

Lend Lease Communities (Yarrabilba) Pty Ltd

Yarrabilba Development Precinct 1, Stages 2 to 9

Traffic Noise Assessment

PLANS AND DOCUMENTS
referred to in the PDA APPROVAL

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EXECUTIVE SUMMARY

Vipac Engineers & Scientists Ltd (VIPAC) has completed a traffic noise assessment for Stages 2 to 9 of Precinct 1 of the Yarrabilba development on the Waterford-Tamborine Road. Noise impacts on the development have been assessed according to the Department of Transport and Main Roads (TMR), AS 3671:1989 and AS/NZS 2107:2000 noise policies.

Based on this assessment, 9 Lots in Stages 2 to 9 were predicted to exceed the TMR traffic noise criteria at the ground floor level and 15 Lots at the first floor level. For lots where the noise criteria are exceeded, the relevant floors require acoustic treatment.

For floors of Lots where the noise criteria is exceeded, glazing requirements were calculated and are detailed in this report. Calculations used worst case assumptions about room and window sizes. Less conservative requirements may be calculated according to AS3671 and AS2107 when final building plans are available.

For floors of Lots where the noise criteria is exceeded, acceptable indoor noise levels can be achieved with the glazing recommendations specified in this report, however external doors and windows of the noise affected rooms must remain closed. Under these conditions, alternative ventilation will be required. Alternative ventilation may include air-conditioning, borrowed ventilation, mechanically assisted ventilation or other suitable methods.

In conclusion, noise impacts associated with the proposed development can be controlled to an acceptable level by implementing the recommendations in this report.



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1. INTRODUCTION

Vipac Engineers & Scientists Ltd (VIPAC) was commissioned by Lend Lease to provide a traffic noise assessment for Stages 2 to 9 of Precinct 1 of the Yarrabilba development, located on the Waterford-Tamborine Road.

The purpose of this assessment is to determine the traffic noise impacts at residential Lots in Stages 2 to 9 of Precinct 1.

Noise impacts have been assessed in accordance with the Department of Transport and Main Roads (TMR), AS 3671:1989 (AS3671) and AS/NZS 2107:2000 (AS2107) noise policies.

2. PROPOSED DEVELOPMENT AND SURROUNDING AREA

The site is located on the Waterford-Tamborine Road. Stages 2 to 9 of Precinct 1 of the proposed development are to consist of 249 Lots.

The following information about the surrounding area was observed on site and presented in Figure 2-1:

- North: Dowe Haven Equestrian Park and residential dwellings
- East: Further development Stages
- South: Further development Stages
- West: Stage 1 of Precinct 1, and further west the Waterford Tamborine Road

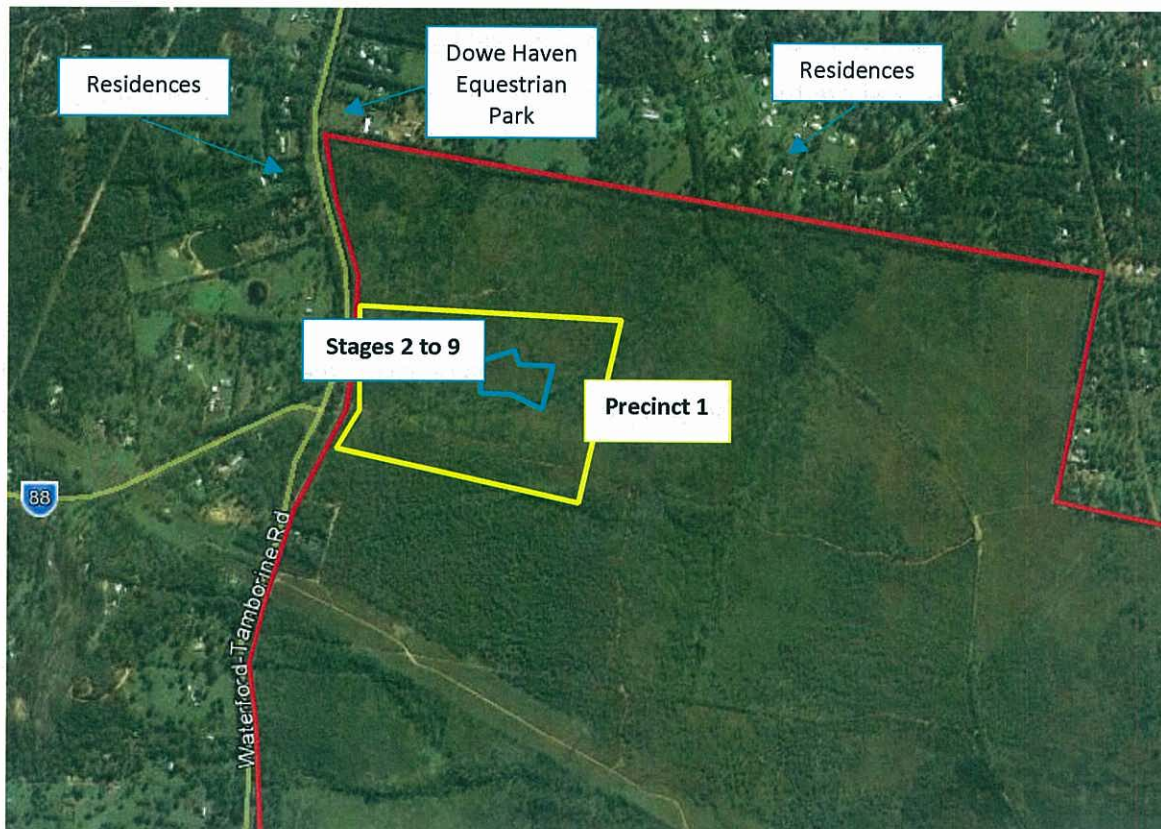


Figure 2-1: Aerial Photograph of the Site

The significant noise source that may potentially impact on Stages 2 to 9 of Precinct 1 is traffic noise from the Precinct 1 Road.

3. NOISE POLICY

The applicable noise criteria are summarised in Table 3-1.

Table 3-1: Applicable Noise Policies

Noise Source	Applicable Noise Criteria
Road traffic noise	The Department of Transport and Main Roads' (TMR) Road Traffic Noise Management: Code of Practice (COP) AS/NZS 2107:2000 Acoustics—Recommended design sound levels and reverberation times for building interiors (AS2107) AS 3671:1989 Acoustics-Road traffic noise intrusion - Building Siting and Construction (AS3671)

The development stages are adjacent to the Precinct 1 Road, which will be a major road in the future. Therefore, the Department of Transport and Main Roads' (TMR) 'Road Traffic Noise Management: Code of Practice' (COP) noise criteria have been adopted. The applicable traffic noise limits are:

External noise limit at future residences:

- 57 dB(A) $L_{A10(18hr)}$ where the background noise level $L_{A90(8hr)}$ is less than 45 dB(A);
- 60 dB(A) $L_{A10(18hr)}$ where the background noise level $L_{A90(8hr)}$ is greater than 45 dB(A);

Private open space:

- 57 dB(A) $L_{A10(18hr)}$ where the background noise level $L_{A90(8hr)}$ is less than 45 dB(A);
- 60 dB(A) $L_{A10(18hr)}$ where the background noise level $L_{A90(8hr)}$ is greater than 45 dB(A);

Where external façade noise limits cannot be met, the TMR COP refers to AS/NZS 2107:2000 'Acoustics-Recommended design sound levels and reverberation times for building interiors' which has the following maximum indoor noise limits for residences near major roads:

- 40 dB(A) for bedrooms
- 45 dB(A) for living rooms

Since Lots in Stage 1 of Precinct 1 will be near a major road, the external noise limit of 60 dB(A) $L_{A10(18hr)}$ free field and the private open space noise limit of 60 $L_{A10(18hr)}$ of have been adopted for this assessment.

4. TRAFFIC NOISE MODELLING METHODOLOGY

Traffic noise calculations were carried out using SoundPLAN noise modelling software. A 3D computational model was created based on the drawings provided.

The data and assumptions used in traffic noise modelling are presented in Table 4-1. The traffic flow data obtained from Cardno is presented in Table 4-2.

Table 4-1: Data and Assumptions Used in Traffic Noise Modelling

Parameter	Data
Future Residence Receiver Heights	Ground Floor: 1.8m above building pad level First Floor: 4.6m above building pad level (assuming height of storeys as 2.8m) Assumed pad levels are included in APPENDIX B.
Future Residence Receiver Locations	Residential Receivers were placed at the minimum allowable residence setbacks from Lot edges based on "Setback Master Building Setback Plan", received from KN Group, dated 13/8/2009, and x11-121base.dwg received from KN Group, dated 19/03/2012.
Buildings on Lots	Buildings on Lots have been considered in noise predictions when calculating noise at Lots not immediately adjacent to the Precinct 1 Road. Buildings with dimensions 10 x 15m, 4m high, have been included in the noise model at worst case locations on Lots, i.e. where buildings will give the least shielding to the Lots behind them.
Terrain Data	- x11-121fincont.dwg, received from KN Group, 19/1/2012 - x11-121base 3d design cont, received from KN Group, 11/11/2011 - Nothern Area 1m Contour.dwg, received from KN Group, 3/11/2010
Development Lot Layout	x11-121base.dwg received from KN Group, dated 19/03/2012
Road Alignment	X11-121base 3d design contours.dwg, received from KN Group, 11/11/2011
Stages 2 and 6 Entrance Walls	The entrance walls adjacent to Lot 88 in Stage 2 and Lot 194 in Stage 6 were included in the noise model to incorporate shielding effects. The walls were positioned and dimensioned according to Drawing No L-ST1-SF-112, 'Streetscape Surface Finishes Sheet 12, received from Lend Lease 17/1/2012
Calculation Method	UK's Calculation of Road Traffic Noise (CoRTN)
Traffic Volume Conversions - AADT to 18hr Traffic Flows	94%
Road Surface	Dense Graded Asphalt was modelled as the road surface for all roads. No road surface correction is applied to the base noise level calculated by SoundPLAN because the base noise level prediction assumes dense graded asphalt road surface.

Table 4-2: Traffic Data Used for Noise Modelling

Scenario	Road	AADT	18hr Traffic Volumes	%CV	Speed (km/h)
Ultimate	Precinct 1 Road	13,500	12,690	5%*	60

* Conservative assumptions about %CV have been used, as the information was not available at the time of issue of the report. If the %CV is higher than 5%, revised noise modelling may need to be conducted

5. TRAFFIC NOISE MODELLING RESULTS

Predicted road traffic noise levels are up to 69 dB(A) $L_{A10(18hr)}$. This exceeds the applicable noise limits of 60 dB(A).

Predicted noise levels exceed the applicable noise limits by up to 8 dB(A) at the ground floor and 9 dB(A) at the first floor. 9 Lots exceed the noise limits at the ground floor and 15 Lots exceed the noise limits at the first floor as shown in Table 5-1 and Table 5-2.

Table 5-1: Lots Exceeding Applicable External Noise Limits at the Ground Floor Level

Lot	L10(18hr) (dB(A))	Lot	L10(18hr) (dB(A))	Lot	L10(18hr) (dB(A))
60	67	66	67	88	66
61	67	77	67	194	65
62	68	78	67	195	62

Table 5-2: Lots Exceeding Applicable External Noise Limits at the First Floor Level

Lot	L10(18hr) (dB(A))	Lot	L10(18hr) (dB(A))	Lot	L10(18hr) (dB(A))
60	69	76	61	88	68
61	68	77	68	89	62
62	69	78	68	194	67
66	68	79	61	195	64
67	62	87	60	196	62

Floors of future residences where the noise limits are exceeded will need to be designed and constructed according to the methods outlined in AS 3671:1989, "Acoustics-Road traffic noise intrusion - Building Siting and Construction" and the noise limits in AS2107 (see Section 3). Construction requirements are detailed in Section 5.2.

Noise contour maps are included in APPENDIX A. Predicted noise levels at all Lots exceeding the noise limits are presented in APPENDIX B.

5.1 OUTDOOR RECREATIONAL SPACE

A traffic noise contour map of the predicted free field $L_{A10(18hr)}$ noise at the ground floor level has been included in Figure A-1 to Figure A-3 in APPENDIX A. It can be seen that most Lots have areas that are below the TMR 60 dB(A) $L_{A10(18hr)}$ noise limit.

All Lots have traffic noise levels less than or equal to 62 dB(A). It is expected that when the buildings are constructed traffic noise levels will be at least 8 dB(A) lower in the space shielded by the buildings. Therefore, all Lots will have areas that comply with the TMR 60 dB(A) $L_{A10(18hr)}$ private open space noise limit.

5.2 ARCHITECTURAL TREATMENTS

The TMR 60 dB(A) noise limit will be exceeded at some Lots in Stage 1. Consequently, the building construction should be designed to achieve the recommended noise limits specified in AS 2107 (See Section 3):

- Bedrooms: L_{Aeq} 40 dB(A)
- Other habitable Rooms: L_{Aeq} 45 dB(A)

The recommended acoustic ratings for all walls, windows and roofing were calculated using the procedures in Australian Standard AS3671 "Acoustics – Road Traffic Noise Intrusion Building Siting and Construction" using worst case assumptions about room dimensions and building orientations.

The assumed construction specifications for future residences are given in Table 5-3.

Table 5-3: The Assumed Construction Specifications for Future Residences

Item	Construction	Expected R_w
External Wall	Brick Veneer	52
	10mm plasterboard	
Ceiling and Roof	Sheet metal / Cement tiles	38
	10mm Plasterboard	
	R2.5 Batts Insulation	
Glazing and Frames	4mm Float	24

Glazing requirements are specified in Table 5-4. Where glazing acoustic requirements are not specified in Table 5-4, glazing ratings from Table 5-3 can be used.

Table 5-4: Required Glazing Construction for Residences on Lots exceeding External Noise Limits to Comply with Indoor Noise Limits

Stage	Floor	Room	Orientation of Façade	Required R_w Acoustic Rating of Glazing and Frames
Stage 2	Ground	Bedrooms	E	34
			S	35
			W	34
		Living Rooms	E	27
			S	28
			W	27
	First	Bedrooms	E	35
			S	37
			W	35
		Living Rooms	E	28
			S	30
			W	28
Stage 6	Ground	Bedrooms	N	34
			S	34
			W	35
		Living Rooms	N	27
			S	27
			W	28
	First	Bedrooms	N	35
			S	35
			W	37
		Living Rooms	N	28
			S	28
			W	30

Table 5-4 lists the required R_w ratings (Weighted Sound Reduction Index) for glazing and frames. If consistency of glazing systems is preferred for each room, the higher of the required R_w ratings must be used.

It is required that the R_w performance ratings of the glazing systems (windows and frames) be certified by the supplier prior to installation. Glazing certificates will be required for building certification. Where glazing system requirements are considered high, the design or glazed surface area can be reduced to minimise the acoustic rating required.



For floors of Lots where the noise criteria is exceeded, acceptable indoor noise levels can be achieved with the glazing recommendations specified, however external doors and windows must remain closed. Under these conditions, alternative ventilation will be required. Alternative ventilation may include air-conditioning, borrowed ventilation, mechanically assisted ventilation or other suitable methods.

The recommended glazing requirements are conservative ratings based on preliminary data and assumptions about room sizes and component construction. It is recommended that building construction acoustic requirements be recalculated when final details of room dimensions and building component construction are available.

6. CONCLUSIONS

Vipac Engineers & Scientists Ltd (VIPAC) has completed a traffic noise assessment for Stages 2 to 9 of Precinct 1 of the Yarrabilba development on the Waterford Tamborine Road. Noise impacts on the development have been assessed according to TMR and AS2107 noise policies.

Recommendations are given in this report for noise impacts to comply with applicable noise criteria.

In conclusion, noise impacts associated with the proposed development can be controlled to an acceptable level by implementing the recommendations in this report.

APPENDIX A: NOISE CONTOUR MAPS

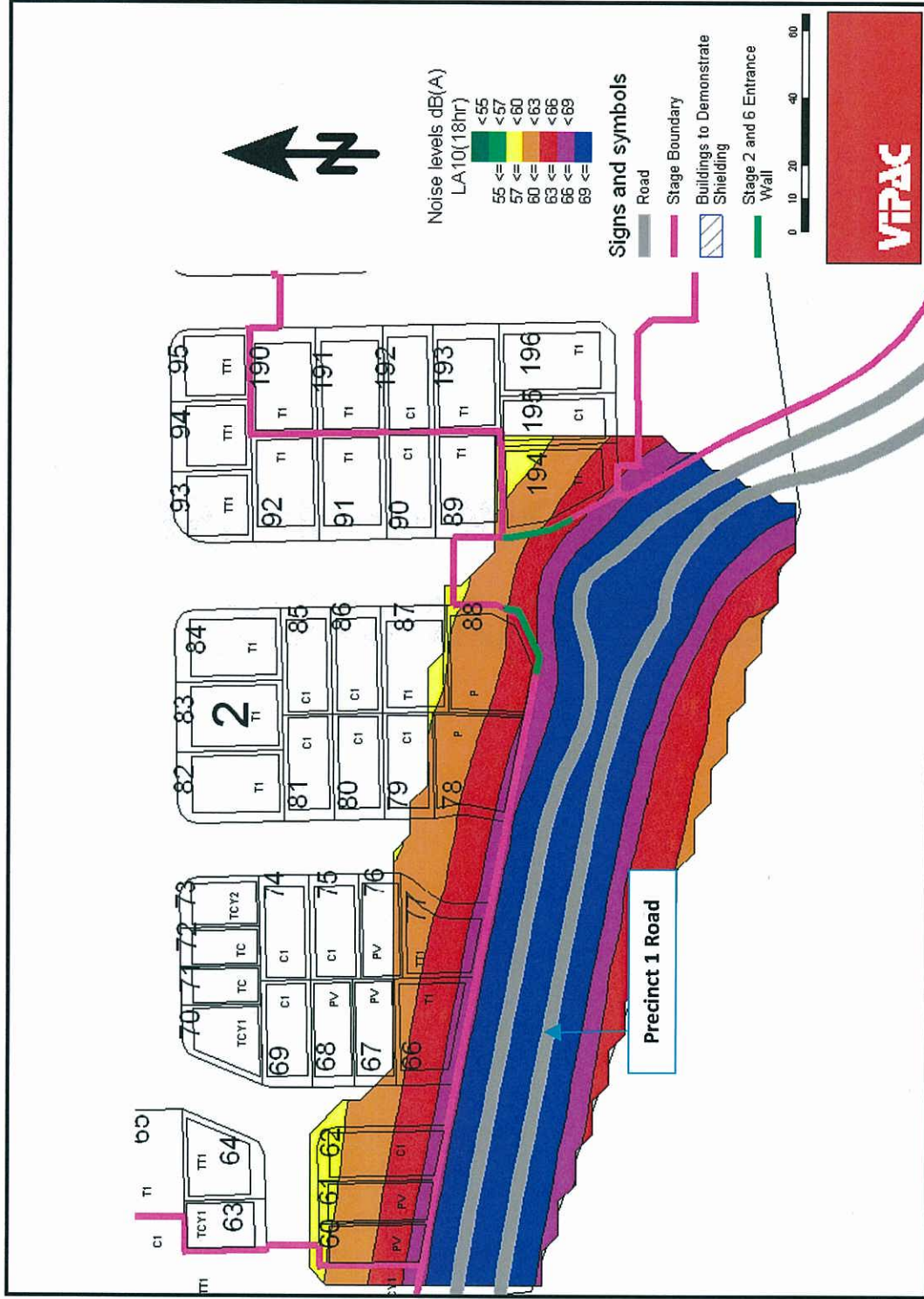


Figure A-1: Predicted Free Field $L_{A10(18hr)}$ Traffic Noise Levels at the Ground Floor - Lots Adjacent to the Precinct 1 Road

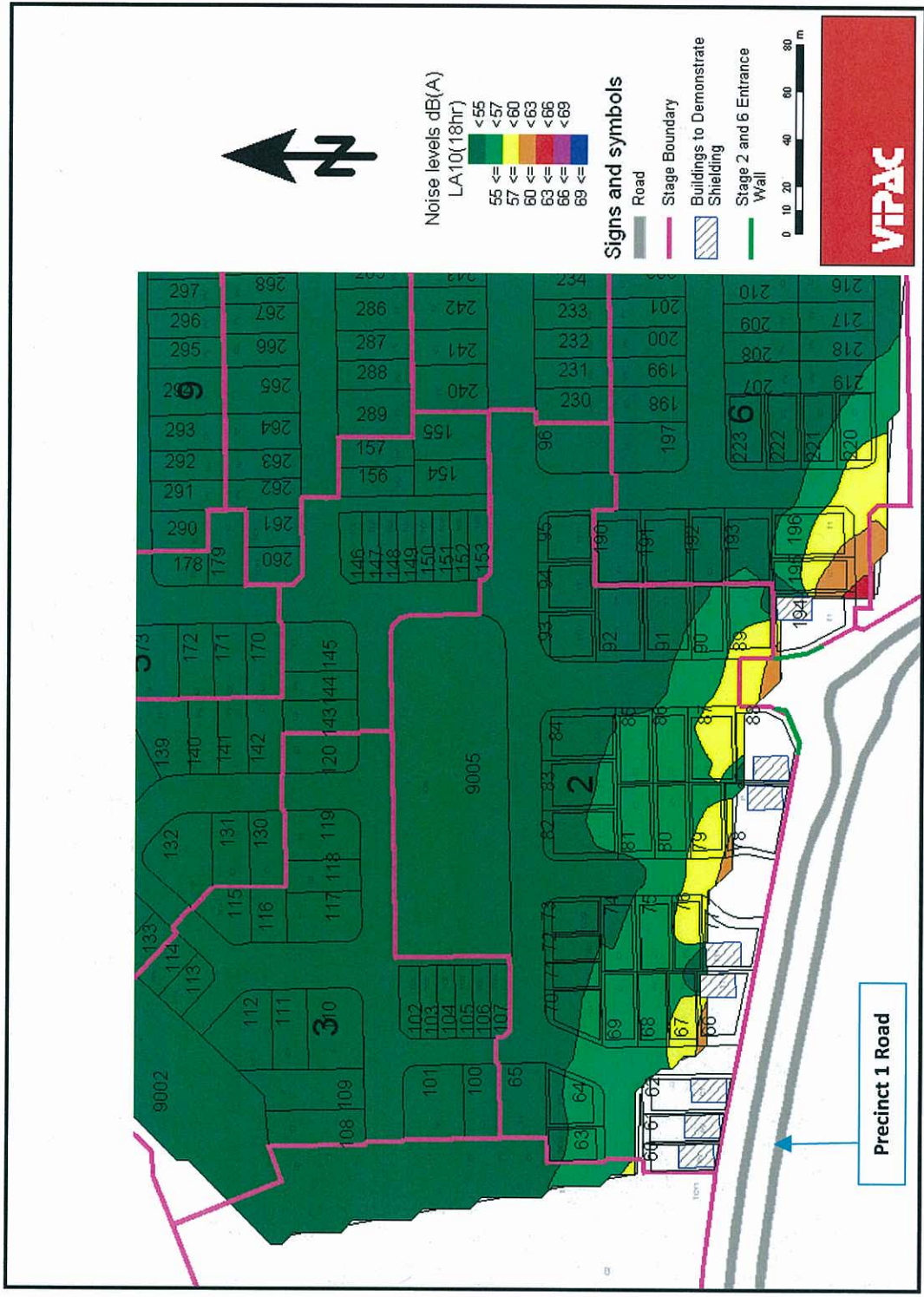


Figure A-2: Predicted Free Field $L_{A10(18hr)}$ Traffic Noise Levels at the Ground Floor - Lots Not Adjacent to the Precinct 1 Road - South

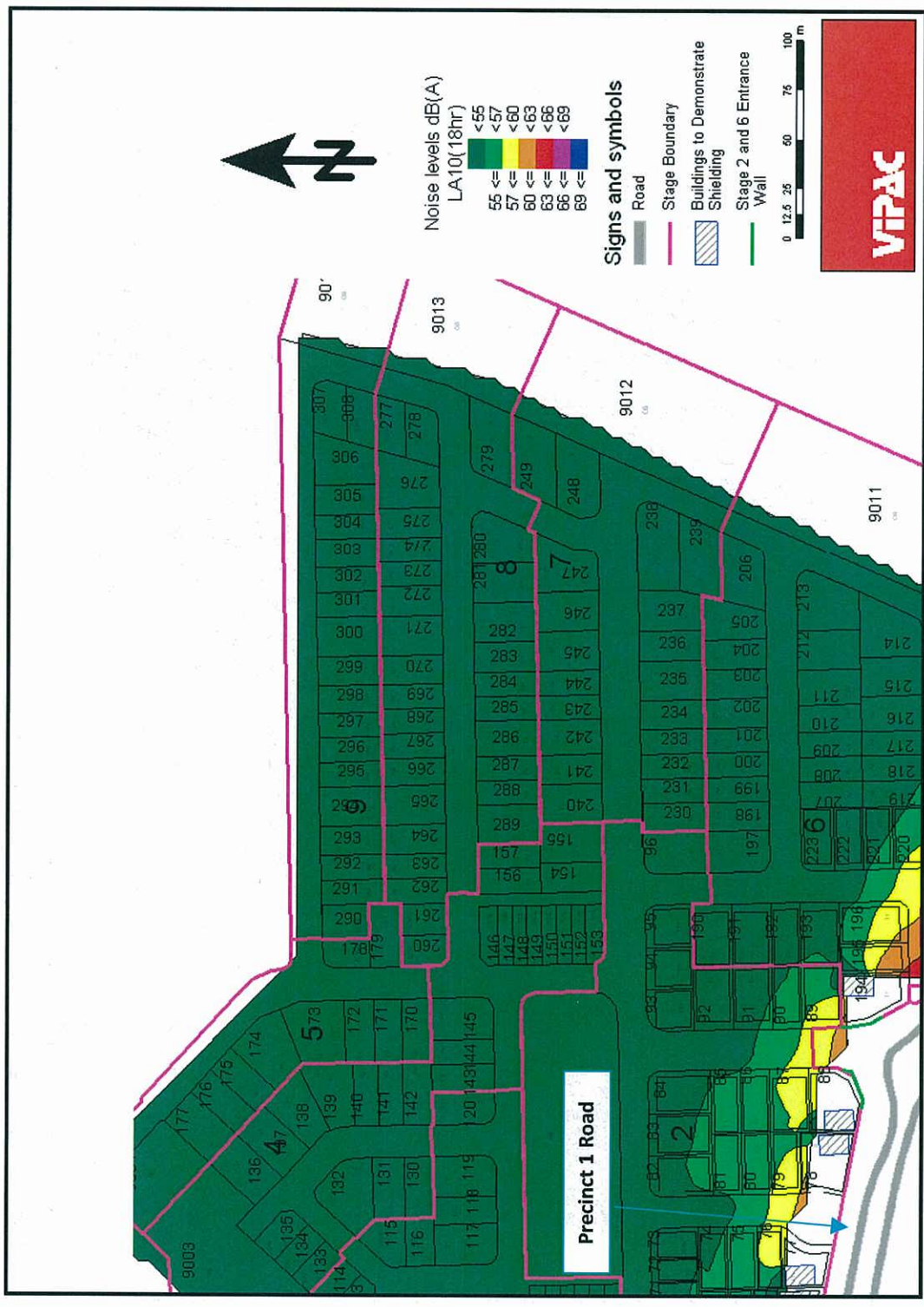


Figure A-3: Predicted Free Field $L_{A10(18hr)}$ Traffic Noise Levels at the Ground Floor - North

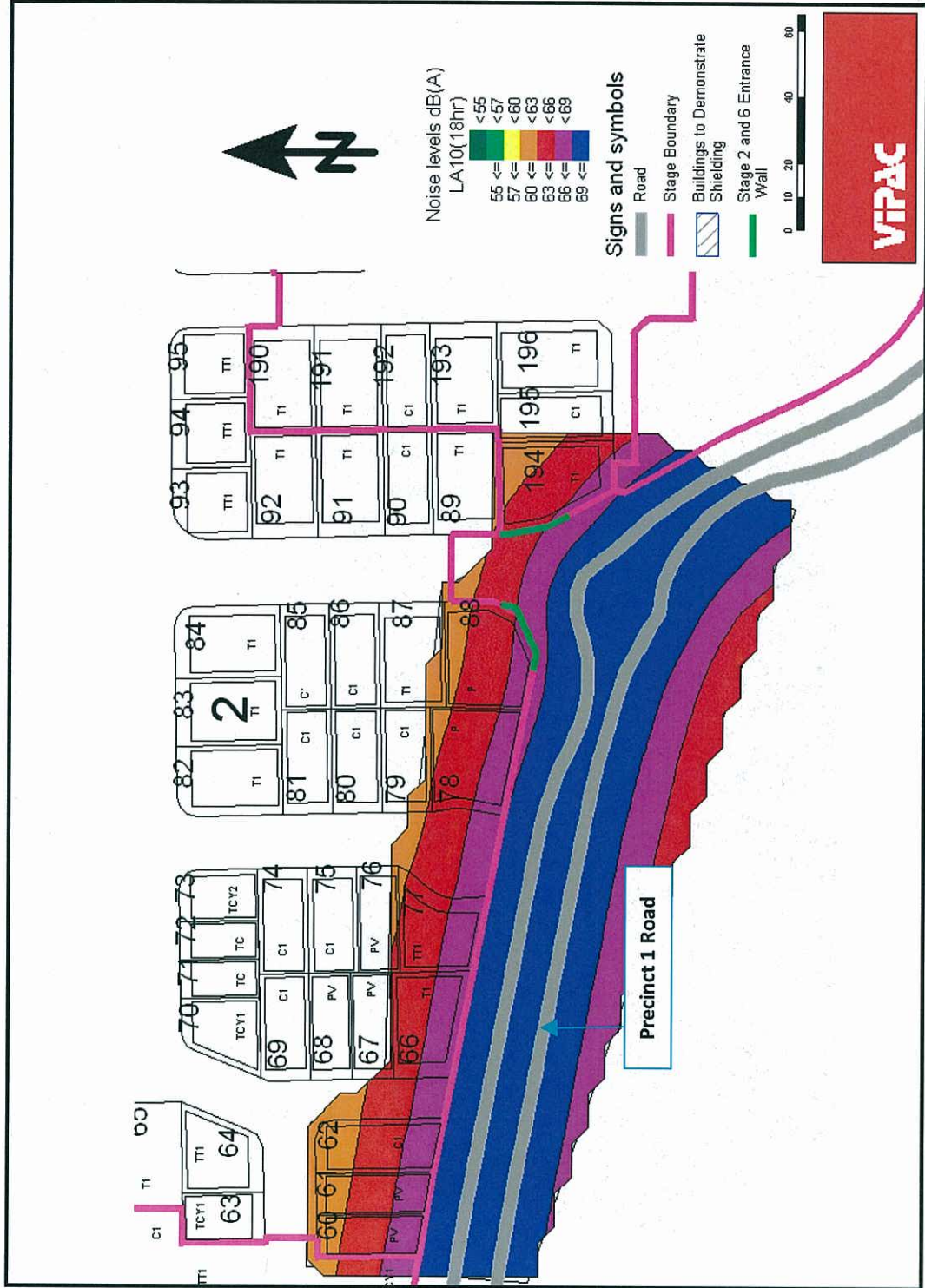


Figure A-4: Predicted Free Field $LA_{10}(18hr)$ Traffic Noise Levels at the First Floor - Lots Adjacent to the Precinct 1 Road

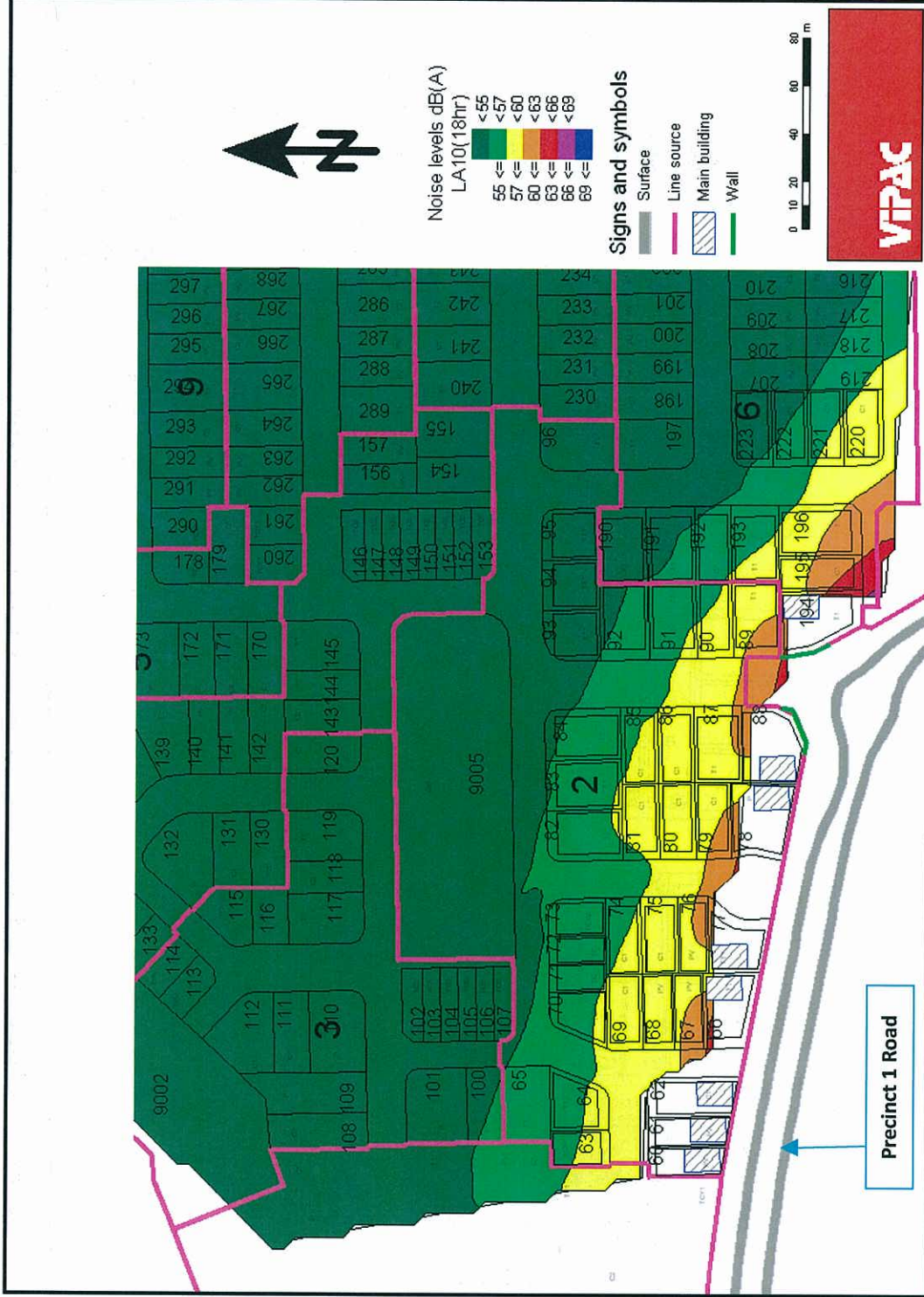


Figure A-5: Predicted Free Field $L_{A10(18hr)}$ Traffic Noise Levels at the First Floor - Lots Not Adjacent to the Precinct 1 Road - South

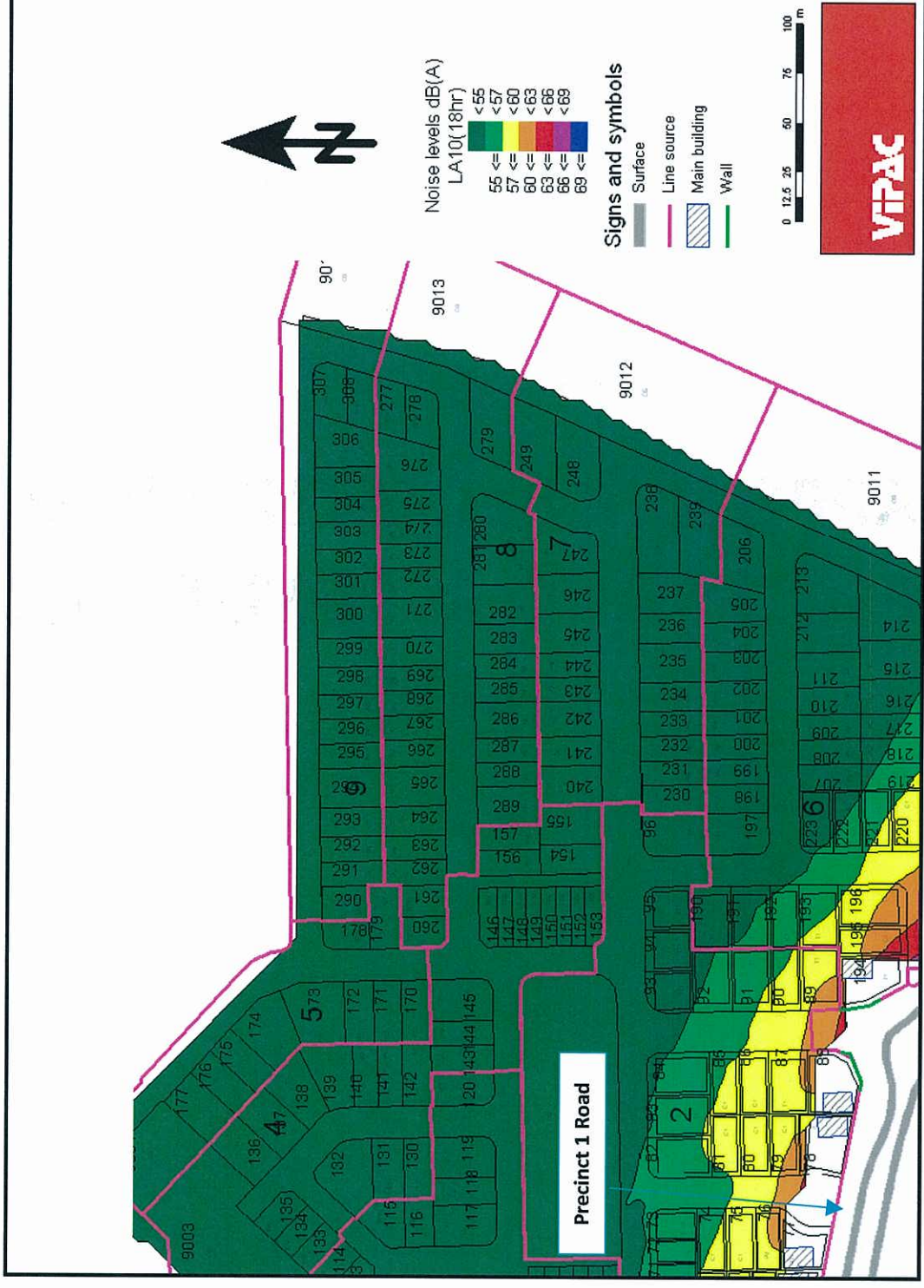


Figure A-6: Predicted Free Field $LA_{10}(18hr)$ Traffic Noise Levels at the First Floor - North

APPENDIX B: CALCULATION RESULTS AND ASSUMED PAD LEVELS

Table B-1: Noise Modelling Results and Assumed Pad Heights

Lot	Assumed Building Pad AHD	Floor	L10(18hr) (dB(A))
60	40.06	Ground	67
		First	69
61	39.79	Ground	67
		First	68
62	39.51	Ground	68
		First	69
63	39.97	Ground	56
		First	58
64	39.97	Ground	55
		First	57
66	39.13	Ground	67
		First	68
67	39.52	Ground	60
		First	62
68	39.68	Ground	57
		First	59
69	39.89	Ground	56
		First	58
70	40.31	Ground	56
		First	57
71	40.45	Ground	55
		First	57
72	40.50	Ground	55
		First	57
73	40.47	Ground	55
		First	57
74	39.88	Ground	56
		First	58
75	39.65	Ground	57
		First	59
76	39.37	Ground	59
		First	61
77	38.82	Ground	67
		First	68
78	37.92	Ground	67
		First	68
79	38.53	Ground	59
		First	61
80	39.15	Ground	57
		First	59
81	39.95	Ground	56
		First	58
82	40.76	Ground	56
		First	57
83	40.82	Ground	56
		First	57
84	40.49	Ground	55
		First	57
85	39.92	Ground	56
		First	58

Lot	Assumed Building Pad AHD	Floor	L10(18hr) (dB(A))
86	39.14	Ground	57
		First	59
87	38.38	Ground	58
		First	61
88	37.69	Ground	66
		First	68
89	37.04	Ground	59
		First	62
90	37.63	Ground	57
		First	59
91	38.35	Ground	55
		First	57
92	39.31	Ground	54
		First	56
93	39.99	Ground	53
		First	55
94	39.67	Ground	53
		First	55
95	38.77	Ground	53
		First	54
190	37.88	Ground	53
		First	55
191	37.39	Ground	54
		First	56
192	36.95	Ground	55
		First	57
193	36.56	Ground	55
		First	58
194	36.31	Ground	65
		First	67
195	36.17	Ground	62
		First	64
196	35.74	Ground	60
		First	62
220	33.92	Ground	58
		First	59
221	34.28	Ground	56
		First	58
222	34.59	Ground	54
		First	56
223	34.94	Ground	53
		First	55