APPENDIX I

Revised Transportation Noise Assessment

Lloyd George Acoustics
PO Box 717
Hillarys WA 6923
T: 9300 4188 F:9300 4199
E: daniel@lgacoustics.com.au W: www.lgacoustics.com.au

Revised Transportation Noise Assessment

Perth-Darwin National Highway Project

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Report: 13122263-01 PDNH

Lloyd George Acoustics Pty Ltd

ABN: 79 125 812 544

PO Box 717
Hillarys WA 6923

T: 9300 4188 / 9401 7770
F: 9300 4199

Contacts	Daniel Lloyd	Terry George	Mike Cake	Matt Moyle
E:	daniel@lgacoustics.com.au	terry@lgacoustics.com.au	mike@lgacoustics.com.au	matt@lgacoustics.com.au
M:	0439 032 844	0400 414 197	0438 201 071	0412 611 330

Prepared By:	Daniel Lloyd
Position:	Project Director
Verified	Terry George
Date:	2 December 2015

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1 INTRODUCTION

Main Roads Western Australia (Main Roads) is currently planning for delivery of the NorthLink WA project, as shown in *Figure 1-1*, which comprises the following two components:

- Perth Darwin National Highway (PDNH) – construction of a new 37km highway link between the junction of Reid Highway/Tonkin Highway and Great Northern Highway/Brand Highway at Muchea; and
- Tonkin Grade Separations – the grade separation of Tonkin Highway with Collier Road, Morley Drive and Benara Road together with associated works including potential widening of the Tonkin Highway.

The NorthLink WA project seeks to deliver a transport corridor that can accommodate the predicted growth in the regional freight task to the State's North West, as well as accommodating the urban traffic demand in the future.

The Perth Darwin National Highway, which is the subject of this noise assessment, will form part of the Australian National Land Freight Network, which aims to provide an interconnected network of freight corridors to the nation's major seaports, airports and freight generating areas, maximising Australia's international competitiveness. The PDNH will connect Perth to the Pilbara and North West WA.

Within the Perth metropolitan region, Tonkin Highway and PDNH will form part of the strategic freight network, linking strategic industrial centres to the Kewdale/Welshpool intermodal terminal. The route will also support further development along the northeast metropolitan corridor, and allow planning provision for a heavy passenger rail line within the Highway median (between Morley Drive and Whiteman to Yanchep Highway).

This report considers the potential noise impacts associated with the Perth Darwin National Highway section by:

- Measuring existing noise levels along the project route;
- Constructing a noise model of the existing road network and calibrating the predicted noise levels against the measured noise levels;
- Using the calibration from the existing model, calculate the noise levels for the year 2040.
- Determine appropriate noise mitigation options to achieve compliant noise levels at surrounding noise sensitive premises.

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

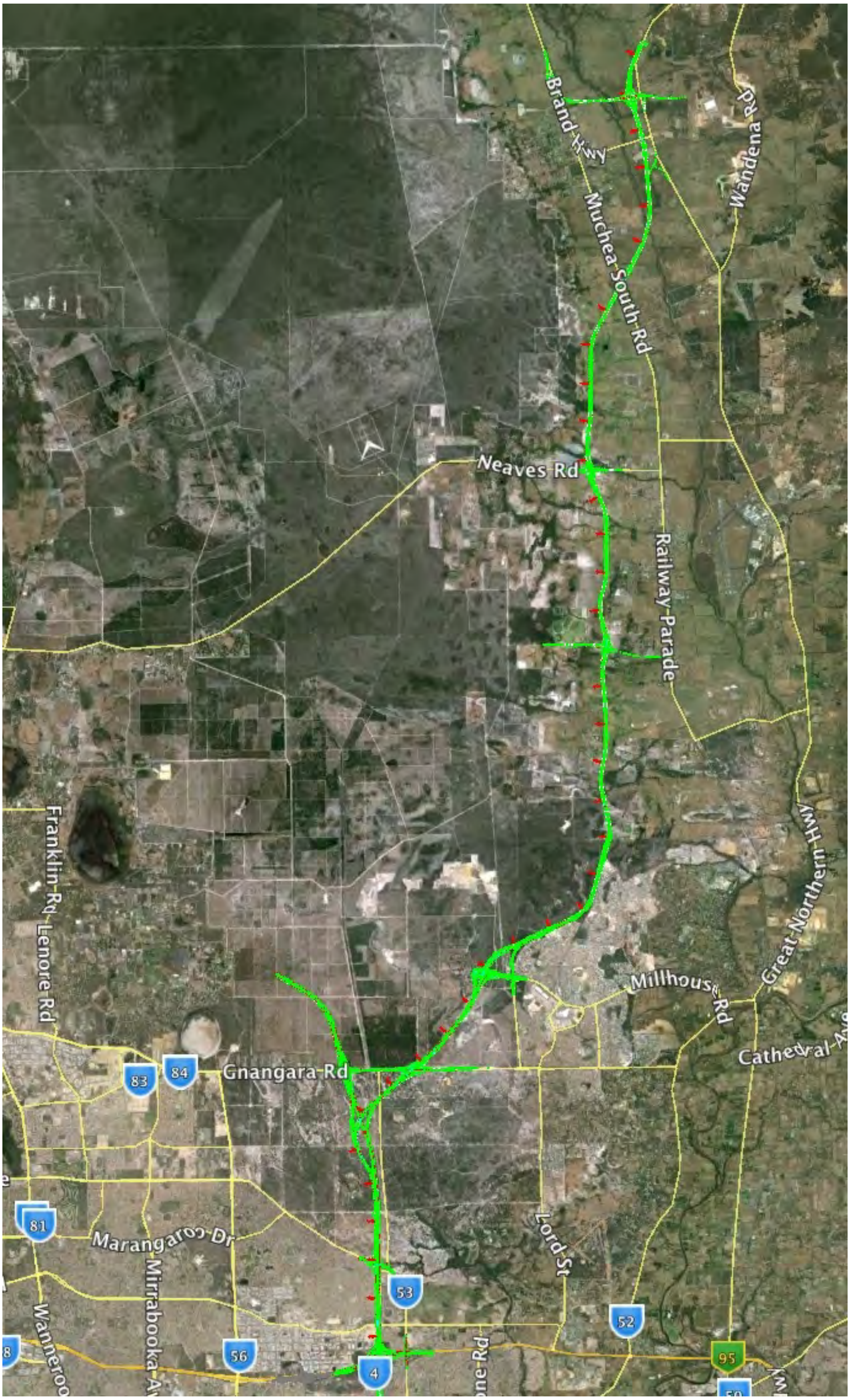


Figure 1-1 Road Project Locality

2 CRITERIA

The criteria relevant to this assessment is the *State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (hereafter referred to as the Policy) produced by the Western Australian Planning Commission (WAPC). The objectives in the Policy are to:

- Protect people from unreasonable levels of transport noise by establishing a standardised set of criteria to be used in the assessment of proposals;
- Protect major transport corridors and freight operations from incompatible urban encroachment;
- Encourage best practice design and construction standards for new development proposals and new or redevelopment transport infrastructure proposals;
- Facilitate the development and operation of an efficient freight network; and
- Facilitate the strategic co-location of freight handling facilities.

When considering the noise levels, the Policy's outdoor noise criteria are shown below in *Table 2-1.* These criteria apply at any point 1-metre from the façade of a habitable ground floor of a noise sensitive premise.

Table 2-1 Outdoor Noise Criteria

Period	Target	Limit
Day (6am to 10pm)	55 dB $L_{Aeq(Day)}$	60 dB $L_{Aeq(Day)}$
Night (10pm to 6am)	50 dB $L_{Aeq(Night)}$	55 dB $L_{Aeq(Night)}$

Note: The 5 dB difference between the target and limit is referred to as the margin.

The Policy's outdoor noise criteria:

- provide an acceptable level of acoustic amenity for existing noise-sensitive land uses and for the planning of new noise-sensitive developments;
- are consistent with other planning policies and community expectations; and
- are practicably achievable.

Where a transport infrastructure project will emit transport noise levels that meet the noise target, no further measures are required under this policy.

Otherwise transport infrastructure providers should design mitigation measures to achieve the noise *limit* of $L_{Aeq\ (Day)}$ 60dB and $L_{Aeq\ (Night)}$ 55dB, when assessed at 1m from the façade at ground floor level.

Transport infrastructure providers are also required to consider design measures to meet the noise target of $L_{Aeq\ (Day)}$ 55dB and $L_{Aeq\ (Night)}$ 50dB, and to implement these measures where reasonable and practicable.

Based on the above, it is considered appropriate to use the Day *limit* criterion of $L_{Aeq\ (Day)}$ 60 dB, when designing the noise mitigation measures. This is consistent with other Main Roads projects.

3 METHOD

Noise measurements and modelling have been undertaken to determine the existing and future noise levels associated with the Project. This section details the method and assumptions used to undertake this assessment.

3.1 Site Measurements

Noise monitoring was undertaken at 20 locations in order to quantify the existing noise levels to determine if day or night period is dominant and to calibrate the noise model. Monitoring sites along Tonkin Highway and in the rural areas were not used in the calibration, as they did not reflect traffic conditions (and noise) expected to be generated by the proposal. For example, congestion on Tonkin Highway and local road traffic are not reflective of free-flowing traffic on the proposed road. Location T on the Great Northern Highway, south of Muchea is more reflective of the traffic conditions (and noise) expected for the proposed road and was therefore used to calibrate the noise model.

The instruments used were ARL Type 316 and ARL Type Ngara noise data loggers. The loggers were positioned at one metre from the façade of interest. Each logger was placed at least one metre from any corner of the building and the microphone height was 1.4 metres above ground floor level.

The loggers were programmed to record hourly L_{A1}, L_{A10}, L_{A90}, and L_{Aeq} levels. From the hourly measurements, the $L_{A10,18\ hour}$, $L_{Aeq,24\ hour}$, $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ values were determined for each complete measurement day. These results were averaged and the mean level reported.

The instruments comply with the instrumentation requirements of *Australian Standard 2702-1984 Acoustics – Methods for the Measurement of Road Traffic Noise*. The loggers 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 certificates for the loggers.

The noise data collected was verified by inspection and professional judgement. Where hourly data was considered atypical, an estimated value based on professional judgement, consistent with normal road traffic noise profiles, was inserted and highlighted by bold italic lettering.

The weather conditions during the measurement period were obtained from the Bureau of Meteorology's Perth Metro (Mount Lawley) and Pearce RAAF stations. This data was compared against the Main Roads specifications for measurement conditions and any unacceptable conditions commented on (*Appendix B*). Where data is significantly affected by weather conditions e.g., rain or high winds, it has been excluded from the results for the measurement period.

The locations of the monitoring are provided in *Figures 3-1 to 3-3,* and were chosen to reflect the changing conditions along the project route. The full noise monitoring report is attached at *Appendix B*.

Figure 3-1 Monitoring Locations A to L

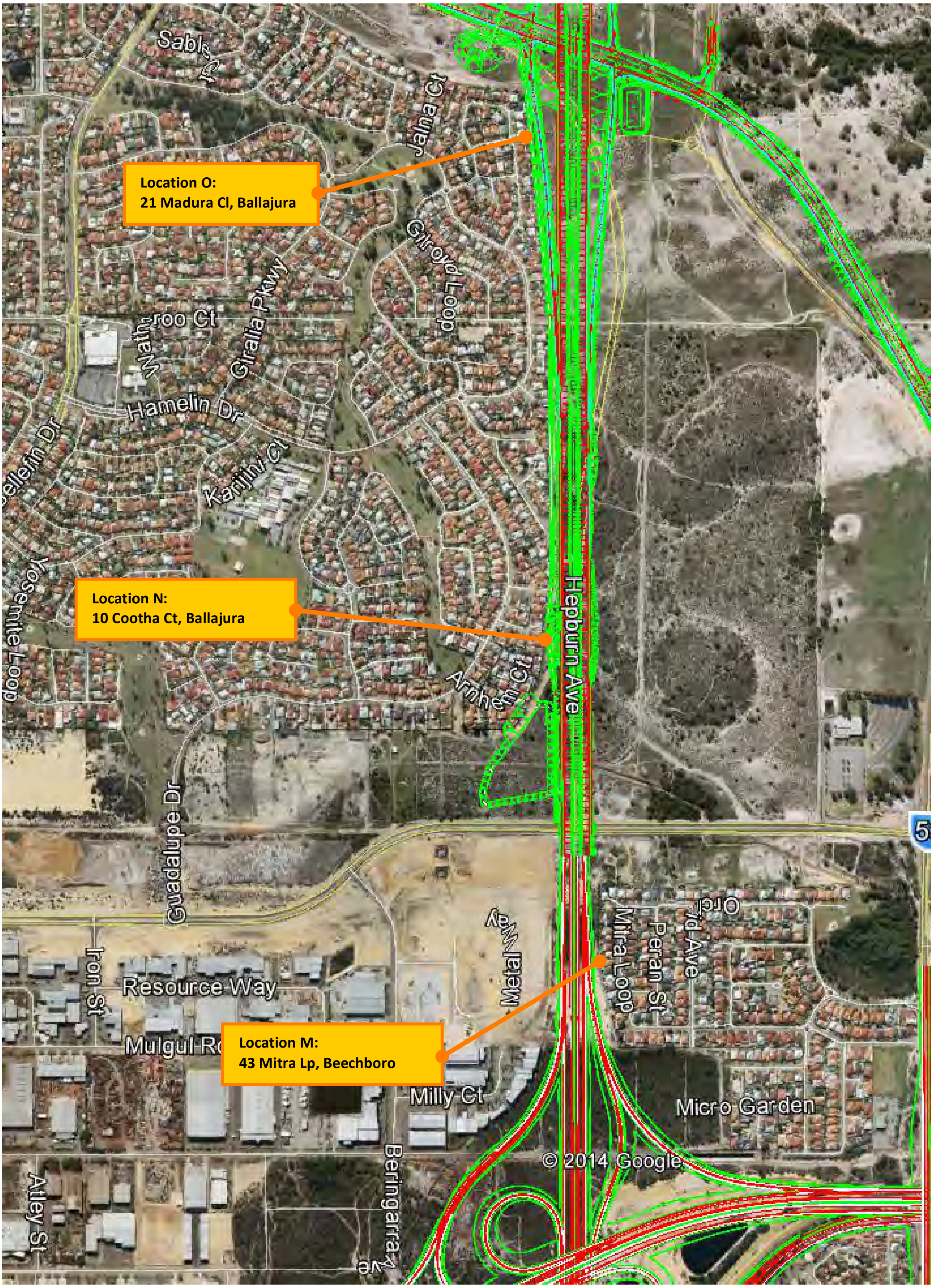


Figure 3-2 Monitoring Locations M to O

Figure 3-3 Monitoring Locations P to T

3.2 Noise Modelling

3.2.1 Noise Model and Set-up

The computer programme *SoundPLAN 7.3* 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 corrections are applied to the exhaust of –8.0 dB (based on *Transportation Noise Reference Book, Paul Nelson, 1987*) and to the engine source of –0.8 dB, so as to provide consistent results with the CoRTN algorithms; and
- An adjustment of –1.7 dB has been applied to the predicted levels 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 1982.

Predictions are made at heights of 1.4 metres above ground floor level and at 1.0 metre from an assumed building façade (resulting in a + 2.5 dB correction due to reflected noise).

3.2.2 Topography, Road Design, Barriers & Cadastral Data

Topographical data, was based on that provided by BG&E, with the contours being in 1.0 metre intervals. The new road design has been integrated into the existing topography. Existing solid property fences located along the project route have been included in the model for the existing scenario. These fences are not considered as noise barriers for future scenarios. Noise barriers for the future scenario would need to be constructed using materials with a surface density exceeding 15 kg/m^2.

Buildings have also been included as these can provide barrier attenuation when located between a source and receiver, in much the same way as a hill or wall provides noise shielding. This is particularly relevant to receivers located behind the first row of buildings adjacent to the corridor. All buildings are assumed to have a height of 4.0 metres.

3.2.3 Traffic Data and Modelling Scenario

Regional traffic models for the Perth Metropolitan area to account for predicted changes in land use and population are periodically developed/updated by Main Roads and the Department of Planning. The 2050 regional traffic model was developed as part of this proposal and updates the 2031 model. The Policy requires the assessment of traffic noise impacts assuming future conditions, being 15 to 20 years from project completion. The 2031 model is not far enough into the future and the 2050 model is too far into the future. For this project, traffic volumes for the year 2040 have been used to represent future conditions.

The road surfaces, traffic volumes, percentage of heavy vehicles and posted speeds for each section of the project were provided by Main Roads and are shown at *Appendix A*. The noise relationship between the various road surfaces is provided in *Table 3-1*. As a guide, 14mm Chip Seal would be the noisiest surface and Open Graded Asphalt the quietest.

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	-1.0 dB	-2.5 dB

3.2.4 Ground Attenuation

The ground attenuation has been assumed to be 0.0 (0%) for the roads and 1.0 (100%) between the roads and the receivers. Note 0.0 represents hard reflective surfaces such as water and 1.00 represents absorptive surfaces such as grass. This is considered to be a reasonable approach for assessment.

3.2.5 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) and this is calculated within the SoundPLAN model.

As noise monitoring was undertaken, the $L_{Aeq(Day)}$ levels are based on the results of the monitoring (refer *Section 4.1)*.

4 NOISE MODEL CALIBRATION

The results of the noise monitoring used to establish existing ambient noise levels and to determine if the day or night period is dominant are summarised below in *Table 4-1*. Detailed measurement results are provided at *Appendix B*.

Table 4-1 Measured Average Noise Levels – Monitoring Locations

No.	Address	Average Weekday Noise Level, dB		
		$L_{A10,18hour}$	$L_{Aeq\ (Day)}$	$L_{Aeq\ (Night)}$
A	2 Redlands St, Bayswater	55.3	54.2	48.8
B	16 Harvest Rd, Morley	60.8	58.8	54.4
C	28A Bruce Rd, Morley	60.5	58.5	53.3
D	2A Abbey Street, Morley	61.6	59.0	52.5
E	9 Clandon Way, Morley	59.4	57.9	52.9
F	48 Alfreda Ave, Morley	59.3	57.1	53.4

Table 4-1 (cont') Measured Average Noise Levels – Monitoring Locations

No.	Address	Average Weekday Noise Level, dB		
		$L_{A10,18hour}$	$L_{Aeq\ (Day)}$	$L_{Aeq\ (Night)}$
G	100 Alfreda Ave, Morley	59.3	56.9	54.6
H	8 Wells Court, Noranda	51.5	49.9	45.5
I	15 Davis Court, Morley	48.3	50.1	44.3
J	6 Acacia Court, Beechboro	57.1	54.9	50.9
K	11 Willow Place, Beechboro	53.9	52.2	48.0
L	8 Jarrah Court, Beechboro	51.6	50.6	45.5
M	43 Mitra Loop, Beechboro	50.9	50.1	52.8
N	10 Cootha Court, Ballajura	47.8	47.4	43.2
O	21 Madura Close, Ballajura	50.3	49.4	47.0
P	12 Fewson Turn, Ellenbrook	45.6	49.1	44.1
Q	32 Stock Road West, Bullsbrook	51.1	54.2	48.2
R	144 Strachan Road, Bullsbrook	45.6	47.7	43.2
S	591 Muchea South Road, Muchea	52.1	50.7	49.3
T	3362 Great Northern Highway	64.5	61.5	58.2

As described in *Section 3.2.4*, the measurement data is used to determine the difference between the $L_{A10,18hour}$ and $L_{Aeq(Day)}$ or $L_{Aeq\ (Night)}$ noise descriptors, as well as to determine if the day or night period traffic noise is dominant when compared to the Policy criteria.

From the measurement results relating to areas adjacent to the existing road network (Locations A to L and T), the average difference between the $L_{Aeq(Day)}$ and $L_{Aeq(Night)}$ levels is 4.6 dB. Generally, as traffic volumes increase into the future, the day noise levels increase greater than the night noise levels. Therefore, for this project it is assumed that for future traffic volumes, the day traffic noise levels will be more than 5 dB above the night traffic noise levels and it will be the day levels that would be compared against the Policy criteria.

The measurement results are also used to calibrate the noise model by comparing the predicted existing noise levels to the measured levels at relevant noise logger locations. As described in *Section 3-1*, for this project, following consultation with the Department of Environment and Regulation, the measurement location on the Great Northern Highway (Location T) is considered the most appropriate location to calibrate the noise model. This comparison is shown in *Table 4-2*.

Table 4-2 Comparison between Measured and Predicted Noise Levels at Monitoring Locations

Rec ID	Address	Measured $L_{Aeq\ (Day)}$	Predicted $L_{Aeq\ (Day)}$	Difference
T	3362 Great Northern Highway	61.5	62.1	-0.6

For the measurement location adjacent to the Great Northern Highway, the calibration factor is -0.6 dB, which shows good correlation with the noise prediction model.

5 RESULTS

5.1 Noranda, Ballajura and Ellenbrook

The results of the noise prediction for the 2040 traffic volumes, together with the location and height of noise barriers, are shown in *Figures 5-1 to 5-4*.

For the Tonkin Highway / Reid Highway Interchange and the section of the PDNH between Reid Highway and Hepburn Avenue, the noise barriers have been designed to ensure, where practicable, all noise sensitive premises receive a traffic noise level below $L_{Aeq\ (Day)}$ 60 dB, assuming forecast or predicted 2040 traffic volumes.

In the vicinity of the residential area of Ellenbrook, which is considered to be a quiet environment, the noise barriers have been designed such that all noise sensitive premises receive a traffic noise level below $L_{Aeq\ (Day)}$ 55 dB, or as low as reasonably practicable. This assumes a maximum noise barrier height of 5.0m and predicted 2040 traffic volumes.

For information purposes, the predicted noise levels for the 2040 traffic volumes assuming no noise barriers are provided in *Appendix C.*

5.2 Rural residential properties north of Ellenbrook

For the rural residential properties north of Ellenbrook, the proposed 2.4 m screen walls will provide some noise mitigation. Where noise levels exceed $L_{Aeq\ (Day)}$ 60 dB, further mitigation will be provided by noise mitigation packages consistent with the Policy Guidelines. This is a common strategy for rural areas where very long barriers would be required to protect a small number of properties.

The predicted noise levels to receivers north of Ellenbrook are provided in *Table 5-1,* with property locations shown in *Figures 5-5 and 5-6*. *Table 5-1* identifies those properties where the predicted noise levels exceed $L_{Aeq\ (Day)}$ 60 dB and noise control would be considered to achieve acceptable internal noise levels. The actual level of protection, which may include facade treatment and/or localised noise barriers within properties, will be determined following negotiations with the property owner and a detailed site investigation.

Table 5-1 Predicted Noise Levels to Noise Sensitive Receivers North of Ellenbrook

Rec No	Address	Predicted Future Noise Level $L_{Aeq\ (Day)}$ dB	Limit Criterion Exceeded?
1	458 Maralla Road, Bullsbrook	61	Y
2	43 Sawpit Road, Bullsbrook	57	N
3	215 Sawpit Road, Bullsbrook	55	N
4	539 Warbrook Road, Bullsbrook	58	N
5	515 Warbrook Road, Bullsbrook	58	N
6	547 Warbrook Road, Bullsbrook	66	Y
7	595 Warbrook Road, Bullsbrook	65	Y
8	25 Raphael Road, Bullsbrook	65	Y

Table 5-1 (cont') Predicted Noise Levels to Noise Sensitive Receivers North of Ellenbrook

Rec No	Address	Predicted Future Noise Level $L_{Aeq\ (Day)}$ dB	Limit Criterion Exceeded?
9	41 Raphael Road, Bullsbrook	65	Y
10	46 Chitty Road, Bullsbrook	56	N
11	207 Raphael Road, Bullsbrook	61	Y
12	68 Stock Road, Bullsbrook	58	N
13	60 Stock West Road, Bullsbrook	59	N
14	32 Stock West Road, Bullsbrook	64	Y
15	916 Cooper Road, Bullsbrook	56	N
16	312 Raphael Road, Bullsbrook	59	N
17	464 Raphael Road, Bullsbrook	61	Y
18	99 Gully Road, Bullsbrook	57	N
19	80 Gully Road, Bullsbrook	55	N
20	80 Gully Road, Bullsbrook	56	N
21	112 Gully Road, Bullsbrook	58	N
22	614 Raphael Road, Bullsbrook	61	Y
23	81 Strachan Road, Bullsbrook	55	N
24	99 Strachan Road, Bullsbrook	56	N
25	654 Raphael Road, Bullsbrook	65	Y
26	667 Raphael Road, Bullsbrook	64	Y
27	144 Strachan Road, Bullsbrook	63	Y
28	84 Strachan Road, Bullsbrook	55	N
29	Lot 3 West Road, Bullsbrook	59	N
30	190 West Road, Bullsbrook	62	Y
31	Lot 2136 Neaves Road, Bullsbrook	55	N
32	47 Davidson Street, Bullsbrook	64	Y
33	491 Muchea South Road, Muchea	56	N
34	518 Muchea South Road, Bullsbrook	55	N
35	591 Muchea South Road, Muchea	62	Y
36	3421 Great Northern Highway, Muchea	57	N
37	43 Brand Highway, Muchea	59	N
38	3599 Brand Highway, Muchea	64	Y
39	299 Brand Highway, Muchea	47	N

Indicates *limit* criteria exceeded.

Figure 5-1

Perth Darwin National Highway Project - South of Reid Highway

$L_{Aeq,Day}$ Noise Level Contours - With Recommended Noise Walls - 2040 Traffic Voumes

Signs and symbols

- Road Source
- Building
- Noise Wall

Scale

0 30 60 120 180 m

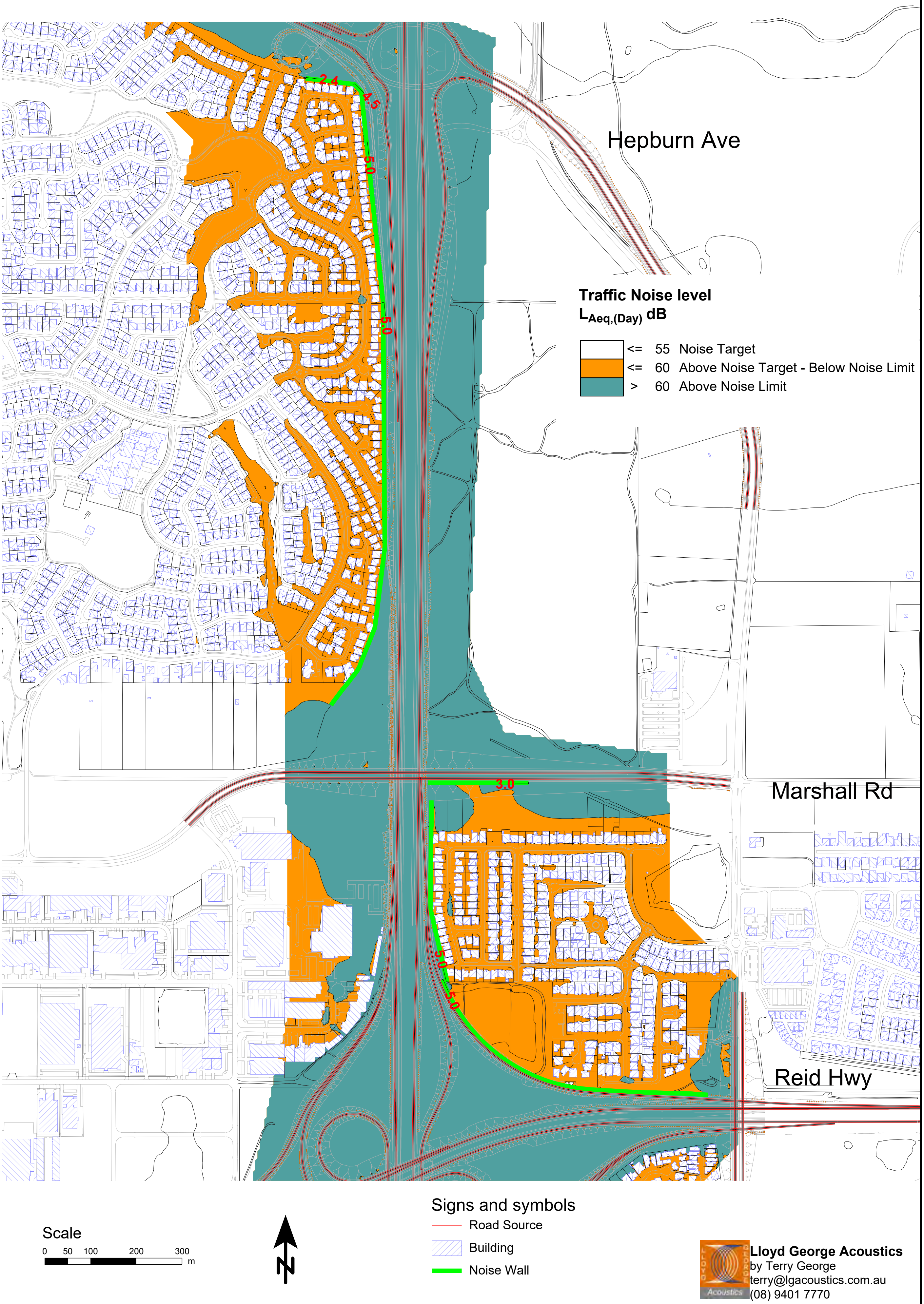
N

Lloyd George Acoustics
by Terry George
terry@lgacoustics.com.au
(08) 9401 7770

Figure 5-2

Perth Darwin National Highway Project - Reid Hwy to Hepburn Ave

$L_{Aeq,Day}$ Noise Level Contours - With Recommended Noise Walls - 2040 Traffic Volumes



Lloyd George Acoustics
by Terry George
terry@lgacoustics.com.au
(08) 9401 7770

Perth Darwin National Highway Project - North of The Promenade

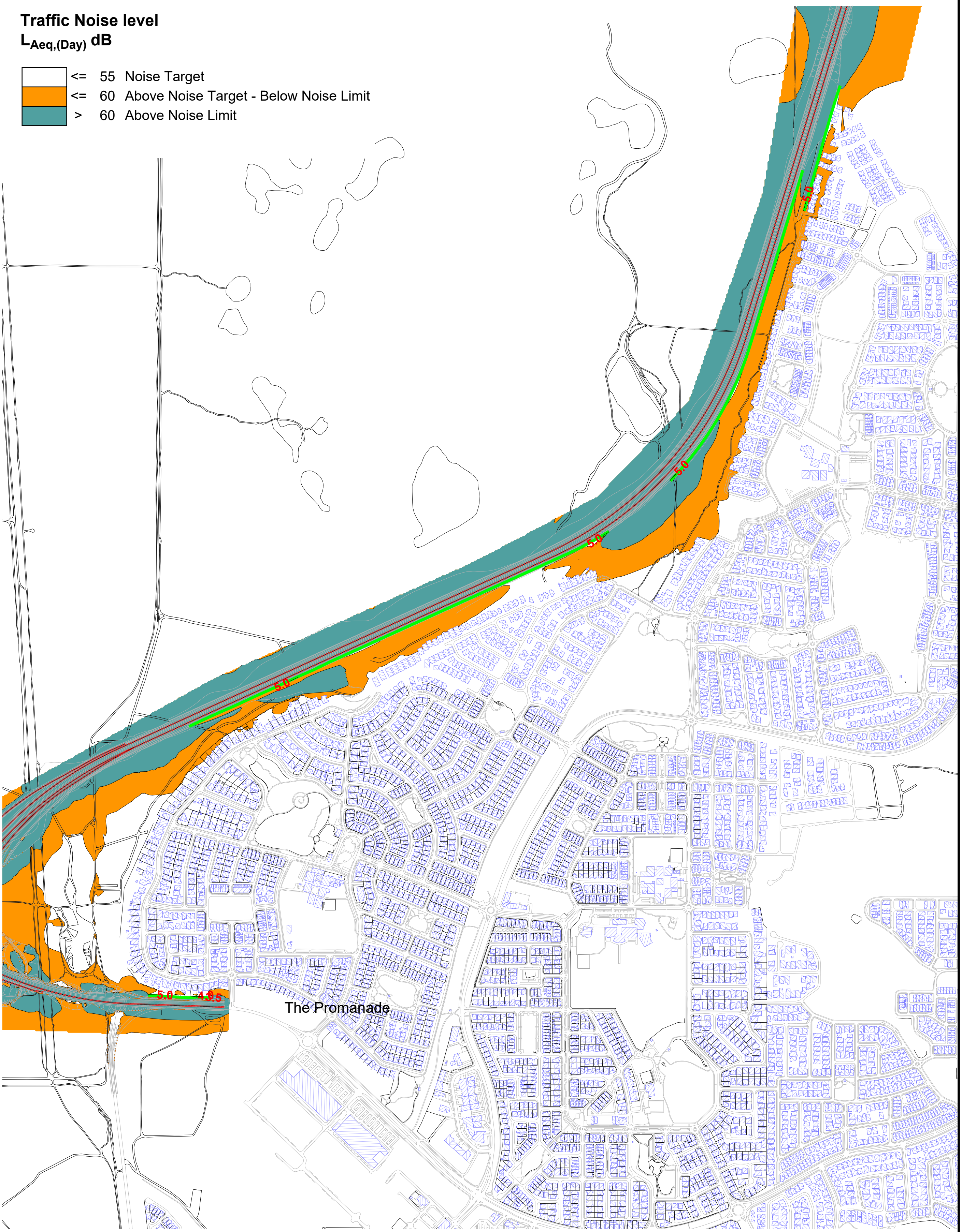
$L_{Aeq,Day}$ Noise Level Contours - With Recommended Noise Walls - 2040 Traffic Volumes

Figure 5-3

Traffic Noise level

$L_{Aeq,(Day)}$ dB

<=	55	Noise Target
<=	60	Above Noise Target - Below Noise Limit
>	60	Above Noise Limit



Signs and symbols

- Road Source
- Building
- Noise Wall

Scale

0 100 200 400 600 m

N

Lloyd George Acoustics
by Terry George
terry@lgacoustics.com.au
(08) 9401 7770

Figure 5-4

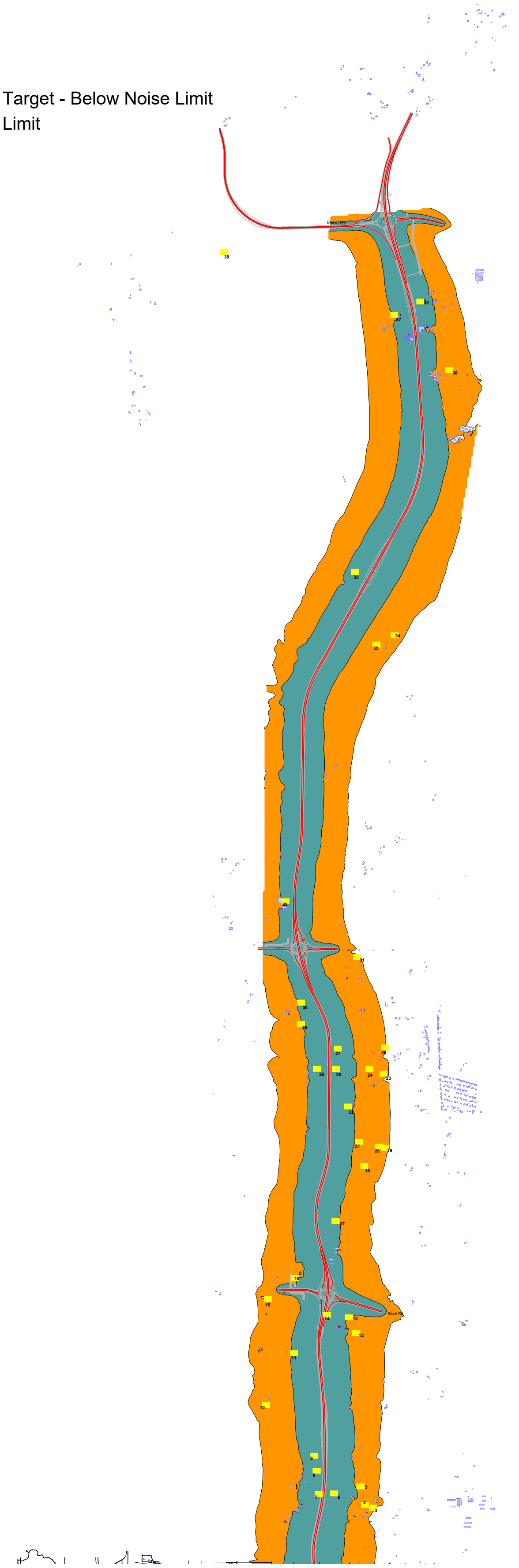
Perth Darwin National Highway Project - North of Ellenbrook

$L_{Aeq,Day}$ Noise Level Contours - 2040 Traffic Volumes

Traffic Noise level

$L_{Aeq,(Day)}$ dB

(white)	<=	55	Noise Target
(orange)	<=	60	Above Noise Target - Below Noise Limit
(teal)	>	60	Above Noise Limit



Scale

0 500 1000 2000 3000 m

N

Signs and symbols

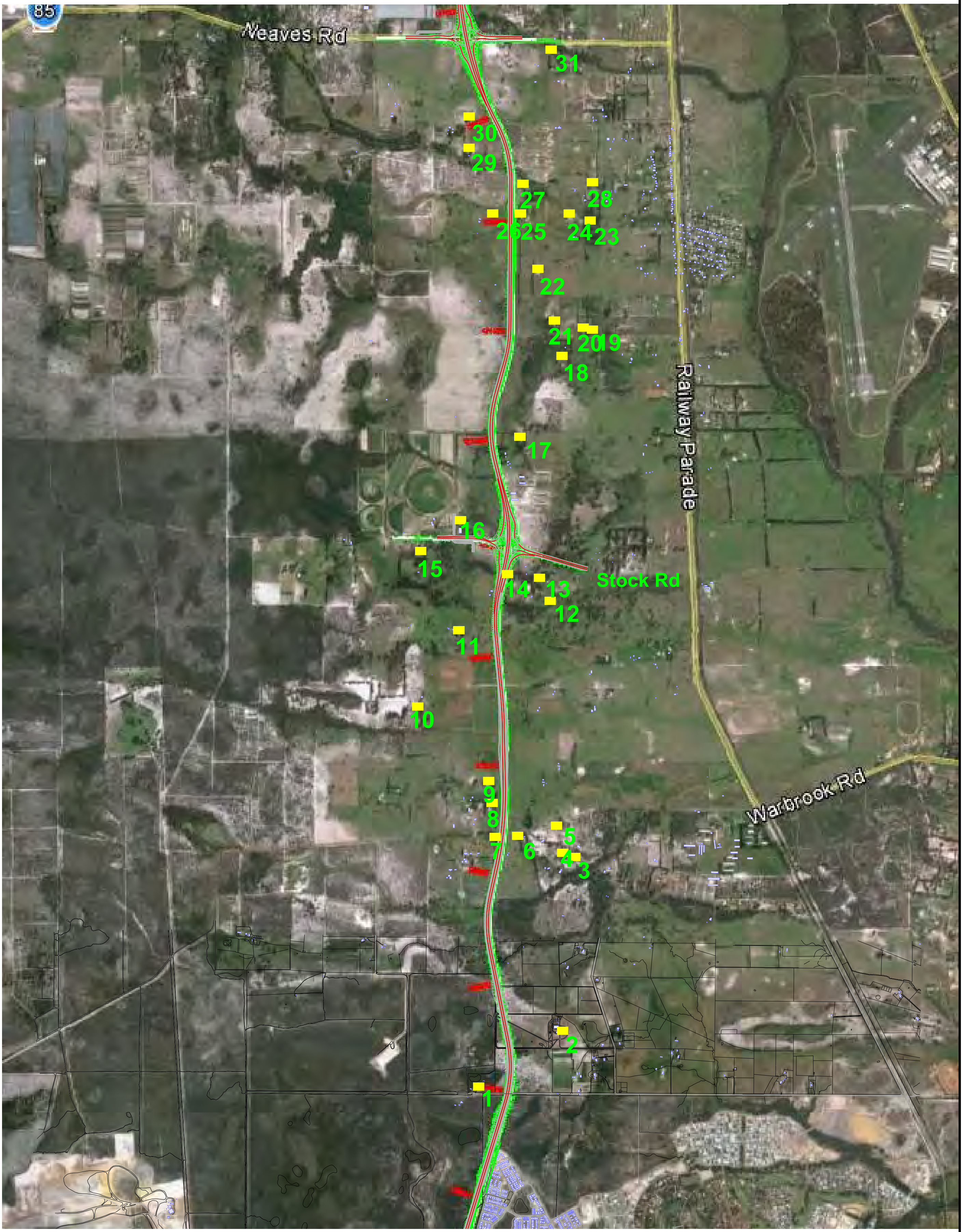
- Road Source
- Building
- Point receiver

Lloyd George Acoustics
by Terry George
terry@lgacoustics.com.au
(08) 9401 7770

Figure 5-5

Perth Darwin National Highway Project - North of Ellenbrook

Reciever Locations



Scale

0 250 500 1000 1500 m

N

Signs and symbols

Road Source

Building

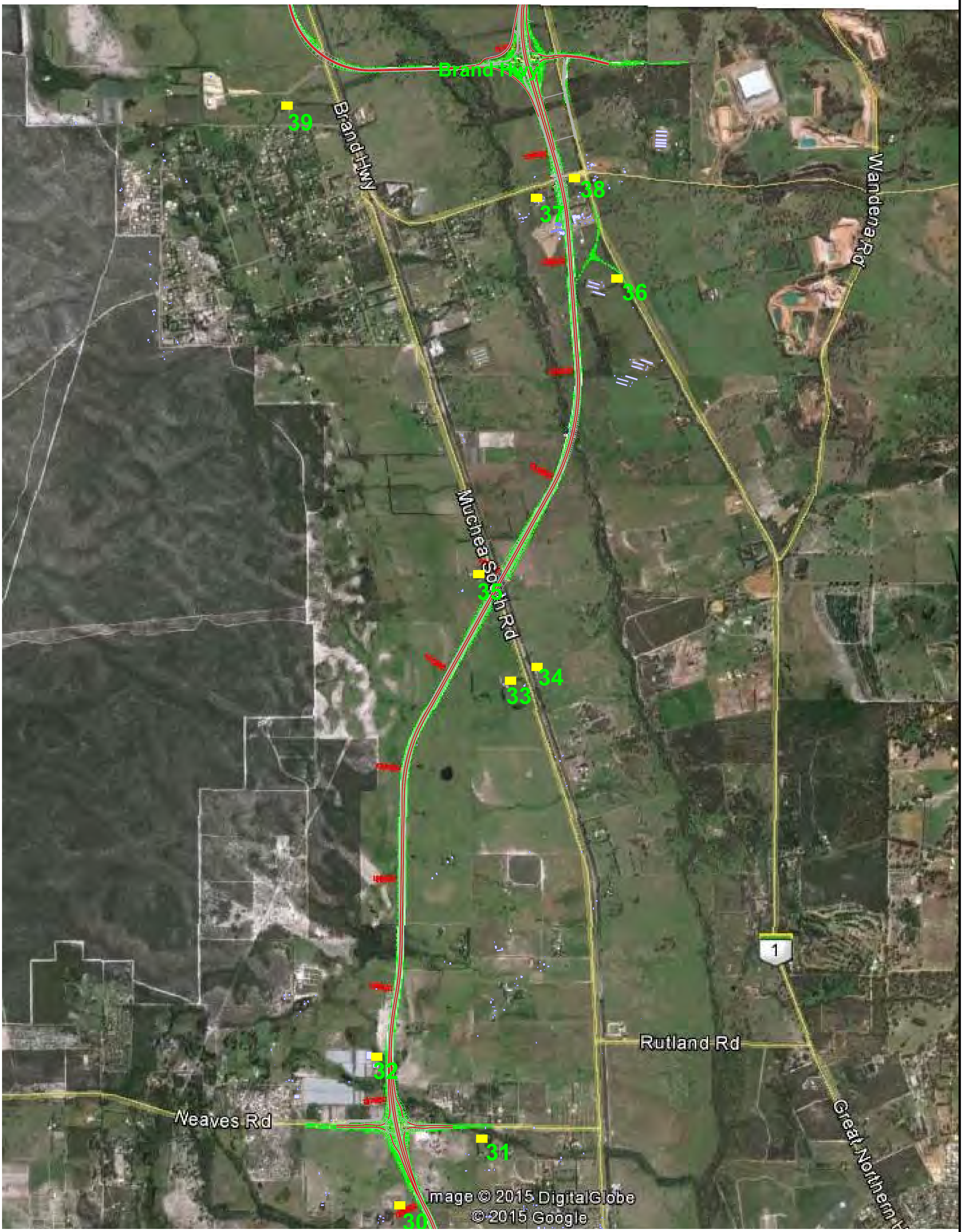
Point receiver

Lloyd George Acoustics
by Terry George
terry@lgacoustics.com.au
(08) 9401 7770

Perth Darwin National Highway Project - South of Brand Hwy

Reciever Locations

Figure 5-6



Scale

0 250 500 1000 1500 m

N

Signs and symbols

- Road Source
- Building
- Point receiver

Lloyd George Acoustics
by Terry George
terry@lgacoustics.com.au
(08) 9401 7770

6 CONCLUSION

The results of this noise assessment have shown that predicted 2040 traffic volumes can achieve the Policy "*limit*" criterion of $L_{Aeq\,(Day)}$ 60 dB at all noise sensitive premises south of Maralla Road (northern extent of Ellenbrook) by incorporating noise mitigation measures in the form of noise barriers, ranging from 2.4 m to 5.0 m high, into the design of the project.

It should be noted that while it is desirable to achieve the "*target*" criterion of $L_{Aeq\,(Day)}$ 55 dB for noise sensitive premises within Ellenbrook, it is not practicable to achieve this noise level at some locations due to a noise barrier height restriction of 5.0m.

For rural residential properties north of Ellenbrook, noise mitigation will be in accordance with the Policy Guidelines. It may consist of building facade upgrades or localised noise barriers, or a combination of both, to achieve acceptable internal noise levels. The extent of noise control required would need to be individually assessed for each property following a building survey and negotiations with the property owner.

Appendix A

Road Surfaces, Posted Speeds and Traffic Volumes

	AAWT 2050	2050 % Heavies	AAWT 2031	2031 Heavies%	Speed	Pavement	AAWT 2040	2040 Heavies%
North of Reid Hwy								
North	81000	11.30%	55000	13%	100	OGA	68000	12.00%
South	82000	11.50%	55000	13%	100	OGA	68500	12.00%
North of Marshall Rd								
Off Ramp N	11500	6.00%	11000	6%	70	DGA	11250	6.00%
On Ramp South	10500	7.00%	10200	8%	70	DGA	10350	8.00%
Marshall Rd								
East	16000	11.70%	16000	10%	60	DGA	16000	11.00%
West	16000	11.70%	17000	10%	60	DGA	16500	11.00%
Hepburn Ave								
West EB	17800	8.00%	15200	10%	70	DGA	16500	9.00%
West WB	17800	8.00%	15600	7%	70	DGA	16700	8.00%
East EB	10800	11.50%	11200	13%	70	DGA	11000	12.00%
East WB	10800	11.50%	9900	10%	70	DGA	10350	11.00%
North of Hepburn Ave								
North	77500	12.50%	51000	15%	100	OGA	64250	14.00%
South	81000	12.70%	52100	15%	100	OGA	66550	14.00%
On Ramp from Hep	8000	16.00%	6500	20%	100	OGA	7250	18.00%
Off Ramp to Hep	9000	16.00%	7500	19%	100	OGA	8250	18.00%
At Split								
NB to PDNH	38000	17.50%	24200	18%	100	OGA	31100	18.00%
SB from PDNH	43000	17.80%	27000	18%	100	OGA	35000	18.00%
NB to EWNS	39000	8.00%	26000	11%	100	OGA	32500	10.00%
SB from EWNS	38000	7.00%	25300	10%	100	OGA	31650	9.00%
South of Gnangara Rd								
Off ramp EWNS	5500	11.70%	6400	13%	70	DGA	5950	12.00%
On ramp EWNS	4500	10.00%	5400	12%	70	DGA	4950	11.00%
Off ramp PDNH	9500	21.00%	6500	21%	70	DGA	8000	21.00%
On ramp PDNH	10000	12.90%	7500	13%	70	DGA	8750	13.00%
EWNS								
Gnangara Rd								
East EB	17800	10.50%	12500	13%	90	OGA	15150	12.00%
East WB	17800	10.50%	12000	12%	90	OGA	14900	11.00%
North of Gnangara Rd								
North	40800	8.00%	23500	10%	100	OGA	32150	9.00%
South	41300	7.00%	24000	9%	100	OGA	32650	8.00%
on Ramp	7300	6.00%	3900	9%	70	DGA	5600	8.00%
of ramp	7800	6.00%	4050	9%	70	DGA	5925	8.00%
PDNH								
North of Gnangara Rd								
North	34000	15.30%	20800	17%	100	OGA	27400	16.00%
South	38000	18.80%	23000	20%	100	OGA	30500	19.00%
on Ramp	5000	10.00%	3200	12%	70	DGA	4100	11.00%
off ramp	5500	14.50%	3500	16%	70	DGA	4500	15.00%
South of The Promanade								
Off Ramp	8000	13.00%	7000	10%	100	OGA	7500	12.00%
OnRamp	13000	15.00%	9600	18%	100	OGA	11300	17.00%
The Promanade								
Both Dir	22600	10.00%	20200	16%	60	DGA	21400	13.00%
North of The Promanade								
On Ramp	3500	9.50%	1600	11%	70	DGA	2550	10.00%
Off Ramp	5000	10.50%	2100	12%	70	DGA	3550	11.00%
North	29500	15.00%	15400	19%	110	OGA	22450	17.00%
South	30000	15.00%	15500	20%	110	OGA	22750	18.00%
North of Maralla Rd								
North	29500	15.00%	15400	19%	110	Chip	22450	17.00%
South	30000	15.00%	15500	20%	110	Chip	22750	18.00%
South of Stock Rd								
Off Ramp	13500	12.60%	5800	20%	70	DGA	9650	16.00%
On Ramp	14000	13.00%	5700	22%	70	DGA	9850	18.00%
Stock Rd								
West Both Dir	5500	18.00%	1300	18%	70	DGA	3400	18.00%
East Both Dir	17000	13.00%	7000	18%	70	DGA	12000	16.00%
North of Stock Rd								
On Ramp	5000	13.00%	1500	17%	70	DGA	3250	15.00%
Off Ramp	5500	11.50%	1700	20%	70	DGA	3600	16.00%
South of Neaves Rd								
North	20500	16.60%	11200	19%	110	Chip	15850	18.00%
South	21000	16.10%	11400	20%	110	Chip	16200	18.00%
Off Ramp	9000	10.20%	4100	11%	70	DGA	6550	11.00%
On Ramp	5000	9.30%	1800	12%	70	DGA	3400	11.00%
Neaves Rd								
West Both Dir	14000	11.20%	6000	12%	70	DGA	10000	12.00%
East Both Dir	10500	8.00%	6700	8%	70	DGA	8600	8.00%
North of Neaves Rd								
On ramp	3500	13.00%	1500	15%	70	DGA	2500	14.00%
Off ramp	3000	14.00%	1000	18%	70	DGA	2000	16.00%
South of Brand Hwy								
North	15300	19.00%	8600	22%	110	Chip	11950	21.00%
South	14500	20.00%	7500	24%	110	Chip	11000	22.00%
Off Ramp	10600	19.00%	4900	24%	70	DGA	7750	22.00%
On Ramp	9800	18.00%	3700	24%	70	DGA	6750	21.00%
North of Brand								
On Ramp	100	20.00%	500	20%	70	DGA	300	20.00%
Off Ramp	100	20.00%	500	24%	70	DGA	300	22.00%
North	4700	19.00%	3900	20%	80	DGA	4300	20.00%
South	5000	24.00%	4000	24%	80	DGA	4500	24.00%
Brand Hwy								
West Both	4300	26.00%	3300	25%	80	DGA	3800	26.00%
East Both	5600	11.20%	4400	14%	80	DGA	5000	12.00%