HERRING STORER ACOUSTICS

SATTERLEY

CATALINA GREEN SUBDIVISION
TAMALA PARK

SPP 5.4 NOISE ASSESSMENT

SEPTEMBER 2024

OUR REFERENCE: 33321-3-17291-04

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NOISE ASSESSMENT
CATALINA GREEN SUBDIVISION
TAMALA PARK

Job No: 17291-04

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FOR

SATTERLEY

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1. INTRODUCTION

Herring Storer Acoustics was commissioned by Satterley to undertake a revised road traffic and passenger rail noise assessment for the proposed development of Catalina Green, Clarkson.

The purpose of this assessment was to revise the previous noise assessment to allow for changes to the subdivision layout and to assess noise received within the development from vehicles travelling along both Neerabup Road, the Mitchell Freeway, and the Yanchep Passenger Rail Line for the future. It is noted that the previous assessment (reference *22924-4-17291*) was based on road traffic only, and did not include passenger rail.

As part of the study, the following was carried out:

- Revise the predictive noise model to include the updated subdivision plan.
- Update the predictive noise model to include passenger rail on the Perth to Yanchep Line.
- Determine by noise modelling the noise levels that would be received at residences within the development from vehicles travelling on the future road and rail system.
- Assess the predicted noise levels received at residence for compliance with the requirements of the WAPC State Planning Policy 5.4 *"Road and Rail Noise"* (SPP 5.4).
- If exceedances are predicted, comment on possible noise amelioration options for compliance with the appropriate criteria.

For this assessment two options have been provided, with and without noise walls for noise control on the western side of the development (Freeway).

The traffic noise assessment has been carried out in accordance with the WAPC State Planning Policy 5.4 *"Road and Rail Noise"*.

For information, the development plan is attached in Appendix A.

2. SUMMARY

Under the WAPC State Planning Policy 5.4, for this development, the appropriate "Noise Targets" to be achieved under SPP 5.4, external to a residence are:

External

Day	Maximum of 55 dB(A) L_{Aeq}
Night	Maximum of 50 dB(A) L_{Aeq}

The policy states that the "outdoor targets are to be met at all outdoor areas as far as reasonable and practical to do so using the various noise mitigation measures outlined in the guidelines". The Policy also states, under Section 6 – Policy Measures that "a reasonable degree of acoustic amenity for living areas on each residential lot". The policy recognises that "it may not be practicable to meet the outdoor noise targets".

The Policy states the following acceptable internal noise levels:

Internal

Living and Work Areas	$L_{Aeq(Day)}$ of 40 dB(A)
Bedrooms	$L_{Aeq(Night)}$ of 35 dB(A)

From the modelling undertaken for the future Kwinana Freeway, noise received at the development would exceed the above criteria. As the inclusion of a noise wall for the entire length of the development is not practical as future residential lots face the roadway, to comply with the requirements of SPP 5.4 "Quiet House" design is required.

Appendix C details the Quiet House Design Packages required for each individual Lot with Appendix D containing the deemed to satisfy construction methods.

We note that alternative constructions as to those listed in Appendix D, are acceptable, provided they are supported by an assessment undertaken by a suitably qualified acoustic consultant.

Due to the orientation of the lots, the outdoor living area is situated behind the house, away from the Freeway, therefore providing a barrier to noise level, hence compliance is achieved with the L_{Aeq} (night) of 50 dB(A).

Additionally, noise modelling indicates that noise received at the closest residence for the Passenger Railway Line would comply with the above criteria. Therefore, no acoustic amelioration, or notifications are required for those residential lots located adjacent to the Railway Line.

3. ACOUSTIC CRITERIA

3.1 WAPC PLANNING POLICY

The Western Australian Planning Commission (WAPC) released on 22 September 2009 State Planning Policy 5.4 *"Road and Rail Transport Noise and Freight Considerations In Land Use Planning"*. Section 5.3 – Noise Criteria, which outlines the acoustic criteria, states:

"5.3 – NOISE CRITERIA

Table 1 sets out the outdoor noise criteria that apply to proposals for new noise-sensitive development or new major roads and railways assessed under this policy.

These criteria do not apply to –

- *proposals for redevelopment of existing major roads or railways, which are dealt with by a separate approach as described in section 5.4.1; and*
- *proposals for new freight handling facilities, for which a separate approach is described in section 5.4.2.*

The outdoor noise criteria set out in Table 1 apply to the emission of road and rail transport noise as received at a noise-sensitive land use. These noise levels apply at the following locations—

- *for new road or rail infrastructure proposals, at 1 m from the most exposed, habitable façade of the building receiving the noise, at ground floor level only; and*
- *for new noise-sensitive development proposals, at 1 m from the most exposed, habitable façade of the proposed building, at each floor level, and within at least one outdoor living area on each residential lot.*

Further information is provided in the guidelines.

TABLE 1 – OUTDOOR NOISE CRITERIA

Time of day	*Noise Target*	*Noise Limit*

Day (6 am–10 pm)	*$L_{Aeq(Day)}$ = 55 dB(A)*	*$L_{Aeq(Day)}$ = 60 dB(A)*
Night (10 pm–6 am)	*$L_{Aeq(Night)}$ = 50 dB(A)*	*$L_{Aeq(Night)}$ = 55 dB(A)*

The 5 dB difference between the outdoor noise target and the outdoor noise limit, as prescribed in Table 1, represents an acceptable margin for compliance. In most situations in which either the noise-sensitive land use or the major road or railway already exists, it should be practicable to achieve outdoor noise levels within this acceptable margin. In relation to greenfield sites, however, there is an expectation that the design of the proposal will be consistent with the target ultimately being achieved.

Because the range of noise amelioration measures available for implementation is dependent upon the type of proposal being considered, the application of the noise criteria will vary slightly for each different type. Policy interpretation of the criteria for each type of proposal is outlined in sections 5.3.1 and 5.3.2.

The noise criteria were developed after consideration of road and rail transport noise criteria in Australia and overseas, and after a series of case studies to assess whether the levels were practicable. The noise criteria take into account the considerable body of research into the effects of noise on humans, particularly community annoyance, sleep disturbance, long-term effects on cardiovascular health, effects on children's learning performance, and impacts on vulnerable groups such as children and the elderly. Reference is made to the World Health Organization (WHO) recommendations for noise policies in their publications on community noise and the Night Noise Guidelines for Europe. See the policy guidelines for suggested further reading.

5.3.1 Interpretation and application for noise-sensitive development proposals

In the application of these outdoor noise criteria to new noise-sensitive developments, the objective of this policy is to achieve –

- *acceptable indoor noise levels in noise-sensitive areas (for example, bedrooms and living rooms of houses, and school classrooms); and*
- *a reasonable degree of acoustic amenity in at least one outdoor living area on each residential lot[1].*

If a noise-sensitive development takes place in an area where outdoor noise levels will meet the noise target, no further measures are required under this policy.

In areas where the noise target is likely to be exceeded, but noise levels are likely to be within the 5dB margin, mitigation measures should be implemented by the developer with a view to achieving the target levels in a least one outdoor living area on each residential lot[1]. Where indoor spaces are planned to be facing any outdoor area in the margin, noise mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces. In this case, compliance with this policy can be achieved for residential buildings through implementation of the deemed-to-comply measures detailed in the guidelines.

In areas where the outdoor noise limit is likely to be exceeded (i.e. above $L_{Aeq(Day)}$ of 60 dB(A) or $L_{Aeq(Night)}$ of 55 dB(A)), a detailed noise assessment in accordance with the guidelines should be undertaken by the developer. Customised noise mitigation measures should be implemented with a view to achieving the noise target in at least one outdoor living or recreation area on each noise-sensitive lot or, if this is not practicable, within the margin.

1 For non residential noise-sensitive developments, (e.g. schools and child care centres) consideration should be given to providing a suitable outdoor area that achieves the noise target, where this is appropriate to the type of use.

Where indoor spaces will face outdoor areas that are above the noise limit, mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces, as specified in the following paragraphs.

For residential buildings, acceptable indoor noise levels are $L_{Aeq(Day)}$ of 40 dB(A) in living and work areas and $L_{Aeq(Night)}$ of 35 dB(A) in bedrooms[2]. For all other noise-sensitive buildings, acceptable indoor noise levels under this policy comprise noise levels that meet the recommended design sound levels in Table 1 of Australian Standard AS 2107:2000 Acoustics—Recommended design sound levels and reverberation times for building interiors.

These requirements also apply in the case of new noise-sensitive developments in the vicinity of a major transport corridor where there is no existing railway or major road (bearing in mind the policy's 15-20 year planning horizon). In these instances, the developer should engage in dialogue with the relevant infrastructure provider to develop a noise management plan to ascertain individual responsibilities, cost sharing arrangements and construction time frame.

If the policy objectives for noise-sensitive developments are not achievable, best practicable measures should be implemented, having regard to section 5.8 and the guidelines."

The Policy, under Section 5.7, also provides information regarding "Notifications on Titles".

4. NOISE MONITORING

Noise monitoring was undertaken at three locations on the boundary of the proposed development between the 31st January and the 8th February 2018 and then on 9th December 2019. From these measurements, the noise received at the development from vehicles travelling along Mitchell Freeway and Neerabup Road was determined.

The results of the noise data logging are summarised in Table 2 with pictures of the monitors and graphical data contained in Appendix E.

2 For residential buildings, indoor noise levels are not set for utility spaces such as bathrooms. This policy encourages effective "quiet house" design, which positions these non-sensitive spaces to shield the more sensitive spaces from transport noise (see guidelines for further information).

TABLE 2 – DETERMINATION OF TRANSPORTATION NOISE AT LOGGERS, dB(A)

Location	Road Source	$L_{A10\ 18hr}$	$L_{Aeq(day)}$	$L_{Aeq(night)}$
Eastern Boundary of Development (55 metres from the road edge)	Mitchell Freeway	52.4	51.0	47.5
Northern Boundary (42 metres from road edge)	Neerabup Road	55.0	53.4	50.2

5. MODELLING

5.1 ROAD TRAFFIC NOISE

Modelling of noise received within the development from the Mitchell Freeway and Neerabup Road was carried out using SoundPlan, using the Calculation of Road Traffic Noise (CoRTN) algorithms. The input data for the model included the parameters detailed in Table 5.1.

TABLE 3 - SUMMARY OF TRAFFIC DATA

Parameter	Mitchell Freeway	Mitchell to Neerabup Off Ramp	Mitchell to Neerabup On Ramp	Neerabup Road
Current 2021 Traffic Flow (vpd) MRWA ROM model	45,600	5,500	5,400	16,200
Current 2021 Traffic Flow (vpd) Counted	61,968	-	-	18,295
Future 2041 Traffic Flow (vpd) MRWA ROM model	128,500	8,900	8,200	27,300
Future 2044 Traffic Flow (vpd) Calculated using MRWA ROM model	138,380	9,584	8,831	29,399
Percentage Heavy Vehicles (%)	3%	7%	8%	2%
Speed (km/hr)	100	60	60	60
Façade Reflection	+2.5 dB	+2.5 dB	+2.5 dB	+2.5 dB

Note: We note that with the difference between the $L_{Aeq,8hr}$ and the $L_{Aeq,16hr}$ being greater than 5 dB(A), achieving compliance with the day period criteria will also achieve compliance with the night period criteria. Therefore, noise modelling was only undertaken for the day period and the results are shown graphically in Appendix B.
The future road traffic volumes were based on information provided by the MRWA ROM department (shown in Appendix F) and the traffic maps.

Other input data for the model included:

- Traffic data from MRWA (https://mrapps.mainroads.wa.gov.au/TrafficMap/)
- Traffic as provided by the MRWA ROM Department, as attached in Appendix F. Note, MRWA ROM modelling provided 2041 traffic forecasts. As SPP 5.4 requires 20-year future, the annual percentage increase between the MRWA provided 2021 and 2041 volumes has been used for the increase to 2043. For this road system it is a 2.5% annual increase.

- Noise source heights for the three road source strings (Passenger Vehicles, Heavy Vehicles Engine and Heavy Vehicle Exhausts) are +0.5, +1.5 and +3.6m, with a noise correction of -0.8 and -8.0 applied to the heavy vehicle's engine and exhaust noise sources.
- Topographical data, with the ground level within the development based on natural ground levels as per surveys conducted.
- A +2.5 dB adjustment to allow for façade reflection.
- Development receiver heights at 1.4m above ground level.
- Future buildings located on the boundary Lots of the development (assumed to be present for future road traffic volumes).
- Calculations based on CoRTN algorithms.
- Other parameter listed in SPP 5.4 as to guidance for modelling road traffic noise / assessment.

Noise modelling for road noise was undertaken for the following scenarios:

S1 Previous (2018) traffic volumes for calibration to noise monitoring data.

S2 Noise emissions from Kwinana Freeway and Neerabup Road (Future traffic flows 2044)

S3 Noise emissions from Kwinana Freeway (Future traffic flows 2044) with a 3m noise wall, and future housing on Lots.

The 1.8m wall for the side facing lots has been assumed to be a Colorbond or equivalent.

For the noise modelling of future traffic, it has been assumed that the percentage of future heavy vehicles remains the same as for the current traffic flows. In this case, we believe that this is a conservative approach, as we believe that the percentage of heavy vehicles would fall over time.

5.2 PASSENGER TRAIN NOISE

To differentiate the noise associated with only passenger rail from the overall noise levels influenced by vehicles on the road network, analysis of individual train events has undertaken.

Measurements of the current passenger rail system have been conducted. Noise level measurements of individual train pass-by events were conducted on the Yanchep to Perth line for the 130km/hr 6 carriage B Series trains.

Passenger trains were measured on 19th June 2024. The measurement location was at the Allara subdivision, on the western side of the passenger rail line. Measurements were in a free field state, i.e no buildings or structures surrounding, or between the measurement location and the rail line.

Measurements were conducted at two locations, namely one to the south of the development where the rail line is deeper in a cutting, and at the northern end of the development where the rail line is closer to grade with the development.

Measurements were conducted using a Larson Davis sound level meter, in current calibration. The measurements were observed, handheld types for the period of the individual train passby events. Additionally, video recordings were carried out of the train pass by events to allow for calculation of speed.

Using the measured levels of the train as a basis for calibration, predictive noise modelling using Soundplan has been carried out. Predictive noise levels for the rail line which is at grade have been calculated. Nord2000 railway algorithms have been used.

Utilising this detailed data, noise levels for each train pass-by event were analysed with the resultant levels detailed in Table 4.1. For the purpose of limiting the amount of data, only a sample of train pass by events have been noted.

TABLE 5.1 - SUMMARY OF MEASURED TRAIN NOISE LEVELS

Measurement	Distance from Rail Line	Train	Direction	Speed (km/hr)	Time for Pass (s)	LAeq Average
1	40m	6 Car Train (144m long)	S	130	47	62.2
2	40m	6 Car Train (144m long)	N	Unknown	38	61.3
3	40m	6 Car Train (144m long)	N	132	35	61.7
4	40m	6 Car Train (144m long)	S	129	35	62.7
5	40m	6 Car Train (144m long)	S	128	30	61.2
6	40m	6 Car Train (144m long)	N	127	33	60.7
7	40m	6 Car Train (144m long)	S	124	29	61.4
8	40m	6 Car Train (144m long)	N	130	40	62.2
9	40m	6 Car Train (144m long)	Both	128	39	63.6
Average				128	36	62

Based on analysis of the measured noise levels, at the 15m monitoring point, train noise is present for an average of 36 seconds. The average L_{Aeq} of the train pass-by events, being a noise level of $L_{Aeq(36seconds)}$) 62 dB(A) has been considered as the calibration point of 40m from the rail line for the current passenger rail use.

The above individual train pass noise level can be used to calculate the $L_{Aeq(16hour)}$ Day, and the $L_{Aeq(8hour)}$ Night noise levels. This is based on the quantity of trains for each period, referencing the passenger rail timetable. Hence, Table 5.2 contains the details used for the calculations.

TABLE 5.2 – RELATIONSHIP BETWEEN MEASURED NOISE LEVELS AND TRAIN VOLUMES

Description	Value
Train Qty per 16 hours Day	195
Distance of receiver (metres)	40
$L_{Aeq(36second)}$ at receiver (Train pass by event)	62
Time train noise is present (Seconds)	36
Total time noise present (Minutes) Day	117
$L_{Aeq(16hour)}$ Day period @40m	**52.9**

Based on the above monitoring results, for this project, the difference between the $L_{Aeq,8hr}$ and the $L_{Aeq,16hr}$ has been taken to be those listed in Table 5.2. It was assumed that these differences would apply in the future.

We note that with the difference between the $L_{Aeq,8hr}$ and the $L_{Aeq,16hr}$ being greater than 5 dB(A), achieving compliance with the day period criteria will also achieve compliance

with the night period criteria. Thus, only noise contour plots for the day period have been shown.

To calibrate the noise model, the existing traffic volumes and current layout were modelled in Soundplan. The resultant noise level at the monitoring locations was compared to the calculated results and an adjustment made in the model to calibrate to the same result.

Noise modelling for the future passenger train was carried out based on the number of train movements as summarised in Table 5.1.

TABLE 5.3 – TRAIN MOVEMENTS

Parameter	Train Movements (per hour)		Speed
	Day	Night	Km/hour
North Bound			
6 Car Set (144 metres long)	5.9	0.75	130
South Bound			
6 Car Set (144 metres long)	6.3	0.9	130

Based on the above number of train movements, once again if compliance is achieved with the day period criteria, compliance will also be achieved with the night period criteria. Therefore, noise modelling was only undertaken for the day period.

Noise modelling for rail was undertaken for the following scenario:

S1 Noise emissions from Yanchep to Perth passenger railway, without noise amelioration.

S2 Noise emissions from Yanchep to Perth passenger railway, with 3.0m noise wall.

6. ASSESSMENT

In accordance with the WAPC Planning Policy 5.4, an assessment of the noise that would be received within the development located at the development from vehicles travelling on the Mitchel Freeway, Neerabup Road and passenger rail associated with the Yanchep to Perth rail line has been undertaken.

In accordance with the Policy, the following would be the acoustic criteria applicable to this project:

External

Day	Maximum of 55 dB(A) L_{Aeq}
Night	Maximum of 50 dB(A) L_{Aeq}
Outdoor Living Areas (Night)	Maximum of 50 dB(A) L_{Aeq}

a

Internal

Sleeping Areas	35 dB(A) $L_{Aeq(night)}$
Living Areas	40 dB(A) $L_{Aeq(day)}$

Noise received at an outdoor area should also be reduced as far as practicable with an aim of achieving an $L_{Aeq\ (night)}$ of 50 dB(A).

From the modelling undertaken for the future Kwinana Freeway, noise received at the development would exceed the above criteria. As the inclusion of a noise wall for the entire length of the development is not practical as future residential lots face the roadway, to comply with the requirements of SPP 5.4 “Quiet House” design is required.

Appendix C details the Quiet House Design Packages required for each individual Lot with Appendix D containing the deemed to satisfy construction methods.

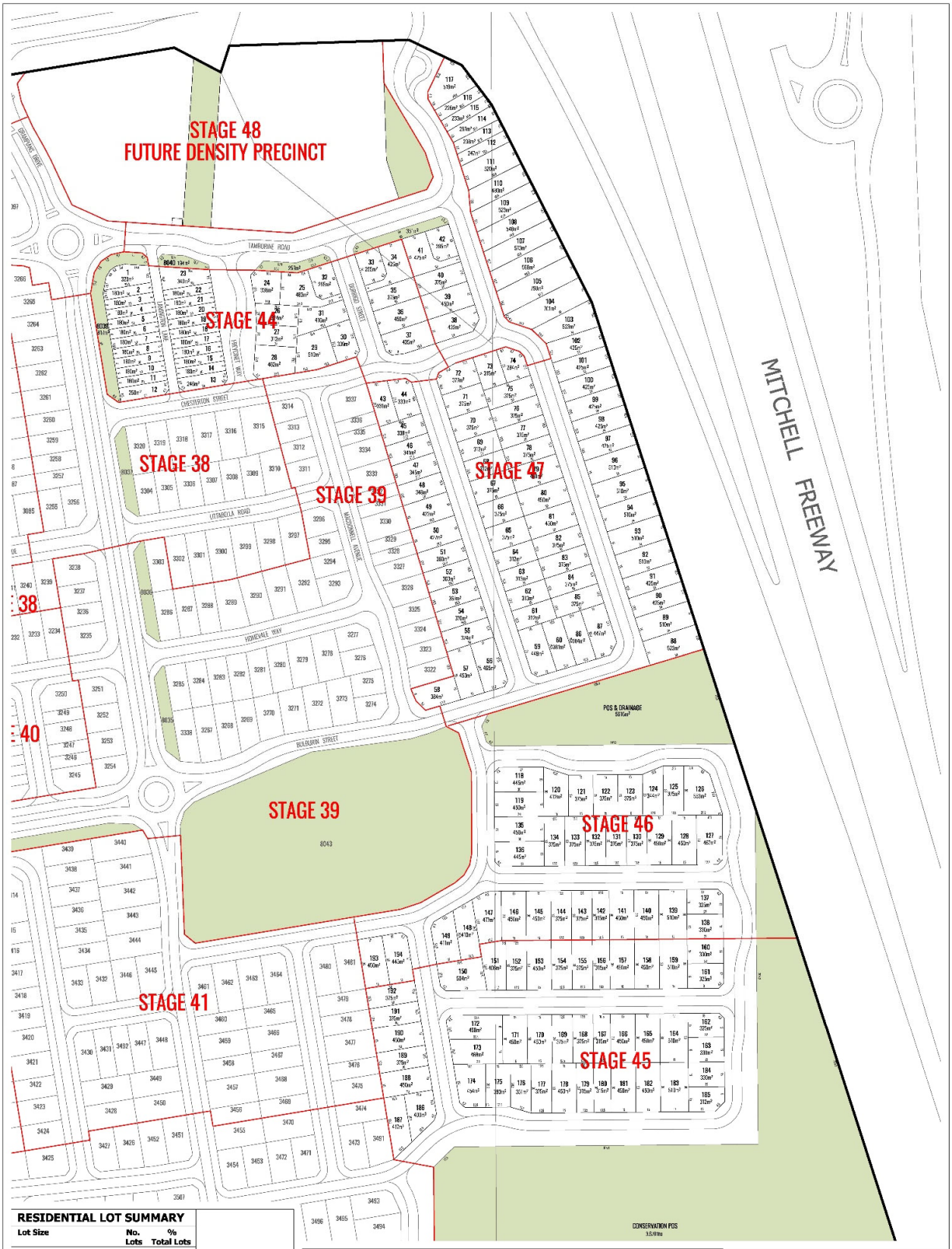
We note that alternative constructions as to those listed in Appendix D, are acceptable, provided they are supported by an assessment undertaken by a suitably qualified acoustic consultant.

Due to the orientation of the lots, the outdoor living area is situated behind the house, away from the Freeway, therefore providing a barrier to noise level, hence compliance is achieved with the L_{Aeq} (night) of 50 dB(A).

Additionally, noise modelling indicates that noise received at the closest residence for the Passenger Railway Line would comply with the above criteria. Therefore, no acoustic amelioration, or notifications are required for those residential lots located adjacent to the Railway Line.

APPENDIX A

DEVELOPMENT PLAN
And
MONITORING LOCATION PLAN



RESIDENTIAL LOT SUMMARY

Lot Size	No. Lots	% Total Lots
180m² - 234m²	21	10.82%
235m² - 399m²	88	45.36%
400m² - 449m²	26	13.40%
450m² - 499m²	36	18.56%
500m² - 549m²	18	9.28%
550m² - 599m²	3	1.55%
700m² - 799m²	2	1.03%
Total Residential Lots	**194**	

Minimum Lot Size 180m²
Maximum Lot Size 750m²
Average Lot Size 382m²
Total Lot Area 7.4178ha

STAGES 44-47 CONCEPT SUBDIVISION PLAN

Catalina Estate, CATALINA REGIONAL COUNCIL

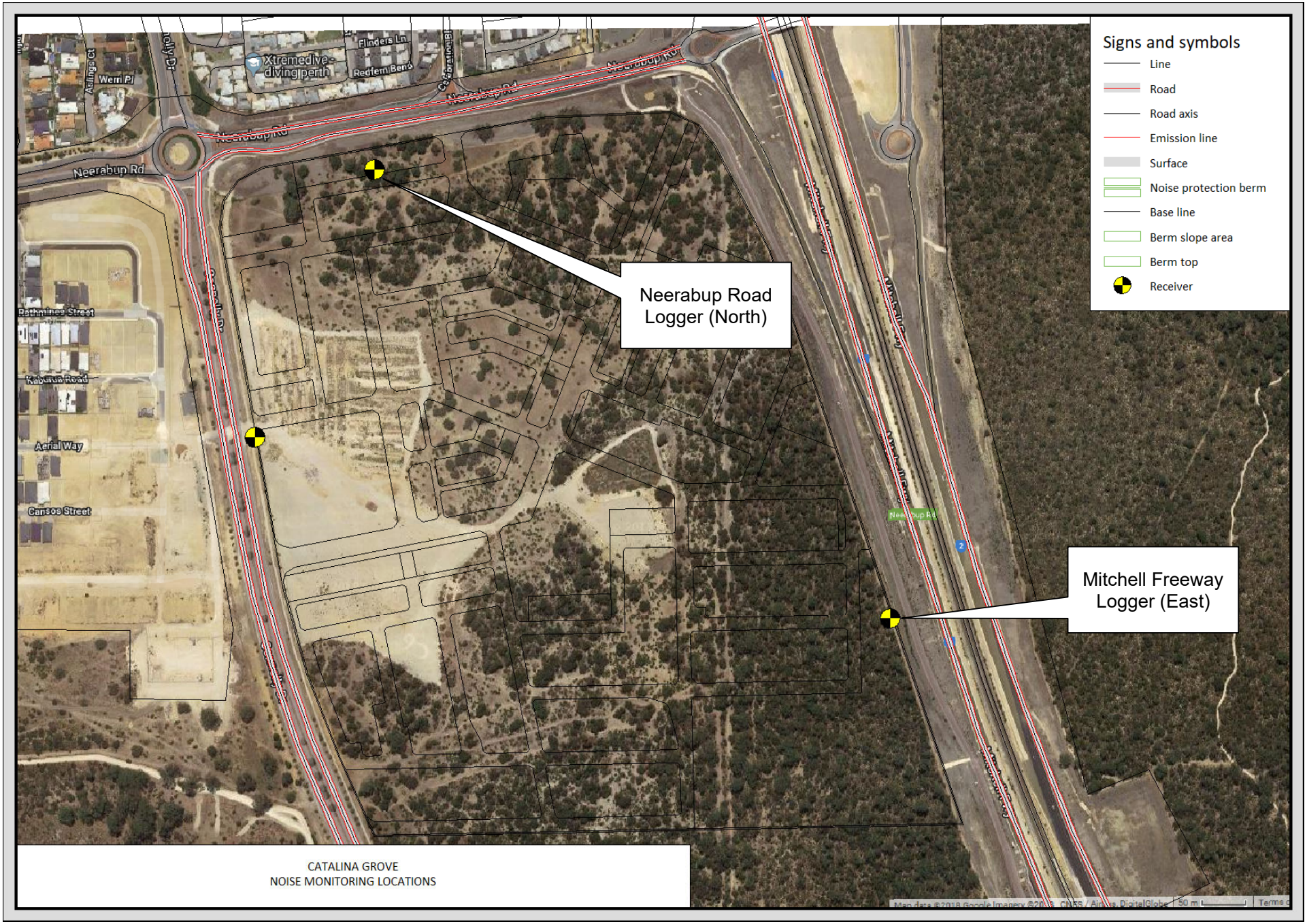
Aerial supplied by: Nearmap
Aerial Date Stamp:
Survey supplied by: MNG
Plan Number: NPS1059 - 021
Revision Number:
Drawn By: JP
Client: CRC

0 20 40 60 80 100 120m

Scale: 1:2000 @A3 | Date Issued: 25.02.2024 | ©Niche Planning Studio

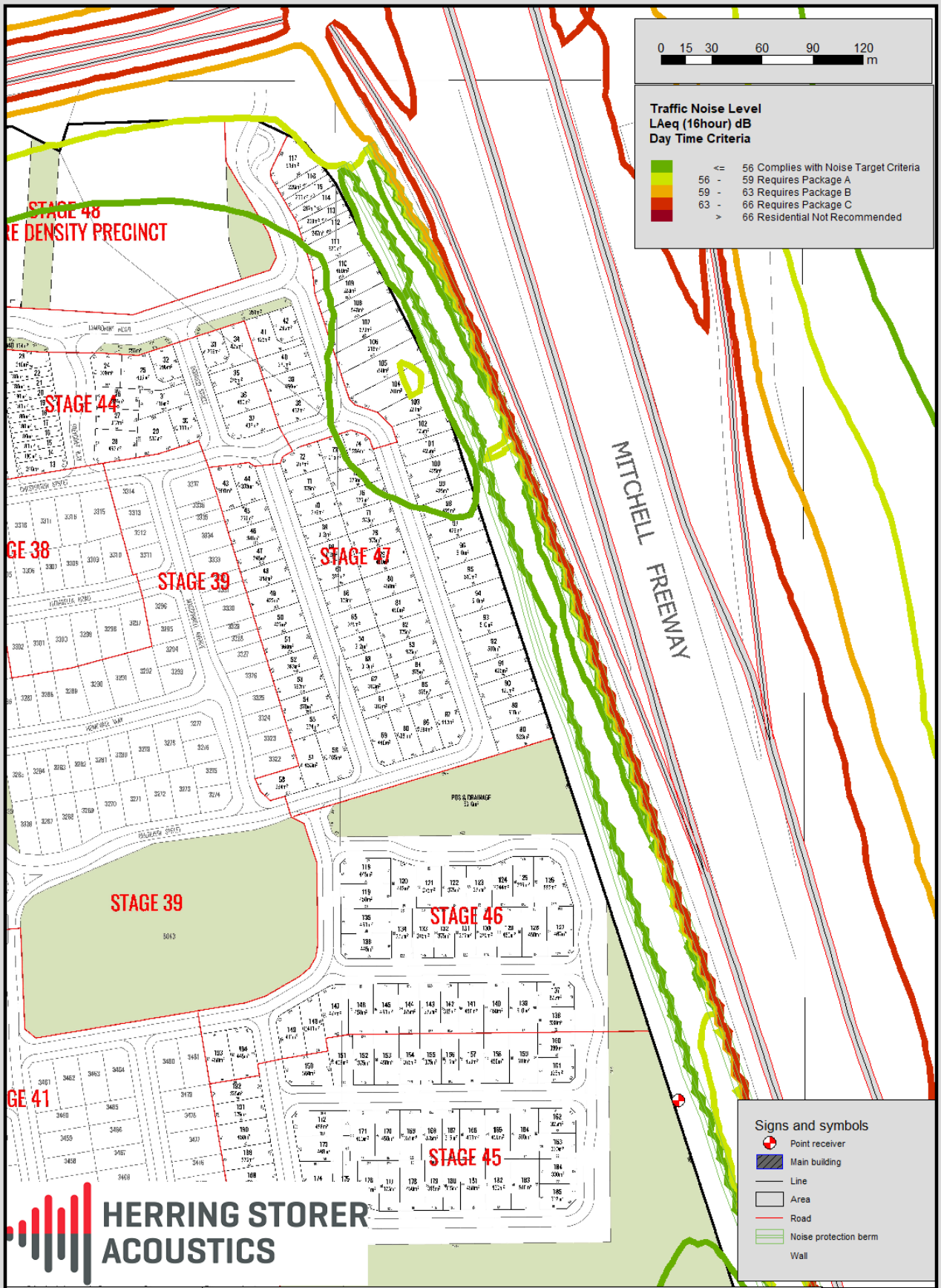
DISCLAIMER:
Lot numbering and layout is subject to approval from the Catalina Regional Council and is subject to detailed survey and design before Town Planning Permit application.
Bulk Rates in $/Lot price only and subject to Architectural Design and approval from an RAIA qualified architect. This plan has been prepared for illustrative purposes only and is not to be used as a means to gauge any precise values or data presented.

NICHE STUDIO


Signs and symbols
Line
Road
Road axis
Emission line
Surface
Noise protection berm
Base line
Berm slope area
Berm top
Receiver
Neerabup Road Logger (North)
Mitchell Freeway Logger (East)
Neerabup Rd
Rathmines Street
Kabunda Road
Aerial Way
Cansos Street
Xtremedive - diving perth
Flinders Ln
Redfern Bend
Celebration Blvd
Werri Pl
Asilings Ct
Telly Dr
CATALINA GROVE
NOISE MONITORING LOCATIONS

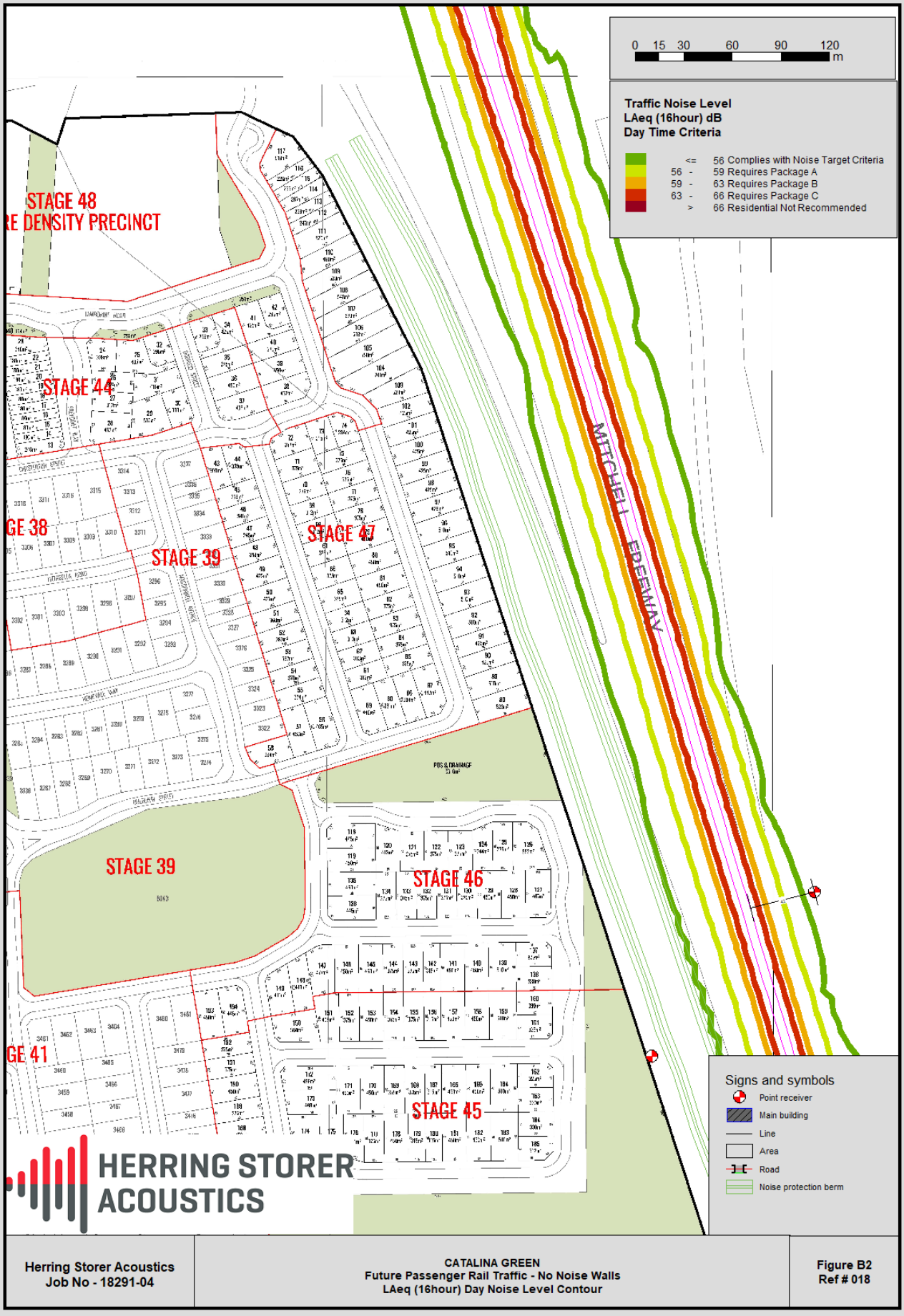
APPENDIX B

NOISE CONTOUR PLOT



HERRING STORER ACOUSTICS

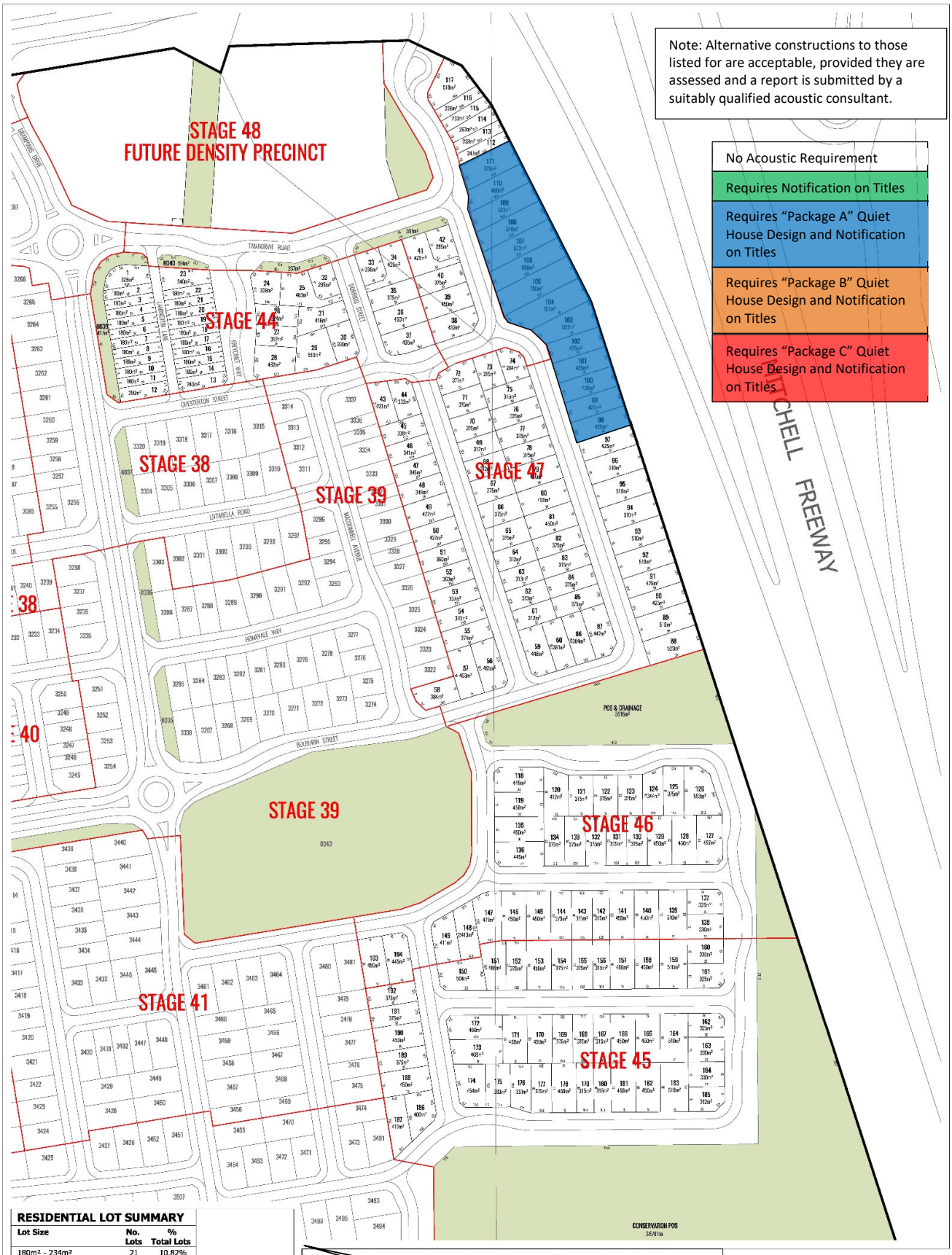
Herring Storer Acoustics Job No - 18291-04	CATALINA GREEN Future Road Traffic - No Noise Walls LAeq (16hour) Day Noise Level Contour	Figure B1 Ref # 019



Herring Storer Acoustics Job No - 18291-04	CATALINA GREEN Future Passenger Rail Traffic - No Noise Walls LAeq (16hour) Day Noise Level Contour	Figure B2 Ref # 018

APPENDIX C

Quiet House Design – Individual Lot Requirements



Note: Alternative constructions to those listed for are acceptable, provided they are assessed and a report is submitted by a suitably qualified acoustic consultant.

No Acoustic Requirement
Requires Notification on Titles
Requires "Package A" Quiet House Design and Notification on Titles
Requires "Package B" Quiet House Design and Notification on Titles
Requires "Package C" Quiet House Design and Notification on Titles

RESIDENTIAL LOT SUMMARY

Lot Size	No. Lots	% Total Lots
180m² - 234m²	21	10.82%
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400m² - 449m²	26	13.40%
450m² - 499m²	36	18.56%
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Minimum Lot Size 180m²
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STAGES 44-47 CONCEPT SUBDIVISION PLAN
Catalina Estate
CATALINA REGIONAL COUNCIL

Aerial supplied by: Nearmap
Aerial Date Stamp:
Survey supplied by: MNG
Plan Number: NPS1059 - 021
Revision Number:
Drawn By: JP
Client: CRC

80 100 120m

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DISCLAIMER
This plan is for illustrative purposes only and should not be used as a means to judge any property value or yield potential.

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APPENDIX D

QUIET HOUSE DESIGN GUIDELINES

Road Traffic and Passenger Rail - Quiet House Requirements
(*Based on Table 3 of State Planning Policy 5.4 2019*)

Exposure Category	Orientation to corridor	Acoustic ratings					Mechanical ventilation/air conditioning considerations
		Walls	**External doors**	**Windows**	**Roofs and ceilings of highest floors**	**Outdoor Living areas**	
A **Quiet House A**	**Facing**	**Bedroom and Indoor Living and work areas** ➢ Rw + Ctr 45dB	**Bedrooms**: ➢ R_w+C_{tr} 28dB **Indoor Living and work areas:** ➢ R_w+C_{tr} 25dB	**Bedrooms**: Window size dependant ➢ **Minimum** R_w+C_{tr} 28 dB **Indoor Living and work areas** Window size dependant ➢ **Minimum** R_w+C_{tr} 25 dB	➢ R_w+C_{tr} 35dB	➢ At least one outdoor living area located on the opposite side of the building from the transport corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum **2 metres** height above ground level	➢ Acoustically rated openings and ductwork to provide a minimum sound reduction performance of **Rw 40dB** into sensitive spaces
	Side On		**Bedrooms**: ➢ R_w+C_{tr} 25dB **Indoor Living and work areas:** ➢ R_w+C_{tr} 22dB	**Bedrooms**: Window size dependant ➢ **Minimum** R_w+C_{tr} 25 dB **Indoor Living and work areas** Window size dependant ➢ **Minimum** R_w+C_{tr} 22 dB			
	Opposite		No specific requirements	No specific requirements			
B **Quiet House B**	**Facing**	**Bedroom and indoor living and work areas** ➢ R_w+C_{tr} 50dB	**Bedrooms** ➢ R_w+C_{tr} 31dB **Indoor Living and work areas:** ➢ R_w+C_{tr} 28dB	**Bedrooms**: Window size dependant ➢ **Minimum** R_w+C_{tr} 31 dB **Indoor Living and work areas** Window size dependant ➢ **Minimum** R_w+C_{tr} 28 dB	➢ **R_w+C_{tr} 35dB**	➢ At least one outdoor living area located on the opposite side of the building from the corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum **2.4 metres** height above ground level	➢ Acoustically rated openings and ductwork to provide a minimum sound reduction performance of **Rw 40dB** into sensitive spaces
	Side-On		**Bedrooms** ➢ R_w+C_{tr} 28dB **Indoor Living and work areas:** ➢ R_w+C_{tr} 28dB	**Bedrooms**: Window size dependant ➢ **Minimum** R_w+C_{tr} 28 dB **Indoor Living and work areas** Window size dependant ➢ **Minimum** R_w+C_{tr} 25 dB			
	Opposite		**Bedrooms** ➢ R_w+C_{tr} 25dB **Indoor Living and work areas:** ➢ R_w+C_{tr} 25dB	**Bedrooms**: Window size dependant ➢ **Minimum** R_w+C_{tr} 25 dB **Indoor Living and work areas** Window size dependant ➢ **Minimum** R_w+C_{tr} 22 dB			
C **Quiet House C**	**Facing**	**Bedroom and indoor living and work areas** ➢ R_w+C_{tr} 50dB	**Bedrooms** ➢ No External doors to bedrooms facing the corridor **Indoor Living and work areas** ➢ Rw+Ctr 31dB	**Bedrooms**: Window size dependant ➢ **Minimum** R_w+C_{tr} 31dB) **Indoor Living and work areas** Window size dependant ➢ **Minimum** R_w+C_{tr} 31dB	➢ **R_w+C_{tr} 40dB**	➢ At least one outdoor living area located on the opposite side of the building from the corridor and/or at least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum **2.4 metres** height above ground level	➢ Acoustically rated openings and ductwork to provide a minimum sound reduction performance of Rw 40dB into sensitive spaces.
	Side-on		**Bedrooms** ➢ R_w+C_{tr} 31dB **Indoor Living and work areas** ➢ R_w+C_{tr} 28dB	**Bedrooms**: Window size dependant ➢ **Minimum** R_w+C_{tr} 31 dB **Indoor Living and work areas** Window size dependant ➢ **Minimum** R_w+C_{tr} 28 dB			
	Opposite		**Bedrooms**: ➢ R_w+C_{tr} 28dB **Indoor Living and work areas:** ➢ R_w+C_{tr} 28dB	**Bedrooms**: Window size dependant ➢ **Minimum** R_w+C_{tr} 28 dB **Indoor Living and work areas** Window size dependant ➢ **Minimum** R_w+C_{tr} 25 dB			

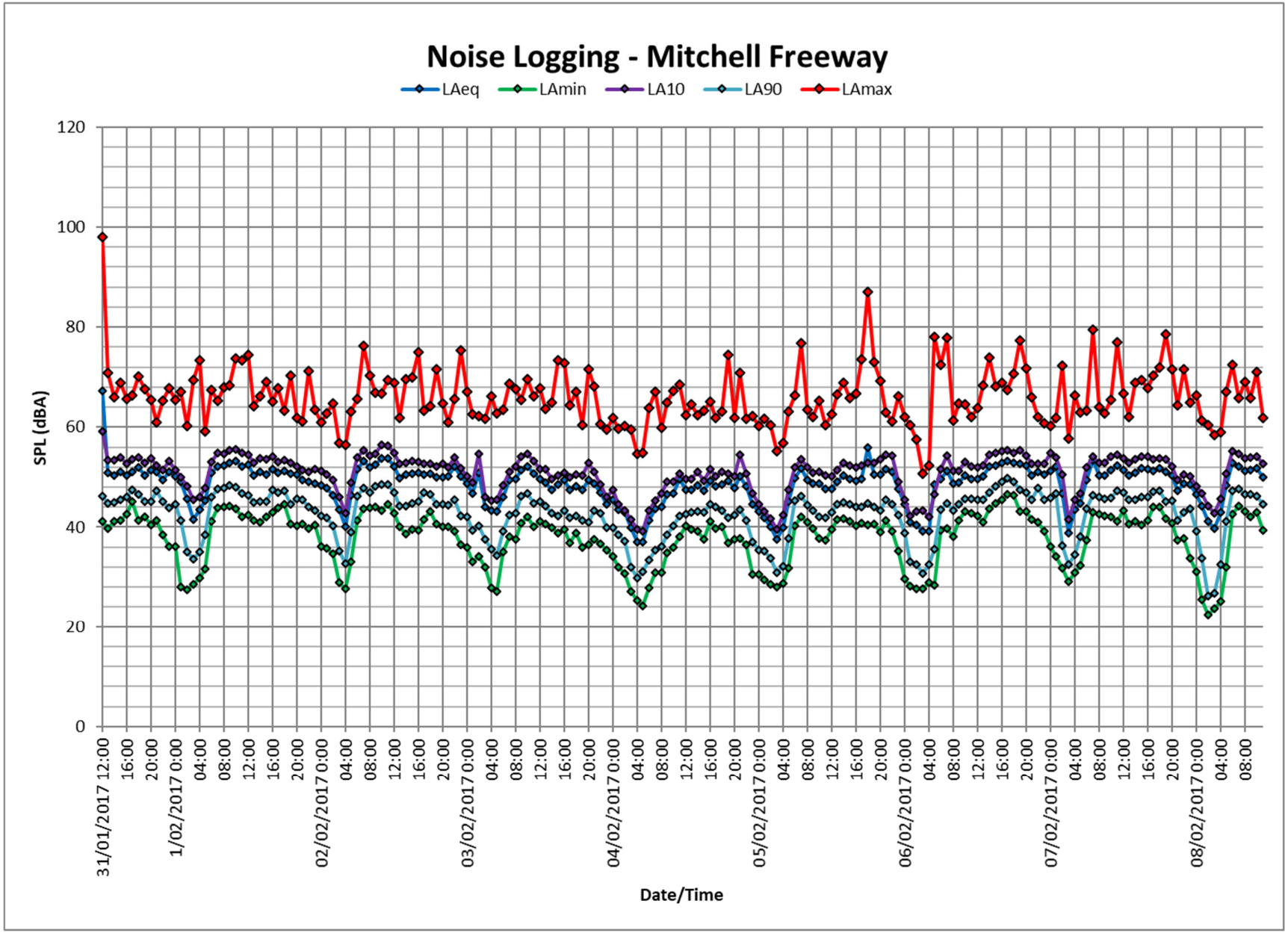
Note: The above treatments are a deemed to satisfy construction. Alternative designs are acceptable, provided they are certified by a suitable qualified acoustic consultant.

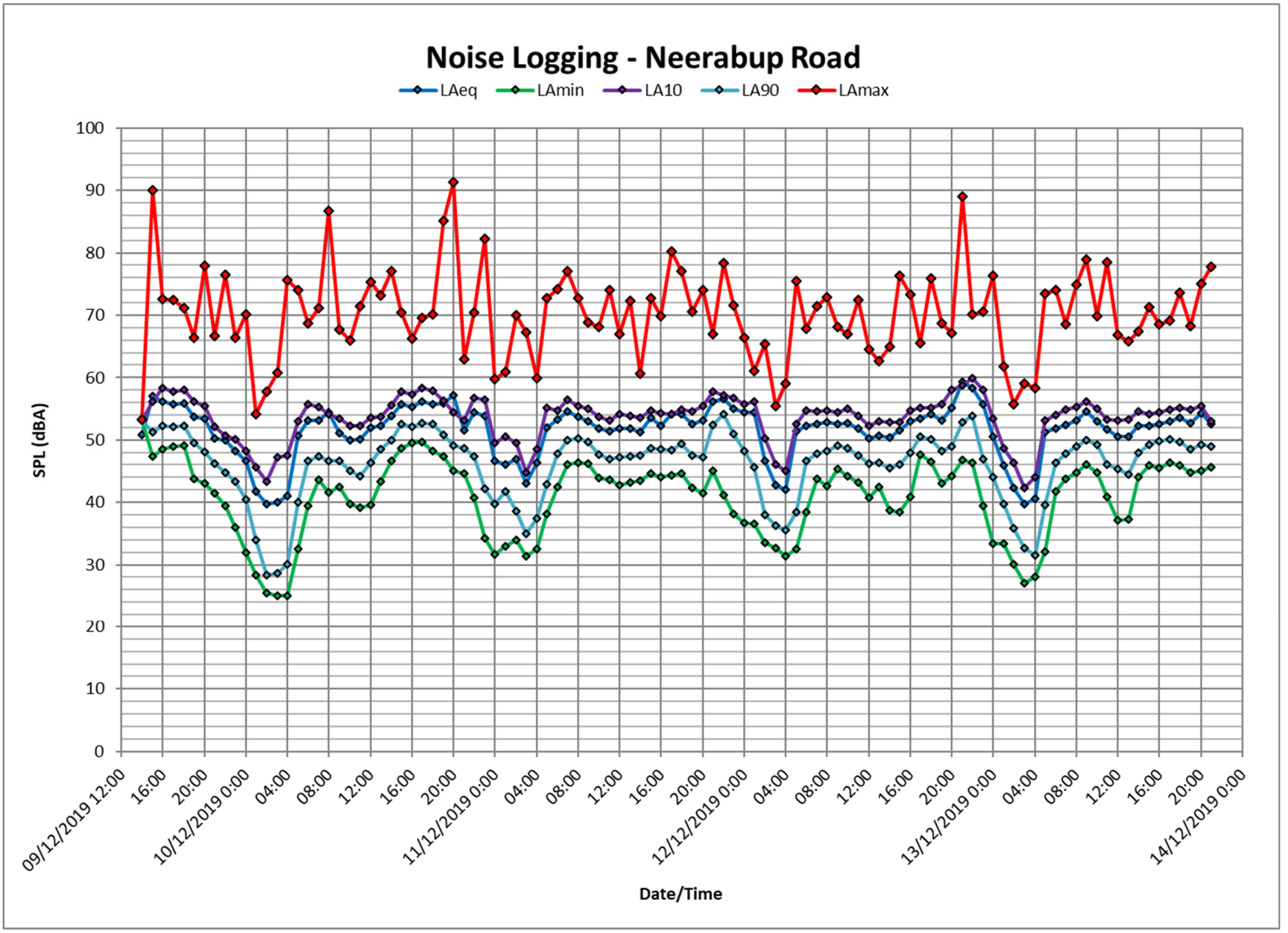
APPENDIX E

MONITORED NOISE LEVELS

FIGURE 1 – MITCHELL FREEWAY MONITORING LOCATIONS

FIGURE 2 – NEERABUP ROAD MONITORING LOCATIONS

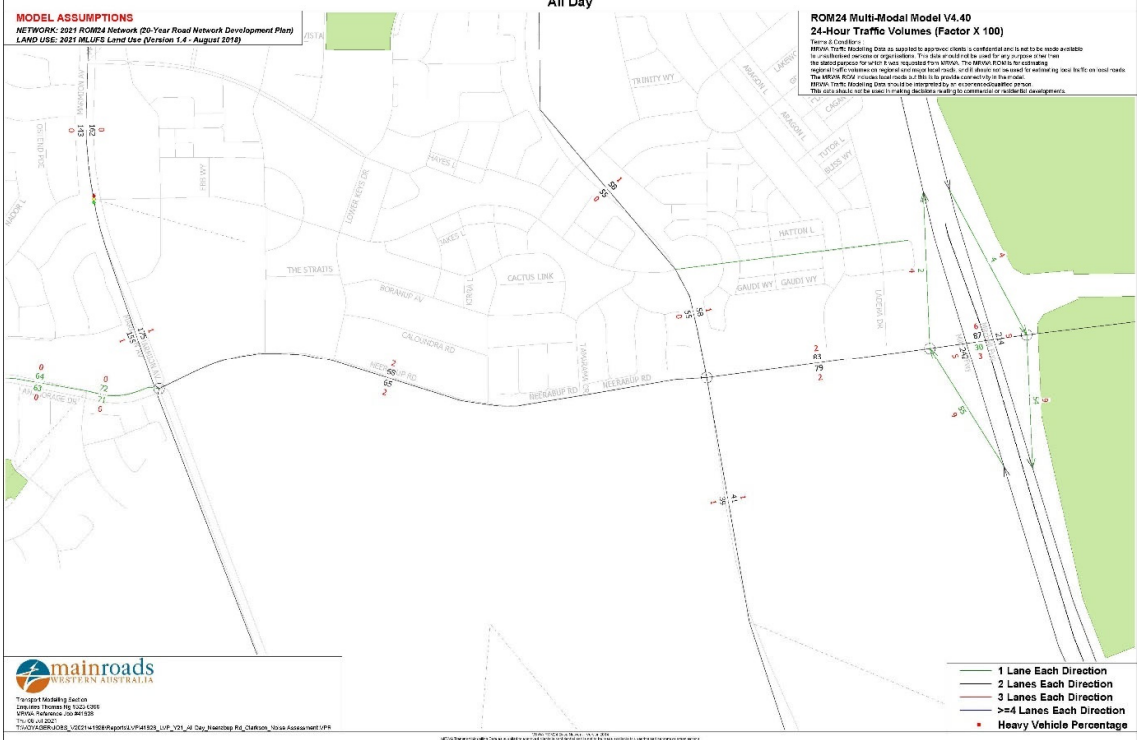

Noise Logging - Mitchell Freeway
LAeq
LAmin
LA10
LA90
LAmax
SPL (dBA)
120
100
80
60
40
20
0
31/01/2017 12:00
16:00
20:00
1/02/2017 0:00
04:00
08:00
12:00
16:00
20:00
02/02/2017 0:00
04:00
08:00
12:00
16:00
20:00
03/02/2017 0:00
04:00
08:00
12:00
16:00
20:00
04/02/2017 0:00
04:00
08:00
12:00
16:00
20:00
05/02/2017 0:00
04:00
08:00
12:00
16:00
20:00
06/02/2017 0:00
04:00
08:00
12:00
16:00
20:00
07/02/2017 0:00
04:00
08:00
12:00
16:00
20:00
08/02/2017 0:00
04:00
08:00
Date/Time


Noise Logging - Neerabup Road
LAeq
LAmin
LA10
LA90
LAmax
SPL (dBA)
100
90
80
70
60
50
40
30
20
10
0
09/12/2019 12:00
16:00
20:00
10/12/2019 0:00
04:00
08:00
12:00
16:00
20:00
11/12/2019 0:00
04:00
08:00
12:00
16:00
20:00
12/12/2019 0:00
04:00
08:00
12:00
16:00
20:00
13/12/2019 0:00
04:00
08:00
12:00
16:00
20:00
14/12/2019 0:00
Date/Time

APPENDIX F

MRWA TRAFFIC DATA

2021 ROM24 Scenario - Link Volume Plot for Neerabup Rd, Clarkson Noise Assessment
LAND USE SCENARIO: MLUFS Version 1.4
All Day



2041 ROM24 Scenario - Link Volume Plot for Neerabup Rd, Clarkson Noise Assessment
LAND USE SCENARIO: MLUFS Version 1.4
All Day