Lloyd George Acoustics
PO Box 717
Hillarys WA 6923
T: 0439 987 455 F:9300 4199
E: olivier@lgacoustics.com.au W: www.lgacoustics.com.au

Environmental Noise Assessment

Beach Club, Eden Beach, Jindalee

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Prepared for:
Satterley

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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	Matt Moyle	Olivier Mallié
E:	daniel@lgacoustics.com.au	terry@lgacoustics.com.au	matt@lgacoustics.com.au	olivier@lgacoustics.com.au
M:	0439 032 844	0400 414 197	0412 611 330	0439 987 455

Prepared By:	Olivier Mallié
Position:	Project Director
Date:	9 February 2017

Table of Contents

List of Tables

List of Figures

Appendices

1 INTRODUCTION

It is proposed to open a restaurant / café (the Eden Beach Club), on Lot 8008 Foreshore Drive, Eden Beach, Jindalee – refer *Figure 1.1*. The Eden Beach Club is a two storey building comprising:

- On the ground floor, a take-away coffee kiosk, public amenities and delivery/storage areas;
- On the upper levels, an alfresco area with an approximate 100 patrons capacity, an enclosed restaurant / café with an approximate 200 patrons capacity; and
- At roof level, the mechanical plant room.

The Eden Beach Club will provide fresh, high quality food and serve breakfast, lunch and dinner. Its proposed hours of operations are 6am to midnight, 7 days a week with the premises licensed as 'Tavern Restricted'.

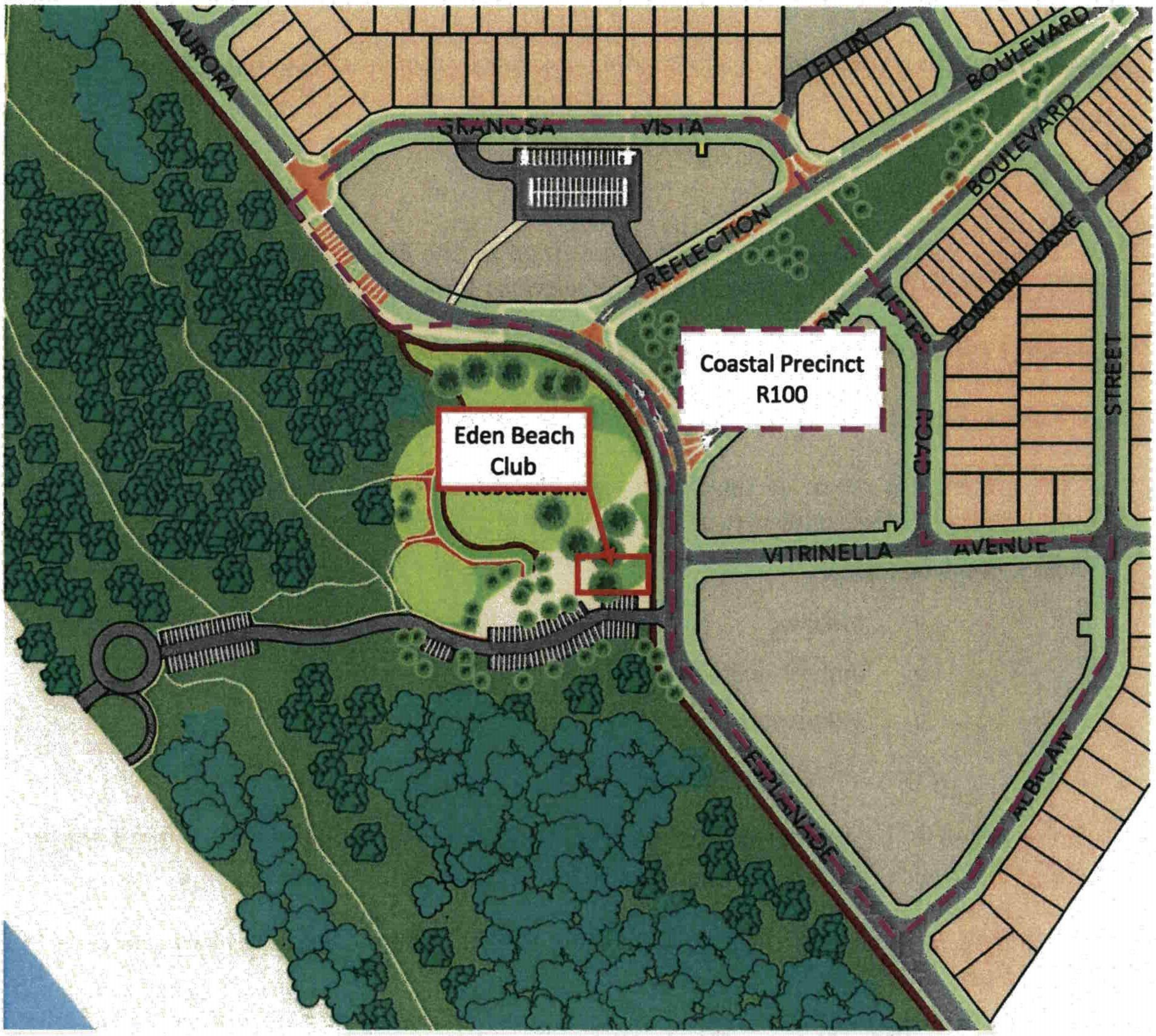


Figure 1-1 Project Locality

It is understood the adjacent lots to the north, east and south east are zoned R100 and will cater for multi-storey residential developments. This report assesses the noise impacts from the proposal at these future residences against the *Environmental Protection (Noise) Regulations 1997* and includes the following noise sources:

- Patrons in Alfresco - as a worst-case scenario, the Alfresco is taken to be at full capacity and with 50 seated patrons;
- Patrons on Balcony - as a worst-case scenario, the Alfresco is taken to be at full capacity and with 20 seated patrons;
- Restaurant / Cafe assumed to be at full capacity and with seated patrons;
- Mechanical plant noise; and
- Goods deliveries and waste collections.

Appendix A presents the development plans this assessment is based upon.

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

2 CRITERIA

Environmental noise in Western Australia is governed by the *Environmental Protection Act 1986*, through the *Environmental Protection (Noise) Regulations 1997* (the Regulations).

Regulation 7 defines the prescribed standard for noise emissions as follows:

"7. (1) Noise emitted from any premises or public place when received at other premises –

(a) Must not cause or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and

(b) Must be free of –

i. tonality;

ii. impulsiveness; and

iii. modulation,

when assessed under regulation 9"

A "...noise emission is taken to significantly contribute to a level of noise if the noise emission ... exceeds a value which is 5 dB below the assigned level..."

Tonality, impulsiveness and modulation are defined in Regulation 9. Noise is to be taken to be free of these characteristics if:

(a) The characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission; and

(b) The noise emission complies with the standard prescribed under regulation 7 after the adjustments of *Table 2-1* are made to the noise emission as measured at the point of reception.

Table 2-1 Adjustments Where Characteristics Cannot Be Removed

Where Noise Emission is Not Music			Where Noise Emission is Music	
Tonality	**Modulation**	**Impulsiveness**	**No Impulsiveness**	**Impulsiveness**
+ 5 dB	+ 5 dB	+ 10 dB	+ 10 dB	+ 15 dB

Note: The above are cumulative to a maximum of 15dB.

The baseline assigned levels (prescribed standards) are specified in Regulation 8 and are shown in *Table 2-2*.

Table 2-2 Baseline Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area[1]	0700 to 1900 hours Monday to Saturday (Day)	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sunday and public holidays (Sunday)	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days (Evening)	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial	All hours	60	75	80
Industrial	All hours	65	80	90

1. ***highly sensitive area*** means that area (if any) of noise sensitive premises comprising —
   (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
   (b) any other part of the premises within 15 metres of that building or that part of the building.

The nearest noise sensitive premises include those future residences along Reflection Boulevard, Vitrinella Avenue and Aurora Esplanade. The influencing factor, applicable at these premises has been calculated as 1 dB as at least one lot will be zoned mixed-use, as shown in *Table 2-3*. The transport factor has been calculated as 0 dB due to local roads being considered neither secondary or major roads for the foreseeable future.

Table 2-3 Influencing Factor Calculation

Description	Within 100 metre Radius	Within 450 metre Radius	Total
Industrial Land	0 %	0 %	0 dB
Commercial Land	20 %	0 %	1 dB
Transport Factor			**0 dB**
Total			**1 dB**

Table 2-4 shows the assigned noise levels including the influencing factor and transport factor at the receiving locations.

Table 2-4 Assigned Noise Levels

Premises Receiving Noise	Time Of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area[1]	0700 to 1900 hours Monday to Saturday (Day)	46	56	66
	0900 to 1900 hours Sunday and public holidays (Sunday)	41	51	66
	1900 to 2200 hours all days (Evening)	41	51	56
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	36	46	56

1. ***highly sensitive area*** means that area (if any) of noise sensitive premises comprising —
   (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
   (b) any other part of the premises within 15 metres of that building or that part of the building.

It must be noted the assigned noise levels above apply outside the receiving premises and at a point at least 3 metres away from any substantial reflecting surfaces. For the purpose of this assessment, the noise emissions were assessed at a point 1 metre away from the most affected building facades and a -2 dB adjustment was made to the predicted noise levels to account for reflected noise.

2.1 Waste Collection and Site Cleaning (Specified Works)

Regulation 14A provides requirements for such activities as the collection of waste, landscaped area maintenance and car park cleaning. Such activities can also be exempt from having to comply with regulation 7, provided they are undertaken in accordance with regulation 14A(2) as follows:

- during daytime hours, defined as:
  - 07:00 to 19:00 Monday to Saturday (excluding public holiday), or

    - 09:00 to 19:00 on a Sunday or public holiday
- in the quietest reasonable and practicable manner; and
- using the quietest equipment reasonably available.

In the case where specified works are to be carried outside daytime hours and their noise emissions are likely not to comply with regulation 7, the works also need to be carried out according to a Noise Management Plan which has been approved by the local government authority CEO.

2.2 Reversing Alarms

With regards to noise from reversing alarms, regulation 3(1)(h) states:

(1) Nothing in these regulations applies to the following noise emissions —

(h) noise emissions from —

(i) a reversing alarm fitted to a motor vehicle, mobile plant, or mining or earthmoving equipment;

If -

(iii) it is a requirement under another written law that such an alarm be fitted; and

(iv) it is not practicable to fit an alarm that complies with the written law under which it is required to be fitted and emits noise that complies with these regulations;

It is considered that reversing alarms fitted to private and commercial vehicles e.g. goods delivery and garbage trucks, are not exempt under the Regulations since they are not specifically required under another written law.

The commonly used fixed noise output tonal reversing alarms also known as 'reversing beeper' emit, by their very nature, tonal and modulating noise at high levels. As such, this type of reversing alarm generally cannot comply with the Regulations even at distant receivers.

Alternative reversing alarms, which can more readily comply with the Regulations, include alarms emitting a broadband signal in-lieu of a tonal 'beep'.

3 METHODOLOGY

Computer modelling has been used to predict the noise levels from the various noise sources at the proposed development. The advantage of modelling is that it is not affected by background noise sources and can provide the noise level for various weather conditions and operating scenarios if necessary.

The software used was *SoundPLAN 7.4* with the CONCAWE algorithms selected. These algorithms have been selected as they include the influence of wind and atmospheric stability. Input data required in the model are:

- Meteorological Information;
- Topographical data;
- Ground Absorption; and
- Source sound power levels.

3.1 Meteorological Information

Meteorological information utilised is provided in *Table 3-1* and is considered to represent worst-case conditions for noise propagation. At wind speeds greater than those shown, sound propagation may be further enhanced, however background noise from the wind itself and from local vegetation is likely to be elevated and dominate the ambient noise levels.

Table 3-1 Modelling Meteorological Conditions

Parameter	Night (1900-0700)	Day (0700-1900)
Temperature (^{o}C)	15	20
Humidity (%)	50	50
Wind Speed (m/s)	3	4
Wind Direction*	All	All
Pasquil Stability Factor	F	E

* Note that the modelling package used allows for all wind directions to be modelled simultaneously.

It is generally considered that compliance with the assigned noise levels needs to be demonstrated for 98% of the time, during the day and night periods, for the month of the year in which the worst-case weather conditions prevail. In most cases, the above conditions occur for more than 2% of the time and therefore must be satisfied.

3.2 Topographical Data

Topographical data was based on that publicly available from GoogleEarth in the form of elevation points. It is noted there are no significant natural features providing noise screening.

Future buildings on the closest lots to the north east and south east are expected to be 3 to 5 storey buildings, with, on the east side, commercial tenancies on the ground floor. These future residences were modelled as individual 5 storey buildings of floor height of 3 metres and with receivers at 1.5 metres above local floor level.

3.3 Ground Absorption

Ground absorption varies from a value of 0 to 1, with 0 being for an acoustically reflective ground (e.g. water or bitumen) and 1 for acoustically absorbent ground (e.g. sand or grass). In this instance, a value of 0.0 has been used for all built-up lots and 1.0 for public open space.

3.4 Source Sound Levels

The sound power levels used in the modelling are provided in *Table 3-2*.

Table 3-2 Source Sound Power Levels, dB

Description	Octave Band Centre Frequency (Hz)								Overall dB(A)
	63	125	250	500	1k	2k	4k	8k	
Alfresco Area	67	78	82	84	77	74	71	60	**84**
Balcony	63	74	78	80	73	70	67	56	**80**
Restaurant / Cafe	73	84	88	90	83	80	77	66	**90**
AC condenser	77	75	65	66	75	75	73	70	**80**
Cool room condenser, 'daytime' mode	79	83	82	79	76	71	66	63	**81**
Cool room condenser, 'night-time' mode	74	78	77	74	71	66	61	58	**76**
Kitchen exhaust fan	76	80	75	84	82	77	71	62	**85**
Toilet exhaust fans, each	63	64	70	64	67	63	55	50	**70**
Refrigerated deliveries	65	68	88	92	97	97	91	80	**102**
Normal Deliveries, L_{max}	111	109	105	999	97	96	95	-	**104**
Waste collection, L_{max}	115	117	112	107	105	104	103	-	**112**

With regards to the above, please note the following:

- The Alfresco Area and Balcony are assumed to be occupied by 50 and 20 seated patrons respectively, of which 50% are assumed to be talking simultaneously at a voice level of 70 dB L_{Aw} per person. These patrons will be seated and were therefore modelled at a height of 1.2 metres. No music is assumed to be played in these areas i.e. no external speakers.
- The Restaurant / Cafe is assumed to be occupied by 200 seated patrons of which 50% are assumed to be talking simultaneously at voice level of 70 dB L_{Aw} per person. These patrons

were modelled at a height of 1.2 metres within the restaurant, with the software then calculating the internal reverberant noise levels. Ambient music may be played in the restaurant however it is at levels allowing for normal conversation to occur.

- Deliveries and waste collection are expected to occur on the western side of the building and under the upper level over-hang. 'Refrigerated deliveries' represent source noise levels from a truck mounted refrigeration compressor and this source was modelled as a point source 2m above local ground level. The 'L_{max}' source levels represent intermittent events such as pallets, crates or waste bins being dropped on the ground. These were modelled as point sources at 1m above ground level.
- All mechanical plant was modelled as a point source 0.5m above roof level.

3.5 Eden Beach Club Building Design

The lower floor of the Eden Beach club comprises mostly of solid construction e.g. masonry with cladding with the exception of the kiosk windows.

The upper floor comprises mostly of full height glazing, either operable or fixed. Various acoustic ratings can be achieved depending on the glass and frame type. Initially, the following construction and acoustic performance for the various elements of the upper level facade were assumed:

- Fixed glazing, R_w (C, C_{tr}) of 36 (-1, -3) e.g. 10.38mm laminated glass;
- Adjustable louvres, R_w (C, C_{tr}) of 33 (0, -1) e.g. 6.38mm laminated glass with gaskets and seals; and
- Bi-fold doors, R_w (C, C_{tr}) of 33 (-1, -2) e.g. 10.38mm laminated glass.

The roof of the restaurant is masonry and taken to be at least 200mm thick concrete with plasterboard ceiling within the restaurant. People occupying a space provide some acoustic absorption and when fully occupied, an average reverberation time of 1.8 seconds was predicted. This should be reduced to below 1 second[1], which can be achieved by installing an absorptive ceiling of minimum NRC 0.7, spread evenly to at least 50% of the ceiling area.

The mechanical plant is located on the roof on the eastern side of the building, above the upper level amenities. The plant room design is initially taken to be open, that is, with no roof cover and with architectural louvres to the sides, which have no significant noise reduction effects.

The lightweight steel framed roof structure and Alfresco balustrade were also included in the model as they provide noise barrier effects to elevated receivers.

[1] AS/NZS 2107 *Recommended design sound levels and reverberation times for building interiors*

4 RESULTS

4.1 Eden Beach Club Operations

The noise contribution from individual noise sources were predicted at the closest receivers as follows:

- Sc 1 - 'normal' restaurant noise e.g. breakfast/lunch/dinner with all operable glazing open.
- Sc 2 - as per Sc 1 but with all operable glazing shut with the exception of the eastern most bi-fold door and the bi-fold door to the balcony open.
- Sc 3 - alfresco area fully occupied by patrons.
- Sc 4 - balcony fully occupied by patrons.
- Mech Plant - noise emissions from the mechanical plant are considered in isolation.

The results of the noise modelling for each scenario above are presented in *Table 4-1* at all floor heights. It is noted that due to the relatively short source to receiver distances the difference between 'day' and 'night-time' conditions was found to be negligible. *Figures 4-1* to *4-5* also show the predicted noise levels as contours map (at ground level) as well as the location of each receiver.

Table 4-1 Summary of Results - Operational Noise

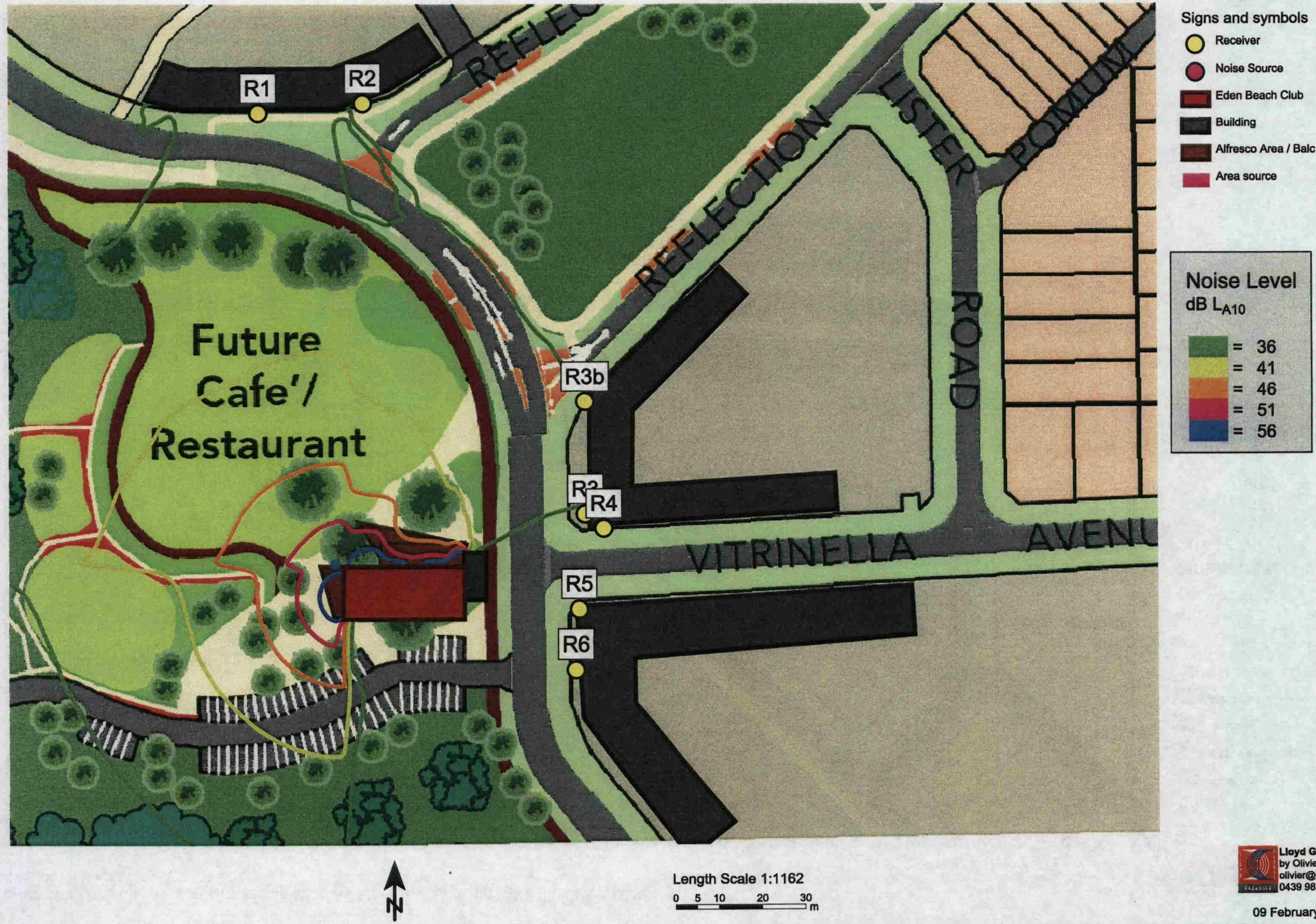
Receiver	Floor	Predicted Scenario Noise Levels, dB L_{A10}				
		Sc 1	Sc 2	Sc 3	Sc 4	Mech Plant, Day
R1	GF	33	32	25	29	39
R1	F 1	34	32	27	29	39
R1	F 2	34	32	28	30	39
R1	F 3	34	32	29	31	39
R1	F 4	34	32	29	31	39
R2	GF	33	29	24	28	40
R2	F 1	34	30	26	29	40
R2	F 2	34	31	28	30	40
R2	F 3	34	30	29	30	40
R2	F 4	34	30	29	31	41
R3	F 1	32	19	30	19	50
R3	F 2	31	23	32	22	51
R3	F 3	30	24	33	17	51

Receiver	Floor	Predicted Scenario Noise Levels, dB L_{A10}				
		Sc 1	Sc 2	Sc 3	Sc 4	Mech Plant, Day
R3	F 4	31	24	33	18	51
R3b	F 1	36	28	31	28	46
R3b	F 2	36	27	32	28	47
R3b	F 3	36	29	33	29	47
R3b	F 4	35	28	34	29	47
R4	F 1	34	27	35	27	50
R4	F 2	29	16	29	18	50
R4	F 3	29	21	30	19	50
R4	F 4	29	21	31	17	50
R5	GF	30	22	31	18	50
R5	F 1	24	21	25	18	52
R5	F 2	30	28	28	18	52
R5	F 3	32	29	30	19	52
R5	F 4	33	29	32	19	52
R6	GF	34	30	33	19	48
R6	F 1	23	21	25	20	50
R6	F 2	29	27	29	19	50
R6	F 3	30	27	30	19	50
R6	F 4	30	28	32	19	50

From these individual noise contribution, the noise levels from additional operational scenarios can be derived. For example, for a normal busy day e.g. Saturday lunch time, the noise levels from scenarios Sc 1, Sc 3, Sc 4 and Mech Plant should be combined to include noise emissions from the restaurant, patrons occupying the alfresco area and balcony, and mechanical plant.

Eden Beach Club - Restaurant Noise With All Operable Glazing Open (Scenario 1)
Lot 8008 Foreshore Drive, Eden Beach, Jindalee

Figure 4-1



Lloyd George Acoustics
by Olivier Mallié
olivier@lgacoustics.com.au
0439 987 455

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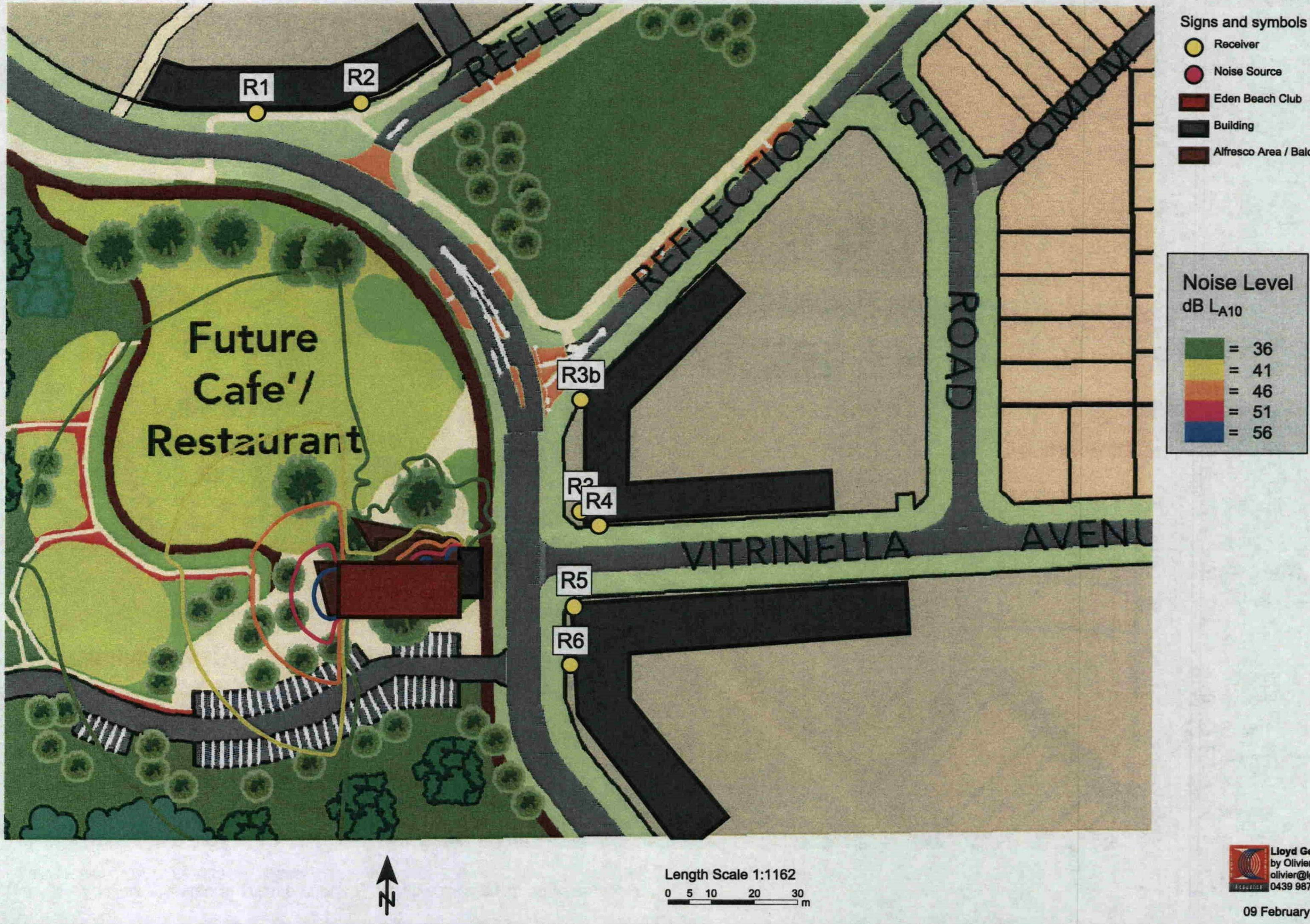
Eden Beach Club - Restaurant Noise With All Operable Glazing Partially Open (Scenario 2)
Lot 8008 Foreshore Drive, Eden Beach, Jindalee

Figure 4-2



Lloyd George Acoustics
by Olivier Mallié
olivier@lgacoustics.com.au
0439 987 455

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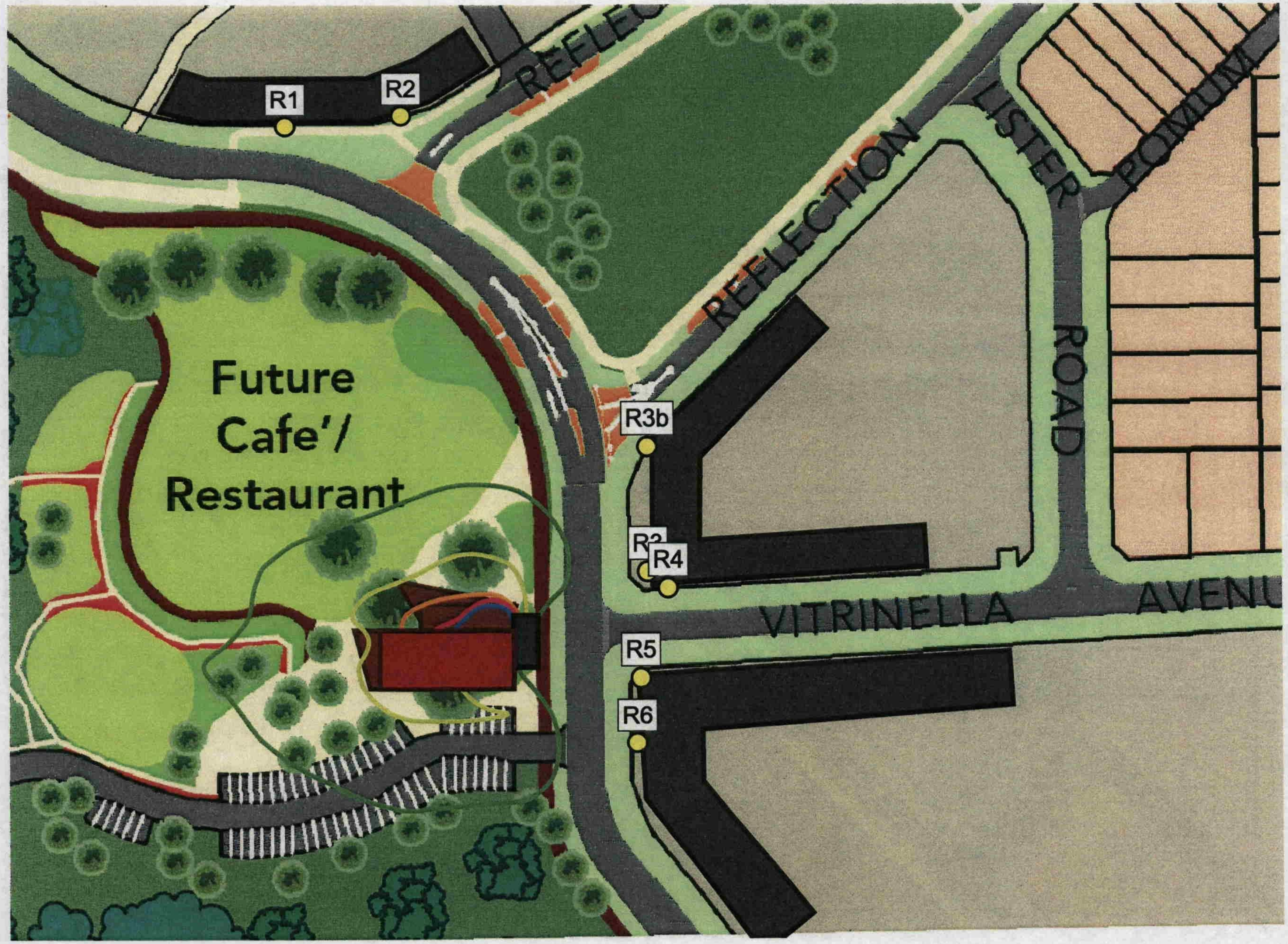
Eden Beach Club - Alfresco Area Fully Occupied (Scenario 3)
Lot 8008 Foreshore Drive, Eden Beach, Jindalee

Figure 4-3



Signs and symbols
- Receiver
- Noise Source
- Eden Beach Club
- Building
- Alfresco Area / Balcony

Noise Level
dB L_{A10}

=	36
=	41
=	46
=	51
=	56

Length Scale 1:1162
0 5 10 20 30 m

Lloyd George Acoustics
by Olivier Mallié
olivier@lgacoustics.com.au
0439 987 455

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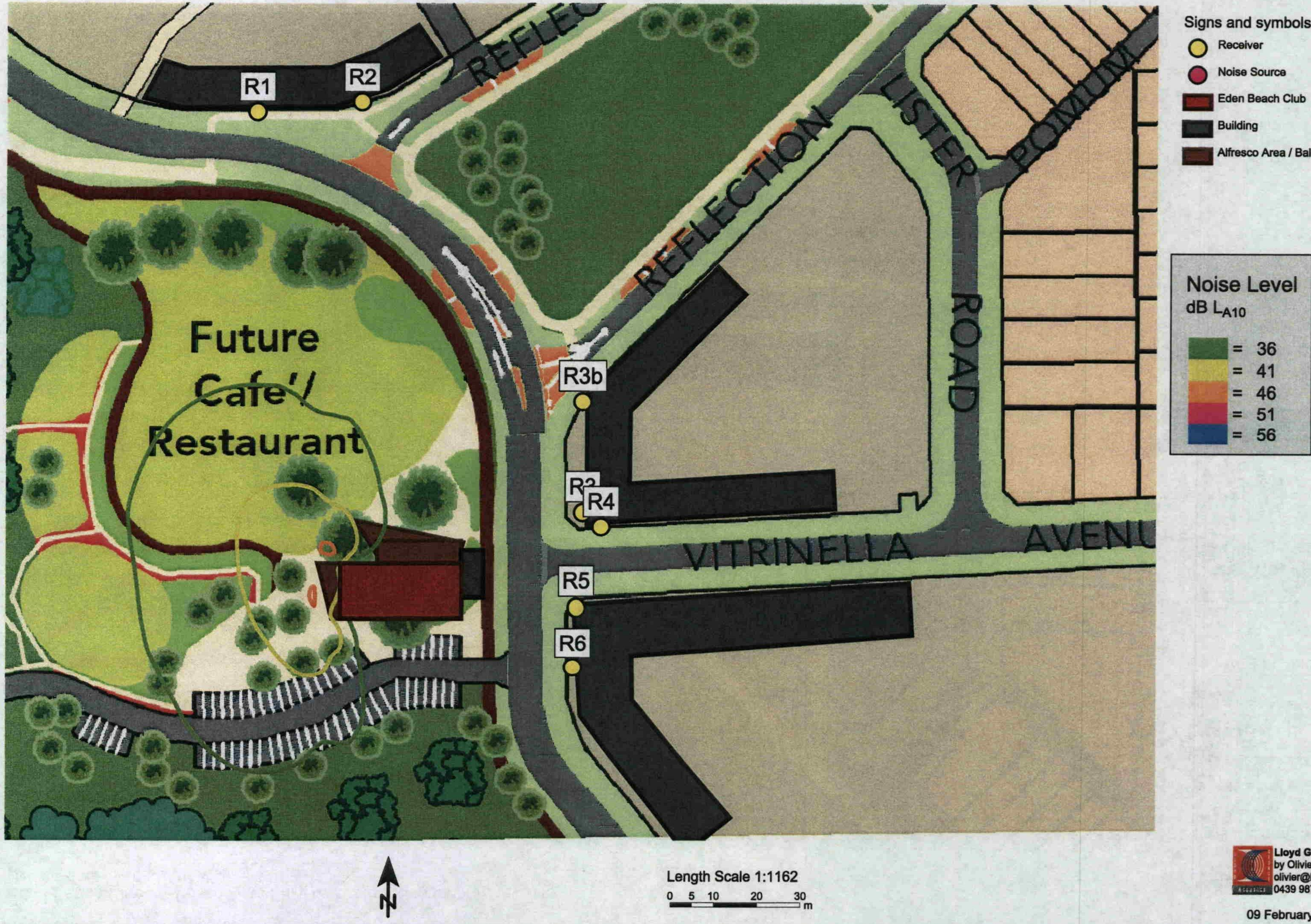
Eden Beach Club - Balcony Fully Occupied (Scenario 4)
Lot 8008 Foreshore Drive, Eden Beach, Jindalee

Figure 4-4



Lloyd George Acoustics
by Olivier Mallié
olivier@lgacoustics.com.au
0439 987 455

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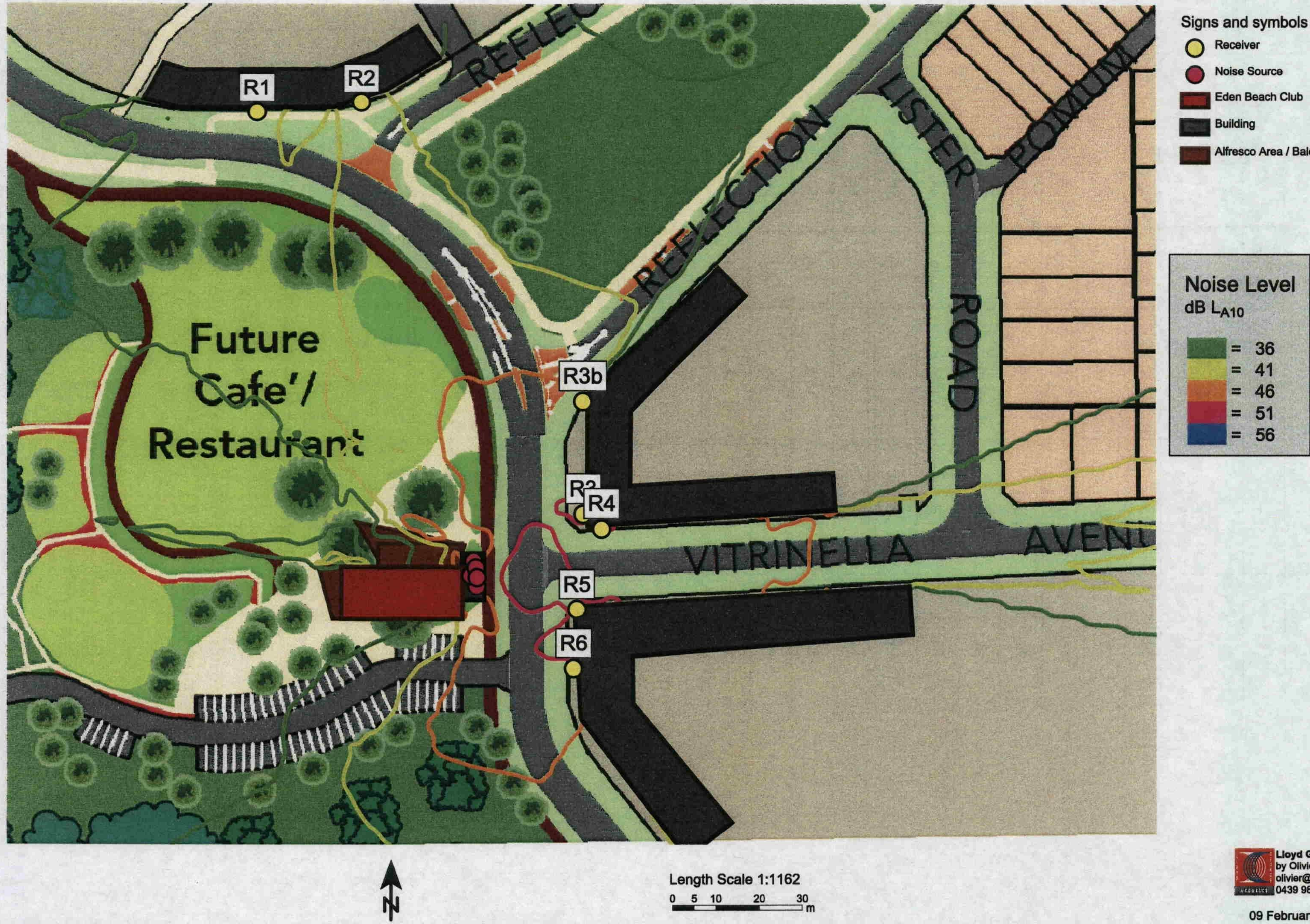
Eden Beach Club - Mechanical Plant Daytime Mode and No Mitigation
Lot 8008 Foreshore Drive, Eden Beach, Jindalee

Figure 4-5



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by Olivier Mallié
olivier@lgacoustics.com.au
0439 987 455

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4.2 Deliveries and Waste Collection

The noise from deliveries and waste collection were also predicted in isolation and *Table 4-2* presents the predicted noise levels at each receiver. *Figures 4-6* to *4-8* also show the predicted noise levels as contours map (at ground level).

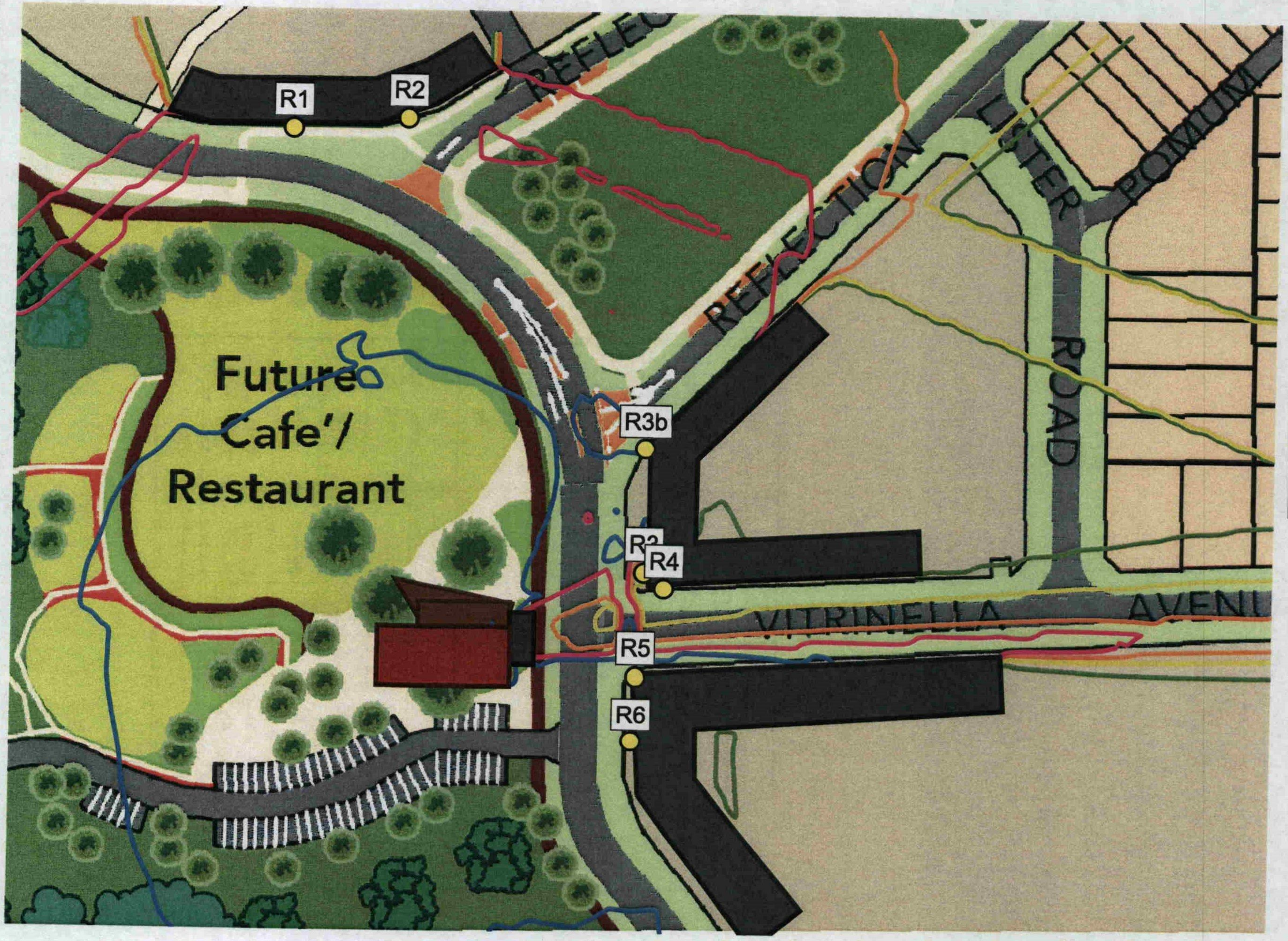
Table 4-2 Summary of Results - Deliveries and Waste Collection

Receiver	Floor	Predicted Scenario Noise Levels, dB L_{A10}		
		Refrigerated Truck, dB L_{A10}	Delivery, dB L_{Amax}	Waste Collection, dB L_{Amax}
R1	GF	52	54	61
R1	F 1	51	53	61
R1	F 2	52	53	61
R1	F 3	53	54	62
R1	F 4	53	54	62
R2	GF	51	53	61
R2	F 1	51	53	60
R2	F 2	51	52	60
R2	F 3	51	52	60
R2	F 4	50	51	59
R3	F 1	39	46	53
R3	F 2	38	42	50
R3	F 3	38	43	50
R3	F 4	38	41	48
R3b	F 1	53	55	63
R3b	F 2	53	55	63
R3b	F 3	51	54	61
R3b	F 4	50	53	61
R4	F 1	38	45	52
R4	F 2	38	43	51
R4	F 3	38	42	50

Receiver	Floor	Predicted Scenario Noise Levels, dB L_{A10}		
		Refrigerated Truck, dB L_{A10}	Delivery, dB L_{Amax}	Waste Collection, dB L_{Amax}
R4	F 4	38	40	48
R5	GF	59	60	68
R5	F 1	51	55	62
R5	F 2	47	52	60
R5	F 3	42	48	56
R5	F 4	40	46	54
R6	GF	59	61	69
R6	F 1	59	60	68
R6	F 2	55	58	65
R6	F 3	53	56	64
R6	F 4	51	55	63

Eden Beach Club - Refrigerated Delivery On West Side of Building
Lot 8008 Foreshore Drive, Eden Beach, Jindalee

Figure 4-6



Signs and symbols

- Receiver
- Noise Source
- Eden Beach Club
- Building
- Alfresco Area / Balcony

Noise Level
dB L_{A10}

=	36
=	41
=	46
=	51
=	56

N

Length Scale 1:1162
0 5 10 20 30 m

Lloyd George Acoustics
by Olivier Mallié
olivier@lgacoustics.com.au
0439 987 455

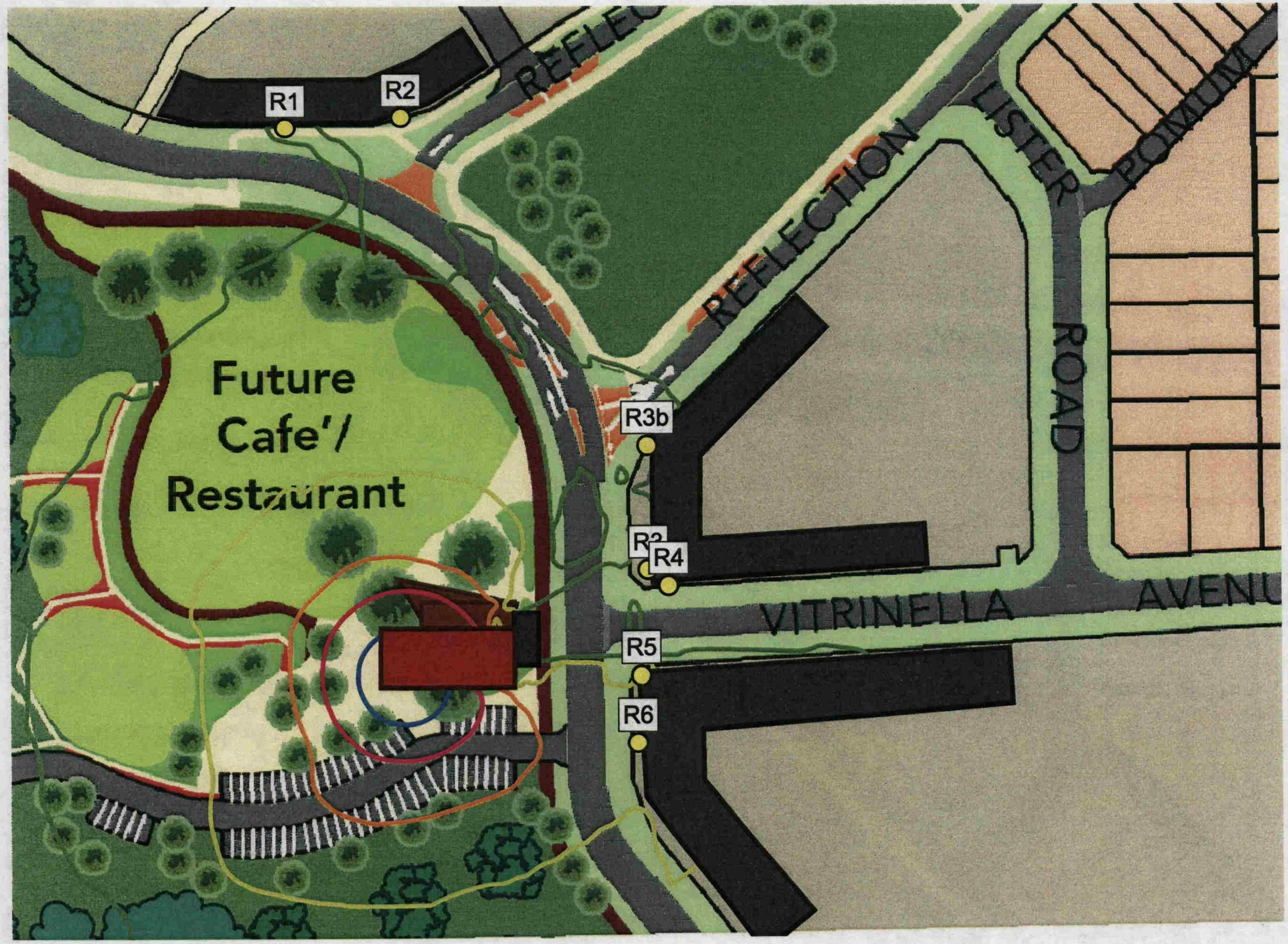
09 February 2017

City Of Wanneroo IM 17/2/2017

Eden Beach Club - Delivery On West Side of Building (e.g. food crates, drinks palettes)
Lot 8008 Foreshore Drive, Eden Beach, Jindalee

Figure 4-7

City of Wanneroo IM 17/2/2017



Signs and symbols

- Receiver
- Noise Source
- Eden Beach Club
- Building
- Alfresco Area / Balcony

Noise Level
dB L_{Amax}

= 56
= 61
= 66
= 71
= 76

N

Length Scale 1:1162
0 5 10 20 30 m

Lloyd George Acoustics
by Olivier Mallié
olivier@lgacoustics.com.au
0439 987 455

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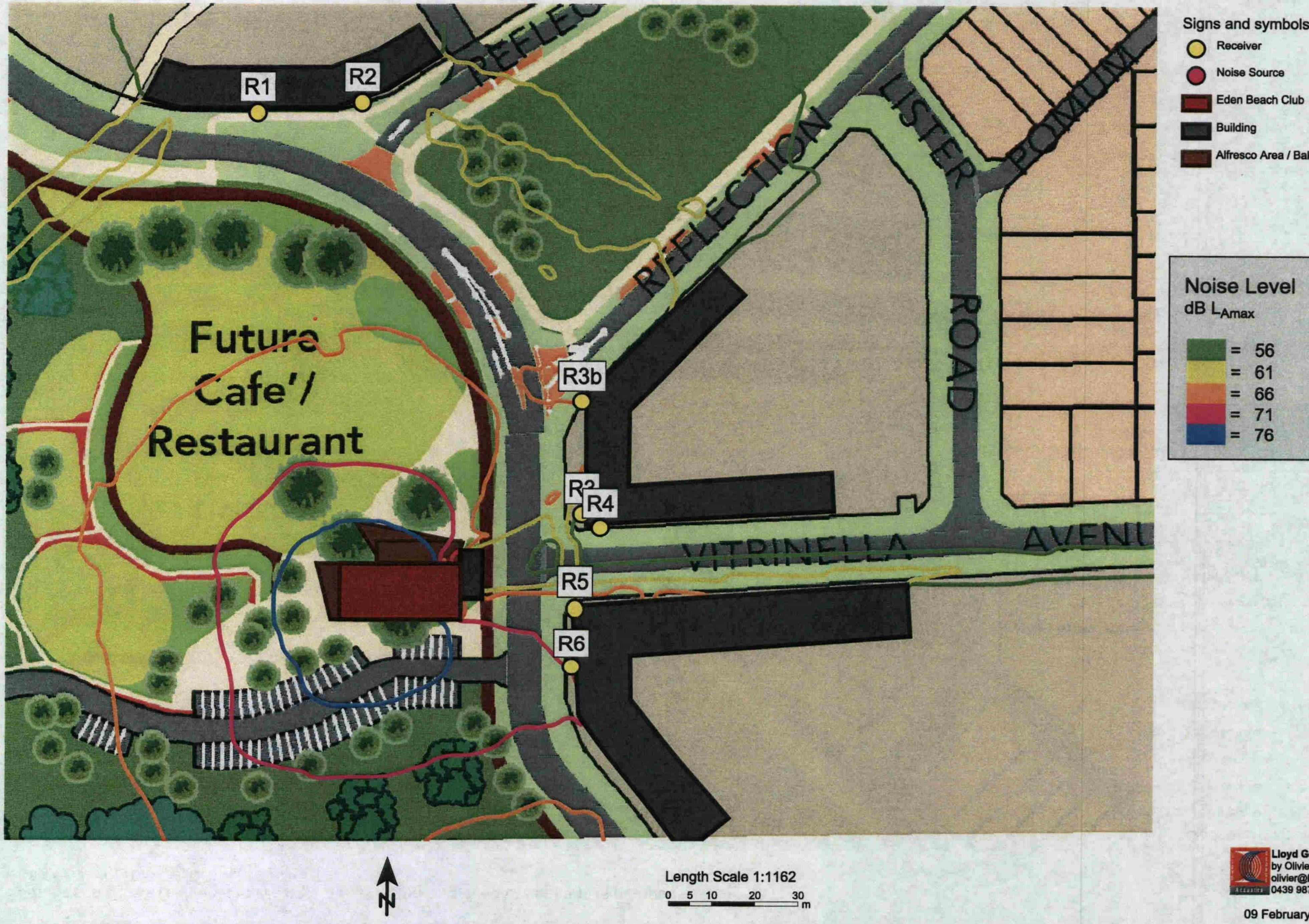
Eden Beach Club - Waste Collection On West Side of Building
Lot 8008 Foreshore Drive, Eden Beach, Jindalee

Figure 4-8



Lloyd George Acoustics
by Olivier Mallié
olivier@lgacoustics.com.au
0439 987 455

09 February 2017

5 ASSESSMENT

Based on the results from *Table 4-1*, the noise emissions from various operational scenarios were assessed. These are detailed in the following sections.

5.1 Normal Operations

This scenario represents a typical busy day and include the following noise sources:

- Restaurant fully occupied and with all operable glazing open;
- Alfresco area and balcony also fully occupied; and
- Mechanical plant operating in daytime mode.

Combining the noise levels from *Table 4-1* for the relevant scenarios, noise levels up to 51-52 dB(A) are predicted at receivers R3 and R5. At both receivers the overall levels are dominated by the mechanical plant.

During the daytime (Monday to Saturday), the applicable assigned noise levels are 46 dB L_{A10}, which would be exceeded by 6 dB. To achieve compliance it is therefore required to first mitigate the mechanical plant noise emissions. This could be achieved by careful selection of plant i.e. quietest available, and enclosing the plant in a dedicated room, the design of which can be finalised at detailed design stage. Mitigating the mechanical plant noise by at least 10 dB would result in an overall noise level of up to 43 dB L_{A10} at receivers R3, which complies with the L_{10} assigned noise level of 46 dB.

The Sundays and public holidays daytime (9am to 7pm) and the evening time (7pm to 10pm any days) have the same assigned noise level of 41 dB L_{A10}. As these levels are 5 dB lower than during the day time, a further 5 dB noise reduction is required. To achieve compliance, a further 5 dB reduction is required to the mechanical plant noise emissions. Overall noise levels up to 39 dB L_{A10} were predicted under such scenario, which complies with the L_{10} assigned noise level of 41 dB.

At night-time i.e. after 10pm, the assigned noise levels are a further 5 dB lower with an applicable assigned noise level of 36 dB L_{A10}. During this period, compliance can be achieved if mechanical plant noise is further reduced and the restaurant's operable glazing is kept shut, with the exception of the eastern most bi-fold door to the alfresco area and the bi-fold door to the balcony. The mitigated night-time noise contours are shown in *Figure 5-1*.

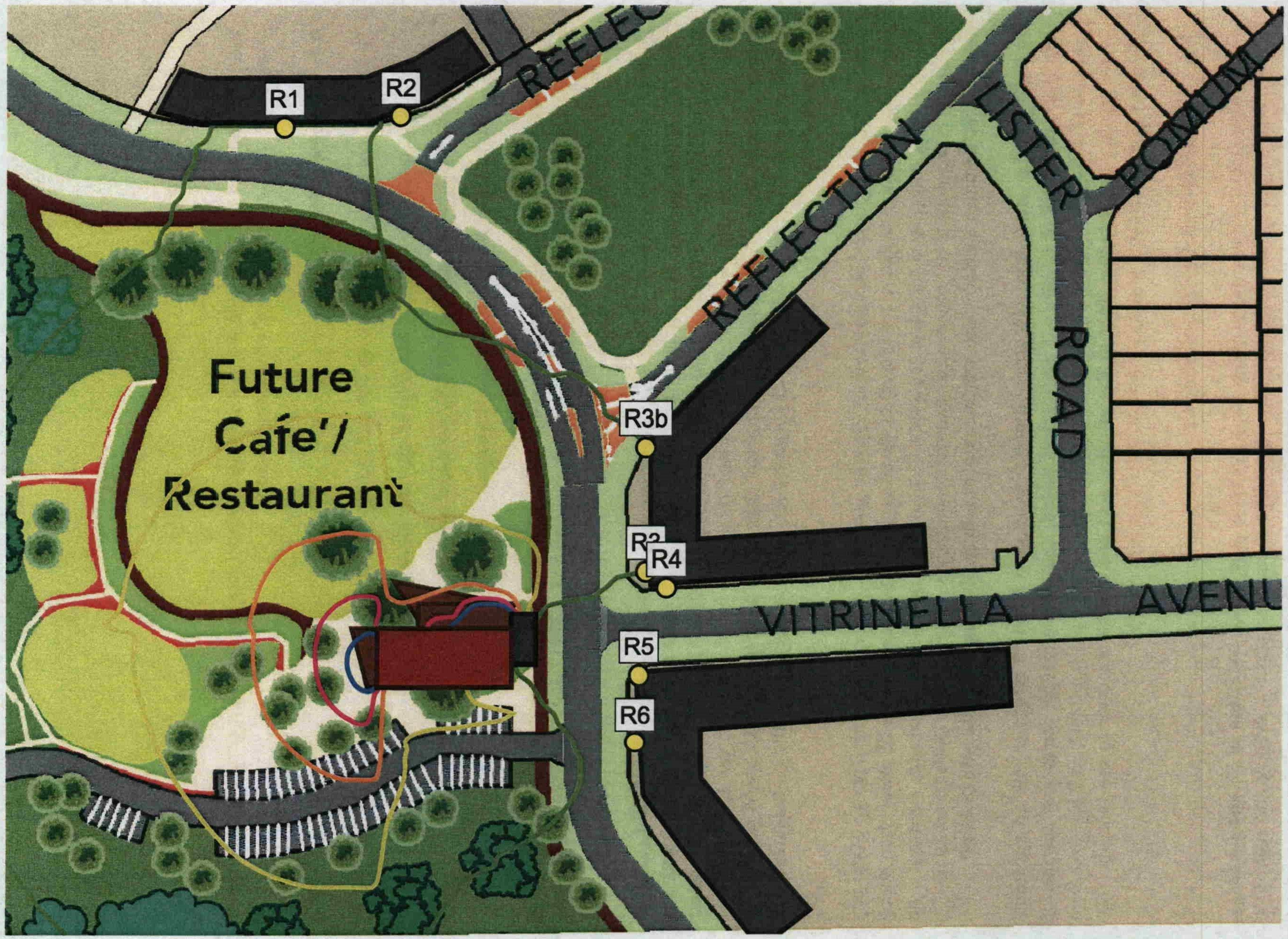
5.2 Deliveries and Waste Collections

From *Table 4-2*, maximum noise levels from deliveries and waste collection of 61 and 69 dB L_{max} were predicted at receiver R6 respectively. Such levels would exceed the evening and night-time L_{max} assigned noise levels and therefore deliveries and waste collection are to be restricted to the daytime Monday to Saturday.

Refrigerated deliveries are also to be restricted to daytime Monday to Saturday and the fridge compressor is to be turned off while the truck is on site.

Eden Beach Club - Restaurant Night-time Noise (Scenarios 2 + 3 + 4 + Mechanical Plant Room)
Lot 8008 Foreshore Drive, Eden Beach, Jindalee

Figure 5-1



Lloyd George Acoustics
by Olivier Mallié
olivier@lgacoustics.com.au
0439 987 455

09 February 2017

6 CONCLUSIONS

An assessment of various activities at the proposed Eden Beach Club has been undertaken by means of noise modelling. Noise levels were predicted at the closest sensitive receivers, being the adjacent future multi-storey residential buildings to the north, east and south east of the Eden Beach Club.

To comply with the Regulations the following noise mitigation measures are required:

- Mechanical plant to be located within dedicated plant room with acoustically lined roof over and walls comprising of acoustic louvres, or include means of forced ventilation. The design of the plant room can be finalised once final plant selection is known, and is to a achieve a minimum 20 dB overall reduction and to remove tonal characteristics.
- At night-time:
    - All of the restaurant's operable glazing is to remain shut at all times. The eastern most bi-fold door to the alfresco area and the bi-fold to the balcony can however remain open; and
    - East entry door to the Alfresco area is to be kept shut when not in use e.g. use self-closing mechanism and not be left ajar.

It must be noted this assessment and the recommendations made in relation to the mechanical plant is based on preliminary information, and should therefore be reviewed as the design progresses and a final plant layout and selection are available. In addition, worst-case assumptions were made in relation to the location and orientation of the adjacent future residential developments and should these change e.g. increased setback, some of the mitigation measures above may not be warranted e.g. alfresco area restrictions.

In relation to waste collections and deliveries, both are to be restricted to daytime Monday to Saturday. With refrigerated deliveries, the fridge compressor is to be turned off while the truck is on site. The following good practices in relation to deliveries and waste management should also be implemented:

- Avoid use of tonal reversing alarms;
- Use impact matting under large waste bins to minimise impact noise;
- Do not empty glass into outdoor bins at night-time.

Finally, an acoustically absorptive ceiling should be provided within the restaurant to minimise reverberant levels. It is recommended using ceiling tiles of NRC 0.7 to at least 50% of the ceiling area.

Appendix A

Development Plans

NOTE. Contractor to check and verify all dimensions levels, and angles on site before commencing. All construction work to be in accordance with the building code of Australia, approved documents an relevant Australian Standards.

EDEN BEACH CLUB - LOT 8008 FORESHORE DRIVE, JINDALEE WA

DEVELOPMENT APPROVAL - REVISED - 24/01/2017

ISSUE	DATE	DESCRIPTION	DRN.
B	24.01.17	DA APPROVAL (REVISED)	LM
A	29.09.16	DA APPROVAL	LM

DA APPROVAL

dmg ARCHITECTURE

DESIGN MANAGEMENT GROUP level 2 1008 hay street perth
telephone +61 8 9212 6866 | facsimile +61 8 9212
info@dmgaustralia.com.au | www.dmgaustralia.com

PROJECT

EDEN BEACH CLUB
LOT 8008 FORESHORE DRIVE
EDEN BEACH, JINDALEE

TITLE

COVER PAGE

SCALE	DRAWN	CHE
NTS	LM	MJ

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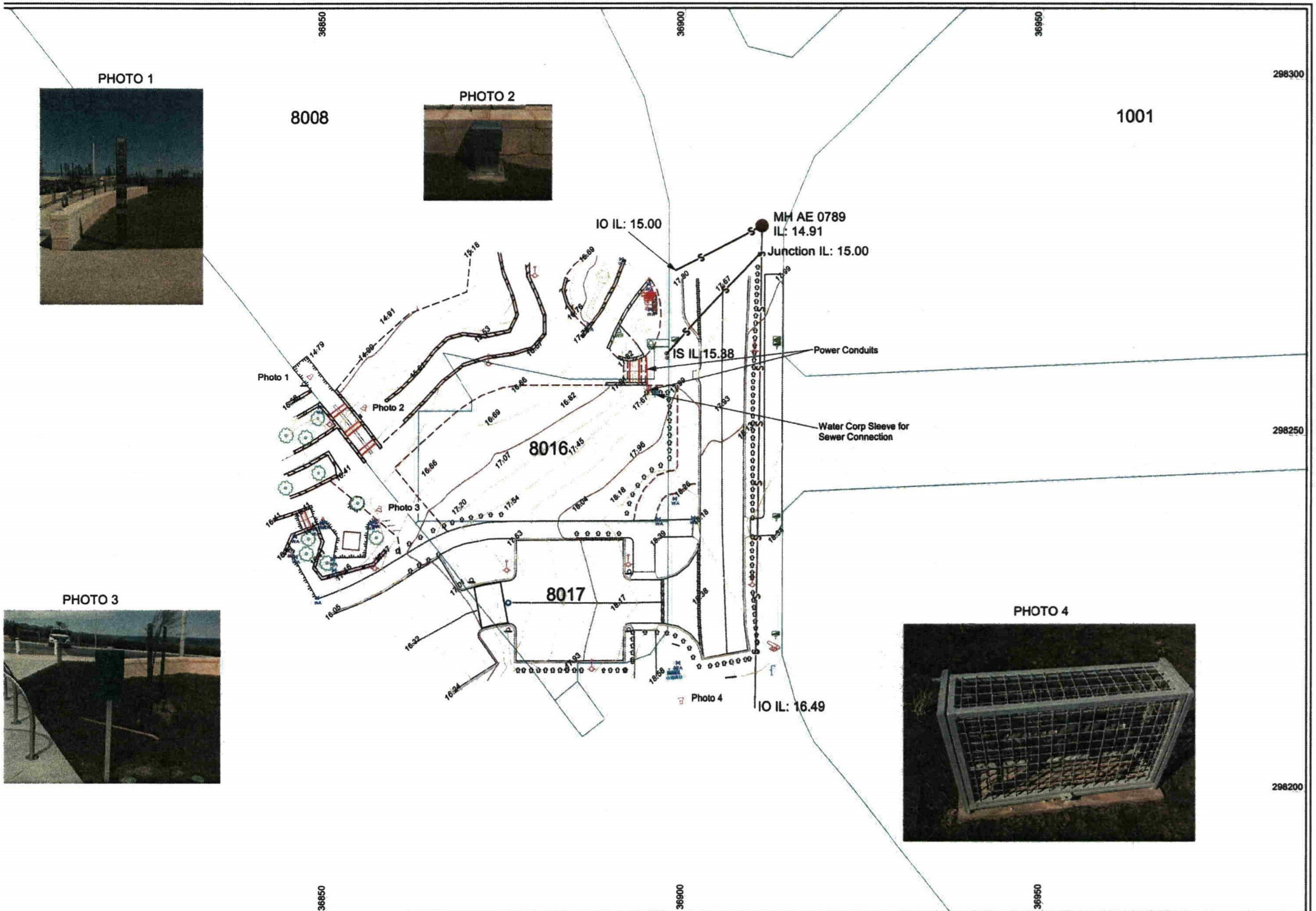
13052	A0.00	B

NOTE. Contractor to check and verify all dimensions, levels, and angles on site before commencing.
All construction work to be in accordance with the building code of Australia, approved documents and relevent Australian Standards.



ISSUE	DATE	DESCRIPTION	DRN.	AP
B	24.01.17	DA APPROVAL (REVISED)	LM	
A	29.09.16	DEVELOPMENT APPROVAL	LM	

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EDEN BEACH CLUB
LOT 8008 FORESHORE DRIVE
EDEN BEACH, JINDALEE

TITLE

FEATURE SURVEY

SCALE	DRAWN	CHECKED
1:500 @ A3	LM	MJ

PROJECT #	DRAWING #	ISSUE
13052	A01.01	B

TKI	16/09/2016	MAD
Drawn	Date	Checked

SCALE 1:500 @ A3
0 5 10 15 20 25
ALL DISTANCES ARE IN METRES
For a true to scale reproduction of this plan, plot it to A3 with the Paging Scaling set to None.

The contents of this plan are current and correct as of the date stated within the revision panel. All consultants and persons wishing to utilise this data should satisfy themselves of this plans currency by contacting the McMullen Nolan Group.

Surveyor:- TAW
Survey Date:- 13/09/2016
Precal/Cad:- 08/09/2016

bsi. ISO 9001 Quality Management — AS/NZS 4801:2001 Occupational Health and Safety Management
FS 565311 OSH 591267

N

The boundaries shown on this plan were not re-established as part of this survey, therefore this plan does not guarantee their accuracy. Existing easements, encumbrance or interest are not depicted and a title search is recommended to obtain this information. Re-establishment of the cadastral boundaries is recommended for any proposed works on or near existing boundaries.

MNG.
MCMULLEN NOLAN GROUP
Level 1, 2 Sabre Crescent
Jandakot, W.A. 6164
PO Box 3526, Success
W.A. 6964, Australia
Offices in: Broome, Bunbury, Kununurra, Newman, Port Hedland
Tel: (08) 6436 1599
Fax: (08) 6436 1500
info@mngsurvey.com.au
www.mngsurvey.com.au
ABN 90 009 363 311

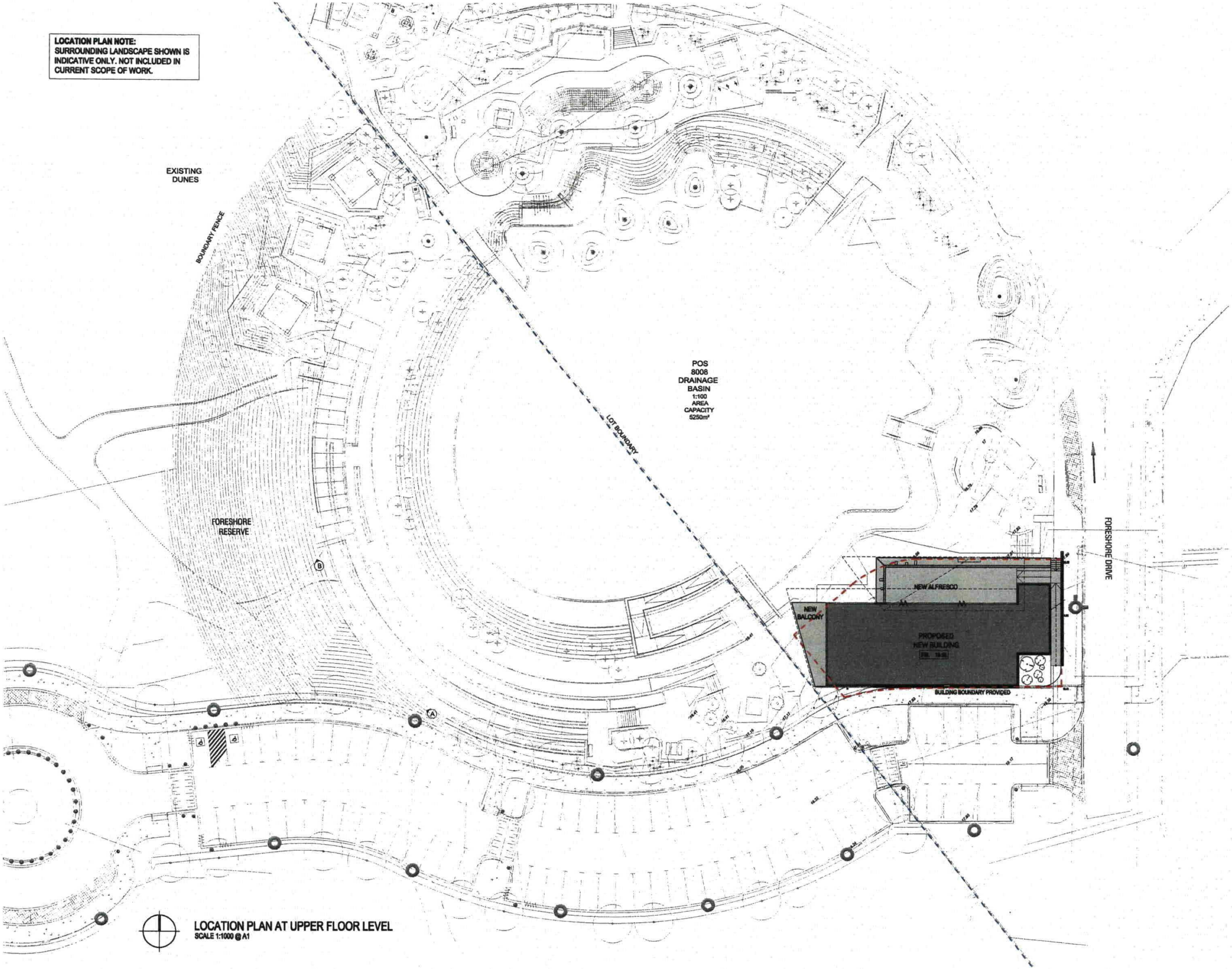
CLIENT: SATTERLEY

EDEN BEACH
POS LOT 8008 CAFE SITE
Detail Survey

Project Mngr	Rad Dobson	Datum	PCG94 / AHD

94070 - DE - 286 - A
Job Number - Type - Plan Number - Revision

LOCATION PLAN NOTE:
SURROUNDING LANDSCAPE SHOWN IS INDICATIVE ONLY. NOT INCLUDED IN CURRENT SCOPE OF WORK.



LOCATION PLAN AT UPPER FLOOR LEVEL
SCALE 1:1000 @ A1

NOTE. Contractor to check and verify all dimensions, levels, and angles on site before commencing.
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dmg ARCHITECTURE

DESIGN MANAGEMENT GROUP level 2 1000 hay street perth
telephone +61 8 9212 8000 | facsimile +61 8 9212 8
info@dmgaustralia.com.au | www.dmgaustralia.com

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LOT 8008 FORESHORE DRIVE
EDEN BEACH, JINDALEE

TITLE

LOCATION PLAN AT UPPER FLOOR LEVEL

SCALE	DRAWN	CHECKED
1:1000 @ A1	LM	LA

PROJECT #	DRAWING #	ISSUE
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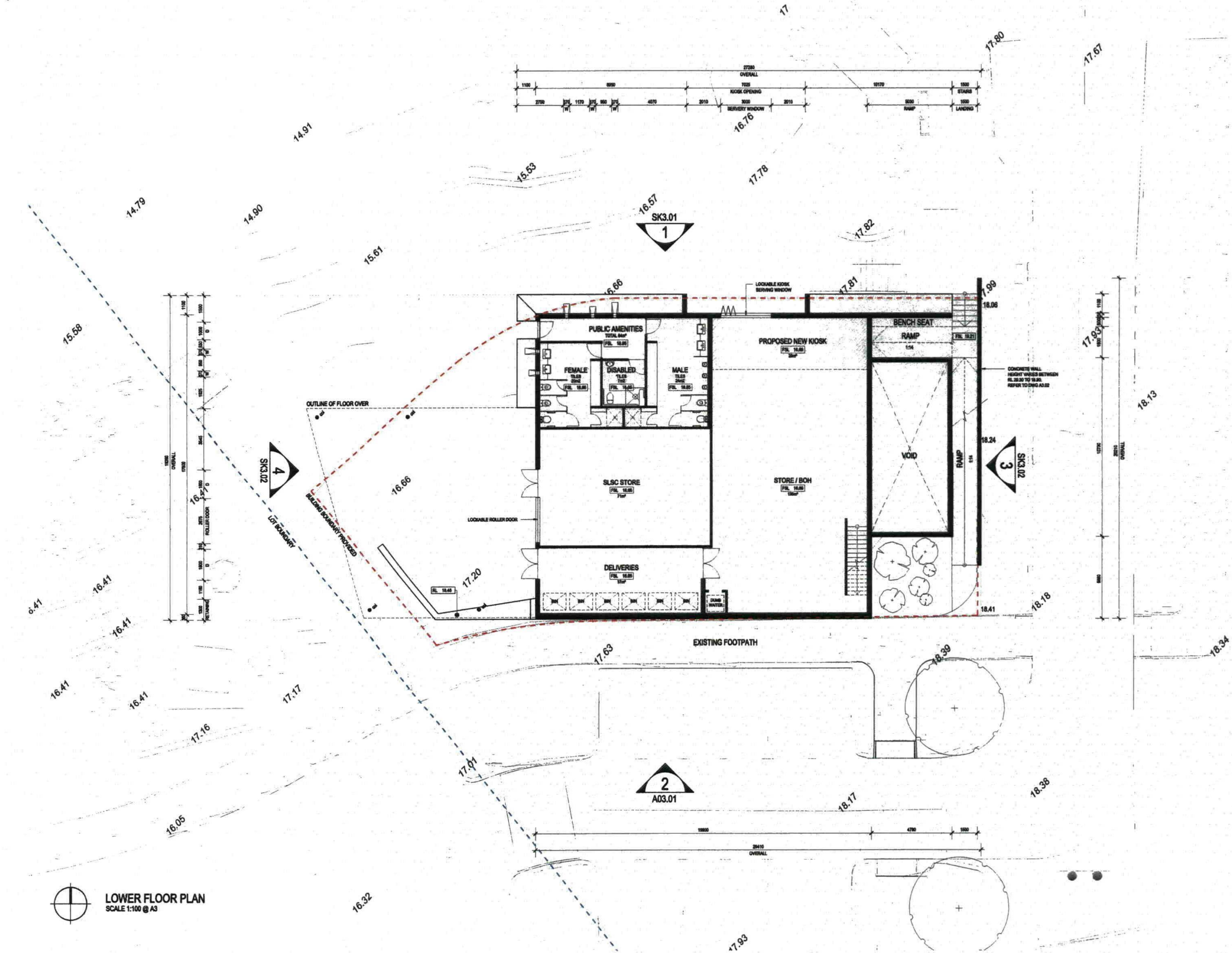

LOWER FLOOR PLAN
SCALE 1:100 @ A3

NOTE. Contractor to check and verify all dimensions, levels, and angles on site before commencing.
All construction work to be in accordance with the building code of Australia, approved documents and relevant Australian Standards.

GENERAL LEGEND

RL 00.00	RELATIVE LEVEL
FSL 00.00	FINISHED SLAB LEVEL
TOW 00.00	TOP OF WALL LEVEL
	LINE OF EXISTING SITEWORKS
	LINE OF PROPOSED NEW BUILDING
	BUILDING BOUNDARY LINE PROVIDED
	LOT BOUNDARY LINE
	PROPOSED NEW TREE
	EXISTING TREE TO BE RETAINED

NOTES:
1. ALL EXISTING SITEWORKS SHOWN IN GREYSCALE
2. ALL NEW CONSTRUCTION SHOWN IN SOLID BLACK

AREA SCHEDULE

UPPER FLOOR	
INTERNAL AREA (m^2)	381
ALFRESCO (m^2)	103
BALCONY (m^2)	41
LOWER FLOOR	
INTERNAL AREA (m^2) (EXCLUDING VOID)	335
TOTAL AREA (m2)	860

ISSUE	DATE	DESCRIPTION	DRN. AP
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dmg ARCHITECTURE

DESIGN MANAGEMENT GROUP level 2 1008 hay street perth
telephone +61 8 9212 [illegible] | facsimile +61 8 9212 [illegible]
info@dmgaustralia.com.au | www.dmgaustralia.com.au

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EDEN BEACH CLUB
LOT 8008 FORESHORE DRIVE
EDEN BEACH, JINDALEE

TITLE

LOWER FLOOR PLAN

SCALE	DRAWN	CHECKED
1:100 @ A1	LM	LA

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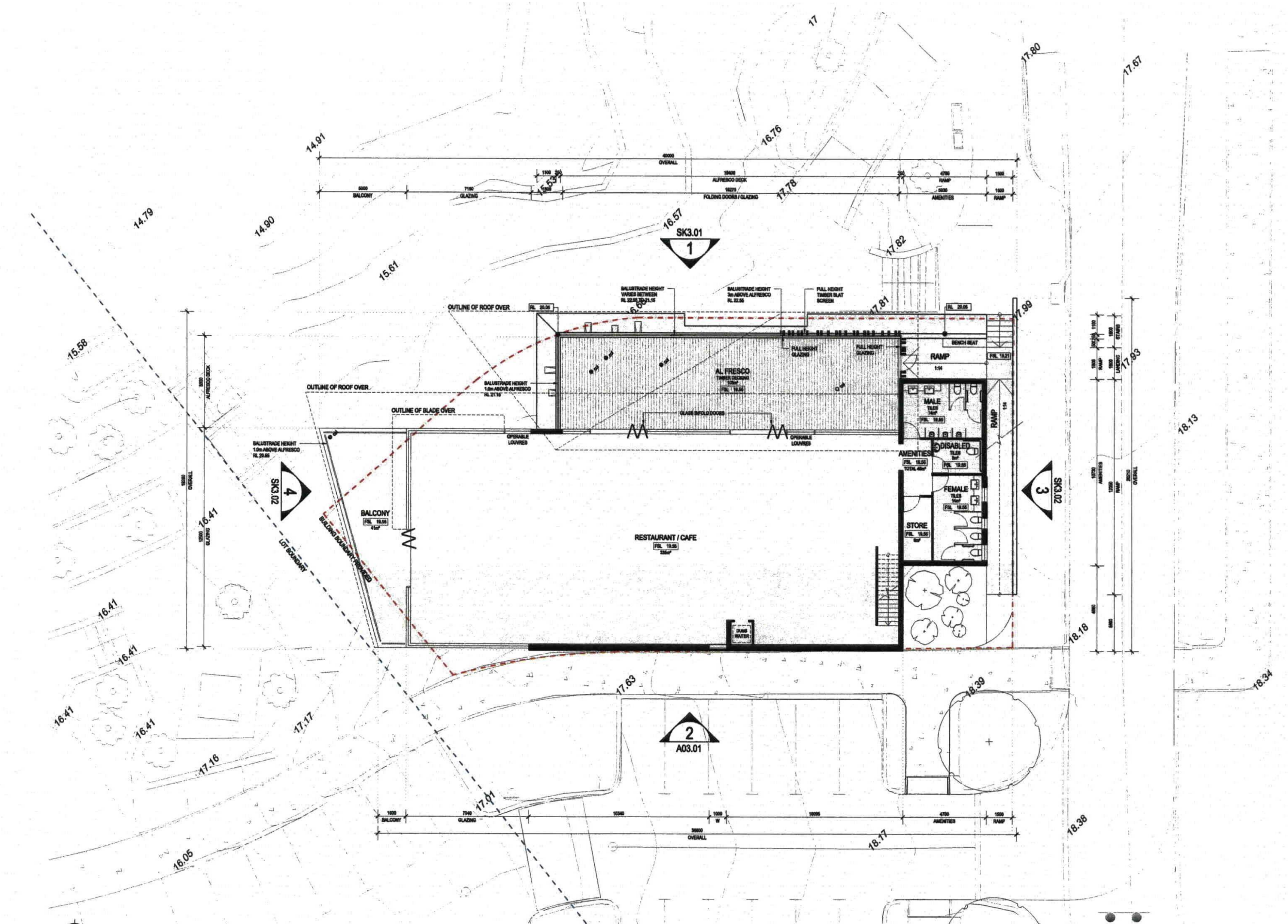
13052	A02.01	B



UPPER FLOOR PLAN
SCALE 1:100

NOTE. Contractor to check and verify all dimensions, levels, and angles on site before commencing. All construction work to be in accordance with the building code of Australia, approved documents and relevant Australian Standards.

GENERAL LEGEND

RL 00.00	RELATIVE LEVEL
FSL 00.00	FINISHED SLAB LEVEL
TOW 00.00	TOP OF WALL LEVEL
	LINE OF EXISTING SITEWORKS
	LINE OF PROPOSED NEW BUILDING
	BUILDING BOUNDARY LINE PROVIDED
	LOT BOUNDARY LINE
	PROPOSED NEW TREE
	EXISTING TREE TO BE RETAINED

NOTES:

1. ALL EXISTING SITEWORKS SHOWN IN GREYSCALE
2. ALL NEW CONSTRUCTION SHOWN IN SOLID BLACK

AREA SCHEDULE

UPPER FLOOR	
INTERNAL AREA (m^2)	381
ALFRESCO (m^2)	103
BALCONY (m^2)	41
LOWER FLOOR	
INTERNAL AREA (m^2) (EXCLUDING VOID)	335
TOTAL AREA (m2)	860

ISSUE	DATE	DESCRIPTION	DRN.
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dmg ARCHITECTURE
DESIGN MANAGEMENT GROUP level 2 1006 hay street perth
telephone +61 8 9212 6860 | facsimile +61 8 9212 6
info@dmgaustralia.com.au | www.dmgaustralia.com

PROJECT

EDEN BEACH CLUB
LOT 8008 FORESHORE DRIVE
EDEN BEACH, JINDALEE

TITLE

UPPER FLOOR PLAN

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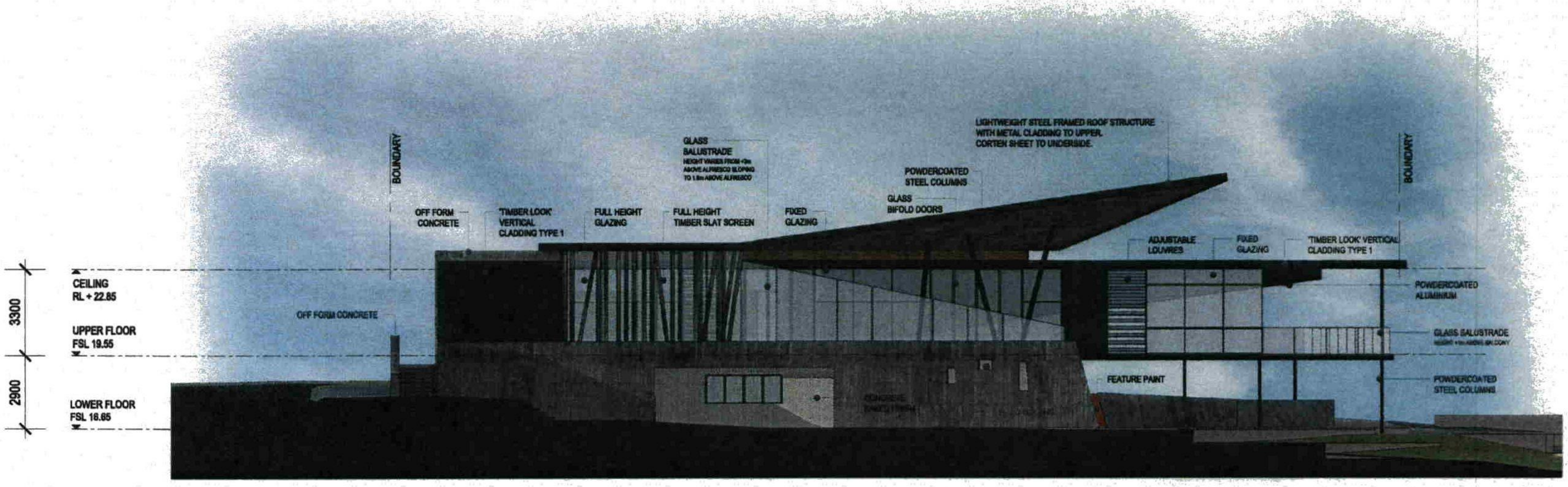
NOTE. Contractor to check and verify all dimensions, levels, and angles on site before commencing. All construction work to be in accordance with the building code of Australia, approved documents and relevant Australian Standards.



NORTH ELEVATION
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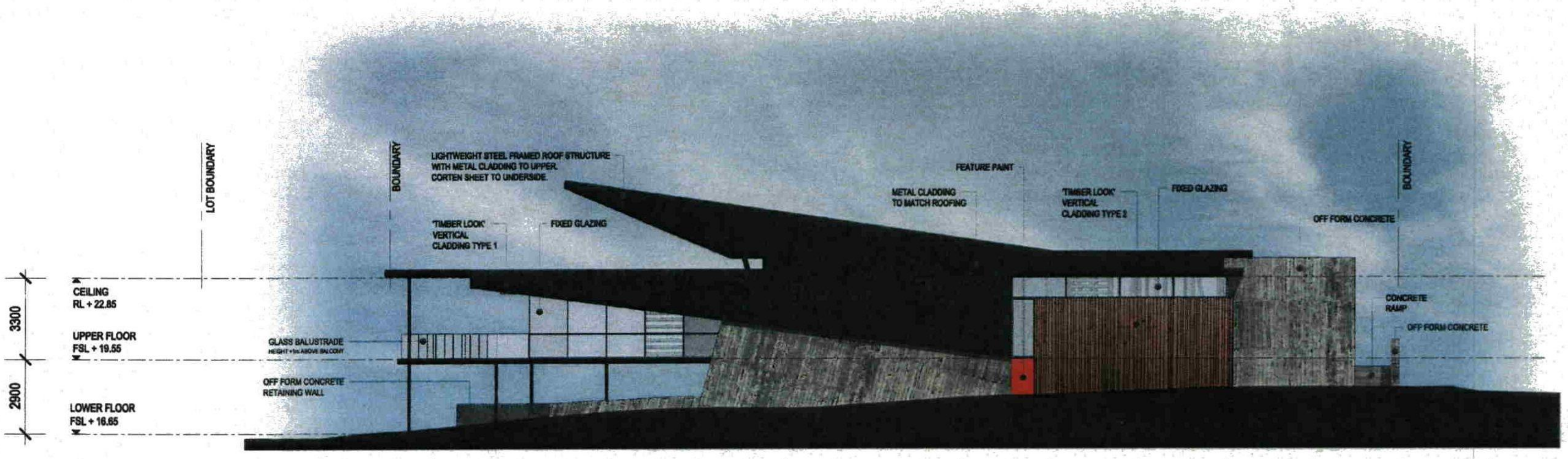
0 5m 10m



SOUTH ELEVATION
SCALE 1:100 @ A1

0 5m 10m

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dmg ARCHITECTURE

DESIGN MANAGEMENT GROUP level 2 1008 hay street perth
telephone +61 8 9252 8888 | facsimile +61 8 9212 682
info@dmgaustralia.com.au | www.dmgaustralia.com.au

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EDEN BEACH CLUB
LOT 8008 FORESHORE DRIVE
EDEN BEACH, JINDALEE

TITLE

ELEVATIONS
NORTH AND SOUTH ELEVATIONS

SCALE	DRAWN	CHECKED
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NOTE. Contractor to check and verify all dimensions, levels, and angles on site before commencing.
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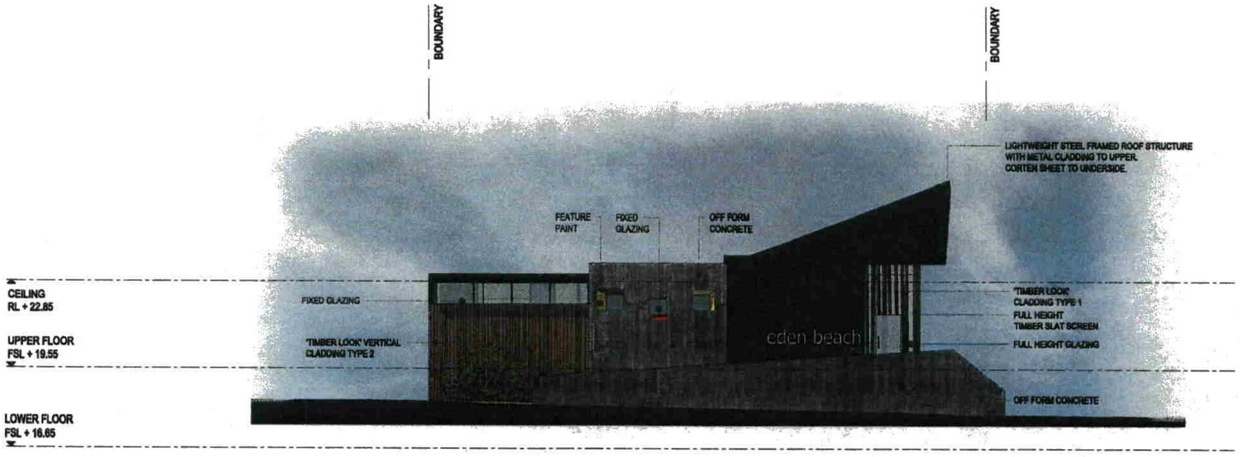

EAST ELEVATION
SCALE 1:100 @ A1
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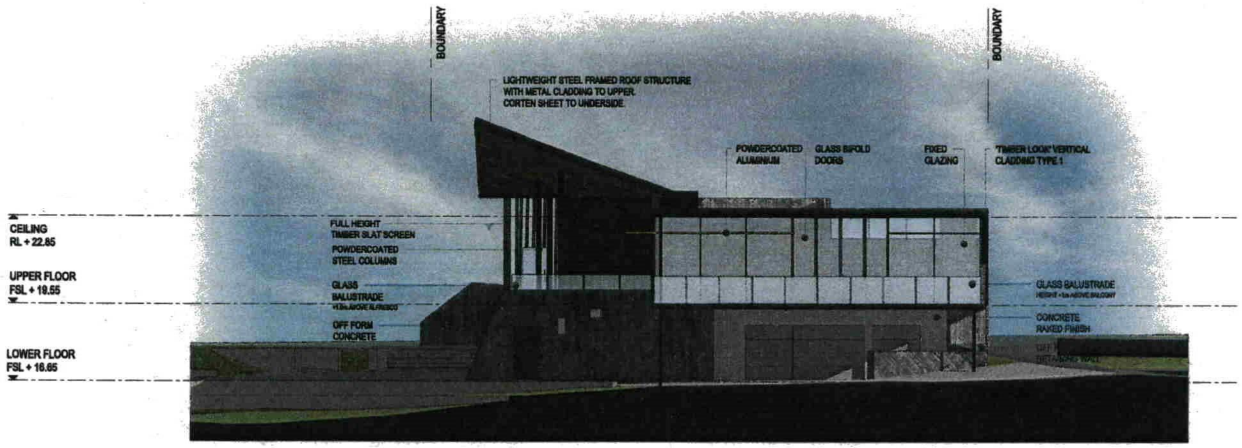

WEST ELEVATION
SCALE 1:100 @ A1
0 5m 10m

ISSUE	DATE	DESCRIPTION	DRN.
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A	29.09.16	DA APPROVAL	LM

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dmg ARCHITECTURE

DESIGN MANAGEMENT GROUP level 2 1008 hay street perth 6
telephone +61 8 9212 8888 | facsimile +61 8 9212 8
info@dmgaustralia.com.au | www.dmgaustralia.com

PROJECT
EDEN BEACH CLUB
LOT 8008 FORESHORE DRIVE
EDEN BEACH, JINDALEE

TITLE
ELEVATIONS
EAST AND WEST ELEVATIONS

SCALE	DRAWN	CHKD
1:100 @ A1	LM	MJ

PROJECT #	DRAWING #	ISSUE
13052	A03.02	B

NOTE. Contractor to check and verify all dimensions, levels, and angles on site before commencing.
All construction work to be in accordance with the building code of Australia, approved documents and relevant Australian Standards.

PERSPECTIVE
SCALE: NTS

PERSPECTIVE
SCALE: NTS

ISSUE	DATE	DESCRIPTION	DRG.	APP.
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info@dmgaustralia.com.au | www.dmgaustralia.com.au

PROJECT

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LOT 8008 FORESHORE DRIVE
EDEN BEACH, JINDALEE

TITLE

PERSPECTIVES

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PROJECT #	DRAWING #	ISSUE
13052	A04.01	B

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.

Sound Power Level (L_w)
Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure levels at known distances. Noise modelling incorporates source sound power levels as part of the input data.

Sound Pressure Level (L_p)
The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

L_{ASlow}
This is the noise level in decibels, obtained using the A frequency weighting and the S time weighting as specified in AS1259.1-1990. Unless assessing modulation, all measurements use the slow time weighting characteristic.

L_{AFast}
This is the noise level in decibels, obtained using the A frequency weighting and the F time weighting as specified in AS1259.1-1990. This is used when assessing the presence of modulation only.

L_{APeak}
This is the maximum reading in decibels using the A frequency weighting and P time weighting AS1259.1-1990.

L_{Amax}
An L_{Amax} level is the maximum A-weighted noise level during a particular measurement.

L_{A1}
An L_{A1} level is the A-weighted noise level which is exceeded for one percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

L_{A10}
An L_{A10} level is the A-weighted noise level which is exceeded for 10 percent of the measurement period and is considered to represent the "*intrusive*" noise level.

L_{Aeq}
The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.

L_{A90}
An L_{A90} level is the A-weighted noise level which is exceeded for 90 percent of the measurement period and is considered to represent the "*background*" noise level.

One-Third-Octave Band
Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20 000 Hz inclusive.

L_{Amax} assigned level
Means an assigned level which, measured as a $L_{A\,Slow}$ value, is not to be exceeded at any time.

L_{A1} assigned level
Means an assigned level which, measured as a $L_{A\,Slow}$ value, is not to be exceeded for more than 1% of the representative assessment period.

L_{A10} assigned level
Means an assigned level which, measured as a $L_{A\,Slow}$ value, is not to be exceeded for more than 10% of the representative assessment period.

Tonal Noise
A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

the presence in the noise emission of tonal characteristics where the difference between -

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\,Slow}$ levels.

This is relatively common in most noise sources.

Modulating Noise
A modulating source is regular, cyclic and audible and is present for at least 10% of the measurement period. The quantitative definition of modulation is:

a variation in the emission of noise that —

(a) is more than 3 dB $L_{A\,Fast}$ or is more than 3 dB $L_{A\,Fast}$ in any one-third octave band;

(b) is present for at least 10% of the representative.

Impulsive Noise
An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of impulsiveness is:

a variation in the emission of a noise where the difference between $L_{A\ peak}$ and $L_{A\ Max\ slow}$ is more than 15 dB when determined for a single representative event;

Major Road
Is a road with an estimated average daily traffic count of more than 15,000 vehicles.

Secondary / Minor Road
Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

Influencing Factor (IF)

$$= \frac{1}{10}(\%\,\text{Type}\,A_{100} + \%\,\text{Type}\,A_{450}) + \frac{1}{20}(\%\,\text{Type}\,B_{100} + \%\,\text{Type}\,B_{450})$$

where :

$\%\,\text{Type}\,A_{100}$ = the percentage of industrial land within a100m radius of the premises receiving the noise

$\%\text{Type}A_{450}$ = the percentage of industrial land within a 450m radius of the premises receiving the noise

$\%\,\text{Type}\,B_{100}$ = the percentage of commercial land within a100m radius of the premises receiving the noise

$\%\text{Type}B_{450}$ = the percentage of commercial land within a 450m radius of the premises receiving the noise

+ Traffic Factor (maximum of 6 dB)

= 2 for each secondary road within 100m

= 2 for each major road within 450m

= 6 for each major road within 100m

Representative Assessment Period
Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

Background Noise
Background noise or residual noise is the noise level from sources other than the source of concern. When measuring environmental noise, residual sound is often a problem. One reason is that regulations often require that the noise from different types of sources be dealt with separately. This separation, e.g. of traffic noise from industrial noise, is often difficult to accomplish in practice. Another reason is that the measurements are normally carried out outdoors. Wind-induced noise, directly on the microphone and indirectly on trees, buildings, etc., may also affect the result. The character of these noise sources can make it difficult or even impossible to carry out any corrections.

Ambient Noise
Means the level of noise from all sources, including background noise from near and far and the source of interest.

Specific Noise
Relates to the component of the ambient noise that is of interest. This can be referred to as the noise of concern or the noise of interest.

Peak Component Particle Velocity (PCPV)

The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and in one of the three orthogonal directions (x, y or z) measured as a peak response. Peak velocity is normally used for the assessment of structural damage from vibration.

Peak Particle Velocity (PPV)

The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and is the vector sum of the PCPV for the x, y and z directions measured as a peak response. Peak velocity is normally used for the assessment of structural damage from vibration.

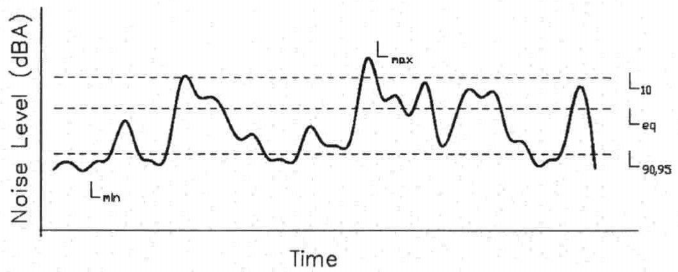
RMS Component Particle Velocity (PCPV)

The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and in one of the three orthogonal directions (x, y or z) measured as a root mean square (rms) response. RMS velocity is normally used for the assessment of human annoyance from vibration.

Peak Particle Velocity (PPV)

The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and is the vector sum of the PCPV for the x, y and z directions measured as a root mean square (rms) response. RMS velocity is normally used for the assessment of human annoyance from vibration.

Chart of Noise Level Descriptors



Typical Noise Levels