	56.4	0.2	0	0
07-Aug-19	10:00	68.8	63.1	60.6	53.5	0.0	0	0
07-Aug-19	11:00	68.5	63.2	60.8	53.7	0.0	190	3.6
07-Aug-19	12:00	68.3	62.4	60.1	53.8	0.0	190	14.8
07-Aug-19	13:00	67.3	62.9	60.4	55.1	0.0	200	16.6
07-Aug-19	14:00	66.3	62.1	59.5	53.7	0.0	240	13
07-Aug-19	15:00	65.9	62.5	59.9	54.0	0.0	230	16.6
07-Aug-19	16:00	66.8	63.3	61.0	55.9	0.0	230	16.6
07-Aug-19	17:00	65.8	63.5	61.2	56.7	0.0	190	18.4
07-Aug-19	18:00	66.6	63.5	61.1	56.0	0.0	210	16.6
07-Aug-19	19:00	65.7	62.6	59.9	52.4	0.0	210	13
07-Aug-19	20:00	65.5	61.3	57.8	46.1	0.0	0	0
07-Aug-19	21:00	66.9	59.8	56.6	44.9	0.0	190	1.8
07-Aug-19	22:00	64.3	58.2	54.6	40.6	0.0	0	0
07-Aug-19	23:00	65.0	57.2	54.1	34.4	0.0	0	0
07-Aug-19	0:00	65.0	55.2	53.1	27.0	0.0	0	0

Reference: 19075094

Hourly Noise Level Data

Lot 47 (#1213) Bussell Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
08-Aug-19	1:00	62.1	46.7	48.4	24.2	0.0	0	0
08-Aug-19	2:00	65.8	51.8	51.9	27.9	0.0	0	0
08-Aug-19	3:00	63.8	52.1	51.0	30.1	0.0	10	1.8
08-Aug-19	4:00	65.1	55.0	52.7	33.4	0.0	0	0
08-Aug-19	5:00	65.6	54.9	52.9	34.9	0.0	0	0
08-Aug-19	6:00	67.0	60.9	57.8	47.1	0.0	150	5.4
08-Aug-19	7:00	69.2	63.3	60.7	53.2	0.0	0	0
08-Aug-19	8:00	68.6	65.1	62.6	57.5	0.0	70	1.8
08-Aug-19	9:00	69.0	64.6	62.2	57.0	0.0	0	0
08-Aug-19	10:00	68.9	62.7	60.3	53.1	0.0	0	0
08-Aug-19	11:00					0.0	240	9.4
08-Aug-19	12:00	67.6	62.4	59.8	52.3	0.0	270	5.4
08-Aug-19	13:00	67.4	62.8	59.9	52.9	0.0	250	13
08-Aug-19	14:00	68.4	62.7	60.2	54.0	0.0	260	13
08-Aug-19	15:00	67.4	63.1	60.5	54.4	0.0	240	13
08-Aug-19	16:00	66.3	63.1	60.7	55.0	0.0	230	13
08-Aug-19	17:00	65.8	63.3	61.1	56.4	0.0	240	14.8
08-Aug-19	18:00	66.2	63.4	61.1	56.2	0.0	220	13
08-Aug-19	19:00	66.4	62.3	59.4	52.1	0.0	200	7.6
08-Aug-19	20:00	67.3	61.7	58.7	49.6	0.0	190	5.4
08-Aug-19	21:00	65.1	60.0	56.5	46.0	0.0	190	9.4
08-Aug-19	22:00	67.6	59.3	56.3	42.4	0.0	200	7.6
08-Aug-19	23:00	64.2	58.8	55.2	35.6	0.0	160	3.6
08-Aug-19	0:00	63.4	55.9	52.4	24.9	0.0	190	3.6
09-Aug-19	1:00	64.3	54.7	52.4	22.2	0.0	0	0
09-Aug-19	2:00	62.9	52.3	51.0	25.4	0.0	130	3.6
09-Aug-19	3:00	64.3	49.8	50.5	23.0	0.0	0	0
09-Aug-19	4:00	63.8	52.3	50.8	27.3	0.0	0	0
09-Aug-19	5:00	64.2	56.2	52.8	34.2	0.0	0	0
09-Aug-19	6:00	67.8	61.4	58.5	47.7	0.0	80	1.8
09-Aug-19	7:00	69.2	64.3	61.5	55.5	0.0	0	0
09-Aug-19	8:00	68.6	64.2	61.9	57.2	0.0	110	3.6
09-Aug-19	9:00	67.0	63.2	60.6	54.5	0.0	0	0
09-Aug-19	10:00	66.5	62.5	59.6	51.4	0.0	130	5.4
09-Aug-19	11:00	67.1	62.0	59.4	51.9	0.0	190	3.6
09-Aug-19	12:00	69.3	63.2	60.7	53.0	0.0	110	9.4
09-Aug-19	13:00	65.9	62.9	60.0	53.2	0.0	130	7.6
09-Aug-19	14:00	68.7	63.5	61.0	54.4	0.0	190	5.4
09-Aug-19	15:00	68.3	63.9	61.7	54.8	0.0	330	9.4
09-Aug-19	16:00	66.6	64.3	61.8	56.3	0.0	270	7.6
09-Aug-19	17:00	66.8	64.3	61.7	56.3	0.0	280	5.4
09-Aug-19	18:00	67.4	64.5	62.1	57.1	0.0	250	3.6
09-Aug-19	19:00	65.8	63.0	60.5	55.2	0.0	240	3.6
09-Aug-19	20:00	65.1	61.8	58.8	51.4	0.0	0	0
09-Aug-19	21:00	65.5	61.3	58.1	49.2	0.0	200	1.8
09-Aug-19	22:00	64.9	60.1	56.6	41.8	0.0	0	0
09-Aug-19	23:00	65.4	58.6	54.8	35.0	0.0	210	3.6
09-Aug-19	0:00	63.6	56.6	52.5	27.1	0.0	190	3.6

Reference: 19075094

Hourly Noise Level Data

Lot 47 (#1213) Bussell Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
12-Aug-19	1:00	63.7	50.6	50.1	24.6	0.0	80	11.2
12-Aug-19	2:00	63.8	52.2	51.5	26.8	0.0	70	13
12-Aug-19	3:00	64.5	51.2	50.7	30.5	0.0	80	11.2
12-Aug-19	4:00	61.1	52.2	49.5	33.1	0.0	80	11.2
12-Aug-19	5:00	63.3	56.3	52.8	34.1	0.0	80	7.6
12-Aug-19	6:00	65.2	60.7	57.2	46.3	0.0	70	7.6
12-Aug-19	7:00	67.5	64.2	61.1	53.7	0.0	70	5.4
12-Aug-19	8:00	70.0	66.3	63.9	59.2	0.0	70	3.6
12-Aug-19	9:00	68.8	64.6	61.8	55.4	0.0	70	5.4
12-Aug-19	10:00	66.2	62.0	59.3	53.2	0.0	60	11.2
12-Aug-19	11:00	65.3	62.1	59.6	54.5	0.0	30	14.8
12-Aug-19	12:00	67.1	63.0	60.5	55.2	0.0	10	16.6
12-Aug-19	13:00	67.0	62.8	60.6	55.5	0.0	10	16.6
12-Aug-19	14:00	67.3	62.5	59.9	54.2	0.0	10	16.6
12-Aug-19	15:00	67.6	63.2	60.9	55.9	0.0	360	18.4
12-Aug-19	16:00	66.7	63.6	61.0	55.6	0.0	10	16.6
12-Aug-19	17:00	66.6	63.1	60.8	55.0	0.0	320	13
12-Aug-19	18:00	67.3	63.8	61.5	56.3	0.0	350	5.4
12-Aug-19	19:00	65.6	62.4	59.7	53.7	0.0	10	3.6
12-Aug-19	20:00	66.9	60.8	58.0	48.9	0.0	0	0
12-Aug-19	21:00	64.0	59.7	56.3	43.0	0.0	0	0
12-Aug-19	22:00	63.7	57.4	54.1	38.0	0.0	90	3.6
12-Aug-19	23:00	65.0	57.2	53.8	31.5	0.0	90	3.6
12-Aug-19	0:00	64.7	56.7	53.6	29.2	0.0	90	1.8
13-Aug-19	1:00	63.1	51.8	50.9	28.6	0.0	0	0
13-Aug-19	2:00	63.1	52.9	50.6	28.2	0.0	70	3.6
13-Aug-19	3:00	63.8	52.1	50.8	28.4	0.0	50	5.4
13-Aug-19	4:00	64.1	54.2	52.1	33.2	0.0	30	11.2
13-Aug-19	5:00	67.3	57.1	54.7	35.5	0.2	30	5.4
13-Aug-19	6:00	67.4	61.9	58.8	49.2	0.0	30	3.6
13-Aug-19	7:00	69.7	64.5	61.9	55.6	2.2	80	5.4
13-Aug-19	8:00	69.4	65.1	62.8	57.0	0.0	270	14.8
13-Aug-19	9:00	67.9	64.5	62.0	55.9	0.0	280	5.4
13-Aug-19	10:00	68.3	63.9	61.3	55.0	0.0	280	13
13-Aug-19	11:00	67.2	63.0	60.4	53.3	0.0	260	14.8
13-Aug-19	12:00	67.7	63.1	60.6	55.1	0.0	270	16.6
13-Aug-19	13:00	69.9	63.3	61.1	54.3	0.0	270	16.6
13-Aug-19	14:00	67.8	62.7	60.3	54.2	0.0	260	20.5
13-Aug-19	15:00	67.3	63.2	60.6	54.9	0.0	260	18.4
13-Aug-19	16:00	66.2	63.6	61.1	55.7	0.0	250	20.5
13-Aug-19	17:00	66.2	63.7	61.3	56.4	0.0	260	16.6
13-Aug-19	18:00	66.8	63.7	61.1	55.2	0.0	260	16.6
13-Aug-19	19:00	65.2	62.1	59.0	50.2	0.0	250	11.2
13-Aug-19	20:00	66.1	61.5	58.0	44.8	0.0	250	7.6
13-Aug-19	21:00	65.7	59.6	56.2	41.4	0.0	240	3.6
13-Aug-19	22:00	64.9	59.1	55.2	38.5	0.0	0	0
13-Aug-19	23:00	64.9	58.0	54.4	32.3	0.0	110	1.8
13-Aug-19	0:00	65.9	53.6	52.5	33.2	0.0	100	3.6

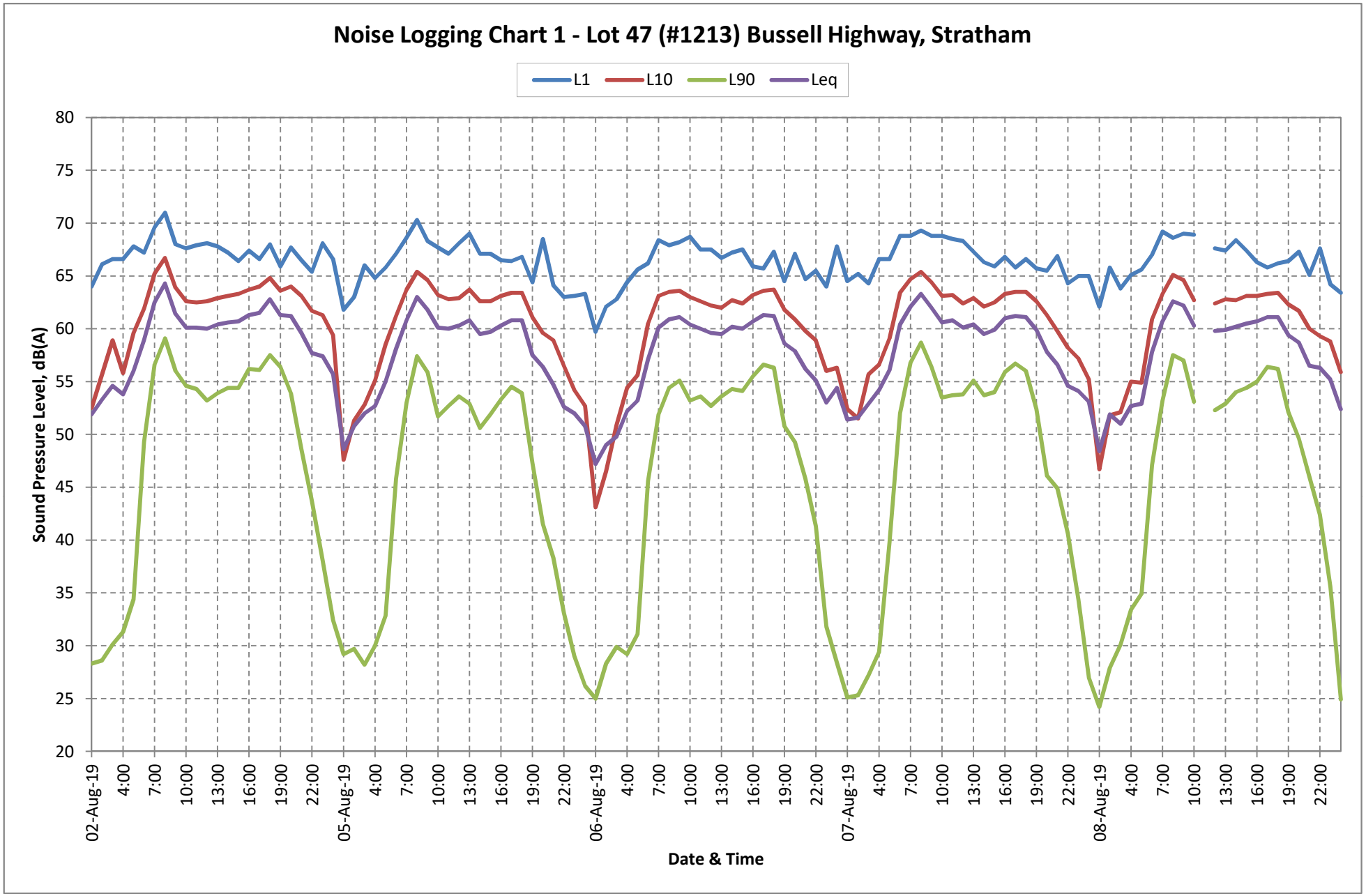
Reference: 19075094

Hourly Noise Level Data

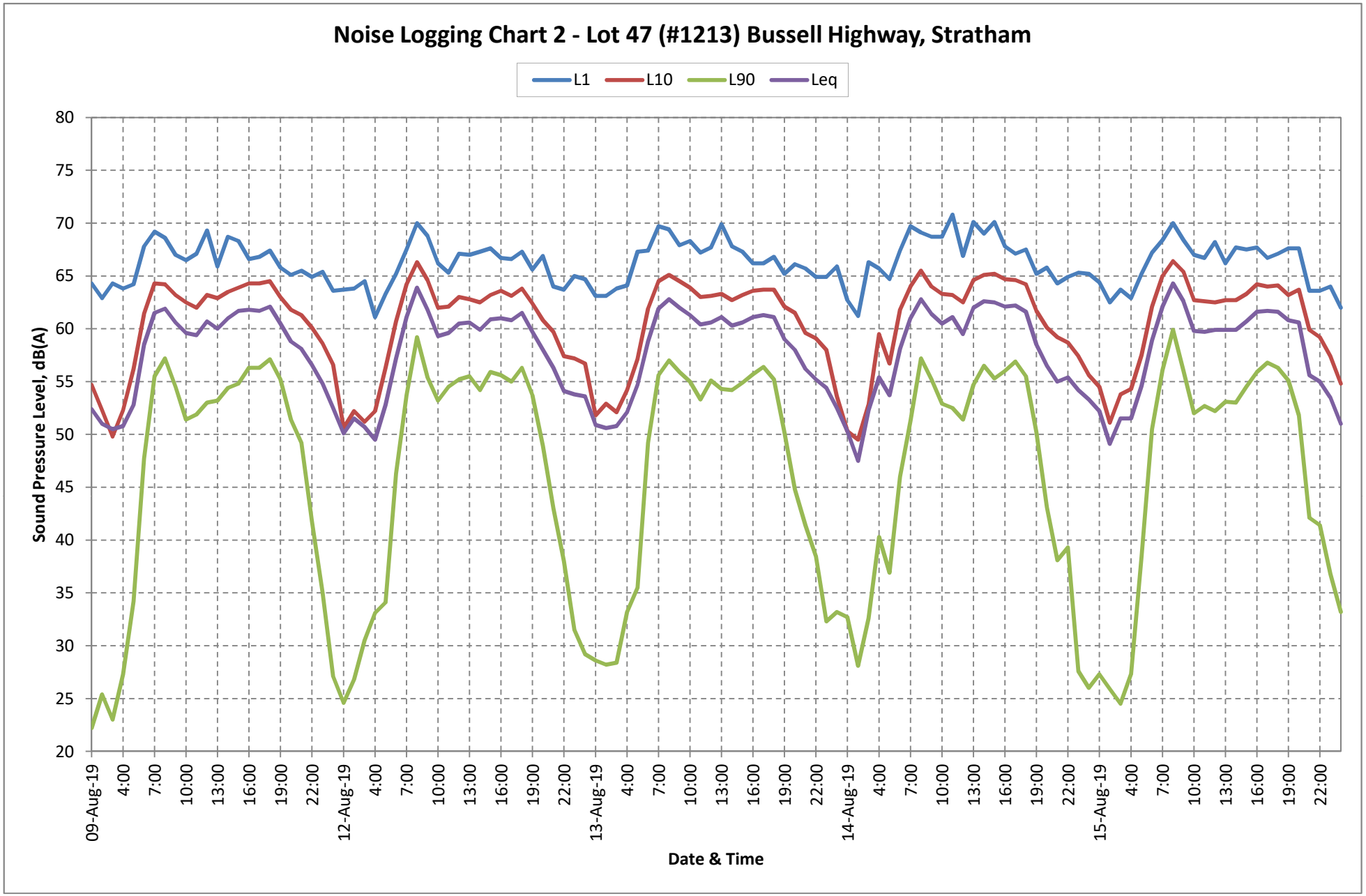
Lot 47 (#1213) Bussell Highway

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
14-Aug-19	1:00	62.7	50.3	50.3	32.7	0.0	60	1.8
14-Aug-19	2:00	61.2	49.5	47.5	28.1	0.0	50	9.4
14-Aug-19	3:00	66.3	52.8	52.3	32.6	2.6	40	9.4
14-Aug-19	4:00	65.7	59.5	55.4	40.3	0.0	50	5.4
14-Aug-19	5:00	64.7	56.7	53.7	36.9	5.8	110	9.4
14-Aug-19	6:00	67.4	61.8	58.1	46.0	2.2	160	7.6
14-Aug-19	7:00	69.7	64.0	61.0	51.3	1.0	90	3.6
14-Aug-19	8:00	69.1	65.5	62.8	57.2	0.2	130	3.6
14-Aug-19	9:00	68.7	64.0	61.4	55.2	0.8	180	5.4
14-Aug-19	10:00	68.7	63.3	60.5	52.9	0.0	90	3.6
14-Aug-19	11:00	70.8	63.2	61.1	52.5	0.0	70	9.4
14-Aug-19	12:00	66.9	62.5	59.5	51.4	0.0	30	7.6
14-Aug-19	13:00	70.1	64.6	62.0	54.7	0.0	350	7.6
14-Aug-19	14:00	69.0	65.1	62.6	56.5	0.6	220	11.2
14-Aug-19	15:00	70.1	65.2	62.5	55.3	5.2	200	16.6
14-Aug-19	16:00	67.8	64.7	62.1	56.0	2.2	180	7.6
14-Aug-19	17:00	67.1	64.6	62.2	56.9	0.0	210	13
14-Aug-19	18:00	67.5	64.2	61.6	55.5	0.0	210	11.2
14-Aug-19	19:00	65.2	61.7	58.5	50.2	0.0	190	16.6
14-Aug-19	20:00	65.8	60.1	56.5	43.1	0.0	200	14.8
14-Aug-19	21:00	64.3	59.2	55.0	38.1	0.0	200	13
14-Aug-19	22:00	64.9	58.7	55.4	39.3	0.0	200	13
14-Aug-19	23:00	65.3	57.4	54.2	27.6	0.0	190	13
14-Aug-19	0:00	65.2	55.6	53.3	26.0	0.0	200	5.4
15-Aug-19	1:00	64.4	54.5	52.2	27.3	0.0	200	1.8
15-Aug-19	2:00	62.5	51.1	49.1	25.9	0.0	190	7.6
15-Aug-19	3:00	63.7	53.8	51.5	24.5	0.0	190	3.6
15-Aug-19	4:00	62.9	54.3	51.5	27.3	0.0	0	0
15-Aug-19	5:00	65.2	57.5	54.6	38.4	0.0	110	1.8
15-Aug-19	6:00	67.2	62.1	58.9	50.5	0.0	90	3.6
15-Aug-19	7:00	68.4	65.0	62.1	56.1	0.0	0	0
15-Aug-19	8:00	70.0	66.4	64.3	59.9	0.0	0	0
15-Aug-19	9:00	68.4	65.4	62.6	56.0	0.2	0	0
15-Aug-19	10:00	67.0	62.7	59.8	52.0	0.0	60	1.8
15-Aug-19	11:00	66.7	62.6	59.7	52.7	0.0	360	7.6
15-Aug-19	12:00	68.2	62.5	59.9	52.2	0.0	330	7.6
15-Aug-19	13:00	66.2	62.7	59.9	53.1	0.0	330	9.4
15-Aug-19	14:00	67.7	62.7	59.9	53.0	0.0	330	13
15-Aug-19	15:00	67.5	63.3	60.7	54.5	0.0	330	14.8
15-Aug-19	16:00	67.7	64.2	61.6	55.9	0.0	340	14.8
15-Aug-19	17:00	66.7	64.0	61.7	56.8	0.0	340	14.8
15-Aug-19	18:00	67.1	64.1	61.6	56.3	0.0	340	11.2
15-Aug-19	19:00	67.6	63.2	60.8	55.1	0.0	350	11.2
15-Aug-19	20:00	67.6	63.7	60.6	51.8	0.0	330	5.4
15-Aug-19	21:00	63.6	59.9	55.6	42.1	0.0	320	5.4
15-Aug-19	22:00	63.6	59.2	55.0	41.4	0.0	300	13
15-Aug-19	23:00	64.0	57.4	53.5	36.8	0.0	320	11.2
15-Aug-19	0:00	62.0	54.8	51.0	33.2	0.0	290	13

Reference: 19075094



Reference: 19075094



Reference: 19075094

Table A5 – Pre-Construction Noise Measurement Summary at Lot 41 (#133) Woods Road, Gelorup

Date	$L_{A10,18hour}$, dB	$L_{Aeq,24hour}$, dB	$L_{Aeq(Day)}$, dB	$L_{Aeq(Night)}$, dB
Friday 02-August-2019	40.9	41.5	42.5	38.2
Monday 05-August-2019	41.6	41.7	43.0	36.6
Tuesday 06-August-2019	41.8	40.2	41.4	35.5
Wednesday 07-August-2019	42.5	42.9	44.3	35.8
Thursday 08-August-2019	40.0	41.7	43.2	35.4
Friday 09-August-2019	39.0	40.0	41.6	30.0
Monday 12-August-2019	43.2	42.6	44.2	34.2
Tuesday 13-August-2019	44.1	45.1	45.4	44.4
Wednesday 14-August-2019	-	-	-	-
Thursday 15-August-2019	-	-	-	-
Weekday Average	**41.6**	**42.0**	**43.2**	**36.3**

Note: Italics indicates data not included in the average.

Traffic Noise Measurement Data

Item	Details
LOCATION	
Project	BORR South Section
Street address	Lot 41 (#133) Woods Road
Locality	Davenport
Occupier	Carol McEvoy
Dates	01 August to 16 August 2019
Category	*Main Roads to provide this information*
SITE	
Distance from the microphone to the kerb	*N/A*
Height of the road in relation to the ground	*N/A*
Road surface type	*N/A*
Speed zone	*N/A*
Absorbing ground	*N/A*
Angle of view	*N/A*
Road gradient	*N/A*
Traffic flow	*N/A*
Heavy vehicles	*N/A*
House-Road orientation.	*N/A*
Carriageways & lanes.	*N/A*
COMMENT	
Comment	Microphone located 1-metre on north side of dwelling where future road will be. Microphone height 1.4m above ground level. 8-Aug-19 11.00am & midday data missing due to battery change Battery failure from 6.00pm on 14-Aug-19
REFERENCES	
AMG Z50 E/N	*Main Roads to provide this information*
Road name	*N/A*
EXCEL file	Lot 41 Woods Road S1.xls
Raw data file	133 Woods Wk1_Sta.csv & 133 Woods Week 2_Sta.csv
EQUIPMENT	
Analyser number	87803A
Microphone number	87803A
Calibrator number	34883971
Calibrator values	94.0 / 94.1
Operator	Lloyd George Acoustics Pty Ltd - Daniel Lloyd
WEATHER	
Wind	Wind analysis based on Bunbury Data 02 Aug 2019 - Light to moderate winds. 05 Aug 2019 - Some Rain. Light to moderate winds. 06 Aug 2019 - Moderate to strong winds. 07 Aug 2019 - Light to moderate winds 08 Aug 2019 - Light to moderate 09 Aug 2019 - Light winds 12 Aug 2019 - Light to moderate winds. 13 Aug 2019 - Light to strong winds. 14 Aug 2019 - Light to moderate. 15 Aug 2019 - Light to moderate winds.

Hourly Noise Level Data

Lot 41 (#133) Woods Road

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
02-Aug-19	1:00	36.5	32.6	31.1	29.0	0.0	80	11.2
02-Aug-19	2:00	37.5	33.6	31.6	29.2	0.0	80	7.6
02-Aug-19	3:00	36.4	34.5	32.8	30.4	0.0	80	9.4
02-Aug-19	4:00	39.1	36.3	34.2	31.4	0.0	120	1.8
02-Aug-19	5:00	39.8	36.7	35.1	32.2	0.0	80	5.4
02-Aug-19	6:00	43.9	37.9	36.8	33.5	0.0	50	3.6
02-Aug-19	7:00	46.6	40.7	39.1	35.5	0.0	190	5.4
02-Aug-19	8:00	49.3	43.6	41.8	38.5	0.0	50	5.4
02-Aug-19	9:00	51.5	45.0	43.1	39.5	0.0	50	9.4
02-Aug-19	10:00	48.1	43.8	41.4	38.2	0.0	40	9.4
02-Aug-19	11:00	46.1	39.9	38.4	34.6	0.0	40	11.2
02-Aug-19	12:00	58.3	41.9	45.3	32.8	0.0	50	11.2
02-Aug-19	13:00	62.1	45.0	48.3	32.4	0.0	20	11.2
02-Aug-19	14:00	52.7	42.0	42.2	31.0	0.0	30	7.6
02-Aug-19	15:00	49.7	42.8	40.2	33.1	0.0	340	7.6
02-Aug-19	16:00	49.2	41.7	39.2	33.0	0.0	300	7.6
02-Aug-19	17:00	49.7	42.7	40.5	32.6	0.0	0	0
02-Aug-19	18:00	56.3	44.5	46.6	34.7	0.0	280	3.6
02-Aug-19	19:00	46.3	37.3	36.3	31.8	0.0	0	0
02-Aug-19	20:00	45.4	36.2	35.6	32.2	0.0	0	0
02-Aug-19	21:00	56.6	37.2	42.1	32.9	0.0	70	3.6
02-Aug-19	22:00	43.6	37.2	36.2	33.5	0.0	0	0
02-Aug-19	23:00	61.5	38.3	45.4	32.8	0.0	0	0
02-Aug-19	0:00	40.4	36.4	34.3	30.7	0.0	0	0
05-Aug-19	1:00	43.5	39.5	35.5	30.0	0.8	290	16.6
05-Aug-19	2:00	44.7	38.1	35.0	29.1	0.0	230	3.6
05-Aug-19	3:00	42.7	38.6	34.6	28.1	0.0	340	1.8
05-Aug-19	4:00	49.2	41.5	38.8	30.2	0.0	10	3.6
05-Aug-19	5:00	44.8	40.3	37.5	32.1	0.0	40	1.8
05-Aug-19	6:00	45.3	43.0	40.4	36.1	0.0	290	13
05-Aug-19	7:00	53.4	50.0	47.1	39.1	0.0	290	13
05-Aug-19	8:00	51.2	47.7	46.0	42.8	1.4	240	11.2
05-Aug-19	9:00	52.3	45.7	42.9	36.6	0.2	0	0
05-Aug-19	10:00	49.8	43.3	40.3	32.7	0.0	0	0
05-Aug-19	11:00	54.6	45.3	43.9	32.4	0.0	100	5.4
05-Aug-19	12:00	54.5	44.7	42.1	32.5	0.0	160	9.4
05-Aug-19	13:00	54.8	48.1	45.1	32.1	0.0	170	11.2
05-Aug-19	14:00	51.4	40.0	38.5	26.4	1.0	90	3.6
05-Aug-19	15:00	50.5	40.7	39.1	28.3	0.0	80	1.8
05-Aug-19	16:00	51.1	41.8	40.1	32.2	0.0	20	1.8
05-Aug-19	17:00	50.2	43.5	40.7	34.1	0.0	320	7.6
05-Aug-19	18:00	60.1	43.9	48.5	35.5	0.0	330	9.4
05-Aug-19	19:00	47.5	43.6	39.1	29.3	0.0	200	5.4
05-Aug-19	20:00	36.3	30.9	29.6	25.7	0.2	150	9.4
05-Aug-19	21:00	46.1	36.4	35.0	29.1	0.0	130	11.2
05-Aug-19	22:00	41.7	34.7	32.7	28.4	0.0	130	9.4
05-Aug-19	23:00	40.8	34.5	32.5	28.6	0.0	130	14.8
05-Aug-19	0:00	38.1	33.7	31.3	28.1	0.0	120	14.8

Reference: 19075094

Hourly Noise Level Data

Lot 41 (#133) Woods Road

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
06-Aug-19	1:00	41.3	36.5	33.3	28.2	0.0	120	11.2
06-Aug-19	2:00	43.9	40.6	37.2	31.2	0.0	140	9.4
06-Aug-19	3:00	45.4	39.5	36.3	30.3	0.0	140	14.8
06-Aug-19	4:00	44.7	37.9	35.2	29.2	0.0	130	16.6
06-Aug-19	5:00	42.0	36.8	33.8	28.7	0.0	150	13
06-Aug-19	6:00	46.3	37.1	35.5	29.7	0.0	150	13
06-Aug-19	7:00	46.5	40.8	37.5	30.8	0.0	150	9.4
06-Aug-19	8:00	49.6	41.9	40.0	32.2	0.0	140	13
06-Aug-19	9:00	48.4	42.3	39.7	32.0	0.0	150	13
06-Aug-19	10:00	44.7	40.3	37.4	31.4	0.0	140	13
06-Aug-19	11:00	55.6	48.3	44.2	29.2	0.0	130	14.8
06-Aug-19	12:00	57.3	53.7	48.9	31.1	0.0	160	14.8
06-Aug-19	13:00	50.5	42.5	39.7	29.9	0.0	150	13
06-Aug-19	14:00	48.3	42.2	39.6	33.7	0.0	170	14.8
06-Aug-19	15:00	48.2	41.2	40.2	33.7	0.0	210	16.6
06-Aug-19	16:00	48.3	43.5	40.8	35.5	0.0	240	16.6
06-Aug-19	17:00	50.9	44.0	42.7	38.4	0.0	220	20.5
06-Aug-19	18:00	47.6	41.3	40.8	35.1	0.0	210	18.4
06-Aug-19	19:00	46.3	38.8	36.9	31.2	0.0	190	5.4
06-Aug-19	20:00	44.2	38.8	36.4	30.8	0.0	0	0
06-Aug-19	21:00	44.0	38.5	36.0	30.2	0.0	0	0
06-Aug-19	22:00	43.8	39.0	36.1	31.0	0.0	50	1.8
06-Aug-19	23:00	45.2	40.3	37.5	30.4	0.0	160	5.4
06-Aug-19	0:00	39.3	34.6	32.1	28.2	0.4	0	0
07-Aug-19	1:00	38.3	33.5	30.8	27.8	0.0	190	3.6
07-Aug-19	2:00	36.7	32.0	30.0	27.8	0.0	180	5.4
07-Aug-19	3:00	37.3	33.0	30.6	27.8	0.0	200	3.6
07-Aug-19	4:00	38.7	34.4	32.0	28.6	0.0	0	0
07-Aug-19	5:00	43.2	39.1	35.9	29.3	0.0	0	0
07-Aug-19	6:00	47.5	44.9	41.7	34.8	0.0	0	0
07-Aug-19	7:00	50.1	46.8	44.6	40.9	0.0	0	0
07-Aug-19	8:00	62.1	53.4	51.9	43.8	0.0	0	0
07-Aug-19	9:00	49.9	47.6	45.6	42.5	0.2	0	0
07-Aug-19	10:00	51.3	43.7	41.9	33.5	0.0	0	0
07-Aug-19	11:00	44.8	38.1	35.7	30.8	0.0	190	3.6
07-Aug-19	12:00	48.1	42.9	39.5	32.9	0.0	190	14.8
07-Aug-19	13:00	53.6	41.5	44.9	34.3	0.0	200	16.6
07-Aug-19	14:00	54.1	43.3	42.2	32.8	0.0	240	13
07-Aug-19	15:00	47.6	42.2	39.5	34.2	0.0	230	16.6
07-Aug-19	16:00	61.5	46.8	48.8	35.0	0.0	230	16.6
07-Aug-19	17:00	50.5	44.1	42.8	36.3	0.0	190	18.4
07-Aug-19	18:00	51.9	42.8	41.7	36.9	0.0	210	16.6
07-Aug-19	19:00	48.7	41.7	40.2	34.3	0.0	210	13
07-Aug-19	20:00	43.4	38.5	35.9	30.6	0.0	0	0
07-Aug-19	21:00	44.5	36.7	34.8	29.1	0.0	190	1.8
07-Aug-19	22:00	42.6	36.5	33.9	28.6	0.0	0	0
07-Aug-19	23:00	45.2	39.0	35.8	28.9	0.0	0	0
07-Aug-19	0:00	43.6	38.5	34.5	27.8	0.0	0	0

Reference: 19075094

Hourly Noise Level Data

Lot 41 (#133) Woods Road

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
08-Aug-19	1:00	41.3	32.5	31.2	27.5	0.0	0	0
08-Aug-19	2:00	44.6	40.0	35.7	28.5	0.0	0	0
08-Aug-19	3:00	41.5	36.2	33.5	29.3	0.0	10	1.8
08-Aug-19	4:00	41.9	37.3	34.3	29.7	0.0	0	0
08-Aug-19	5:00	45.1	40.1	36.9	30.1	0.0	0	0
08-Aug-19	6:00	46.7	42.9	40.2	34.5	0.0	150	5.4
08-Aug-19	7:00	49.3	46.1	43.7	39.7	0.0	0	0
08-Aug-19	8:00	51.8	47.6	45.3	40.0	0.0	70	1.8
08-Aug-19	9:00	52.1	47.2	45.1	38.0	0.0	0	0
08-Aug-19	10:00					0.0	0	0
08-Aug-19	11:00					0.0	240	9.4
08-Aug-19	12:00	49.1	40.8	39.1	33.1	0.0	270	5.4
08-Aug-19	13:00	45.8	40.2	38.1	33.9	0.0	250	13
08-Aug-19	14:00	47.5	41.8	40.8	35.6	0.0	260	13
08-Aug-19	15:00	51.0	44.8	43.0	35.8	0.0	240	13
08-Aug-19	16:00	59.6	46.0	46.0	34.0	0.0	230	13
08-Aug-19	17:00	48.4	41.1	39.0	33.2	0.0	240	14.8
08-Aug-19	18:00	48.8	41.2	39.6	33.6	0.0	220	13
08-Aug-19	19:00	59.8	38.0	43.8	29.6	0.0	200	7.6
08-Aug-19	20:00	43.8	35.3	34.2	29.0	0.0	190	5.4
08-Aug-19	21:00	42.2	33.2	32.3	28.8	0.0	190	9.4
08-Aug-19	22:00	62.5	32.5	48.7	28.1	0.0	200	7.6
08-Aug-19	23:00	37.0	32.1	30.8	27.8	0.0	160	3.6
08-Aug-19	0:00	35.6	31.8	29.5	27.4	0.0	190	3.6
09-Aug-19	1:00	36.8	30.6	29.8	27.6	0.0	0	0
09-Aug-19	2:00	35.6	31.0	29.5	27.8	0.0	130	3.6
09-Aug-19	3:00	37.6	31.7	30.2	27.4	0.0	0	0
09-Aug-19	4:00	35.8	31.3	29.7	27.3	0.0	0	0
09-Aug-19	5:00	35.7	30.5	29.6	27.3	0.0	0	0
09-Aug-19	6:00	39.9	32.8	32.2	29.2	0.0	80	1.8
09-Aug-19	7:00	48.9	44.1	39.1	26.2	0.0	0	0
09-Aug-19	8:00	49.0	42.3	38.9	29.7	0.0	110	3.6
09-Aug-19	9:00	46.9	39.9	37.0	29.9	0.0	0	0
09-Aug-19	10:00	47.2	40.9	37.1	27.0	0.0	130	5.4
09-Aug-19	11:00	46.4	36.4	35.7	26.8	0.0	190	3.6
09-Aug-19	12:00	49.6	41.2	38.4	25.8	0.0	110	9.4
09-Aug-19	13:00	47.0	39.0	36.1	25.6	0.0	130	7.6
09-Aug-19	14:00	57.0	40.7	46.2	26.3	0.0	190	5.4
09-Aug-19	15:00	52.5	42.4	41.9	31.8	0.0	330	9.4
09-Aug-19	16:00	59.8	48.4	48.5	36.6	0.0	270	7.6
09-Aug-19	17:00	55.6	46.1	44.4	32.6	0.0	280	5.4
09-Aug-19	18:00	53.0	44.1	43.8	35.2	0.0	250	3.6
09-Aug-19	19:00	46.0	39.6	37.0	32.4	0.0	240	3.6
09-Aug-19	20:00	43.8	36.2	34.8	30.9	0.0	0	0
09-Aug-19	21:00	41.0	31.5	31.3	28.3	0.0	200	1.8
09-Aug-19	22:00	41.1	30.4	30.7	27.9	0.0	0	0
09-Aug-19	23:00	37.5	30.8	29.8	27.4	0.0	210	3.6
09-Aug-19	0:00	29.2	28.1	27.8	27.2	0.0	190	3.6

Reference: 19075094

Hourly Noise Level Data

Lot 41 (#133) Woods Road

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
12-Aug-19	1:00	31.9	30.0	29.1	28.0	0.0	80	11.2
12-Aug-19	2:00	40.6	32.5	31.5	28.3	0.0	70	13
12-Aug-19	3:00	40.4	34.8	33.2	29.7	0.0	80	11.2
12-Aug-19	4:00	37.0	34.3	32.2	29.8	0.0	80	11.2
12-Aug-19	5:00	35.5	33.1	31.8	29.7	0.0	80	7.6
12-Aug-19	6:00	43.1	36.7	35.5	32.3	0.0	70	7.6
12-Aug-19	7:00	49.0	45.6	41.1	34.6	0.0	70	5.4
12-Aug-19	8:00	59.1	50.2	48.9	37.6	0.0	70	3.6
12-Aug-19	9:00	52.7	45.4	50.6	38.8	0.0	70	5.4
12-Aug-19	10:00	52.6	45.2	43.4	38.0	0.0	60	11.2
12-Aug-19	11:00	57.6	45.2	45.7	36.8	0.0	30	14.8
12-Aug-19	12:00	52.6	44.2	43.1	37.2	0.0	10	16.6
12-Aug-19	13:00	54.2	44.2	45.1	37.0	0.0	10	16.6
12-Aug-19	14:00	47.2	41.3	39.4	34.2	0.0	10	16.6
12-Aug-19	15:00	47.0	42.7	40.1	36.0	0.0	360	18.4
12-Aug-19	16:00	50.0	42.4	41.6	35.8	0.0	10	16.6
12-Aug-19	17:00	56.5	44.8	44.1	36.2	0.0	320	13
12-Aug-19	18:00	49.7	43.5	41.5	37.6	0.0	350	5.4
12-Aug-19	19:00	46.8	42.4	40.8	36.6	0.0	10	3.6
12-Aug-19	20:00	43.3	40.3	37.9	33.8	0.0	0	0
12-Aug-19	21:00	43.0	38.5	36.3	32.7	0.0	0	0
12-Aug-19	22:00	45.5	41.0	38.5	33.4	0.0	90	3.6
12-Aug-19	23:00	44.0	38.9	35.6	29.6	0.0	90	3.6
12-Aug-19	0:00	48.6	42.0	38.2	28.3	0.0	90	1.8
13-Aug-19	1:00	46.1	37.7	35.0	28.2	0.0	0	0
13-Aug-19	2:00	46.7	40.2	36.2	28.3	0.0	70	3.6
13-Aug-19	3:00	47.3	41.4	37.2	27.7	0.0	50	5.4
13-Aug-19	4:00	63.1	51.0	49.1	29.5	0.0	30	11.2
13-Aug-19	5:00	48.6	43.0	39.9	32.6	0.2	30	5.4
13-Aug-19	6:00	63.0	49.7	50.4	39.6	0.0	30	3.6
13-Aug-19	7:00	52.1	49.6	46.7	42.0	2.2	80	5.4
13-Aug-19	8:00	63.2	51.3	51.3	42.0	0.0	270	14.8
13-Aug-19	9:00	53.6	47.6	45.9	41.7	0.0	280	5.4
13-Aug-19	10:00	53.1	46.2	44.9	39.9	0.0	280	13
13-Aug-19	11:00	50.3	42.5	41.3	37.2	0.0	260	14.8
13-Aug-19	12:00	54.2	45.3	44.9	39.4	0.0	270	16.6
13-Aug-19	13:00	60.5	46.9	48.5	39.2	0.0	270	16.6
13-Aug-19	14:00	49.8	46.1	43.6	39.3	0.0	260	20.5
13-Aug-19	15:00	47.9	44.3	42.2	38.8	0.0	260	18.4
13-Aug-19	16:00	55.9	46.6	46.6	40.1	0.0	250	20.5
13-Aug-19	17:00	49.5	44.8	43.3	40.4	0.0	260	16.6
13-Aug-19	18:00	50.7	44.7	47.8	39.6	0.0	260	16.6
13-Aug-19	19:00	45.6	41.6	39.2	34.2	0.0	250	11.2
13-Aug-19	20:00	45.0	39.3	37.1	31.5	0.0	250	7.6
13-Aug-19	21:00	44.6	40.1	37.1	31.4	0.0	240	3.6
13-Aug-19	22:00	41.9	37.9	35.2	30.3	0.0	0	0
13-Aug-19	23:00	45.8	39.3	36.7	30.1	0.0	110	1.8
13-Aug-19	0:00	47.2	39.5	36.9	31.2	0.0	100	3.6

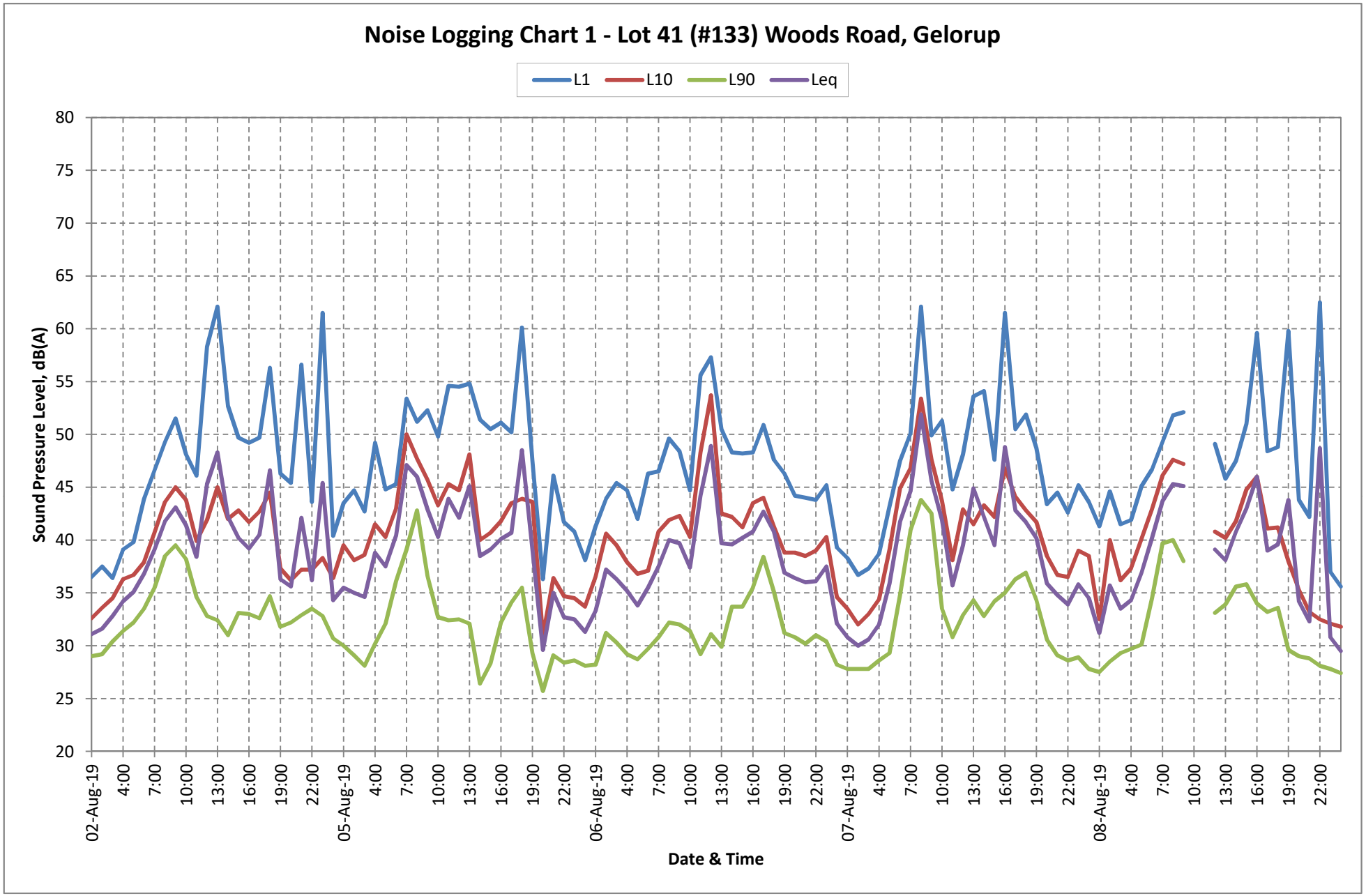
Reference: 19075094

Hourly Noise Level Data

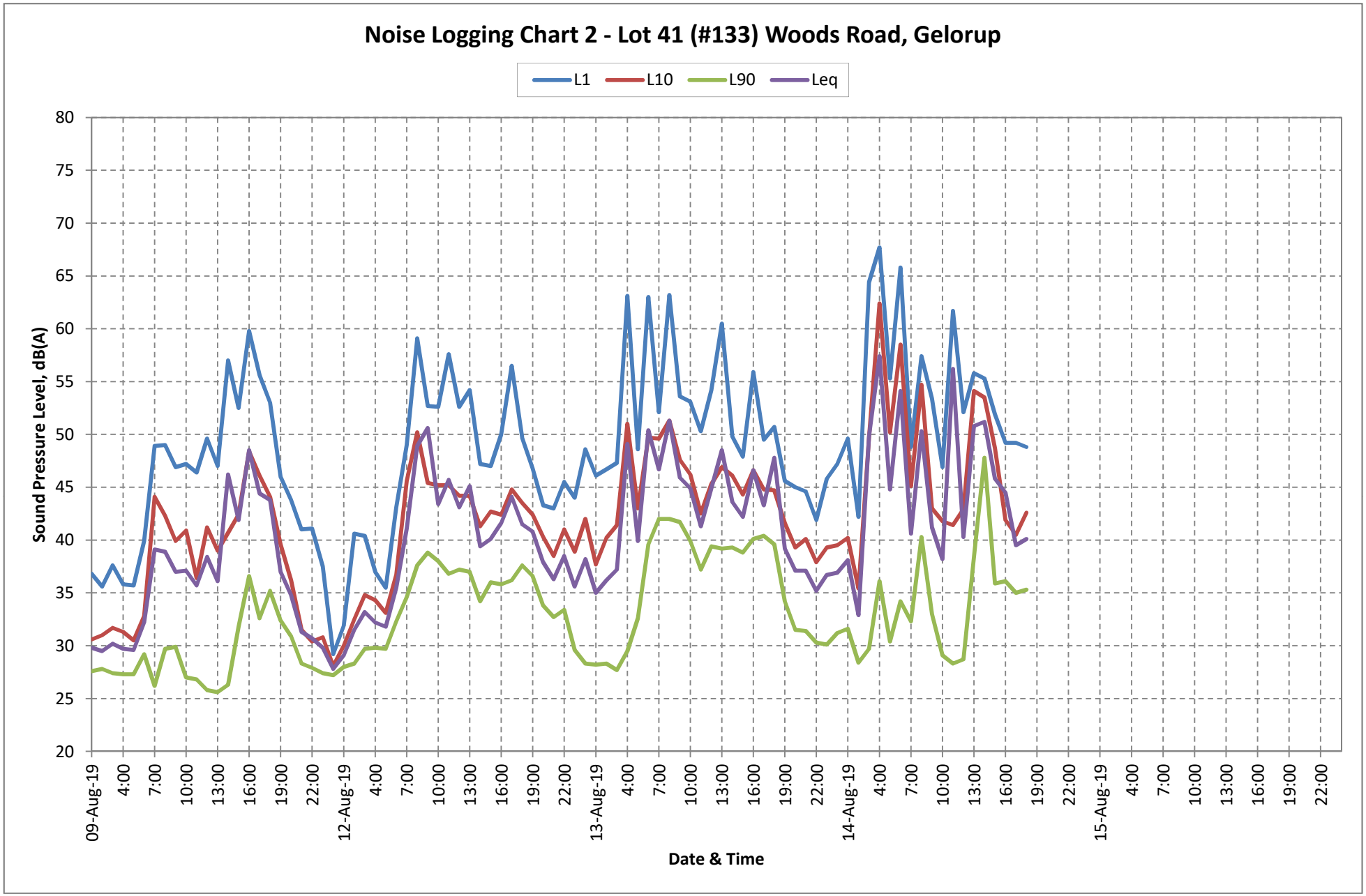
Lot 41 (#133) Woods Road

Date	Time	L1	L10	Leq	L90	Rain mm	Wind degrees	Wind km/h
14-Aug-19	1:00	49.6	40.2	38.1	31.6	0.0	60	1.8
14-Aug-19	2:00	42.2	35.4	32.9	28.4	0.0	50	9.4
14-Aug-19	3:00	64.4	49.7	49.8	29.7	2.6	40	9.4
14-Aug-19	4:00	67.7	62.4	57.4	36.1	0.0	50	5.4
14-Aug-19	5:00	55.3	50.2	44.8	30.4	5.8	110	9.4
14-Aug-19	6:00	65.8	58.5	54.1	34.2	2.2	160	7.6
14-Aug-19	7:00	48.8	45.1	40.6	32.3	1.0	90	3.6
14-Aug-19	8:00	57.4	54.7	50.3	40.3	0.2	130	3.6
14-Aug-19	9:00	53.4	43.0	41.2	33.0	0.8	180	5.4
14-Aug-19	10:00	46.9	41.8	38.2	29.1	0.0	90	3.6
14-Aug-19	11:00	61.7	41.4	56.2	28.3	0.0	70	9.4
14-Aug-19	12:00	52.1	42.9	40.3	28.7	0.0	30	7.6
14-Aug-19	13:00	55.8	54.1	50.8	38.4	0.0	350	7.6
14-Aug-19	14:00	55.3	53.5	51.2	47.8	0.6	220	11.2
14-Aug-19	15:00	51.9	48.7	45.8	35.9	5.2	200	16.6
14-Aug-19	16:00	49.2	41.9	44.5	36.1	2.2	180	7.6
14-Aug-19	17:00	49.2	40.5	39.5	35.0	0.0	210	13
14-Aug-19	18:00	48.8	42.6	40.1	35.3	0.0	210	11.2
14-Aug-19	19:00					0.0	190	16.6
14-Aug-19	20:00					0.0	200	14.8
14-Aug-19	21:00					0.0	200	13
14-Aug-19	22:00					0.0	200	13
14-Aug-19	23:00					0.0	190	13
14-Aug-19	0:00					0.0	200	5.4
15-Aug-19	1:00					0.0	200	1.8
15-Aug-19	2:00					0.0	190	7.6
15-Aug-19	3:00					0.0	190	3.6
15-Aug-19	4:00					0.0	0	0
15-Aug-19	5:00					0.0	110	1.8
15-Aug-19	6:00					0.0	90	3.6
15-Aug-19	7:00					0.0	0	0
15-Aug-19	8:00					0.0	0	0
15-Aug-19	9:00					0.2	0	0
15-Aug-19	10:00					0.0	60	1.8
15-Aug-19	11:00					0.0	360	7.6
15-Aug-19	12:00					0.0	330	7.6
15-Aug-19	13:00					0.0	330	9.4
15-Aug-19	14:00					0.0	330	13
15-Aug-19	15:00					0.0	330	14.8
15-Aug-19	16:00					0.0	340	14.8
15-Aug-19	17:00					0.0	340	14.8
15-Aug-19	18:00					0.0	340	11.2
15-Aug-19	19:00					0.0	350	11.2
15-Aug-19	20:00					0.0	330	5.4
15-Aug-19	21:00					0.0	320	5.4
15-Aug-19	22:00					0.0	300	13
15-Aug-19	23:00					0.0	320	11.2
15-Aug-19	0:00					0.0	290	13

Reference: 19075094



Reference: 19075094



Reference: 19075094

Appendix B

Terminology

The following is an explanation of the terminology used throughout this report.

Decibel (dB)

The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

A-Weighting

An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A dB.

L_1

An L_1 level is the noise level which is exceeded for 1 per cent of the measurement period and is considered to represent the average of the maximum noise levels measured.

L_{10}

An L_{10} level is the noise level which is exceeded for 10 per cent of the measurement period and is considered to represent the "*intrusive*" noise level.

L_{90}

An L_{90} level is the noise level which is exceeded for 90 per cent of the measurement period and is considered to represent the "*background*" noise level.

L_{eq}

The L_{eq} level represents the average noise energy during a measurement period.

$L_{A10,18hour}$

The $L_{A10,18\ hour}$ level is the arithmetic average of the hourly L_{A10} levels between 6.00 am and midnight. The *CoRTN* algorithms were developed to calculate this parameter.

$L_{Aeq,24hour}$

The $L_{Aeq,24\ hour}$ level is the logarithmic average of the hourly L_{Aeq} levels for a full day (from midnight to midnight).

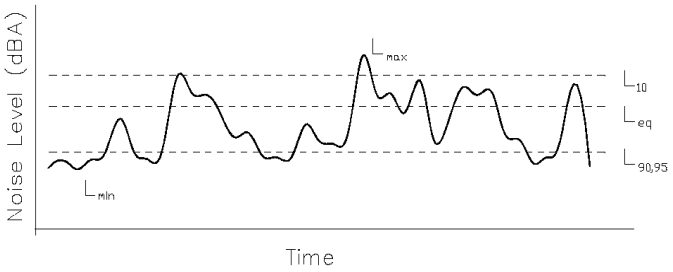
$L_{Aeq,8hour}$ / $L_{Aeq\ (Night)}$

The $L_{Aeq\ (Night)}$ level is the logarithmic average of the hourly L_{Aeq} levels from 10.00 pm to 6.00 am on the same day.

$L_{Aeq,16hour}$ / $L_{Aeq\ (Day)}$

The $L_{Aeq\ (Day)}$ level is the logarithmic average of the hourly L_{Aeq} levels from 6.00 am to 10.00 pm on the same day. This value is typically 1-3 dB less than the $L_{A10,18hour}$.

Chart of Noise Level Descriptors



Austroads Vehicle Class

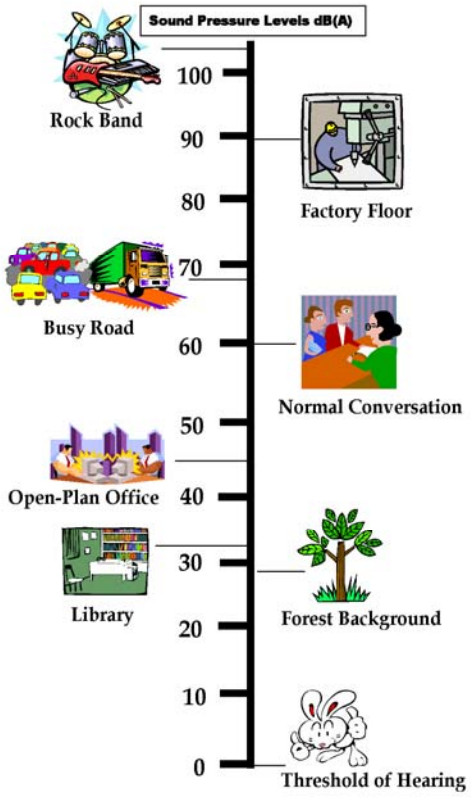
AUSTROADS Vehicle Classification System

Level 1 Length (indicative)	Level 2 Axles and Axle Groups		Level 3 Vehicle Type	AUSTROADS Classification		
Type	Axles	Groups	Typical Description	Class	Parameters	Typical Configuration
			LIGHT VEHICLES			
Short up to 5.5m		1 or 2	**Short** Sedan, Wagon, 4WD, Utility, Light Van, Bicycle, Motorcycle, etc	1	d(1) ≤ 3.2m and axles = 2	
	3, 4 or 5	3	**Short - Towing** Trailer, Caravan, Boat, etc	2	groups = 3 d(1) ≥ 2.1m, d(1) ≤ 3.2m, d(2) ≥ 2.1m and axles = 3, 4 or 5	
			HEAVY VEHICLES			
Medium 5.5m to 14.5m	2	2	**Two Axle Truck or Bus**	3	d(1) > 3.2m and axles = 2	
	3	2	**Three Axle Truck or Bus**	4	axles = 3 and groups = 2	
	> 3	2	**Four Axle Truck**	5	axles > 3 and groups = 2	
Long 11.5m to 19.0m	3	3	**Three Axle Articulated** Three axle articulated vehicle, or Rigid vehicle and trailer	6	d(1) > 3.2m, axles = 3 and groups = 3	
	4	> 2	**Four Axle Articulated** Four axle articulated vehicle, or Rigid vehicle and trailer	7	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 4 and groups > 2	
	5	> 2	**Five Axle Articulated** Five axle articulated vehicle, or Rigid vehicle and trailer	8	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 5 and groups > 2	
	≥ 6	> 2	**Six Axle Articulated** Six axle articulated vehicle, or Rigid vehicle and trailer	9	axles = 6 and groups > 2 or axles > 6 and groups = 3	
Medium Combination 17.5m to 36.5m	> 6	4	**B Double** B Double, or Heavy truck and trailer	10	groups = 4 and axles > 6	
	> 6	5 or 6	**Double Road Train** Double road train, or Medium articulated vehicle and one dog trailer (M.A.D.)	11	groups = 5 or 6 and axles > 6	
Large Combination Over 33.0m	> 6	> 6	**Triple Road Train** Triple road train, or Heavy truck and three trailers	12	groups > 6 and axles > 6	

Definitions: Group: Axle group, where adjacent axles are less than 2.1m apart
Groups: Number of axle groups
Axles: Number of axles (maximum axle spacing of 10.0m)

d(1): Distance between first and second axle
d(2): Distance between second and third axle

Typical Noise Levels



Appendix B

Terminology

The following is an explanation of the terminology used throughout this report.

Decibel (dB)
The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

A-Weighting
An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as L_A dB.

L_1
An L_1 level is the noise level which is exceeded for 1 per cent of the measurement period and is considered to represent the average of the maximum noise levels measured.

L_{10}
An L_{10} level is the noise level which is exceeded for 10 per cent of the measurement period and is considered to represent the "*intrusive*" noise level.

L_{90}
An L_{90} level is the noise level which is exceeded for 90 per cent of the measurement period and is considered to represent the "*background*" noise level.

L_{eq}
The L_{eq} level represents the average noise energy during a measurement period.

$L_{A10,18hour}$
The $L_{A10,18\ hour}$ level is the arithmetic average of the hourly L_{A10} levels between 6.00 am and midnight. The *CoRTN* algorithms were developed to calculate this parameter.

$L_{Aeq,24hour}$
The $L_{Aeq,24\ hour}$ level is the logarithmic average of the hourly L_{Aeq} levels for a full day (from midnight to midnight).

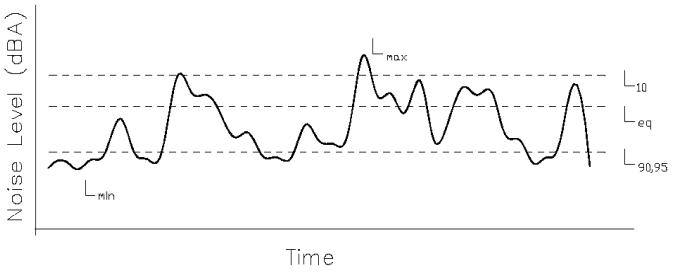
$L_{Aeq,8hour}$ / $L_{Aeq\ (Night)}$
The $L_{Aeq\ (Night)}$ level is the logarithmic average of the hourly L_{Aeq} levels from 10.00 pm to 6.00 am on the same day.

$L_{Aeq,16hour}$ / $L_{Aeq\ (Day)}$
The $L_{Aeq\ (Day)}$ level is the logarithmic average of the hourly L_{Aeq} levels from 6.00 am to 10.00 pm on the same day. This value is typically 1-3 dB less than the $L_{A10,18hour}$.

Satisfactory Design Sound Level
The level of noise that has been found to be acceptable by most people for the environment in question and also to be not intrusive.

Maximum Design Sound Level
The level of noise above which most people occupying the space start to become dissatisfied with the level of noise.

Chart of Noise Level Descriptors



Austroads Vehicle Class

AUSTROADS Vehicle Classification System

Level 1 Length (indicative) Type	Level 2 Axles and Axle Groups Axles	Groups	Level 3 Vehicle Type Typical Description	AUSTROADS Classification Class	Parameters	Typical Configuration
			LIGHT VEHICLES			
Short up to 5.5m		1 or 2	**Short** Sedan, Wagon, 4WD, Utility, Light Van, Bicycle, Motorcycle, etc	1	d(1) ≤ 3.2m and axles = 2	
	3, 4 or 5	3	**Short - Towing** Trailer, Caravan, Boat, etc	2	groups = 3 d(1) > 2.1m, d(1) ≤ 3.2m, d(2) ≥ 2.1m and axles = 3, 4 or 5	
			HEAVY VEHICLES			
Medium 5.5m to 14.5m	2	2	**Two Axle Truck or Bus**	3	d(1) > 3.2m and axles = 2	
	3	2	**Three Axle Truck or Bus**	4	axles = 3 and groups = 2	
	> 3	2	**Four Axle Truck**	5	axles > 3 and groups = 2	
Long 11.5m to 19.0m	3	3	**Three Axle Articulated** Three axle articulated vehicle, or Rigid vehicle and trailer	6	d(1) > 3.2m, axles = 3 and groups = 3	
	4	> 2	**Four Axle Articulated** Four axle articulated vehicle, or Rigid vehicle and trailer	7	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 4 and groups > 2	
	5	> 2	**Five Axle Articulated** Five axle articulated vehicle, or Rigid vehicle and trailer	8	d(2) < 2.1m or d(1) < 2.1m or d(1) > 3.2m axles = 5 and groups > 2	
	> 6	> 2	**Six Axle Articulated** Six axle articulated vehicle, or Rigid vehicle and trailer	9	axles = 6 and groups > 2 or axles = 6 and groups = 3	
Medium Combination 17.5m to 36.5m	> 6	4	**B Double** B Double, or Heavy truck and trailer	10	groups = 4 and axles > 6	
	> 6	5 or 6	**Double Road Train** Double road train, or Medium articulated vehicle and one dog trailer (M.A.D.)	11	groups = 5 or 6 and axles > 6	
Large Combination Over 33.0m	> 6	> 6	**Triple Road Train** Triple road train, or Heavy truck and three trailers	12	groups > 6 and axles > 6	

Definitions: Group: Axle group, where adjacent axles are less than 2.1m apart. Groups: Number of axle groups. Axles: Number of axles (maximum axle spacing of 10.0m). d(1): Distance between first and second axle. d(2): Distance between second and third axle.

Typical Noise Levels