MATTHEW PALAVIDIS
VICTOR FATTORETTO
MATTHEW SHIELDS

Maroochydore City Centre, Lot 50 and 60

Noise Impact Assessment

BRISBANE
Level 1
82 Arthur Street
FORTITUDE VALLEY QLD 4006
(07) 3211 5591

ABN 98 145 324 714
www.acousticlogic.com.au

Project ID	20240807.2
Document Title	Noise Impact Assessment
Attention To	Walker Maroochydore Developments Pty Ltd

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	31/07/2024	20240807.2/3107A/R0/TS	TS		
1	11/09/2024	20240807.2/1109A/R1/TS	TS		TS

TABLE OF CONTENTS

1 INTRODUCTION AND PROJECT DESCRIPTION

Acoustic Logic Consultancy have been engaged to conduct a noise impact assessment of the proposed mixed-use development described as 'Maroochydore City Centre'. To facilitate the assessment, attended and unattended noise monitoring was conducted of the following was assessed:

- Road traffic noise impacts from Aerodrome Road, Maud Street, and First Avenue onto the proposed development.
- Noise from general onsite activities to the closest sensitive receivers.

Pursuant to Section 94 of the *Economic Development Act 2012* a PDA Development permit is sought for:

- Reconfiguration of a Lot (2 Lots into 1 Lot);
- Reconfiguration of a Lot (to accommodate road closure); and
- Making a Material Change of Use from vacant land to 251 dwellings (Multiple Dwellings), Short Term Accommodation, Commercial Premises, Office, Food and Drink Outlet, Office, Shop and Sales office**.**

2 SITE DESCRIPTION

2.1 SITE LOCATION

The proposed development site is described as 'Maroochydore City Centre and is located on the following lots:

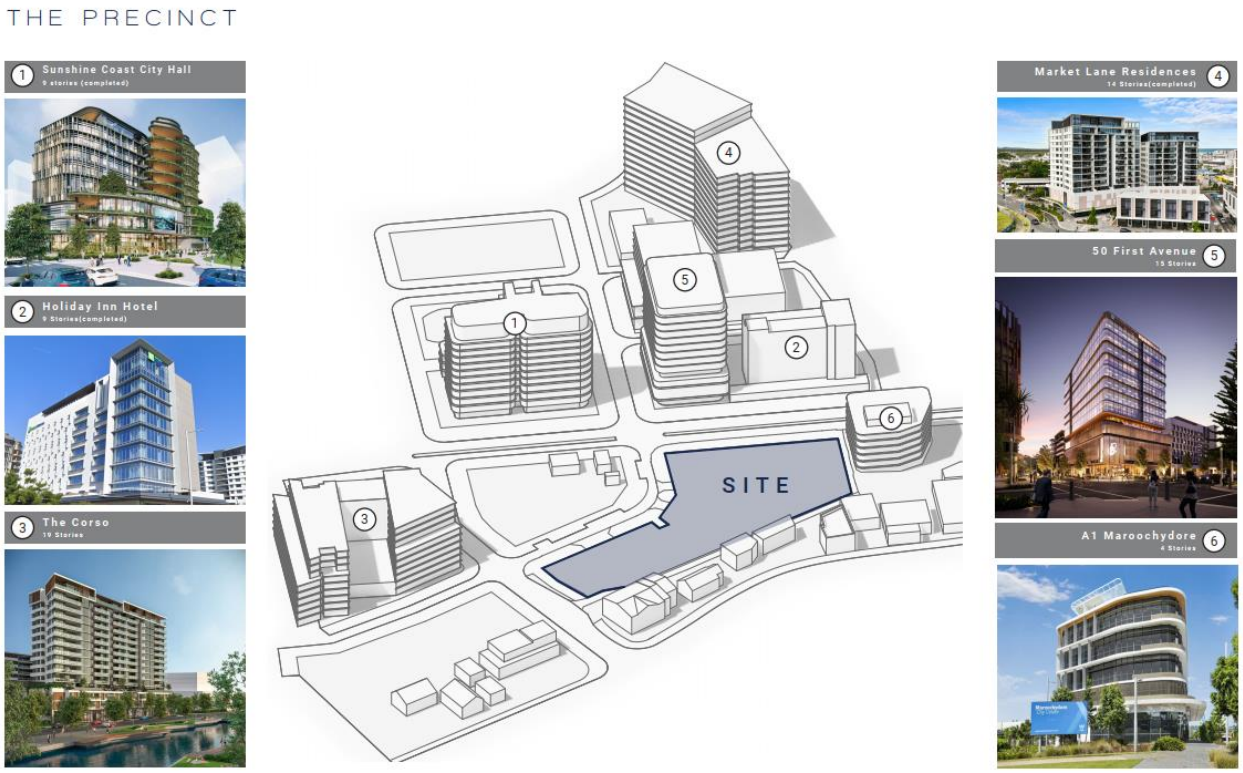
- Lot 600 on SP321692
- Lot 50 on SP305312

Refer to Figure 1 for site location.

Figure 1 – Site location

A comprehensive site survey was carried out which identified the following:

- The site is bound by First Avenue to the northwest and Islander Way to the southwest.
- Gaba Lane bounds the site to the east, separating the development from commercial/retail land uses.
- Aerodrome Road is located approximately 75 metres northeast of the development.
- Surrounding sites are indicated in the following image.



2.2 ACOUSTIC ENVIRONMENT

The site and immediately surrounding area are primarily affected by road traffic noise from surrounding road network.

2.3 STATE TRANSPORT NOISE CORRIDOR

Aerodrome Road north of the development is a state-controlled road. However, the site does **not** fall int the transport noise corridor. Refer to Figure 2 for the state planning policy interactive mapping system transport noise corridor overlay obtained on the 31st of July 2024.

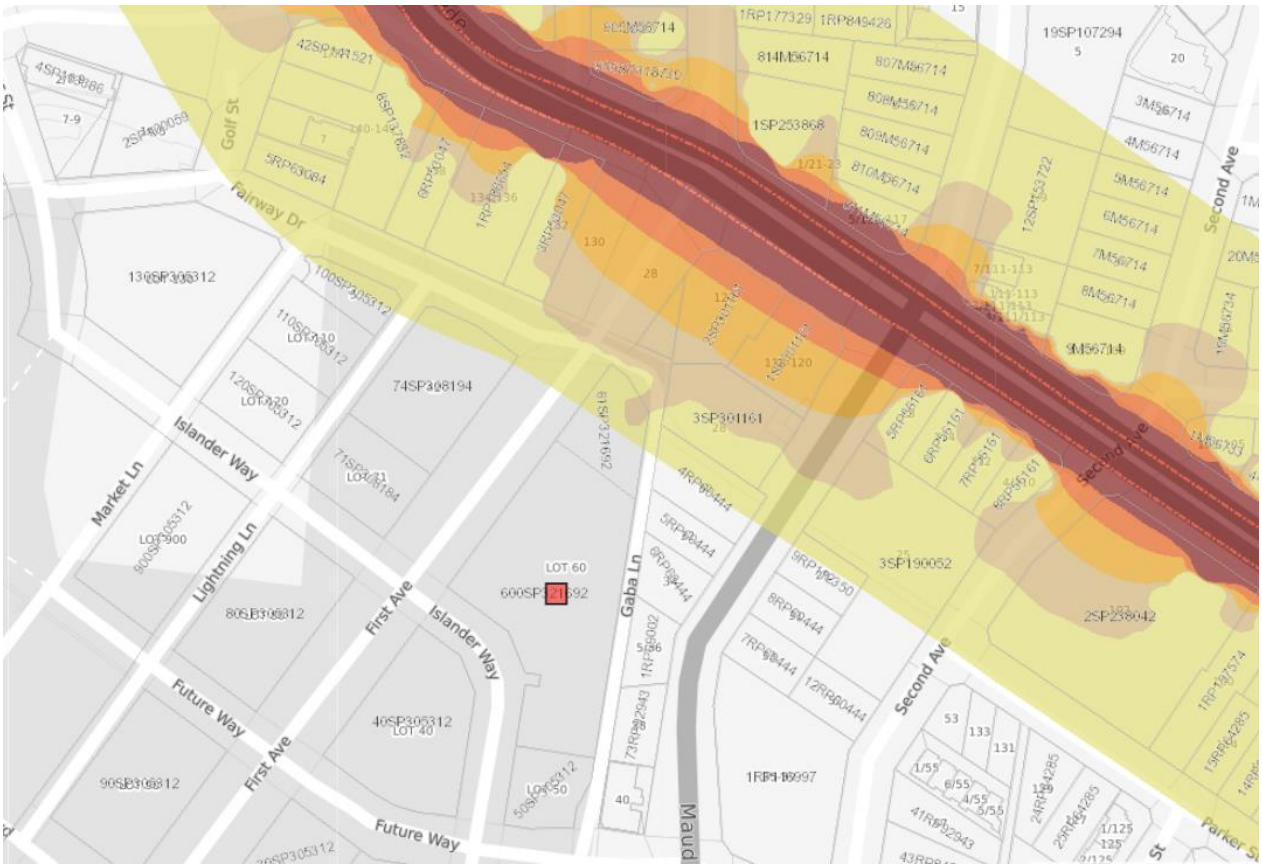


Figure 2 – State Planning Policy Interactive Mapping System Transport Noise Corridor Overlay

3 NOISE MEASUREMENTS

3.1 EQUIPMENT

The following equipment was used for the unattended noise monitoring:

- Acoustic Research Labs NGARA Environmental Noise Monitor
- Norsonic Nor140 Sound Level Meter
- Norsonic Nor1256 Calibrator

3.2 NOISE MEASUREMENT LOCATIONS

Unattended and attended noise measurements were conducted in the vicinity of the site at the locations shown in Figure 3

Figure 3 – Noise Measurement Locations

3.3 UNATTENDED NOISE MONITORING

Unattended monitoring of ambient noise was conducted using an Acoustic Research Labs NGARA environmental noise monitor. The monitor was placed in a free-field position, at a distance of 4 metres from the nearest lane of First Avenue, and at a height of 1.5 metres above the ground surface level. The noise monitor was set to record noise levels between 4 February and 8 February 2021 (inc.).

Given the surrounding construction activities at the time of assessment, the measurements were not repeated in 2024 and were compared against the background noise values in approval MCU22/0145 (Approved on the 2nd of August 2023).

The ambient and road traffic noise monitoring was conducted in general accordance with the Australian Standard AS1055 *Acoustics – Description and measurement of environmental noise* and the Transport Noise Management Code of Practice and Noise Measurement Manual Qld.

Refer to Figure 3 for the unattended noise monitoring location.

3.4 ATTENDED ROAD TRAFFIC NOISE MEASUREMENTS

Attended road traffic noise measurements were taken of Aerodrome Road, Maud Street, and First Avenue. The noise measurements were conducted using a Norsonic Nor140 Sound Level Meter.

Refer to Figure 3 for the attended noise monitoring location.

3.5 NOISE RESULTS

3.5.1 Unattended Noise Measurement Results

The ambient and road traffic noise monitoring results are presented in Table 1.

Table 1 – Unattended Noise Measurement Results

Day	RBL L_{90} dB(A)			L_{eq} dB(A)		$L_{10,\ 18hr}$
	Day	Evening	Night	Day	Night	
Thursday	-	45	42	-	53	-
Friday	51	45	41	61	53	60
Saturday	46	43	39	56	52	54
Sunday	44	45	40	52	53	52
Monday	52	-	-	61	-	-
Average	**48**	**44**	**40**	**58**	**53**	**55**

The background noise values in approval MCU22/0145 (Approved on the 2nd of August 2023) were as follows:

1. Day: 45dB(A)L90 RBL (slightly lower than Table 1);
2. Evening 46dB(A)L90 RBL (higher than Table 1); and
3. Night 41dB(A)L90 RBL (higher than Table 1).

Given that the ambient noise values of evening and night in the nearby approved development were higher, the monitoring values in Table 1 have been maintained for these periods and the assessment uses the following background noise levels (RBL L90 dB(A));

1. Day: 45dB(A)
2. Evening 44dB(A); and
3. Night 40dB(A).

3.5.2 Short Term Supplementary Noise Measurements

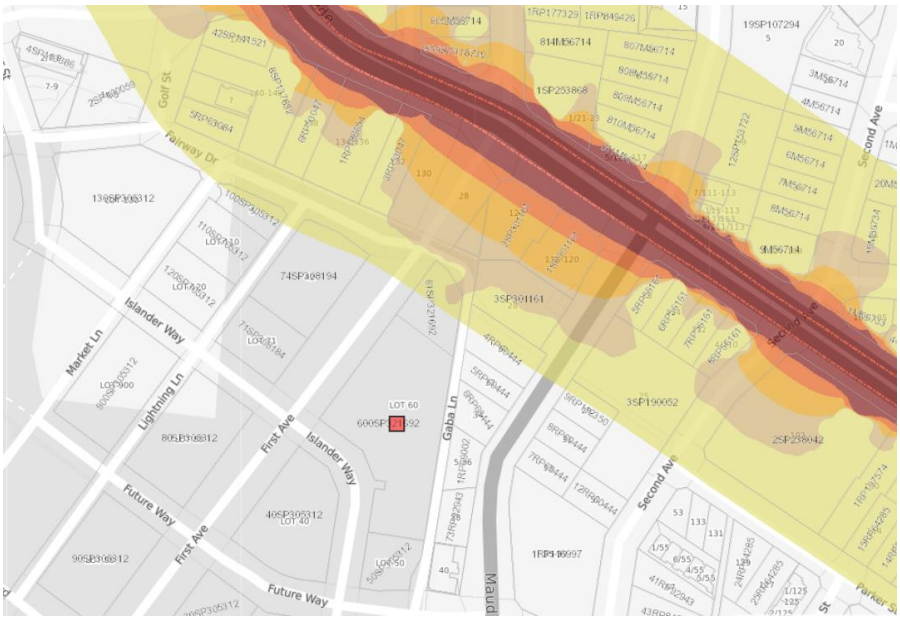
The supplementary short term noise results are presented in Table 2

Table 2 – Measured Noise Results

No.	Day	Date	Time Period	Road	Noise Levels dB(A)		
					$L_{eq,\ 15\ min}$	$L_{10,\ 15\ min}$	$L_{90,\ 15\ min}$
1	Tuesday	30/07/2024	4pm-6pm	First Avenue	59	60	47
3	Tuesday	30/07/2024	4pm-6pm	First Avenue	58	61	52
4	Tuesday	30/07/2024	4pm-6pm	Aerodrome Road	69	72	57

3.5.3 Aerodrome Road

Aerodrome Road noise measurement values have been referenced from MCU22/0145 (Approved on the 2nd of August 2023) for informative purposes only, given that the Aerodrome Road noise impacts obtained from SDAP mapping show that the site does **not** fall in the transport noise corridor



Descriptor	dB(A)	
	Day	Night
L10(18hr)	60.6	
Leq(1hr)	63.4	58.3
L90(8h)	39.5	
L90(18h)	49.3	

4 NOISE SENSITIVE RECEIVERS

The closes noise sensitive receivers (residential/accommodation) are the following:

1. North: Mixed Use Development (132 & 134-136 Aerodrome Road)
2. Northwest: Holiday Inn Express Hotel at 42 First Avenue.

Refer to Figure 4 for receiver locations.

Figure 4 – Noise Sensitive Receivers Location

5 ROAD TRAFFIC NOISE CRITERIA

The roads close to the development are the following:

- Aerodrome Road;
- Maud Street; and
- First Avenue.

The site is not located in a designated state transport noise corridor. The noise criteria used in this assessment are the indoor design noise levels in *Table 1: Design sound levels and reverberation times for different areas of occupancy in buildings* of AS2107:2016 *Acoustics – Recommended design sound levels and reverberation times for building interiors*.

The recommended design sound levels are presented in Table 3 which are based on apartments in inner city areas or entertainment districts or near major roads.

Table 3 – AS2107:2016 Design Sound Levels

Type of Occupancy/Activity	Design Sound Level ($L_{Aeq,t}$) range
Apartment common areas	45 to 50
Living areas	35 to 45
Sleeping areas (night time)	35 to 40
Work areas	35 to 45
Small retail stores	<50
Commercial Office Use	40 to 45
Foyer and recreational area	45 to 50
Restaurant	40 to 50
Other	AS/NZS2107:2016

Where T represents the length of the period, I.e. Day (T=15hours): 7am-10pm; Night (T=9hours): 10pm-7am.

6 ENVIRONMENTAL NOISE CRITERIA

6.1 ENVIRONMENTAL PROTECTION ACT 1994

The following relevant noise limits would apply for mechanical plant onsite:

440T Pumps:

- Between 10pm-7am: no audible noise;
- Between 7am and 7pm: 5dB(A) above background level;
- Between 7pm and 10pm: 3dB(A) above background level.

440U Air-conditioning equipment:

- Between 10pm and 7am: 3dB(A) above background level;
- From 7am to 10pm: 5dB(A) above background level.

6.2 ENVIRONMENTAL PROTECTION (NOISE) POLICY

6.2.1 Acoustic Quality Objectives

The Queensland Environmental Protections (Noise) Policy contains the following acoustic quality objectives.

Table 4 – Acoustic Quality Objectives

Sensitive Receptor	Time of Day	Acoustic quality objectives (measured at the receptor) dB(A)			Environmental Value
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$	
Dwelling (for outdoors)	daytime and evening	50	55	65	Health and wellbeing
Dwelling (for indoors)	daytime and evening	35	40	45	Health and wellbeing
	Night-time	30	35	40	Health and wellbeing, in relation to the ability to sleep
Commercial and retail activity (for indoors)	When the activity is open for business	45			Health and wellbeing

6.2.2 Controlling Background Creep

The background creep noise limits proposed for the development are presented in Table 5.

Table 5 – Background Creep Noise Limits

Type of Noise	Time of Day	Measured Existing Noise Level (Logger)	Noise limit (at the receptor) dB(A)	
		$L_{A90,T}$	$L_{Aeq,adj,T}$	$L_{A90,T}$
Continuous Noise	Day	45	NA	45
	Evening	44	NA	44
	Night	40	NA	40
Intermittent Noise	Day	45	50	NA
	Evening	44	49	NA
	Night	40	45	NA

6.3 SUNSHINE COAST PLANNING SCHEME 2014

6.3.1 Nuisance Code (Part 9.4.3)

The following Nuisance Code criteria from the Sunshine Coast Planning Scheme 2014 applies to the development.

Table 6 – Sunshine Coast Planning Scheme 2014 Nuisance Code Acoustic Criteria (Table 9.4.3.3.1)

Performance Outcomes	Acceptable Outcomes
Acoustic Amenity and Noise	
PO1 Development other than development involving live entertainment or *amplified music* in a designated special entertainment precinct or as part of a temporary event, is located, designed, constructed and operated to ensure that noise emissions do not unreasonably impact on surrounding *sensitive land uses* having regard to the location and setting of the development. Note – this performance outcome applies even if noise emissions are generated by *sensitive land uses*, from sources such as communal areas, service areas, plant and equipment (e.g. air conditioning units) and the like.	**AO1.1** Development, other than development in a designated special entertainment precinct, involving live entertainment or *amplified music* is designed and constructed to achieve *amplified music* noise levels external to existing or approved affected residences of:- (a) LA10 not greater than 5dB(A) above the background noise levels LA90 from 6am to 10pm; and (b) LOCT10 not greater than 8dB above the octave background noise levels LOCT90 from 10pm to 6am. Note: Acceptable outcome AO1 is provided as a guide only. A higher or lower noise level may be appropriate

Performance Outcomes	Acceptable Outcomes
	depending on the locations, setting, and context of the proposed development. **AO1.2** For development not involving live entertainment of *amplified music*, no acceptable outcome provided.
PO2 Development that is a *sensitive land use,* other than development in the *residential activity group* located in a designated special entertainment precinct and associated primary or secondary buffer area or a *prescribed mixed use area*, is located, designed, constructed and operated to achieve a satisfactory level of acoustic amenity where there is potential for noise emissions generated from surrounding development, including potential future development anticipated by the zoned or precinct, to adversely affect the *sensitive land uses*. Editor's note – this performance outcome related to a 'reverse amenity' situation where a proposed *sensitive land use* may be adversely impacted by noise emissions from surrounding development. In such cases, it is contingent upon the proposed *sensitive land use* to implement measures to ensure a satisfactory level of acoustic amenity is provided to prospective occupants and users of the development.	**AO2** The *sensitive land use* is not established in an area that will be adversely impacted by noise generated by existing land uses, activities and possible future development in the area. **OR** Where located in an area where adverse noise impacts are likely, the *sensitive land use* mitigates all potential impacts through site layout, design, construction, and operation.

6.3.2 SC6.15 Planning Scheme Policy

SC6.15 Planning Scheme Policy for the Nuisance Code states in Section SC6.15.4:

(a) compliance with Performance Outcomes PO1 and PO2 of Table 9.4.3.3.1 (Performance outcomes and acceptable outcomes for assessable development) of the Nuisance code may be demonstrated in part or aided by the submission of a noise impact assessment report prepared by a competent person, which properly addresses, describes or includes the following:-

(i) a location plan identifying the subject site and sensitive land uses or the nearest potentially sensitive land uses to the subject site and any significant features such as topographic variation, barriers and intervening buildings;

(ii) the results of measurements of background LA90 noise levels using an appropriate methodology at a location representative of the nearest potentially affected sensitive land uses to the subject site in the absence of noise emissions from the subject site, with:-

(A) the background noise levels to include time periods that are most likely to be sensitive from a noise perspective (generally at night); and

(B) the background noise monitoring to be completed for a sufficient period of time to establish 'the average minimum background noise levels' for the locality;

(iii) comparison of the background noise level with predicted source noise levels using an appropriately recognised methodology and criteria, from the proposed activity at the nearest potentially affected sensitive land uses to determine compliance with criteria as defined in Schedule 1 of the Environmental Protection (Noise) Policy 2008; and

(iv) specification of appropriate control and mitigation measures as necessary;

The reference to Environmental Protection (Noise) Policy 2008 Acoustic Quality Objectives is in Section 6.2.1 of the acoustic assessment.

7 ADOPTED NOISE LIMITS

The proposed noise criteria for the site are listed in Table 7. This has been based on the relevant applicable state and council criteria for the development presented in Section 5 and Section 6.

Table 7 – Adopted Noise Limits

Noise Source	Receiver	Noise Objective
Road Traffic Noise	Onsite Indoor Areas	**AS2107:2016** - Apartment common areas ≤50 dB(A) $L_{Aeq,T}$ - Living areas ≤45 dB(A) $L_{Aeq,T}$ - Sleeping areas ≤40 dB(A) $L_{Aeq,T\ (night\ time)}$ - Work areas ≤45 dB(A) $L_{Aeq,T}$ Others: follow AS/NZS2107:2016
General Noise Onsite	Receiver 1: mixed Use Development (132 & 134-136 Aerodrome Road) Receiver 2: Holiday Inn Express Hotel at 42 First Avenue.	**Acoustic Quality Objectives** **Daytime and Evening** - $L_{Aeq,adj,1hr}$ ≤50 dB(A) - $L_{A1,adj,1hr}$ ≤ 65 dB(A) **Night-time**[1] - $L_{Aeq,adj,1hr}$ ≤45 dB(A) - $L_{A1,adj,1hr}$ ≤ 60 dB(A) **Background Creep (Intermittent Noise)** - Day: $L_{Aeq,adj,T}$ ≤50 dB(A) - Evening: $L_{Aeq,adj,T}$ ≤49 dB(A) - Night $L_{Aeq,adj,T}$ 45 dB(A)
Mechanical Plant Noise	Receiver 1: mixed Use Development (132 & 134-136 Aerodrome Road) Receiver 2: Holiday Inn Express Hotel at 42 First Avenue. Receiver 4: Onsite Residential from Onsite Commercial Plant	**Background Creep (Continuous Noise)** - Day: $L_{Aeq,adj,T}$ ≤45 dB(A) - Evening: $L_{Aeq,adj,T}$ ≤44 dB(A) - Night $L_{Aeq,adj,T}$ ≤40 dB(A) Pumps and Other Plant: EPA1994

Note 1: based on the noise level difference allowable inside, same difference is applied outside.

8 ROAD TRAFFIC NOISE ASSESSMENT

Road traffic noise impacts were modelled using SoundPLAN™ software. The model was calibrated against the road traffic noise measurements presented in Section 3, and based on the predicted traffic volumes for 2034

The documents of the approved development across the road (42 First Avenue) state that there are proposed to be 9,048 vehicles during 18hour period and 60km/h speed limit with 10% heavy vehicles along First Avenue which is higher than when the surrounding areas have not been fully developed. To derive L_{eq} from $L_{10,18hr}$ values, the difference in currently measured descriptors is applied as per general practise. With those the impact at the monitoring location is predicted to be 70dB(A)$L_{10,18hr}$ / 73dB(A) $L_{eq,1hr,av}$ which is considered conservative as it leads to higher values than those on Aerodome Road. In reality, the $L_{eq,1hr,av}$ noise emissions from First Avenue are not expected to exceed those on Aerodrome Drive. However, in the absence of a fully operational and fully developed Maroochydore City Centre precinct in its entirety, we have adopted these values for the purposes of this assessment. Considering the conservative outcome and noting that First Avenue traffic was not included in the approved development (approved on the 2nd of August 2023), we consider the proposed values to be suitable for the assessment.

Furthermore, given that the Aerodrome road is a major road, future impacts have been modelled with the assumption that the peak hour traffic flows increase by 1dB(A), which allows up to 30% increase in traffic flow. Such assumption tends to be conservative as with the increasing traffic flow, the speeds tend to decrease which would limit the actual nett noise increase on the road. The approved development MCU22/0145 (Approved on the 2nd of August 2023), utilized a 10-year increase of 12 % only, with 2.33% heavy vehicles. On that basis, the proposed 1dB(A) noise increase is conservative.

Table 8 – Road Traffic Model

Road	Height Above Ground	Noise Level $L_{eq,1hr,av}$ dB(A)	
		Current	Model (Future)[1]
First Avenue	1.5 metres	61	73
Aerodrome Road	1.5 metres	69	70
Maud Street	1.5 metres	66	67

Note 1: The model future noise levels take into consideration the road traffic noise increase due traffic growth.

The predicted road traffic noise impacts are presented in the following figures.

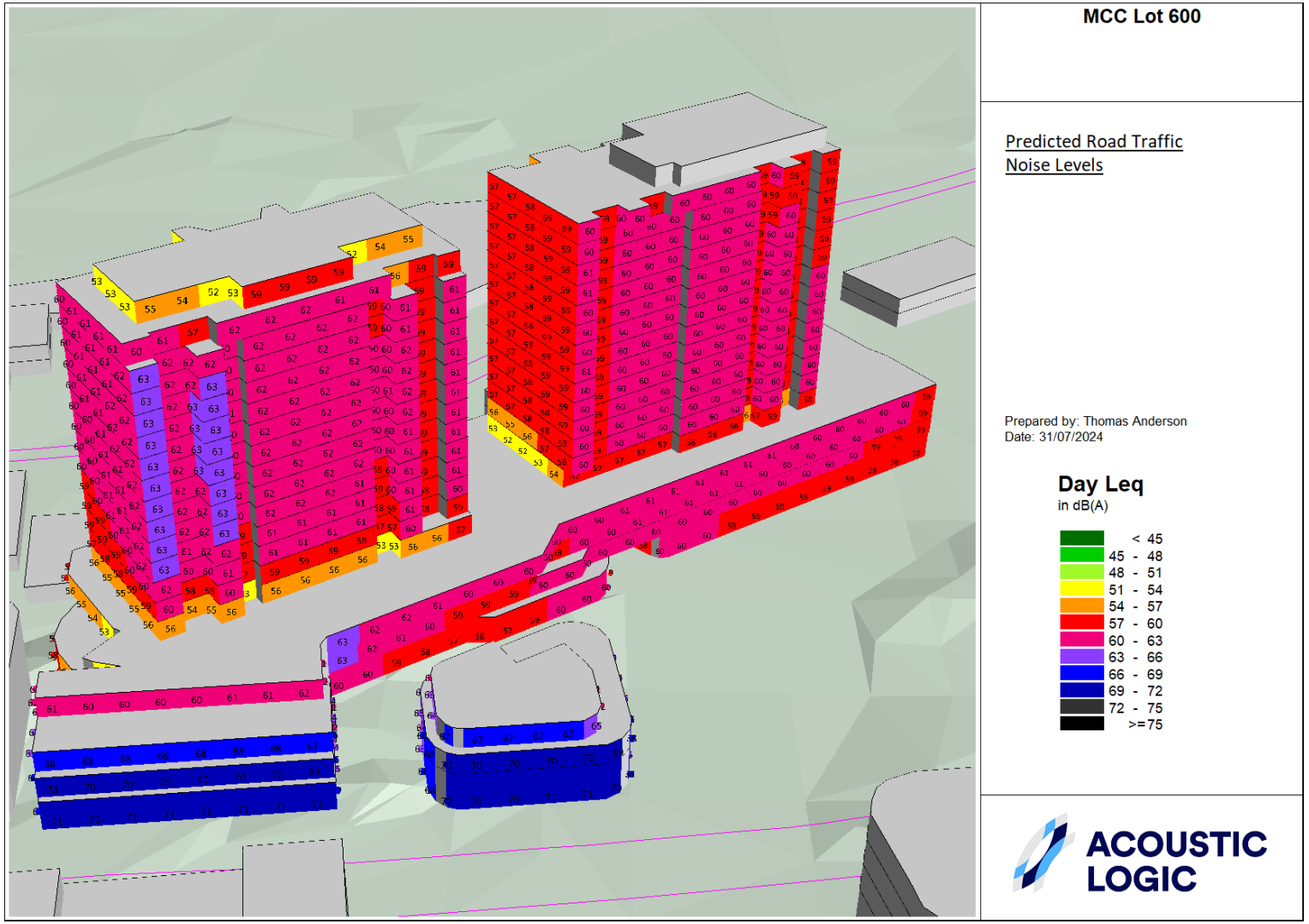


Figure 5 – Predicted Road Traffic Noise Impacts – view 1

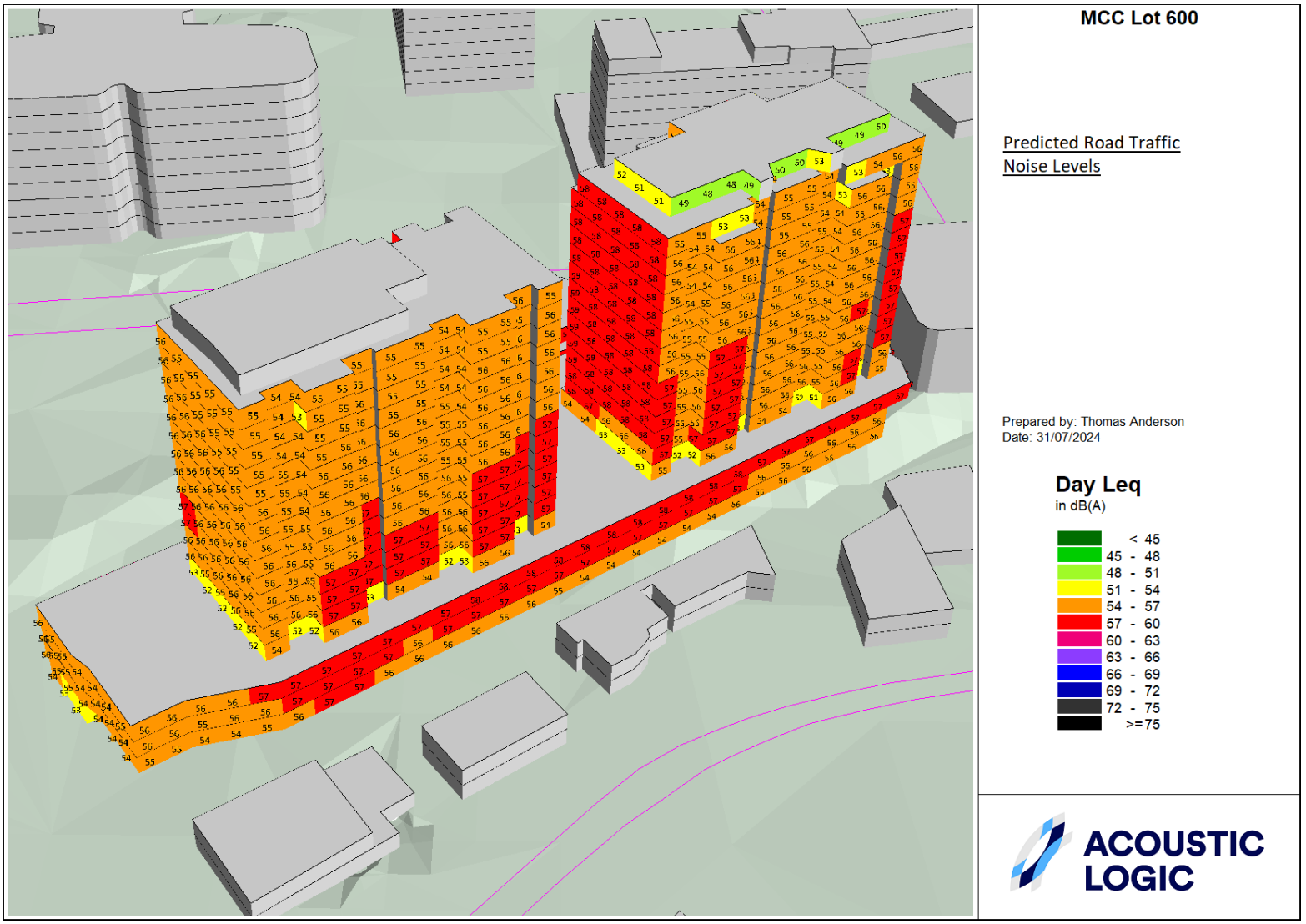


Figure 6 – Predicted Road Traffic Noise Impacts – view 2

The road traffic noise impacts have been predicted to be ≤71dB(A) $L_{eq,1hr.}$ Based on the modelled road traffic noise impacts, façade acoustic treatments have been provided to achieve compliance with the adopted noise limits in Section 7.

9 ENVIRONMENTAL NOISE ASSESSMENT

9.1 GENERAL NOISE EMISSIONS

Assessment of the general noise activities onsite to the nearest sensitive receivers was carried out with the results presented in the following sections.

Note the noise impacts consider building screening, distance attenuation, and barrier attenuation.

The following table indicates predictions of noise emissions from the site operations at closest sensitive receivers.

Table 9 – Background Creep Noise Levels, Receiver 1 – 134-136 Aerodrome Road

Activity	Noise Source	Single Event Duration	No. Events per 15 minutes			Distance	Noise Impacts $L_{Aeq,\ 15\ minutes}$			Compliance With Intermittent Noise Limit		
	$L_{Aeq,adj}$	(seconds)	Day	Evening	Night	(m)	Day	Evening	Night	Day	Evening	Night
Criteria										**50**	**49**	**45**
Car Door Closure	83	2	15	10	5	37	29	27	24	Yes	Yes	Yes
Car Engine Start	82	2	15	10	5	37	28	26	23	Yes	Yes	Yes
Car on Ramp (Ground Level)	74	10	45	30	15	75	20	19	16	Yes	Yes	Yes
Truck Reverse Alarm	105	30	1	1	0	64	36	36	0	Yes	Yes	Yes
Recreation Area (inc. swimming pool)	85	900	1	1	0	80	39	39	0	Yes	Yes	Yes
Total							**41**	**41**	**27**	**Yes**	**Yes**	**Yes**

Table 10 Acoustic Quality Objectives Outdoor Noise Levels, Receiver 1 – 134-136 Aerodrome Road

Activity	Noise Source	Single Event Duration	No. Events per hour			Distance	Noise Impacts $L_{Aeq,\ 1hr}$			Outdoor Noise Compliance		
	$L_{Aeq,adj}$	(seconds)	Day	Evening	Night	(m)	Day	Evening	Night	Day	Evening	Night
Criteria										**50**	**50**	**45**
Car Door Closure	83	2	30	20	10	37	26	24	21	Yes	Yes	Yes
Car Engine Start	82	2	30	20	10	37	25	23	20	Yes	Yes	Yes
Car on Ramp (Ground Level)	74	10	90	60	30	75	17	16	13	Yes	Yes	Yes
Truck Reverse Alarm	105	30	4	4	0	64	36	36	0	Yes	Yes	Yes

Activity	Noise Source	Single Event Duration	No. Events per hour			Distance	Noise Impacts $L_{Aeq,\ 1hr}$			Outdoor Noise Compliance		
	$L_{Aeq,adj}$	(seconds)	Day	Evening	Night	(m)	Day	Evening	Night	Day	Evening	Night
Criteria										**50**	**50**	**45**
Recreation Area (inc. swimming pool)	85	900	4	4	0	60	39	39	0	Yes	Yes	Yes
Total							**43**	**43**	**24**	**Yes**	**Yes**	**Yes**

Table 11 – Background Creep Noise Levels, Receiver 2 – 42 First Avenue

Activity	Noise Source	Single Event Duration	No. Events per 15 minutes			Distance	Noise Impacts $L_{Aeq,\ 15}$ minutes			Compliance With Intermittent Noise Limit		
	$L_{Aeq,adj}$	(seconds)	Day	Evening	Night	(m)	Day	Evening	Night	Day	Evening	Night
Criteria										**50**	**49**	**45**
Car Door Closure	83	2	15	10	5	37	29	27	24	Yes	Yes	Yes
Car Engine Start	82	2	15	10	5	37	28	26	23	Yes	Yes	Yes
Car on Ramp (Ground Level)	74	10	45	30	15	75	20	19	16	Yes	Yes	Yes
Truck Reverse Alarm	105	30	1	1	0	64	36	36	0	Yes	Yes	Yes
Recreation Area (inc. swimming pool)	85	900	1	1	0	60	42	42	0	Yes	Yes	Yes
Total							**43**	**43**	**27**	**Yes**	**Yes**	**Yes**

Table 12 Acoustic Quality Objectives Outdoor Noise Levels, Receiver 2 – 42 First Avenue

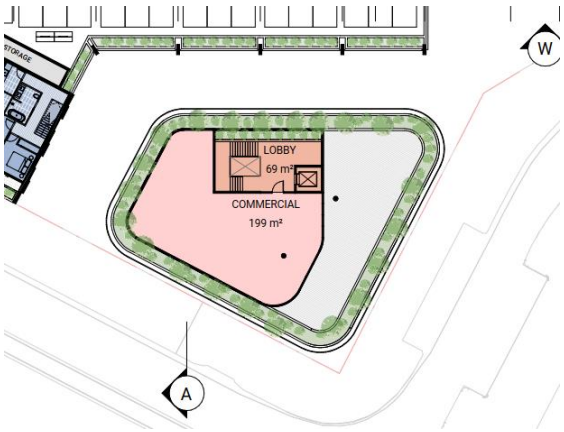
Activity	Noise Source	Single Event Duration	No. Events per hour			Distance	Noise Impacts $L_{Aeq, 1hr}$			Outdoor Noise Compliance		
	$L_{Aeq,adj}$	(seconds)	Day	Evening	Night	(m)	Day	Evening	Night	Day	Evening	Night
Criteria										**50**	**50**	**45**
Car Door Closure	83	2	30	20	10	37	26	24	21	Yes	Yes	Yes
Car Engine Start	82	2	30	20	10	37	25	23	20	Yes	Yes	Yes
Car on Ramp (Ground Level)	74	10	90	60	30	75	17	16	13	Yes	Yes	Yes
Truck Reverse Alarm	105	30	4	4	0	64	36	36	0	Yes	Yes	Yes
Recreation Area (inc. swimming pool)	85	900	4	4	0	80	42	42	0	Yes	Yes	Yes
Total							**41**	**41**	**24**	**Yes**	**Yes**	**Yes**

Based on the predicted noise impacts from general onsite activities at the nearest sensitive receivers, we predict compliance with the adopted noise limits in Section 7.

9.2 COMMERCIAL NOISE EMISSIONS

No major noise emission sources have been proposed, however, we anticipate pedestrian activity on the ground level due to the retail and grocery store frontage, as well as commercial use of the external balcony on Level 02 Podium. Commercial plant is addressed in Section 9.3 and vehicular/loading in Section 9.1. This section addresses specifically patron noise levels which is following conservatively the noise source description based on generally applied *Prediction of Noise from Small to Medium Sized Crowds* (M.J. Hayne et al, Proceedings of ACOUSTICS 2011, Gold Coast. The method is conservative as it is applied generally for crowd in an outdoor social setting such as those at a bar or club.

Ground Level



Level 02 Podium

Cumulative noise due to patrons outdoors was modelled for the site based on the following assumptions:

- Patron sound spectrum as per below

Table 13 –Patron Sound Power Level Spectrum (Notes dB relationship to overall dBA)

Source	125Hz	250Hz	500Hz	1KHz	2KHz	4KHz
Noise Spectrum	-7	-7	-1	-4	-9	-18

- Patron impact is determined by using the crowd noise definition as per the abovementioned crowd noise formula:

  L_{WAmax} = 11 Log(N) + 81dB(A)

  L_{WAeq} = 15 Log(N) + 64dB(A)

  Where:

  N- number of patrons

- 50 patrons outdoors on the Ground Level and Level 02 Podium as shown in Table 14.

Table 14 – Indoor Patrons

Location	No. Patrons	Source Level SWL dB(A)
Ground Level Retail (outdoor)	50	90
Level 02 Podium Commercial Terrace (outdoor)	50	90

- Allowance for background noise emissions of music have been also considered at 4 locations, even though no specific amplified music proposal is put forward, each with SWL 75dB(A) – blue dots indicated on Ground Level

The noise emissions were modelled using SoundPLAN™ model as shown in Figure 7.

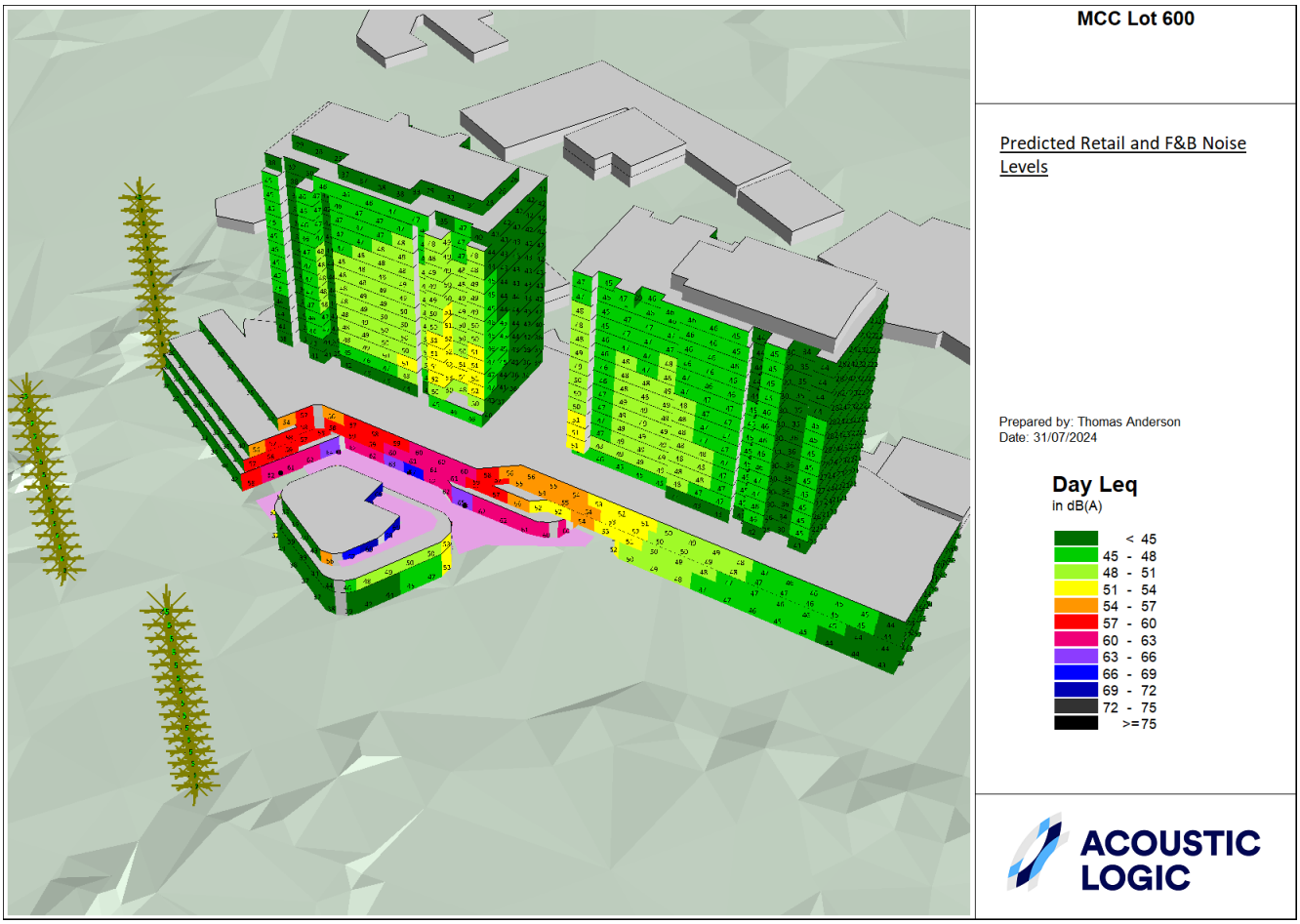


Figure 7 – Retail and F&B SoundPLAN Onsite Sources – View 1

The predicted noise impacts are presented in

Table 15 – Predicted Commercial Patron Noise Impacts

Receiver	Time Period	Noise Limit	Predicted Noise Level	Compliance
R1: 134-136 Aerodrome Road	Day	$L_{Aeq,adj,T}$ ≤50 dB(A)	45	Yes
	Evening	$L_{Aeq,adj,T}$ ≤49 dB(A)	45	
	Night	$L_{Aeq,adj,T}$ ≤45 dB(A)	45	
R2: 42 Frist Avenue	Day	$L_{Aeq,adj,T}$ ≤50 dB(A)	45	
	Evening	$L_{Aeq,adj,T}$ ≤49 dB(A)	45	
	Night	$L_{Aeq,adj,T}$ ≤45 dB(A)	45	

Recommendations have been provided in Section 10 are followed, compliance is predicted with the day and evening and night criteria.

9.3 MECHANICAL PLANT NOISE

The proposed development will include ancillary mechanical services plant *(e.g. condensing units, exhaust fans, etc)*. The noise limit criteria for the mechanical services are to be kept in line with the measured background noise for the proposed development. Once mechanical plant selection is finalise, a full assessment of all selected mechanical plant shall be taken by a qualified Acoustic Consultant.

All plant must be treated sufficiently to ensure compliance with the noise limits nominated in Section 7 are achieved.

9.3.1 Car Park Exhaust Noise

The plans currently do not indicate any exhaust vents for the car park. If vents are present we anticipate that sufficient treatment with attenuators will lead to compliance with the adopted noise limits in Section 7.

9.3.2 Other Plant

Selection of plant and acoustic treatment must be added if required in order to achieve compliance with noise limits in Section 7. Assessment is required by a qualified acoustic consultant.

10 RECOMMENDATIONS

Based on the predicted noise impacts, the recommendations are presented below.

10.1 GLAZED WINDOWS AND DOORS

The glazing assemblies required to satisfy the nominated project indoor noise requirements are presented in Table 16 and Table 17, based on the worst impacted location on each level, which can further be reviewed during detailed design phase to achieve indoor noise limits.

Due to structural requirements, safety considerations, or other purposes, glazing of different configurations, areas of coverage, or thickness may need to be used. In areas where the glazing has specifications different to those scheduled, the glazing shall still maintain the acoustic rating and meet the project acoustic objectives.

Table 16 – Minimum Residential Tower Requirements for Windows and Doors

Floor	Facade	Glazing Type	Minimum Typical Glazing Thickness	Acoustic Seals Requirement	Minimum Acoustic Performance of Glazing System
SOHO	All	Type D	10.76 acoustic Lam or 14.38mm lam	Yes	Rw38
Podium Levels and Recreation Level 4	All façades	Type C	10.38mm laminated	Yes	Rw35
Levels 5 -12	Southern façade	Type C	10.38mm laminated	Yes	Rw35
Levels 5-12	Western and Northern facade	Type C	10.38mm laminated	Yes	Rw35
Levels 5-12	Eastern façades	Type B	6.38mm laminated	Yes	Rw32
Levels 13 and above	Eastern and Southern façade	Type B	6.38mm laminated	Yes	Rw32
Levels 13 and above	Western and Northern facade	Type C	10.38mm laminated	Yes	Rw35

Table 17 – Minimum Commercial Glazing Recommendation

Floor	Location	Glazing Type	Minimum Typical Glazing Thickness	Acoustic Seals Requirement	Minimum Acoustic Performance
Commercial Tower (Based on Open Plan Offices)	Refer to Figure 8 for glazing location	D	6mm/12mm gap/6mm or 6mm	Yes	Rw24
	Refer to Figure 8 for glazing location	E	6mm/12mm gap/10.38mm lam OR 10.38mm lam	Yes	Rw35
F&B / Retail	All façades	E	6mm/12mm gap/6mm	Yes	Rw32
		OR			
		Type B	6.38mm laminated	Yes	Rw32

Note, for the purposed of this assessment the windows and doors were assumed to be closed for compliance.

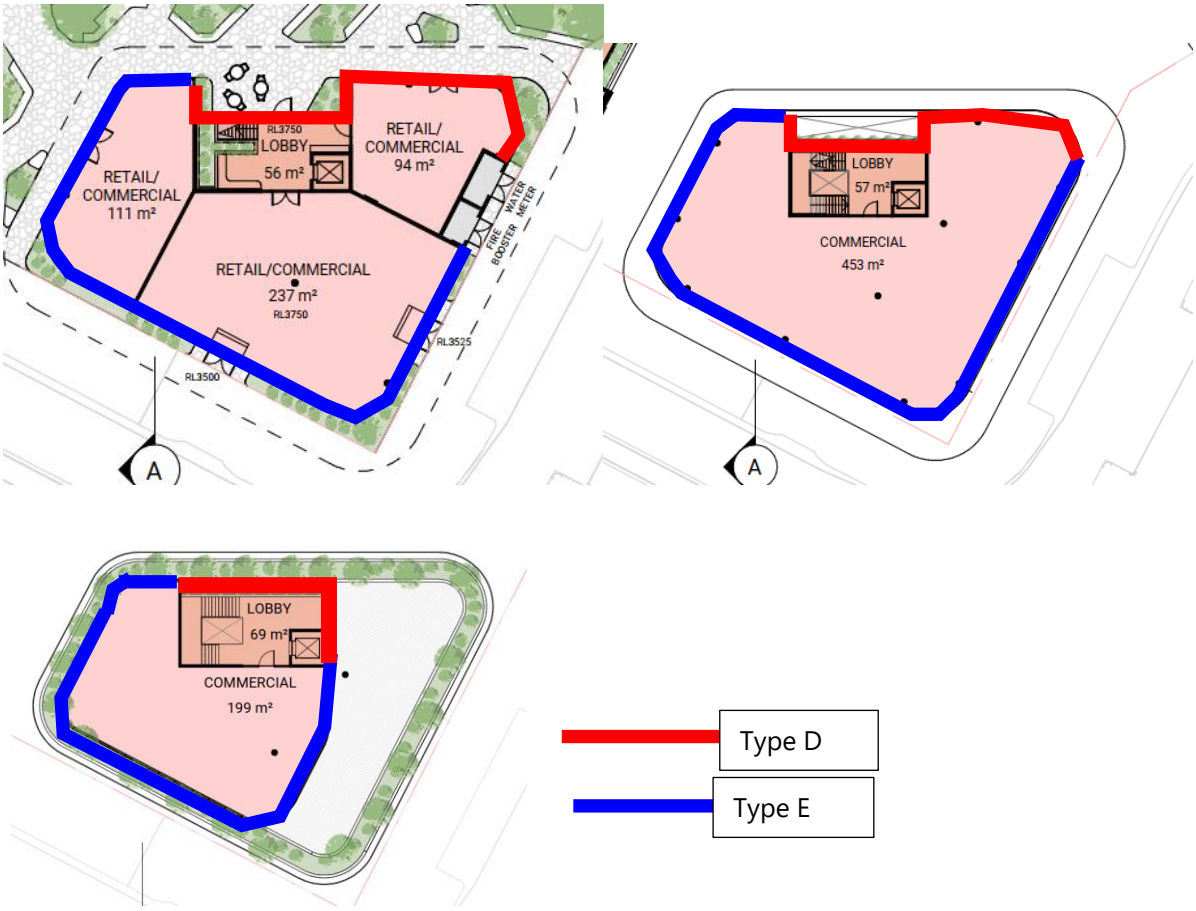


Figure 8 – Commercial Building Façade Types

10.1.1 Alternative Ventilation

In accordance with the Approved Acoustic Report, alternative ventilation systems are required for the habitable rooms in the apartments. These can be either similar to air-conditioning or mechanical ventilation in order to allow windows and doors to be closed.

10.1.2 Acoustic Sealing of Glazing System Frames

Where glazing is required to achieve a nominated acoustic performance the perimeter of the frame shall be acoustically sealed into the opening so there is no leakage of noise between the frame and the building opening. The sealing method selected shall take into account and allow for any movement of the frame relative to the building opening and so that the acoustic performance is maintained.

10.2 HORIZONTAL AND VERTICAL NOISE TRANSMISSION

In addition to achieving indoor noise limits with appropriately selected and installed façade systems, the façade must be designed and installed to limit vertical and horizontal sound transmission via the façade, façade cavities and other façade elements. Façade junctions are to maintain the acoustic integrity of the internal separation requirements as documented in the National Construction Code/Building Code of Australia (BCA) for acoustic ratings between rooms (i.e. façade elements must ensure that $R_w+C_{tr}50$ between apartments is achieved). Workshop drawings detailing vertical and horizontal sections are to be submitted to the acoustic consultant for review and approval.

10.3 EXTERNAL WALL CONSTRUCTION

In case any external walls of apartments are not glazed, these are assumed of masonry/concrete construction. Such construction is acoustically satisfactory in order to meet the project acoustic objectives. Alternative construction details may be suitable, provided that the project acoustic objectives are not compromised. Workshop drawings detailing the external wall systems are to be submitted to the acoustic consultant for review and approval.

10.4 EXTERNAL FLOORS

All external floors residential areas have been assumed to be of nominally 200mm thick concrete. These are acoustically satisfactory in order to meet the project acoustic objectives. Alternative wall ratings and construction details are suitable, provided that the project acoustic objectives are not compromised. Workshop drawings detailing the external wall systems are to be submitted to the acoustic consultant for review and approval.

10.5 ROOF CONSTRUCTION

Where roof is constructed of concrete it is acoustically satisfactory to meet the project acoustic objectives.

10.6 PENETRATIONS

Acoustically treat all penetrations through building envelope to maintain the nominated acoustic ratings as well as achieve the nominated project noise criteria. This includes ventilation, sprinkler pipes etc.

10.7 MECHANICAL PLANT

Information regarding mechanical plant was not available at the time of the assessment. We recommend that all mechanical plant be designed to comply with the criteria stated in Section 7 with an assessment by a qualified acoustic consultant to be conducted prior to installation.

10.8 MANAGEMENT CONTROLS

The following management controls are recommended for the development:

- Access to the recreation areas, including the swimming pool and gym, shall be restricted to the daytime and evening periods, 7am – 10pm, only.
- Movements of trucks and vans (i.e. deliveries and reversing) that are equipped with reverse alarms in the loading dock shall be limited to the time period between 7am and 6pm.
- Waste collection is limited to the day time period or to be in line with the current Council waste collection hours to reduce the potential for additional disturbance to surrounding residents.
- Operation of the external retail/commercial tenancies and the commercial terrace shall not be limited based on the assessment on the proviso that no external music is played (or limited to 70dB(A) Lw (sound power level) at the locations assessed in this report) and no entertainment activities occur. Internal areas can also operate after 10pm and prior to 7am on the proviso that external facades are closed, unless assessment of specific operational scenarios allow external windows and doors of the commercial tenancies to remain opened; and the noise generation is limited to achieve noise emission compliance with Council limits The commercial space is considered to be of low noise generating activity and on that basis, operational time limits are not proposed.

10.9 CAR PARKING

The following is recommended:

1. Expansion Joints on ramps shall have a smooth transition so the car wheels remain in contact with the ramp. No metal cover or be sheathed in rubber to absorb shocks.
2. Any drainage or otherwise metal plates/grates shall be properly fixed to avoid any rattling or adverse impact noise generation.
3. Expansion Joints on the car park level will need a smooth mound over them. No uneven metal angles covering the two mating slab edges at the structural break.
4. Doors shall be quiet in operation. Isolation of the doors shall be used where the motors are fixed to the structure.
5. Ensure that door panels do not rattle, and the operation of any door guides, rollers, etc. is smooth.
6. Door guides should be fitted with vibration isolated fixings where required to prevent door operation from being audible within occupied spaces.
7. Door motors shall be fitted with a soft start/stop controller to minimise noise.

10.10 MECHANICAL PLANT

Selection of plant and acoustic treatment must be added if required in order to achieve compliance with Council and Statutory noise emission limits. Assessment is required by a qualified acoustic consultant and such requirement must be conditioned by Council.

10.11 ADDITIONAL COMMENTS

Gym, residents lounge, pool and residential roof terrace noise impacts to own development apartments do not form part of the DA noise impact assessment requirements. These will need to be addressed at a later stage. In order to reduce adverse impacts, the following strategies shall be applied:

- Time restrictions (Body Corporate By-Law). Nominally, the hours of use are between 7am to 10pm unless otherwise allowed within by-lay with additional noise control strategies applied;
- All rooftop areas and podium recreation areas above/adjacent apartments to include sufficient impact noise controls (e.g. minimum NCC/BCA requirements);
- Swimming pool and gym floor to include adequate vibration isolation.

11 CONCLUSION

Acoustic Logic Consultancy carried out an acoustic assessment of the proposed mixed-use development described as Maroochydore City Centre on Lot 600 Frist Avenue, Maroochydore. As part of the assessment, impacts from road traffic noise and environmental noise were assessed.

Provided the recommendations in Section 10 are followed, the development is predicted to satisfy noise assessment criteria and achieve the project target noise limits in Section 7.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Pty Ltd
Tarmo Saar

APPENDIX A: ARCHITECTURAL PLANS USED IN ASSESSMENT

DA100
FLOOR PLAN - GROUND LEVEL

0 5 10 15 20 25

SCALE 1:500 @ A3 SIZE m

ISSUE P
Date of Issue | 24.09.09

70850 | WALKER'S MAROOCHYDORE | CORNER FIRST AVE AND, SOUTH SEA ISLANDER WAY, MAROOCHYDORE

DEVELOPMENT APPLICATION | PLUS ARCHITECTURE

DA101
FLOOR PLAN - LEVEL 01 - PODIUM

0 5 10 15 20 25

SCALE 1:500 @ A3 SIZE m

ISSUE L
Date of Issue | 24.09.09

70850 | WALKER'S MAROOCHYDORE | CORNER FIRST AVE AND, SOUTH SEA ISLANDER WAY, MAROOCHYDORE

DEVELOPMENT APPLICATION | PLUS ARCHITECTURE

DA102
FLOOR PLAN - LEVEL 02 - PODIUM

0 5 10 15 20 25

SCALE 1:500 @ A3 SIZE m

ISSUE L
Date of Issue | 24.09.09

70850 | WALKER'S MAROOCHYDORE | CORNER FIRST AVE AND, SOUTH SEA ISLANDER WAY, MAROOCHYDORE

DEVELOPMENT APPLICATION | PLUS ARCHITECTURE

DA103
FLOOR PLAN - LEVEL 03 - PODIUM

0 5 10 15 20 25

SCALE 1:500 @ A3 SIZE m

ISSUE L

Date of Issue | 24.09.09

70850 | WALKER'S MAROOCHYDORE | CORNER FIRST AVE AND, SOUTH SEA ISLANDER WAY, MAROOCHYDORE

DEVELOPMENT APPLICATION | PLUS ARCHITECTURE

DA104
FLOOR PLAN - LEVEL 04 - RECREATION

0 5 10 15 20 25

SCALE 1:500 @ A3 SIZE m

ISSUE K

Date of Issue | 24.09.09

70850 | WALKER'S MAROOCHYDORE | CORNER FIRST AVE AND, SOUTH SEA ISLANDER WAY, MAROOCHYDORE

DEVELOPMENT APPLICATION | PLUS ARCHITECTURE

DA118
FLOOR PLAN - LEVEL 18 - ROOFTOP RECREATION

0 5 10 15 20 25

SCALE 1:500 @ A3 SIZE m

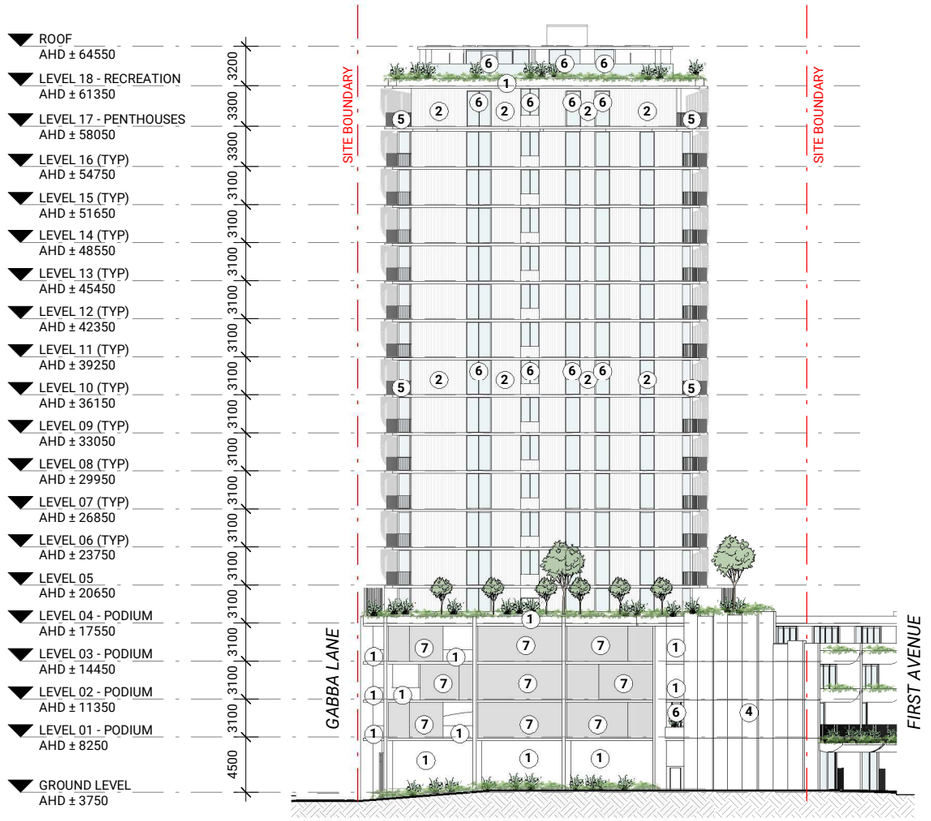
ISSUE J
Date of Issue | 24.09.05

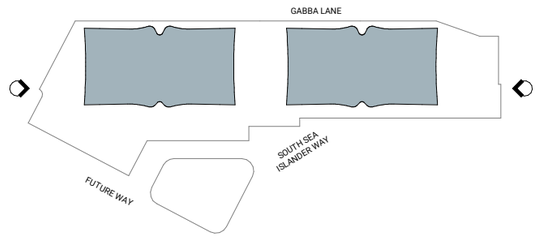
70850 | WALKER'S MAROOCHYDORE | CORNER FIRST AVE AND, SOUTH SEA ISLANDER WAY, MAROOCHYDORE

DA200
ELEVATION NORTH & SOUTH - OVERALL

MATERIAL LEGEND

① PAINTED CONCRETE FINISH
② VERTICAL RIBBED CONCRETE
③ FEATURE BRICK SCREENING
④ FINE TEXTURED CONCRETE
⑤ BRONZE VERTICAL METALWORK & SCREENING
⑥ TINTED GLAZING
⑦ BRONZE COLOUR PATTERNED SCREENING
⑧ STONE CLADDING





0 5 10 15 20 25
SCALE 1:500 @ A3 SIZE m

ISSUE A
Date of Issue | 24.09.03

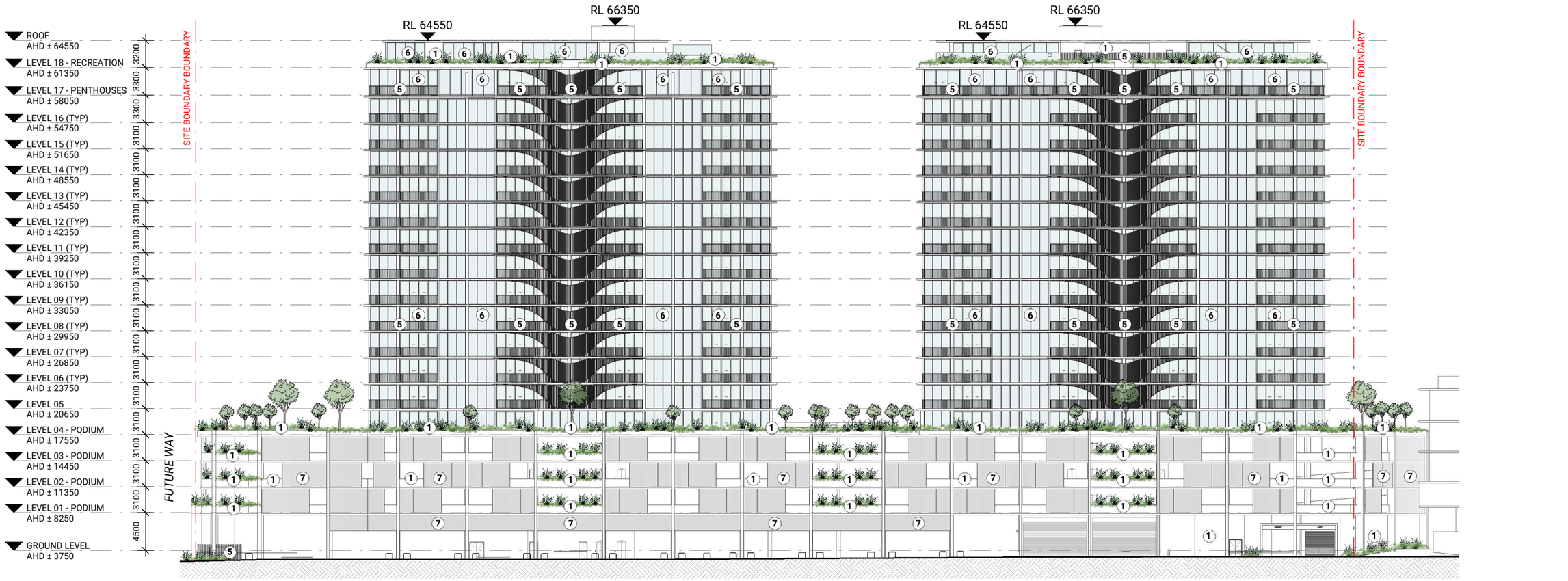
70850 | WALKER'S MAROOCHYDORE | CORNER FIRST AVE AND, SOUTH SEA ISLANDER WAY, MAROOCHYDORE

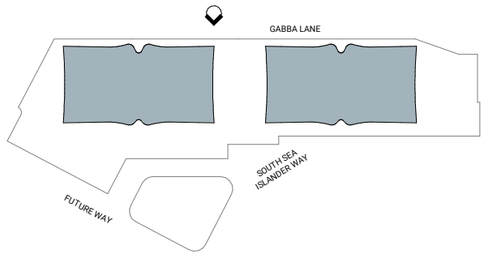
DEVELOPMENT APPLICATION | PLUS ARCHITECTURE

DA201
ELEVATION EAST - OVERALL

MATERIAL LEGEND

① PAINTED CONCRETE FINISH
② VERTICAL RIBBED CONCRETE
③ FEATURE BRICK SCREENING
④ FINE TEXTURED CONCRETE
⑤ BRONZE VERTICAL METALWORK & SCREENING
⑥ TINTED GLAZING
⑦ BRONZE COLOUR PATTERNED SCREENING
⑧ STONE CLADDING





0 5 10 15 20 25
SCALE 1:500 @ A3 SIZE m

ISSUE A
Date of Issue | 24.09.03

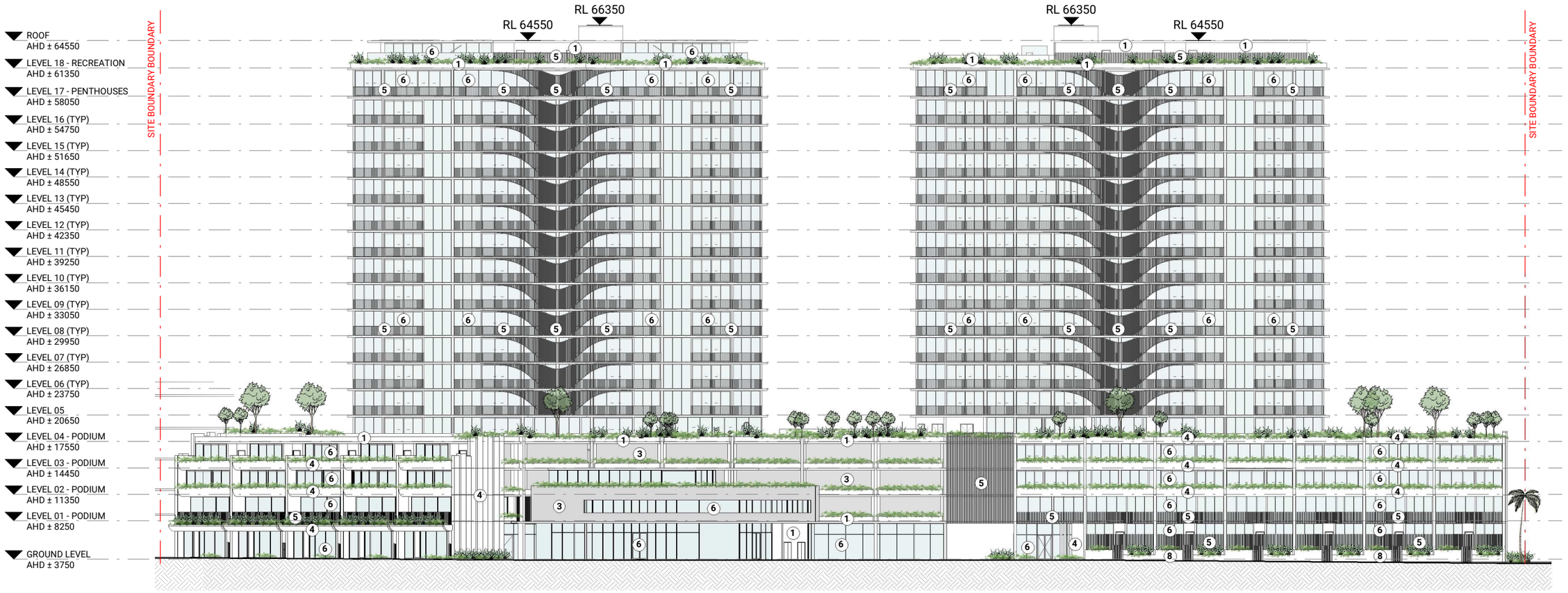
70850 | WALKER'S MAROOCHYDORE | CORNER FIRST AVE AND, SOUTH SEA ISLANDER WAY, MAROOCHYDORE

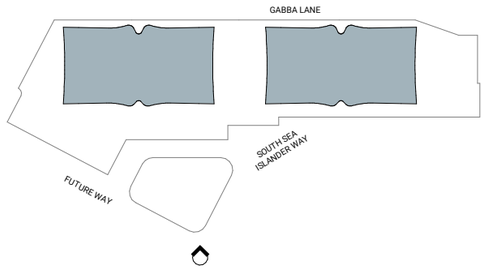
DEVELOPMENT APPLICATION | PLUS ARCHITECTURE

DA203
ELEVATION WEST - OVERALL EXTERNAL

MATERIAL LEGEND

① PAINTED CONCRETE FINISH
② VERTICAL RIBBED CONCRETE
③ FEATURE BRICK SCREENING
④ FINE TEXTURED CONCRETE
⑤ BRONZE VERTICAL METALWORK & SCREENING
⑥ TINTED GLAZING
⑦ BRONZE COLOUR PATTERNED SCREENING
⑧ STONE CLADDING





0 5 10 15 20 25
SCALE 1:500 @ A3 SIZE m

ISSUE A
Date of Issue | 24.09.03

70850 | WALKER'S MAROOCHYDORE | CORNER FIRST AVE AND, SOUTH SEA ISLANDER WAY, MAROOCHYDORE

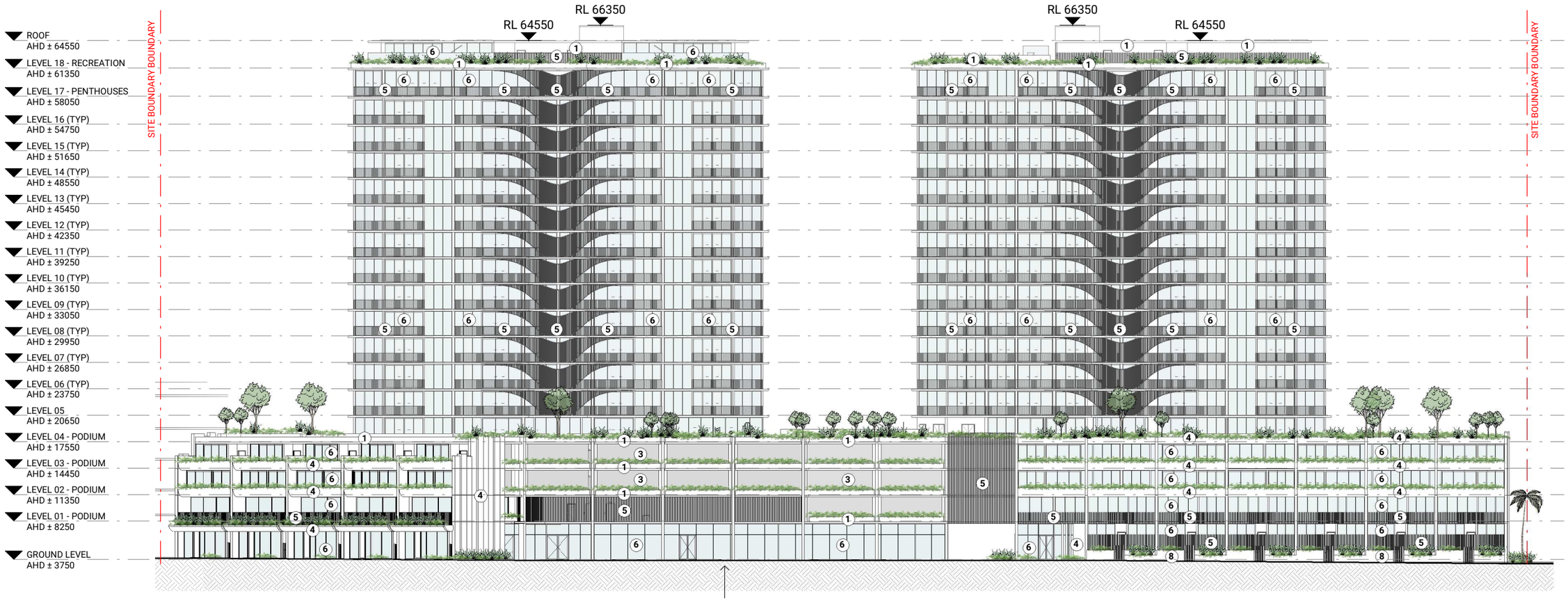
DEVELOPMENT APPLICATION | PLUS ARCHITECTURE

DA202

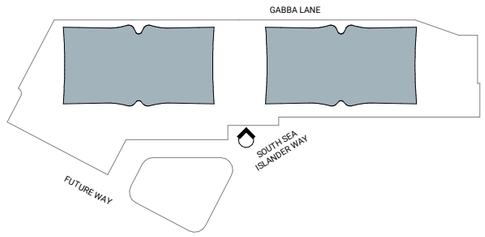
ELEVATION WEST - OVERALL INTERNAL COLONADE

MATERIAL LEGEND

① PAINTED CONCRETE FINISH
② VERTICAL RIBBED CONCRETE
③ FEATURE BRICK SCREENING
④ FINE TEXTURED CONCRETE
⑤ BRONZE VERTICAL METALWORK & SCREENING
⑥ TINTED GLAZING
⑦ BRONZE COLOUR PATTERNED SCREENING
⑧ STONE CLADDING



NOTE: COMMERCIAL BUILDING HIDDEN FOR CLARITY



0 5 10 15 20 25 m

SCALE 1:500 @ A3 SIZE

ISSUE A
Date of Issue | 24.09.03

70850 | WALKER'S MAROOCHYDORE | CORNER FIRST AVE AND, SOUTH SEA ISLANDER WAY, MAROOCHYDORE

DEVELOPMENT APPLICATION | PLUS ARCHITECTURE