



MAROOCHYDORE PRIVATE HOSPITAL, MAROOCHYDORE

Noise Impact Assessment

18 November 2021

Essence Project Management

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**PLANS AND DOCUMENTS
referred to in the PDA
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The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

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We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like.

Supplementary professional advice should be sought in respect of these issues.

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1 Introduction

Renzo Tonin & Associates was engaged to prepare a noise impact assessment for the proposed Maroochydore Private Hospital to be located on Lots J1 and J2 at Mundoo Boulevard, Maroochydore.

The assessment authority is Economic Development Queensland (EDQ).

This report has been prepared for the Development Application (DA) stage of the project and provides preliminary comments for the following acoustic issues:

- Noise intrusion from external sources (local mechanical plant and traffic noise);
- Noise emissions from steady state noise sources (mechanical plant), and;
- Noise emissions from non-steady state noise sources (truck deliveries and carpark activities).

Specialised acoustic advice and associated reports will be prepared as the design progresses through the various design stages.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Proposed Development

The Maroochydore Private Hospital; is located within the Principal Centre (CBD) Zone within Precinct 3 of the Maroochydore Priority Development Area (PDA). The intended mixed-use development is approximately 11,876m² and includes the following:

- Diagnostic imaging;
- Pathology;
- Medical consulting suites;
- Private Hospital, providing elective surgery with day only and overnight accommodation;
- University of Sunshine Coast (USC);
- Retail;
- Coffee Shop;
- Restaurant/Bar; and
- 211 carparking spaces.

Table 1 presents a list of floor levels and proposed occupancy.

Table 1: Floor Level and Occupancy

Floor Level	Proposed Occupancy
Ground	Medical Imaging (G.06), Pathology (G.03), Coffee Shop (G.01), Restaurant (G.02), 3 x Tenancy (G.04, G.05 & G.07), Substation, Loading Dock, Amenities, Fire Pump room, Waste room
Level 1	Carpark (60 bays), Plantroom, Amenities
Level 2	Carpark (76 bays), Plantroom
Level 3	Carpark (75 bays), Plantroom
Level 4	3 x USC Tenancy (4.02, 4.03 & 4.04), 2 x Medical Tenancy (4.01 & 4.05), Amenities
Level 5	6 x Medical Tenancy (5.01, 5.02, 5.03, 5.04, 5.05 & 5.06)
Level 6	8 x Medical Tenancy (6.01, 6.02, 6.05, 6.06, 6.07, 6.08, 6.09 & 6.11)
Level 7	Hospital (7.01)
Level 8	Hospital (8.01)
Level 9	Indoor Lounge, Plantroom, Open deck

The local authority is Sunshine Coast Council (SCC). The real property description is Lots J1 and J2.

The site is bounded by Mundoo Boulevard, South Sea Islander Way, Market Lane and Future Way.

Refer to Figures 1, 2 and 3 for site location details.

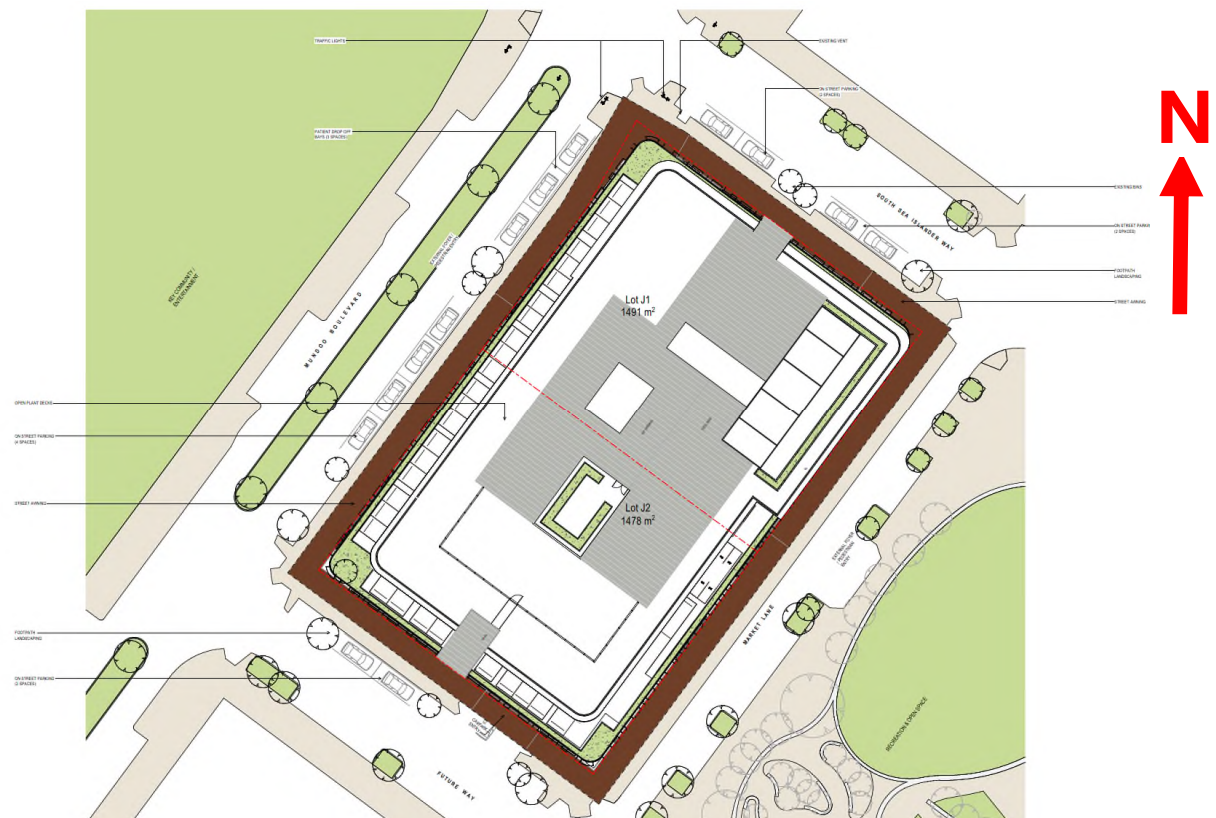


Figure 1: Site Location, Mundoo Boulevard



Figure 2: Site Location, Mundoo Boulevard

Figure 3 presents a zoning layout.



Figure 3: Zoning Layout - Principal Centre (CBD) Zone)

3 Noise Issues

A review of the proposed development and surrounding area identified the following noise issues that require consideration:

- Noise intrusion from external sources (local mechanical plant and traffic noise);
- Noise emissions from steady state noise sources (mechanical plant), and;
- Noise emissions from non-steady state noise sources (truck deliveries and carpark activities).

Table 2 presents a list of the nearest noise sensitive receivers (NSR's).

Table 2: Nearest noise sensitive receivers (NSR's)

Receiver	Building Type	Address	RP	Distance Separation to NSR (approx.)
NSR1	Residential apartments	Horton Apartments, 1A Mungar Street	OSP171082	90m NW
NSR2	Mixed use	9 Market Lane	130SP305312	35m N
NSR3	Commercial	3 South Sea Islander 5 Fairway Drive	120SP305312 100SP305312	30m NE
NSR4	Commercial	First Avenue 42 First Avenue	71SP308184 74SP308194	100m E
NSR5	Commercial	54 First Avenue	80SP305312	60m SE

Figure 4 shows the site is surrounded by a number of noise sensitive receivers described in Table 2.

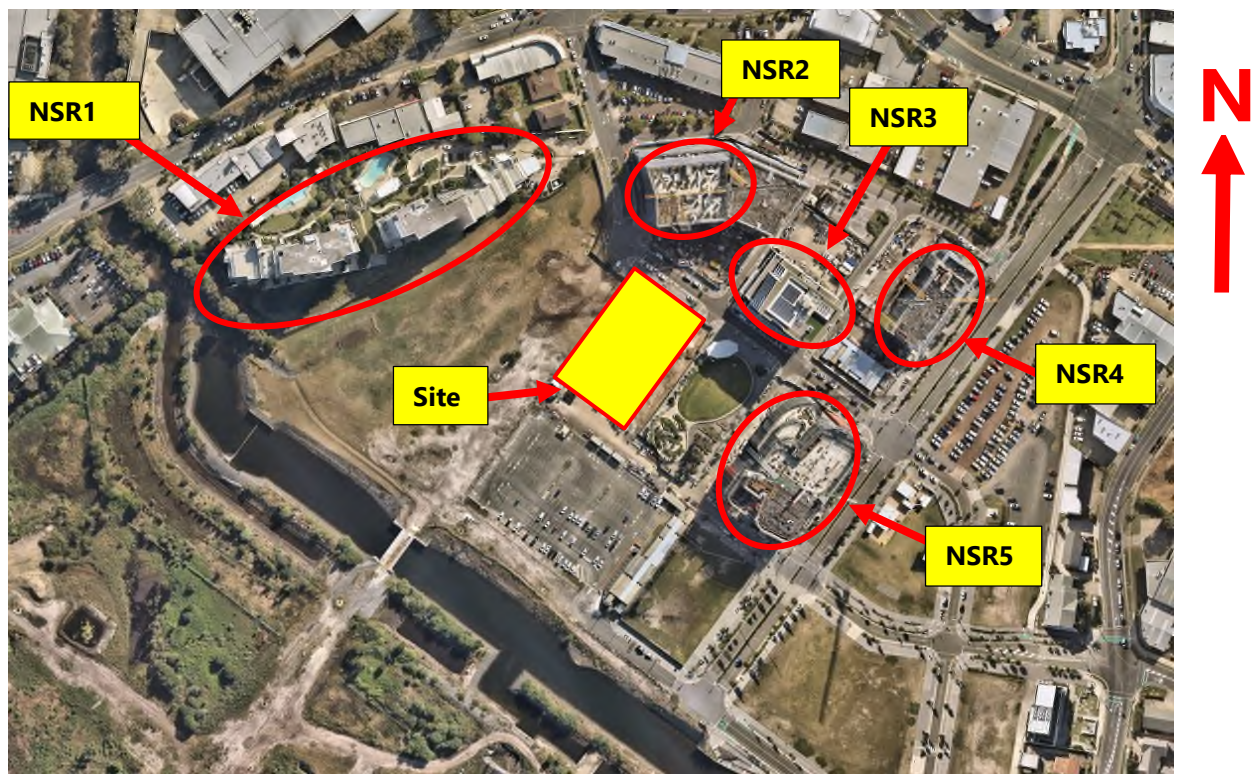


Figure 4: Nearest Noise Sensitive Receivers (NSR's)

4 Noise Criteria

Applicable noise emission limits are determined from local government and state government policies and Acts.

4.1 Sunshine Coast Council (SCC) Planning Scheme 2014

The development is located within the Sunshine Coast Council (SCC) local government area.

Schedule 6 Planning scheme policies in the Sunshine Coast Planning Scheme 2014 states the following:

SC6.15.4 Advice for preventing or minimising nuisance emissions and imissions associated with noise and/or vibration

The following is advice for achieving Performance Outcomes PO1 and PO2 of Table 9.4.3.3.1 (Performance outcomes and acceptable outcomes for assessable development) of the Nuisance code where there is potential for noise and/or vibration emissions or imissions to cause environmental harm or nuisance at a sensitive land use:-

(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;

.....

(c) where a sensitive land use is proposed in a locality with existing noise sources, Council may also require submission of a noise impact assessment report prepared by a competent person that includes the following:-

(i) a location plan identifying the subject site, any existing or future potential noise sources in the locality that could potentially affect sensitive land uses on the subject site and any significant features such as topographic variation, barriers and intervening buildings;

(ii) the results of measurements of LA10, LAeq and background LA90 noise levels at the subject site, with:-

(A) the noise measurements to include time periods that are most likely to be affected by noise from existing sources and also include measurement of background in the absence of noise from local emission sources; and

(B) the noise monitoring to be completed for a sufficient period of time to establish typical and worst case pre-existing noise levels for the subject site;

(iii) an assessment of the measured and predicted noise levels using an appropriately recognised methodology and criteria. From the assessment, the determination of compliance with the criteria as defined in Schedule 1 of the Environmental Protection (Noise) Policy 2008; and

(iv) specification of appropriate control measures if necessary.

Section 9.4.3.3 *Performance outcomes and acceptable outcomes* in the Sunshine Coast Planning Scheme 2014 states the following

Table 9.4.3.3.1 Performance outcomes and acceptable outcomes for assessable development

Performance Outcomes		Acceptable Outcomes	
Acoustic Amenity and Noise ¹³			
P01	<i>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</i>	A01.1	<i>Development, other than development in a designated special entertainment precinct, involving live entertainment or amplified music is designed and constructed to achieve an amplified music noise level external to existing or approved affected residences of:-</i>
	<i>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.</i>		<i>(a) LA10 not greater than 5dB(A) above the background noise levels LA90 from 6am to 10pm; and</i>
			<i>(b) LOCT10 not greater than 8dB above the octave band background noise levels LOCT90 from 10pm to 6am.</i>
			<i>Note: Acceptable outcome AO1 is provided as a guide only. A higher or lower noise level may be appropriate depending on the location, setting and context of the proposed development.</i>

Performance Outcomes		Acceptable Outcomes	
Acoustic Amenity and Noise ¹³			
		A01.2	For development not involving live entertainment or amplified music, no acceptable outcome provided.
P02	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 zone or precinct, to adversely affect the sensitive land use.	A02	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.
	Editor's note—this performance outcome relates 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.		

¹³ Note—Council will take the order of occupancy of new and existing noise sources into consideration in implementing Performance Outcome PO1 of this code. The intent of this performance outcome is not to require existing lawful uses to control noise emissions in response to encroachment by new noise sensitive development.

4.2 Department of Environment and Science – Environmental Protection (Noise) Policy 2019

Schedule 1 of the EPP (Noise) 2019 presents outdoor and indoor acoustical quality objectives during the day, evening and night-time periods. These objectives apply to all forms of noise experienced by a receptor.

The acoustical quality objectives for dwellings are reproduced in Table 3 below. The objectives are presented in terms of the adjusted L_{Aeq} , L_{A10} and L_{A01} noise levels measured over a 1-hour time period.

Table 3: EPP (Noise) acoustic quality objectives

Sensitive Receptor	Time of Day	Acoustic Quality Objectives (dBA)		
		L_{Aeq} , adj, 1hr	L_{A10} , adj, 1hr	L_{A01} , adj, 1hr
Residence (for outdoors)	Daytime and Evening	50	55	65
Residence (for indoors)	Daytime and Evening	35	40	45
	Night-time	30	35	40
Commercial and retail activity (for indoors)	Business hours	45	-	-

4.3 Environmental Protection Act 1994

The object of this Act is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development).

The Act describes a number of offences relating to noise emission, including building work, regulated devices (e.g. power tools, pumps, air-conditioning equipment, refrigeration equipment, etc.).

4.3.1 Section 440U: Air-conditioning equipment

- (1) *This section applies to premises at or for which there is air conditioning equipment.*
- (2) *An occupier of the premises must not use, or permit the use of, the equipment on any day—*
- (a) before 7a.m, if it makes a noise of more than 3dB(A) above the background level; or*
 - (b) from 7a.m. to 10p.m, if it makes a noise of more than 5dB(A) above the background level; or*
 - (c) after 10p.m, if it makes a noise of more than 3dB(A) above the background level.*

4.3.2 Section 440V: Refrigeration equipment

- (1) *This section applies to a person who is -*
- a) An occupier of premises at or for which there is plant or equipment for refrigeration (refrigeration equipment);*
- Or*
- b) An owner of refrigeration equipment that is on or in a vehicle, other than a vehicle used or to be used on a railway.*
- (2) *The person must not use, or permit the use of, the refrigeration equipment on any day -*
- (a) before 7a.m, if it makes a noise of more than 3dB(A) above the background level; or*
 - (b) from 7a.m. to 10p.m, if it makes a noise of more than 5dB(A) above the background level; or*
 - (c) after 10p.m, if it makes a noise of more than 3dB(A) above the background level.*

In the case of **continuous noise**, the following criteria are generally applied:

- Between 7am and 10pm: $L_{A \text{ max adj, T}}^1 \leq L_{A \text{ bg, T}}^2 + 5\text{dBA}$.

¹ $L_{A \text{ max adj, T}}$ refers to the average maximum noise emission level measured at the noise-sensitive premises and adjusted upwards if required, to account for annoying characteristics such as impulsiveness or tonality. Typically, adjustments of 2dBA or 5dBA apply.

² $L_{A \text{ bg, T}}$ refers to the background noise level, usually measured as the L_{A90} statistical noise level in the absence of the intrusive noise.

- Between 10pm and 7am: $L_{A \max adj, T} \leq L_{A bg, T} + 3dBA$.

4.4 Australian Standard AS/NZS 2107

Internal noise limits for mechanical noise have been specified based upon the levels presented in Australian Standard AS/NZS2107-2016 Acoustics - Recommended Design Sound Levels and Reverberation Times for Building Interiors.

Table 4 below presents typical design sound levels for various spaces within the health buildings.

Table 4: Design Sound Levels from AS/NZS 2107:2016

Occupancy	Design Sound Level (Leq,t) Range dBA	Design Reverberation Time (T) Range, s
Educational Buildings		
Laboratories – Teaching	35 to 45	0.5 to 0.8
Laboratories – Working	40 to 50	0.5 to 0.8
Professional and administrative offices	35 to 40	0.6 to 0.8
Office Buildings		
Cafeterias	45 to 50	< 1.0
Corridor and lobbies	45 to 50	< 1.0
Executive office	35 to 40	0.4 to 0.6
General office areas	40 to 45	0.4 to 0.6
Meeting room (small)	40 to 45	< 0.6
Open plan office	40 to 45	0.4 (see Note 1)
Public spaces	40 to 50	0.5 to 1.0
Quiet rooms	40 to 45	< 0.6
Reception areas	40 to 45	0.6 to 0.8
Rest rooms and break-out spaces	40 to 45	0.4 to 0.6
Toilets	40 to 55	-
Undercover car parks	< 65	-
Municipal buildings		
Restaurants and cafeterias - Cafeterias	40 to 50	See Note 1
Restaurants and cafeterias – food courts	45 to 55	See Note 1
Restaurants and cafeterias – coffee shops	40 to 50	See Note 1
Restaurants and cafeterias - restaurants	40 to 50	See Note 1
Health Buildings		
Corridors & lobby spaces	< 50	See Note 1
Consulting rooms	40 to 45	0.4 to 0.6
Kitchens, sterilizing & service areas	< 55	< 0.8 (see Note 8)
Laboratories	40 to 50	0.4 to 0.7
MTI/CT Scan/X-Ray areas/Ultrasound	45 to 50	See Note 1

Occupancy	Design Sound Level (Leq,t) Range dBA	Design Reverberation Time (T) Range, s
Nurses' stations	40 to 45	0.4 to 0.7
Office areas	35 to 45	0.4 to 0.7
Operating theatres	40 to 50	See Notes 1, 8
Patient lounge	40 to 45	0.4 to 0.6
Post-Op, Pre-Op, recovery rooms	40 to 45	0.4 to 0.6 (see Note 8)
Pharmacies	45 to 50	0.4 to 0.6
Staff rooms	40 to 50	0.4 to 0.6
Sterilizing areas in operating theatres	40 to 45	< 0.9 (see Note 8)
Surgeries/treatment/procedure rooms	40 to 45	0.4 to 0.7
Utilities Rooms	50 to 60	-
Ward Bedrooms – Single Bed	35 to 40	0.4 to 0.7
Ward Bedrooms – Multiple Beds	35 to 40	0.4 to 0.7 (see Note 8)
Waiting rooms, reception areas	40 to 50	< 0.7

Note 1 – Reverberation time should be minimized for noise control.

Note 8 – Health requirements for hygiene and infection control may preclude achieving these recommended reverberation times.

5 Noise Measurements

5.1 Ambient Noise Levels

Noise measurement of existing ambient noise levels was conducted over a continuous 8-day period commencing on Friday 25th June 2021. The measurements were conducted using an unattended logger located on the vacant site.

Figure 5 shows the noise monitoring location marked as Location L1.

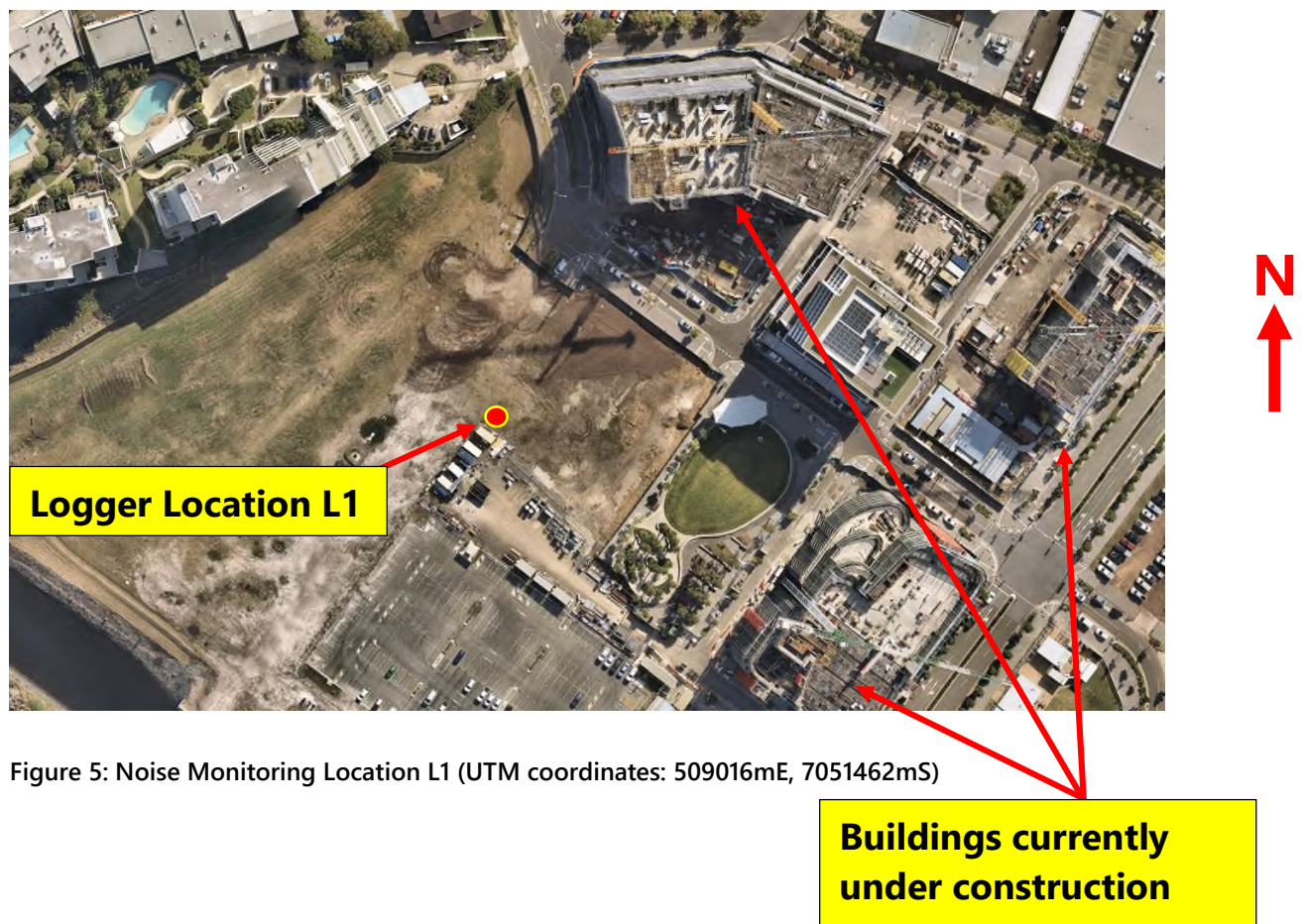


Figure 5: Noise Monitoring Location L1 (UTM coordinates: 509016mE, 7051462mS)

The test instrumentation consisted of:

- *Portable Noise Logger:* RTA07, NTi-XL2 (S/N: A2A-2422-D0, FW4.60);
- *Acoustical Calibrator:* Larson Davis/ NTi CAL200 (S/N 15600).

The results of the ambient noise logging are presented graphically in Appendix C of this report and summarized in Table 5.

The average ambient results include values for the L_{A01} ³, L_{A10} ⁴, L_{Aeq} ⁵ and L_{Amax} ⁶ for each of the day, evening and night periods. For the L_{Amax} , L_{A01} and L_{A10} parameters, arithmetic averaging has been used. For L_{Aeq} , logarithmic averaging has been used. For L_{A90} ⁷ the result has been calculated as the Rating Background Level (RBL) of the dataset in accordance with accepted practice.

Table 5: Existing ambient noise levels

Time of Day	Average Noise Levels (dBA)				
	L_{A01}	L_{A10}	L_{A90} (RBL)	L_{Aeq}	L_{Amax}
Day (7am-6pm)	64	59	51	59	74
Evening (6pm-10pm)	55	51	45	52	63
Night (10pm-7am)	52	48	39	51	62

From observations made during separate site visits, the noise levels at the logger location were primarily influenced by local construction activities during daytime (refer to Figure 5 for construction locations) and local traffic noise during other periods. Weather conditions were fine during the noise logging sessions.

The measurement procedures used, and the results reported in this document were conducted in accordance with Renzo Tonin and Associates' Quality Assurance System, Australian Standard AS1055-2018 "Acoustics - Description and Measurement of Environmental Noise" and the DES's Noise Control Manual (March 2020).

5.2 Noise Emission Limits for Residential Receptors

A comparison of the noise requirements discussed in Sections 4.1, 4.2 and 4.3 suggests the most stringent noise limits occur during the night time period of 10pm to 7am. That is if noise emissions from the Private Hospital comply during the quieter night time period, noise emissions are expected to comply during other periods including daytime (7am to 6pm) and evening periods (6pm to 10pm).

For broadband steady state noises produced by mechanical plant, the most stringent noise limit is considered background level plus 3dBA or 5dBA depending on the time period.

The following noise limit is assumed at the nearest noise sensitive residential receivers (NSR1 and NSR2) for compliance purposes:

$$L_{eq, adj, T} = L_{90} \text{ (RBL from Table 5)} + 5 = 51 + 5 = 56\text{dBA daytime periods (7am to 6pm)}$$

$$L_{eq, adj, T} = L_{90} \text{ (RBL from Table 5)} + 5 = 45 + 5 = 50\text{dBA evening periods (6pm to 10pm)}$$

$$L_{eq, adj, T} = L_{90} \text{ (RBL from Table 5)} + 3 = 39 + 3 = 42\text{dBA night time periods (10pm to 7am)}$$

³ L_{A01} is the A-weighted sound pressure level exceeded for 1% of the time.

⁴ L_{A10} is the A-weighted sound pressure level exceeded for 10% of the time.

⁵ L_{Aeq} is the equivalent or energy-averaged A-weighted sound pressure level.

⁶ L_{Amax} is the average of the maximum A-weighted sound pressure levels occurring within the consecutive 15 minute samples.

⁷ L_{A90} is the A-weighted sound pressure level exceeded for 90% of the time.

5.3 Noise Emission Limits for Commercial & Retail Receptors

Table 3 in Section 4.2 of this report discusses an acoustic quality objective of 45dBA Leq, adj, 1 hour for commercial and retail spaces. The objective applies for indoors during business hours.

For commercial receivers the equivalent external or outdoor noise level is $[45 + 20 =] 65\text{dBA Leq, adj, 1 hour}$ based on a minimum noise reduction of 20dBA across the glazing system.

For commercial receivers, an external noise limit of 65dBA Leq, adj, 1 hour during business hours is considered reasonable. This noise limit is a component noise level.

For retail receivers typically located at street level, Table 5 shows existing ambient noise levels during daytime periods were determined to be around 59dBA Leq (measured externally) and well above the 45dBA Leq acoustic quality objective (indoors).

For retail receivers, an external noise limit of 59dBA Leq, adj, 1 hour during business hours is considered reasonable. This noise limit is a component noise level.

6 Noise Intrusion from External Sources

Table 3 in Section 4.4 of this report provides recommended internal noise levels for steady state noises (internal air conditioning) and quasi steady state noises (external mechanical plant and local traffic noises).

The lower range of recommended internal noise levels is typically around 35dBA to 40dBA L_{eq} .

Based on our site observations and noise logging results, external noise levels around 60dBA L_{eq} may be expected around the building façade.

Based on our analysis of the site ambient environment, local future development and experience from similar projects, we recommend all façade glazing assembly should have a minimum acoustic rating of $Rw35$ or higher. A performance rating of $Rw 35$ may be achieved using heavier laminated glass such as 10.38mm glass or 6.5mm VLam Hush glass in an appropriate aluminium framing system.

We suggested discussing the acoustic requirements of glazing assemblies (rated to $Rw 35$) with reputable suppliers such as G James Glass, AWS, Bradnams and Capral.

The glazing assembly includes the glass and aluminium framing system. The client would be advised not to commence detailing or otherwise commit to glazing assemblies which have not been tested in an approved laboratory or for which an opinion only is available. Testing of glazing assemblies is a component of the quality control of the design process and should be viewed as a priority.

7 Noise Emissions

The following noise emissions have been identified as potentially impacting the nearest noise sensitive receivers:

- Noise emissions from steady state noise sources (mechanical plant), and;
- Noise emissions from non-steady state noise sources (truck deliveries and carpark activities).

7.1 Steady State Sources

Noise emissions from mechanical services plant located in plantrooms on Ground Level, Level 1, Level 02, Level 03 and Level 09 must be controlled to acceptable levels.

The following figures show locations of the plantrooms.

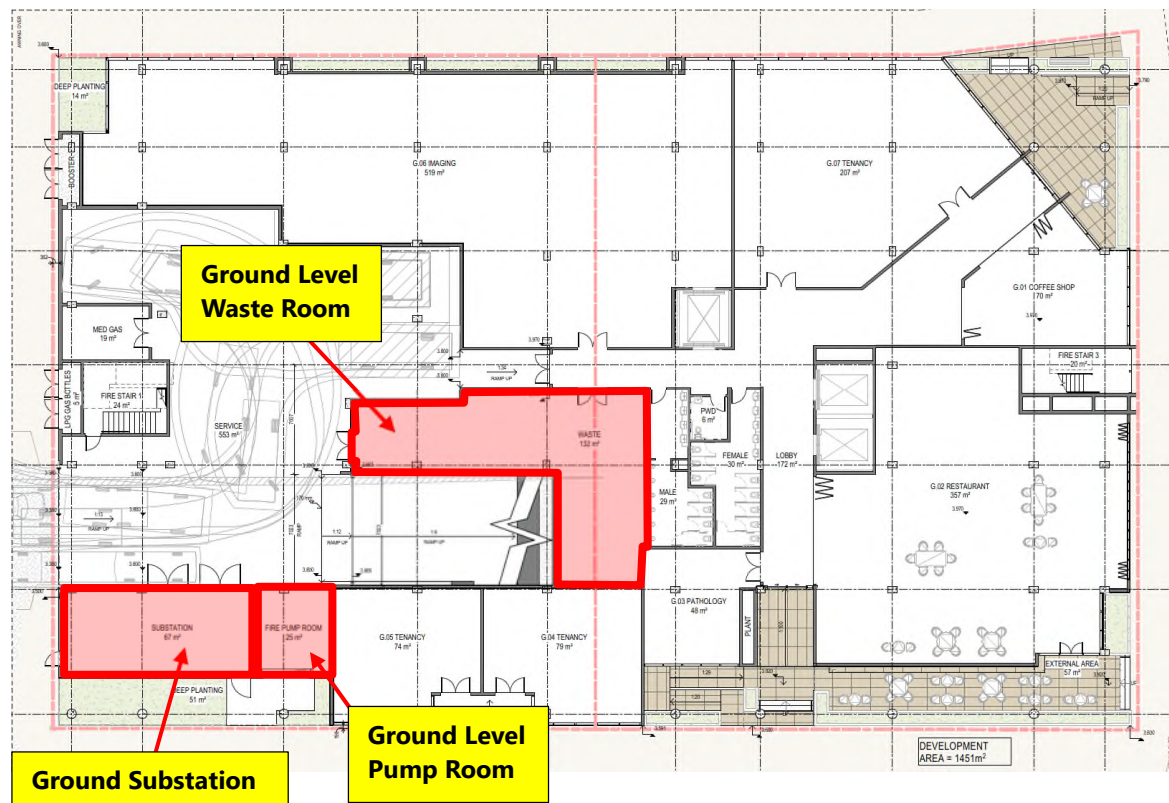


Figure 6: Ground Level Plantrooms

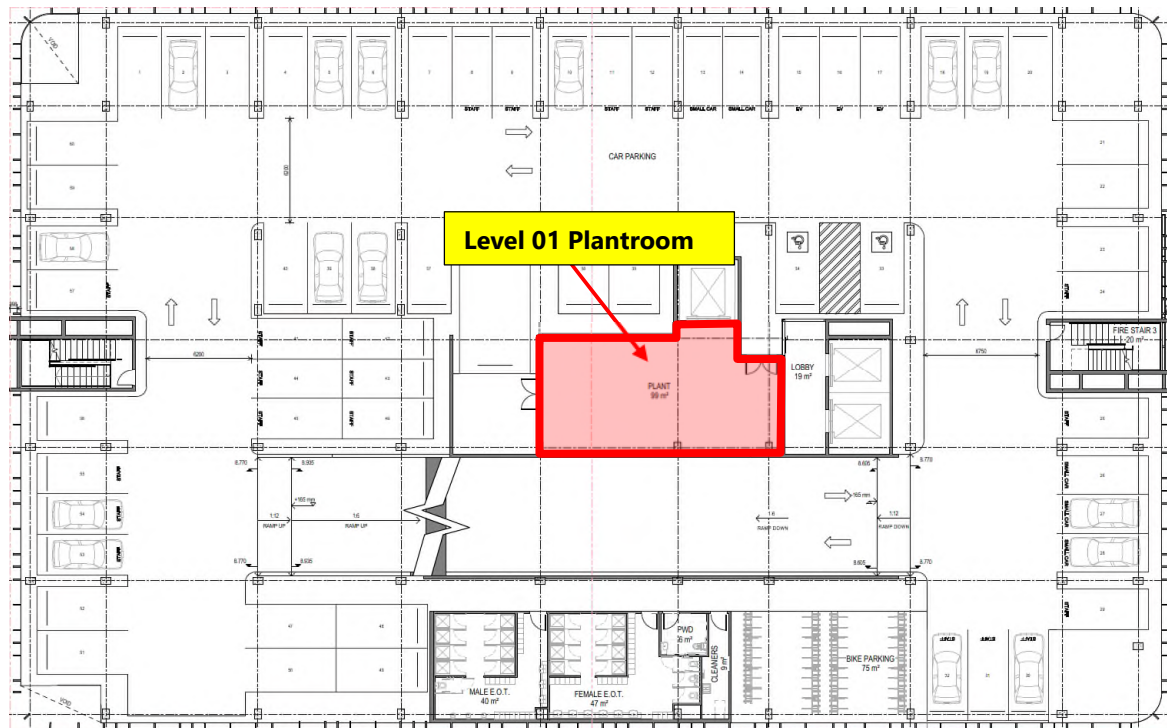


Figure 7: Level 01 Plantroom



Figure 8: Level 02 Plantroom

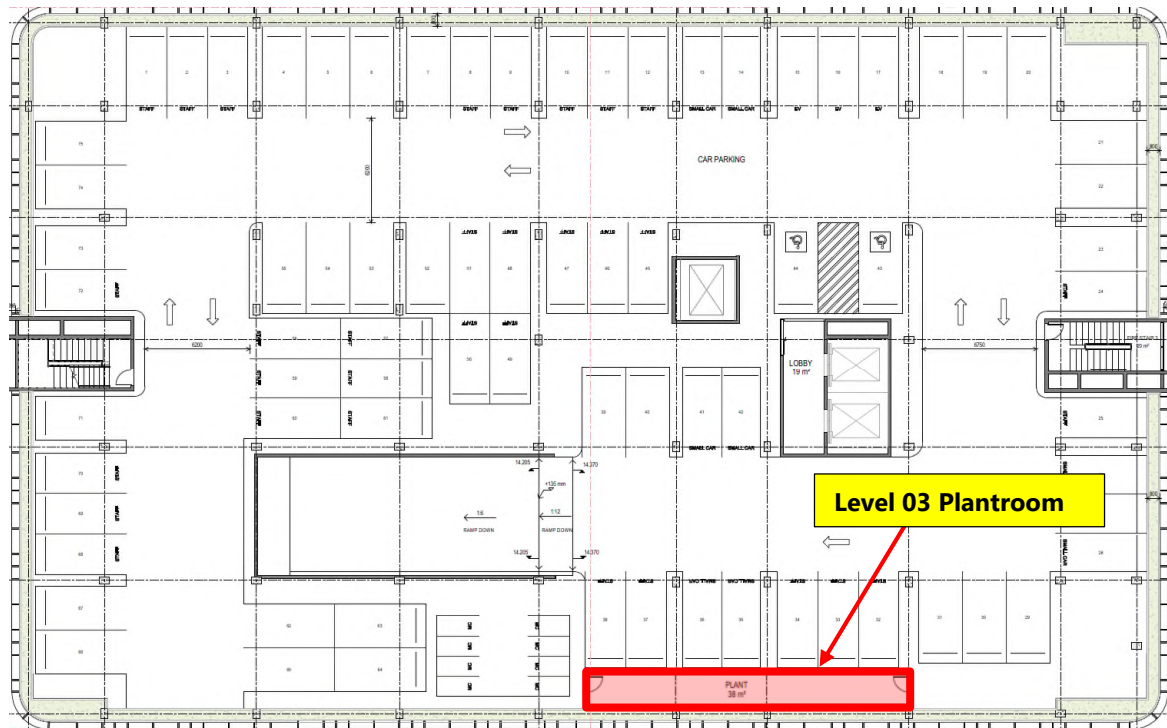


Figure 9: Level 03 Plantroom

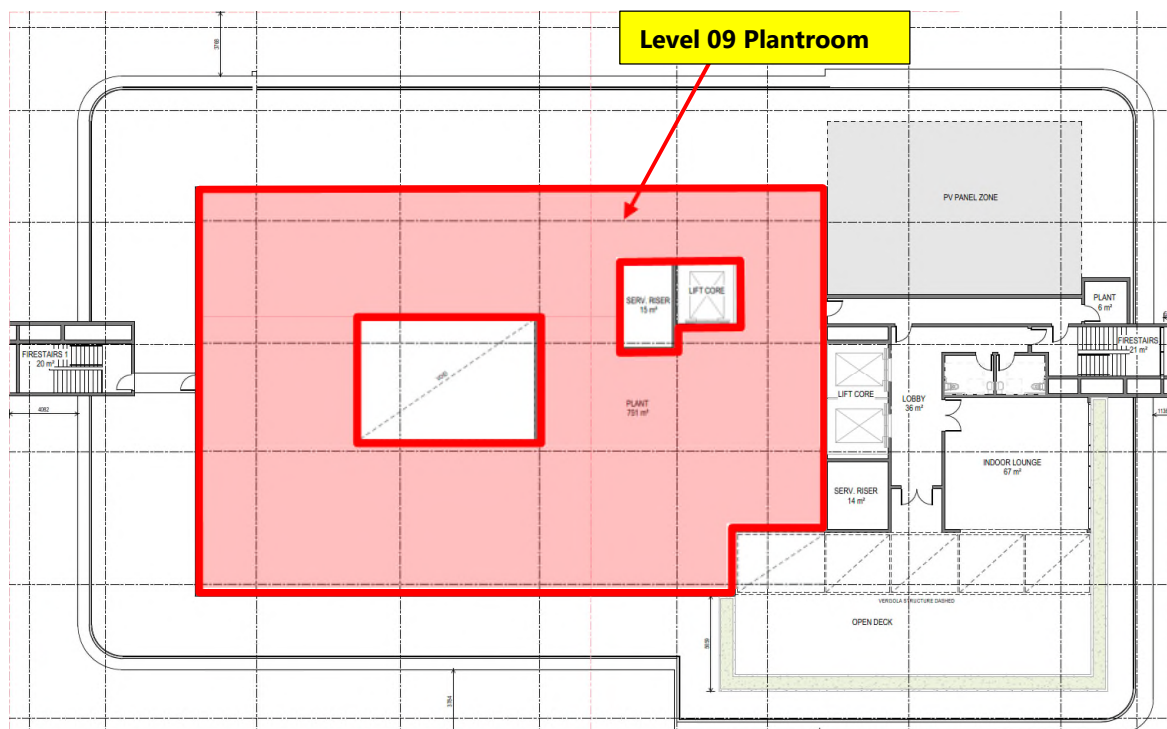


Figure 10: Level 09 Plantroom

A detailed assessment of the noise impact from mechanical plant will be undertaken later, when detailed plant layout and noise data is available.

The detailed assessment will include noise emissions from the Ground Level Substation, Automated Waste Collection System (AWCS), Fire Pump Room and plantrooms located on Levels 01, 02, 03 and 09.

Standard noise control treatment in the form of acoustic silencers, internal duct insulation, air plenums and acoustic louvres may be required to minimise noise emissions to the atmosphere.

7.2 Non-Steady State Sources

Non steady state noise sources including truck deliveries and carpark activities. The following figures shows of locations of the loading dock and carparking spaces.

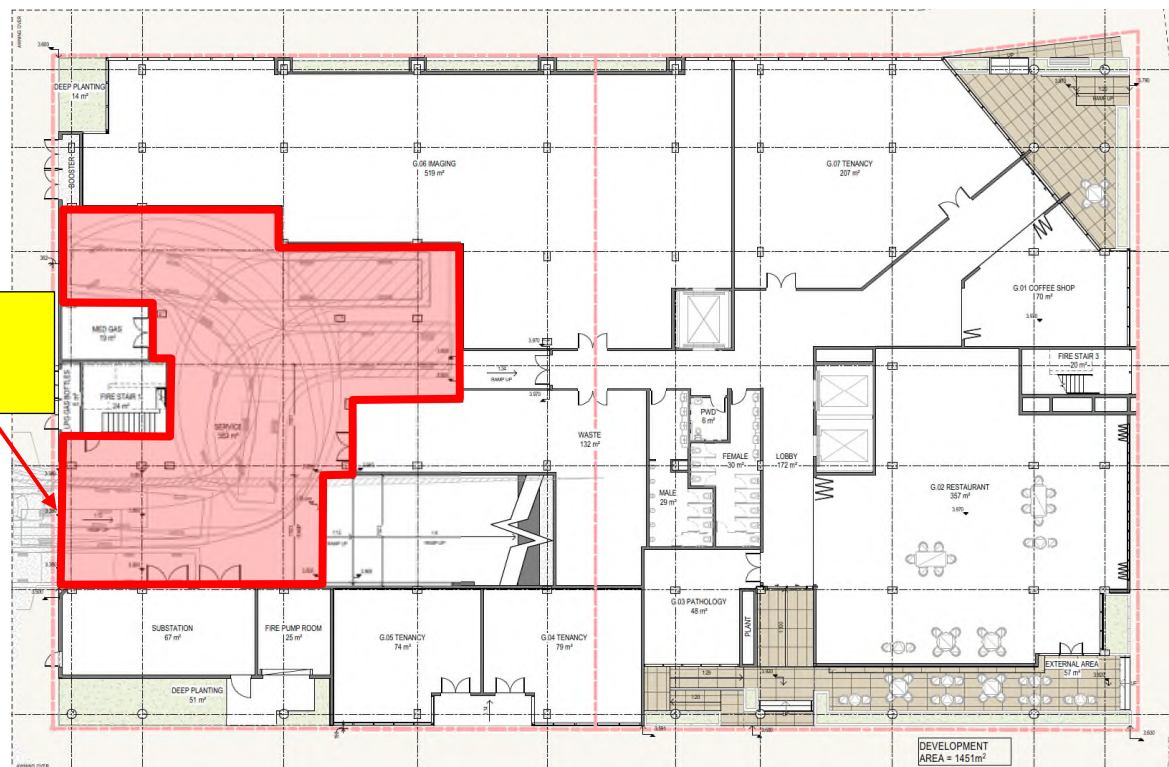


Figure 11: Ground Level Loading Dock

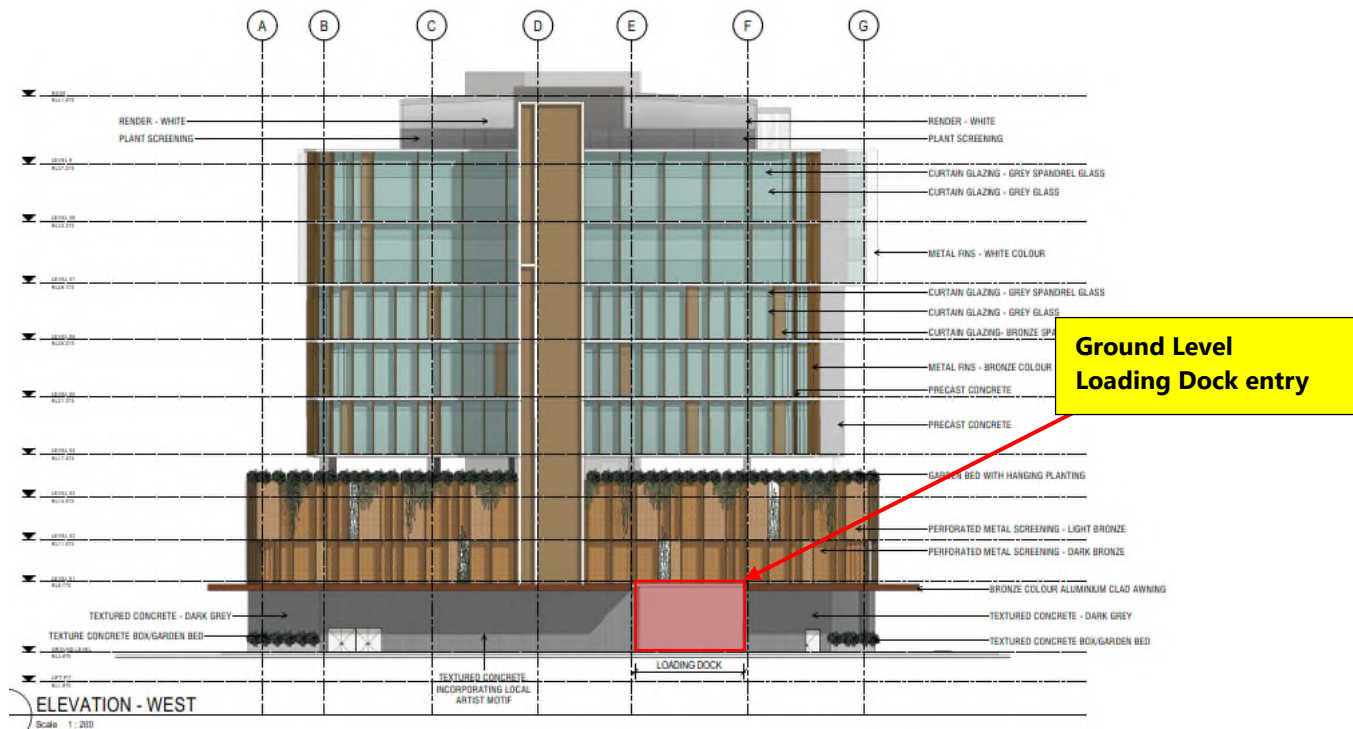


Figure 12: Ground Level Loading Dock entry



Figure 13: Level 01 Carparking (60 bays)

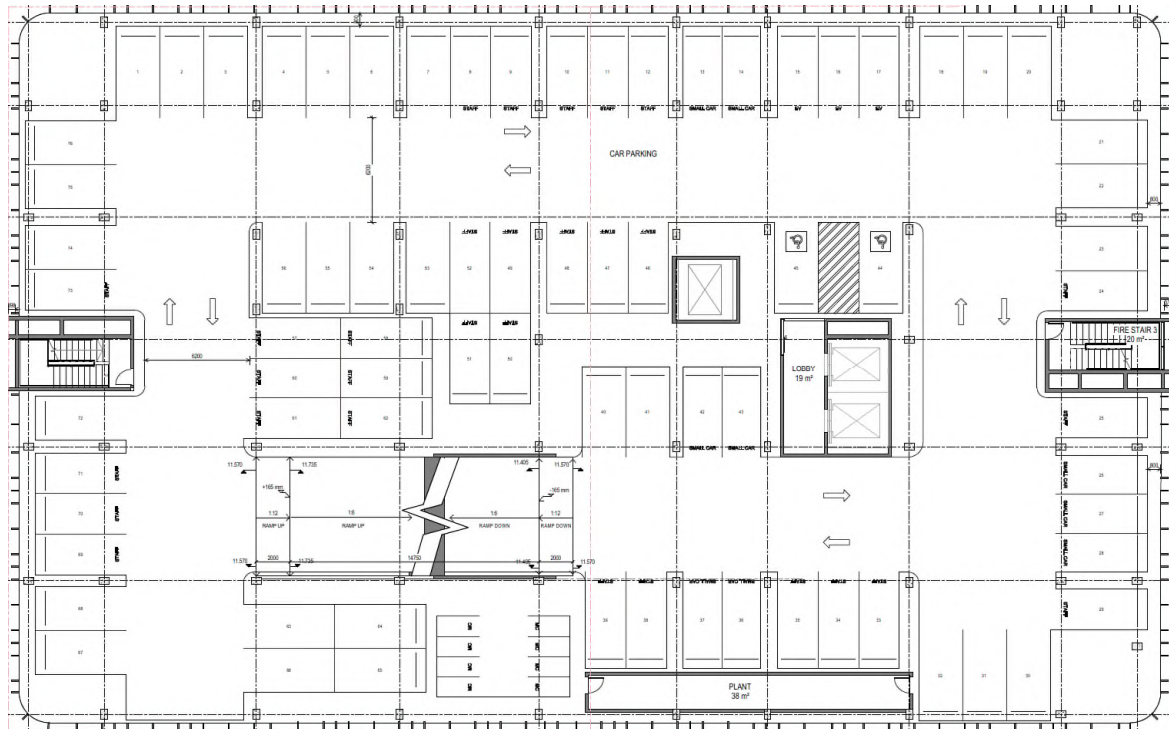


Figure 14: Level 02 Carparking (76 bays)

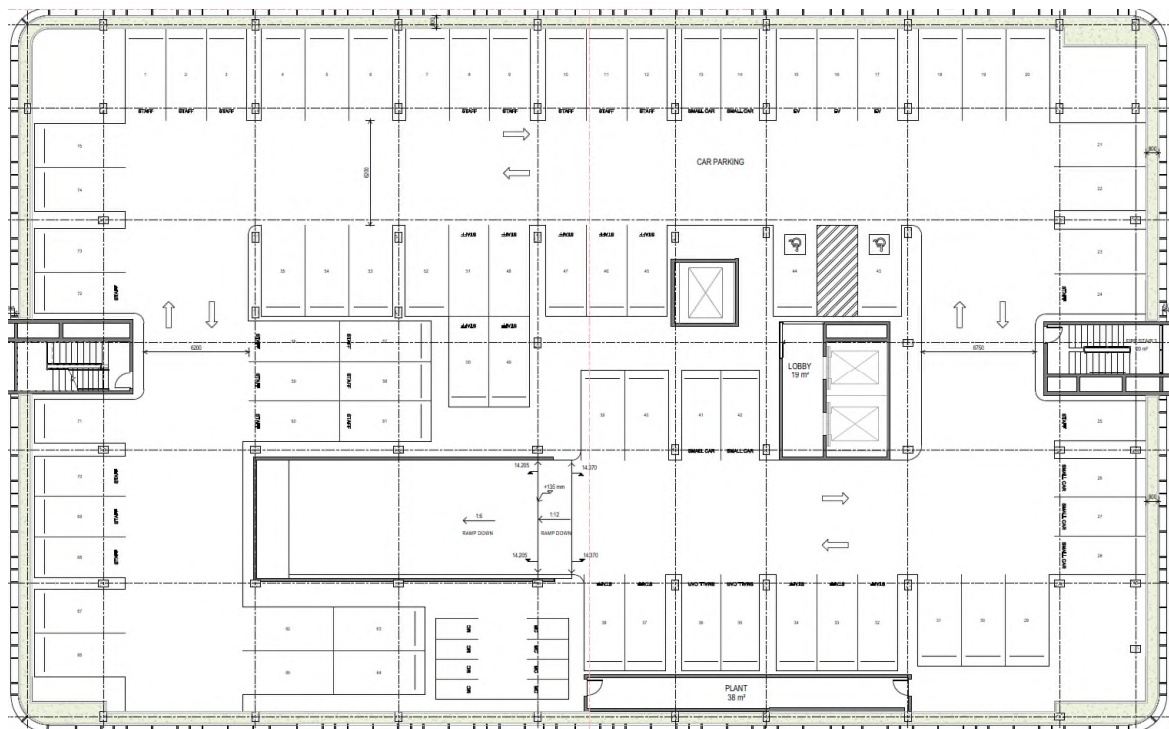


Figure 15: Level 03 Carparking (75 bays)

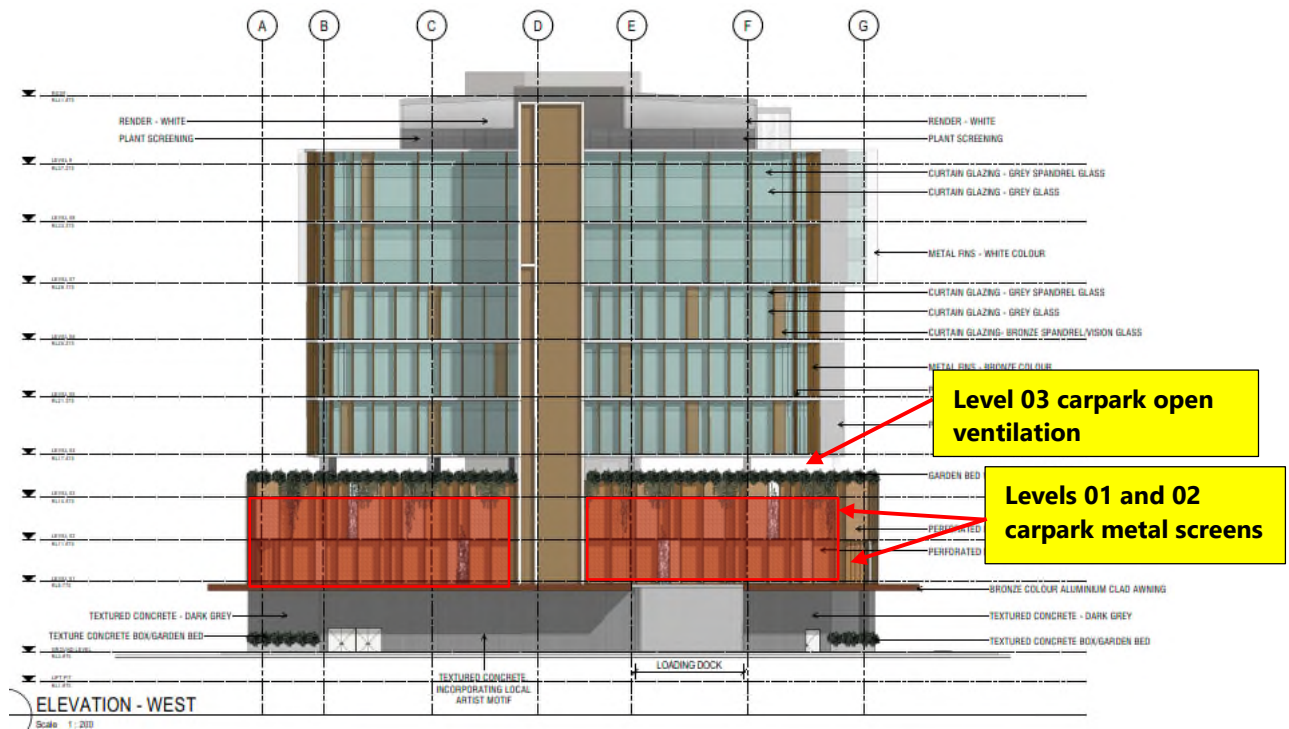


Figure 16: carpark ventilation via metal screens

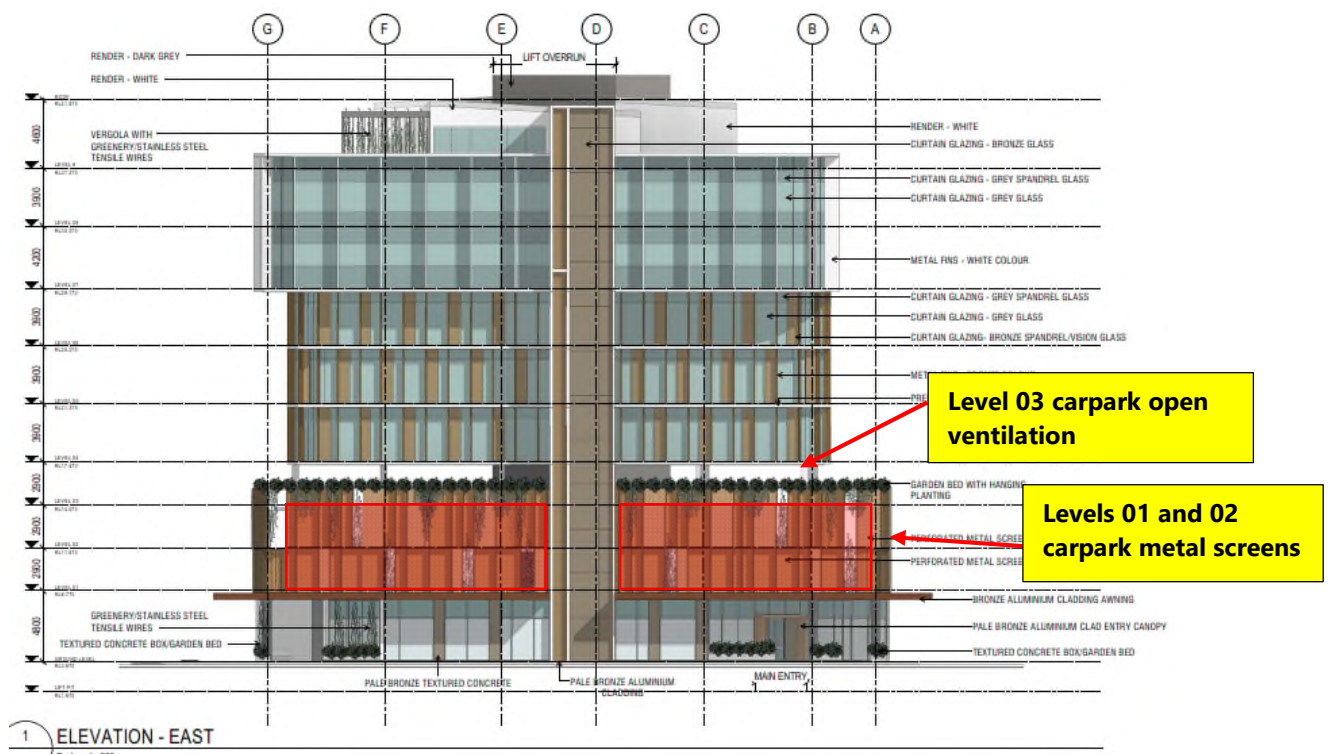


Figure 17: carpark ventilation via metal screens and openings



Figure 18: carpark ventilation via metal screens and openings

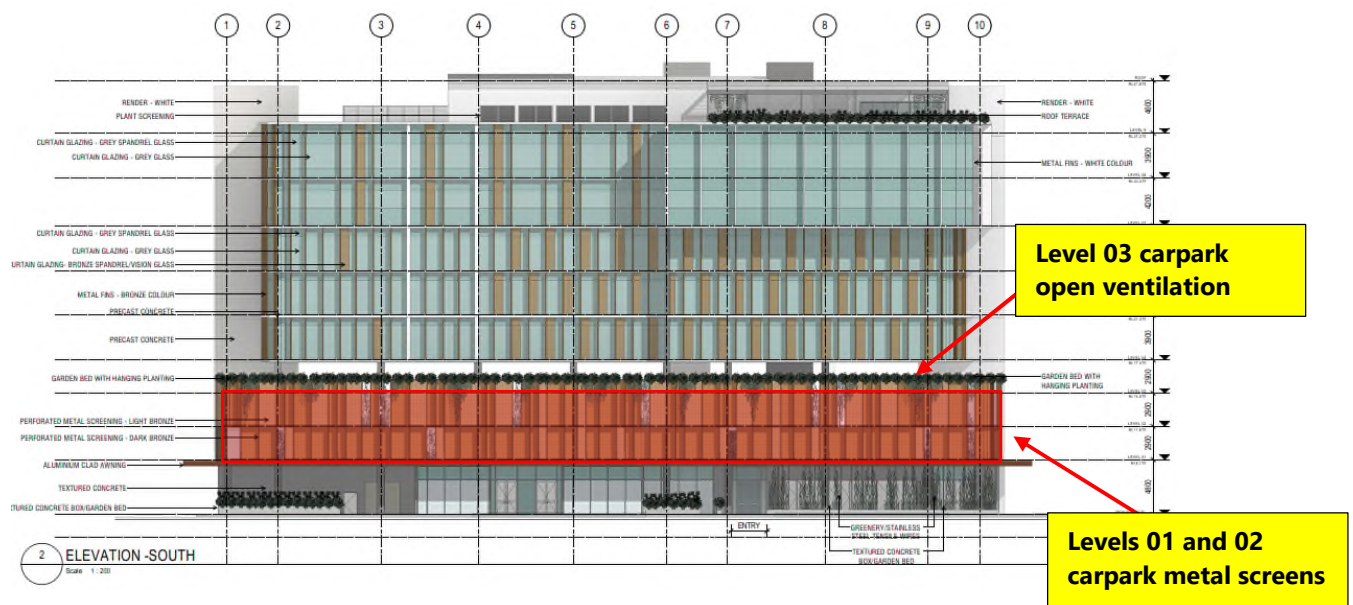


Figure 19: carpark ventilation via metal screens and openings

7.3 Noise Model

Predictions of noise emissions to the nearest noise sensitive receivers have been predicted using the CadnaA⁸ computer programme (Version 2021 MR) and compared against the criteria presented in Section 4.

The noise prediction models take account of:

- Location of noise sources and receiver locations;
- Height of sources and receivers;
- Separation distances between sources and receivers;
- Shielding from building structures;
- Attenuation from intervening structures.

7.4 Loading Dock

Noise generated by the proposed loading dock has been assessed using the noise sources shown in Table 6 below.

Table 6: Source noise levels for loading dock and truck activities (Sound Power Levels, L_w), dBA

Noise Source	Noise Descriptor	Overall dB(A)	Octave Band Centre Frequency - Hz (dB)							
			63	125	250	500	1k	2k	4k	8k
Truck – small rigid accelerating and moving (5km/h – L _w per metre)	L _{eq,15min}	64	71	62	63	60	59	58	52	46
Truck – HRV moving constant speed (10km/h – L _w per metre)	L _{eq}	92	103	92	88	91	87	83	79	-

Notes: Source - Renzo Tonin past project files and database

Table 7 presents predicted noise levels from loading dock activities at the nearest noise sensitive receivers surrounding the site.

Table 7: Predicted Noise Levels from Loading Dock Activities, dBA

Noise Sensitive Receiver	Occupancy	Loading Dock Noise
		L _{eq, adj} , 15 minutes
NSR1	Residential apartments	13
NSR2	Mixed use	0
NSR3	Commercial	0
NSR4	Commercial	0
NSR5	Commercial	18

⁸ CadnaA is a noise modeling program used for the calculation, presentation, assessment and prediction of environmental noise.

Table 7 shows noise levels based on one vehicle accessing and departing the loading dock based over 15 minutes complies with the residential noise criteria for day (56dBA L_{eq}), evening (50dBA L_{eq}) and night time (42dBA L_{eq}) periods.

Table 7 also shows noise levels comply with the commercial and retail noise criteria discussed in Section 5.2 of this report.

7.5 Carpark Noise

Noise generated by car park activities includes vehicle doors closing, vehicle engines starting, vehicles accelerating and vehicles moving.

The sound power levels generated by carpark activities on site are presented in the following table.

Table 8: Carpark activity sound power levels

Activity	Metric	Sound Power Level, dB(A) re. 1pW
Vehicle moving (10km/h)	Passby L_{weq}	79
Door Slam	SEL	86
Engine Start	SEL	92

The general residential noise criteria was determined as:

Day (7am to 6pm) 56dB(A) $L_{eq, adj, T}$

Evening (6pm to 10pm) 50dB(A) $L_{eq, adj, T}$

Night (10pm to 7am) 42dB(A) $L_{eq, adj, T}$

Where "T" is either a relevant representative 15 minutes or if the duration of the noise occurs for less than 15 minutes the duration of the noise source.

These levels are considered component noise levels.

The worst-case scenario for car park activities is during peak hours where up to 211 vehicles may use the car park, as described in Table 9.

Table 9: Peak Hourly Vehicle Movements within Carpark

Period	Peak Hourly Vehicle Movements within Car Park
AM Peak	211 cars
PM Peak	211 cars

For assessment purposes we assume a maximum of 53 vehicle movements over any 15 minutes within the carpark during the AM or PM peak hour period.

Table 10 presents predicted noise levels at the nearest noise sensitive receivers surrounding the existing and new car parks modelling up to $(211 / 4 =)$ 53 peak vehicle movements (within 15 minutes).

Table 10: Predicted Noise Levels

Noise Sensitive Receiver	Occupancy	Predicted Carpark Noise dBA Leq, adj, 15 minutes	Complies with noise criteria?
NSR1	Residential apartments	34	Yes
NSR2	Mixed use	42	Yes
NSR3	Commercial	45	Yes
NSR4	Commercial	23	Yes
NSR5	Commercial	36	Yes

Table 10 shows carpark noise emissions are predicted to comply with the daytime peak period of up to 53 vehicle movements (15 minutes).

Carpark noise emissions are expected to be minimal during evening and night time periods with fewer cars entering the carpark levels.

Table 10 also shows noise levels comply with the commercial and retail noise criteria discussed in Section 5.2 of this report.

8 Internal noise from mechanical plant

The mechanical services for the building will be designed to ensure that the limits previously presented in Table 4 in Section 4.4 of this report are achieved. These limits will be co-ordinated with Mechanical Engineer's design.

The design and installation of the mechanical plant will need to ensure that noise breakout and duct-borne noise from each plantroom will not cause a problem. Isolation of the mechanical plant to prevent vibrations from entering the building structure will also need to be addressed.

Acoustic lagging, cladding and bulkheads may be required to minimise case radiated breakout noise.

Vibration transfer and structure borne noise may occur if not treated adequately.

To minimise the potential transmission of vibration to the building fabric by the following

- Balancing – All rotating equipment such as fans, pumps, centrifugal compressors etc. complete with pulleys, couplings, belts etc. should be statically and dynamically balanced.
- Mountings – Equipment should be mounted on rigid bases supported by vibration isolators.
- Inertia Blocks – Inertia blocks should be provided for equipment where limiting the amplitude of vibration is required.
- All fans should be isolated from duct work with flexible connections.

9 Conclusion

Renzo Tonin & Associates was engaged to prepare a noise impact assessment for the proposed Maroochydore Private Hospital to be located on Lots J1 and J2 at Mundoo Boulevard, Maroochydore.

The following acoustic issues have been assessed in this report:

- Noise intrusion from external sources (local mechanical plant and traffic noise);
- Noise emissions from steady state noise sources (mechanical plant), and;
- Noise emissions from non-steady state noise sources (truck deliveries and carpark movements).

Noise Intrusion

External noise levels around 60dBA L_{eq} may be expected around the building façade.

We recommend all façade glazing assembly should have a minimum acoustic rating of Rw35 or higher. A performance rating of Rw 35 may be achieved using heavier laminated glass such as 10.38mm glass or 6.5mm VLam Hush glass in an appropriate aluminium framing system.

Noise Emissions from Steady State Sources

Noise emission limits from future mechanical plant have been derived in Sections 5.2 and 5.3. The types of mechanical plant are not yet known. Once new plant is selected, noise emission calculations will be conducted, and acoustic advice provided for possible noise control treatment in order to achieve compliance with the applicable noise limits.

Noise Emissions from Non - Steady State Sources

Noise emissions from the loading dock area on Ground Level were predicted to comply with noise limits at the nearest residential, commercial and retail receivers. No additional noise control treatment is required.

Noise emissions from use of the carpark areas located on Levels 1, 2 and 3 were predicted to comply with noise limits at the nearest residential, commercial and retail receivers. No additional noise control treatment is required.

For assessment purposes we assume a conservative maximum of 53 vehicle movements over any 15 minutes within the carpark during the AM or PM peak hour period.

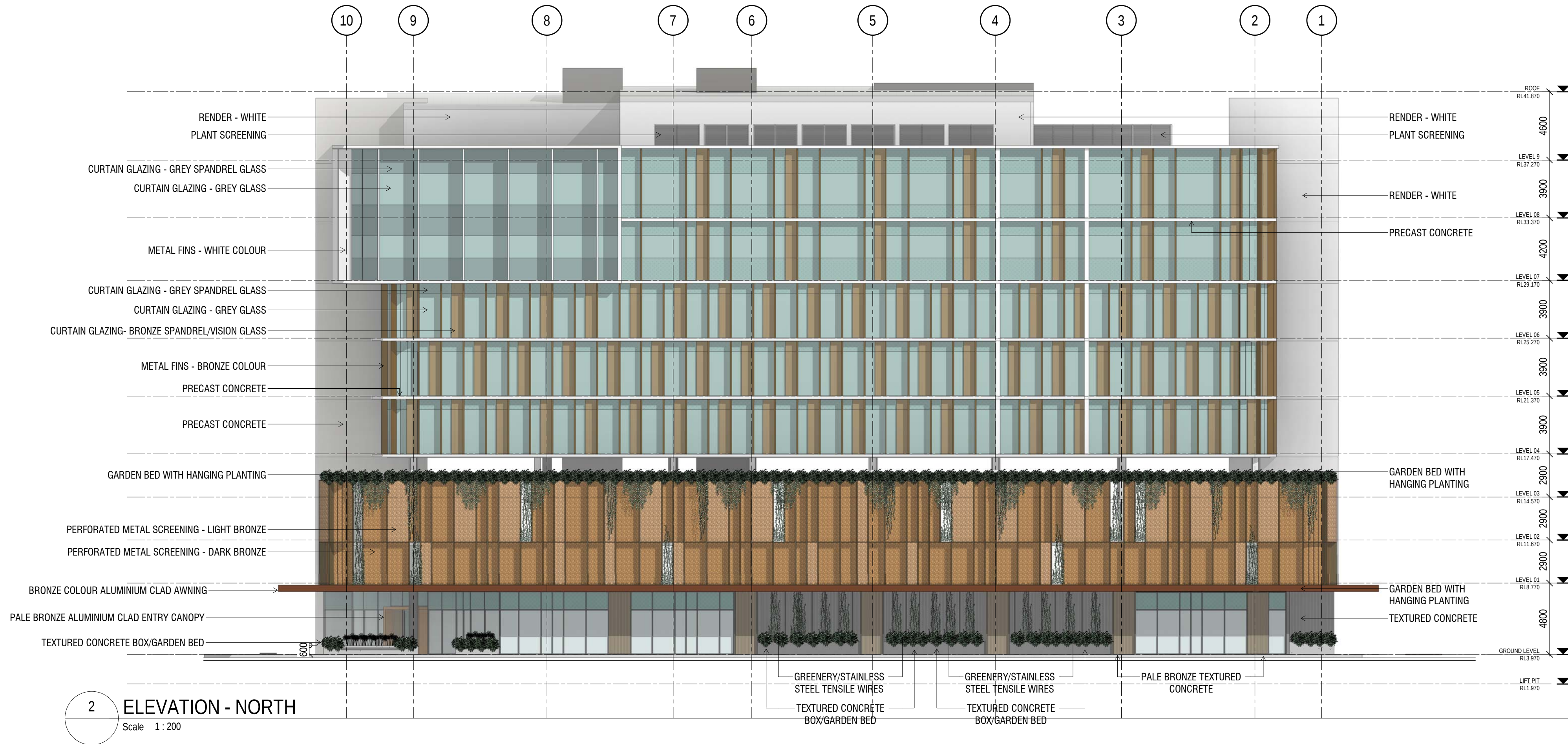
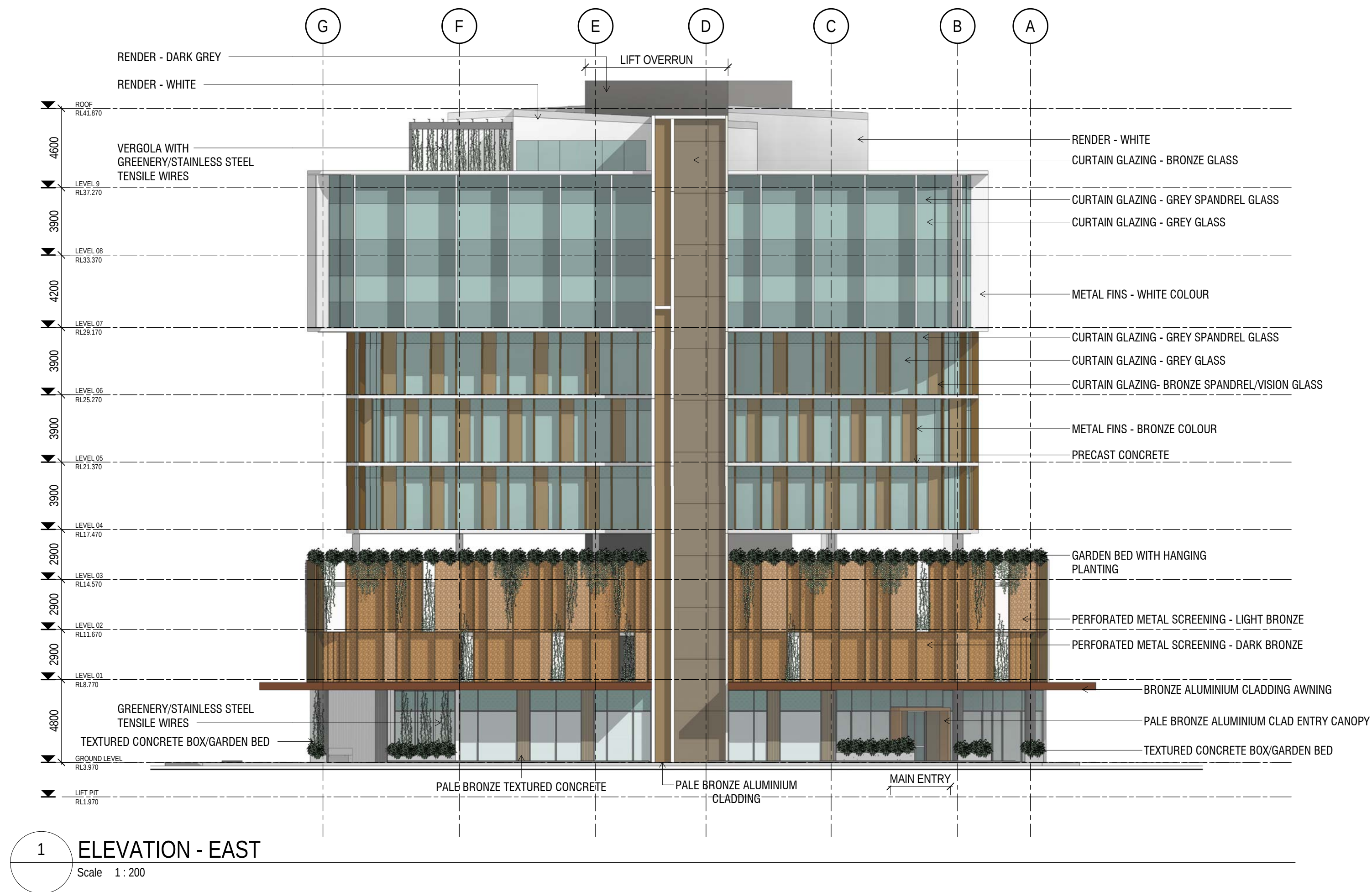
APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).																																								
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.																																								
Assessment period	The period in a day over which assessments are made.																																								
Assessment Point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.																																								
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).																																								
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment: <table><tr><td rowspan="2">threshold of hearing</td><td>0 dB</td><td>The faintest sound we can hear</td></tr><tr><td>10 dB</td><td>Human breathing</td></tr><tr><td rowspan="2">almost silent</td><td>20 dB</td><td></td></tr><tr><td>30 dB</td><td>Quiet bedroom or in a quiet national park location</td></tr><tr><td rowspan="2">generally quiet</td><td>40 dB</td><td>Library</td></tr><tr><td>50 dB</td><td>Typical office space or ambience in the city at night</td></tr><tr><td rowspan="2">moderately loud</td><td>60 dB</td><td>CBD mall at lunch time</td></tr><tr><td>70 dB</td><td>The sound of a car passing on the street</td></tr><tr><td rowspan="2">loud</td><td>80 dB</td><td>Loud music played at home</td></tr><tr><td>90 dB</td><td>The sound of a truck passing on the street</td></tr><tr><td rowspan="2">very loud</td><td>100 dB</td><td>Indoor rock band concert</td></tr><tr><td>110 dB</td><td>Operating a chainsaw or jackhammer</td></tr><tr><td rowspan="2">extremely loud</td><td>120 dB</td><td>Jet plane take-off at 100m away</td></tr><tr><td>130 dB</td><td></td></tr><tr><td>threshold of pain</td><td>140 dB</td><td>Military jet take-off at 25m away</td></tr></table>			threshold of hearing	0 dB	The faintest sound we can hear	10 dB	Human breathing	almost silent	20 dB		30 dB	Quiet bedroom or in a quiet national park location	generally quiet	40 dB	Library	50 dB	Typical office space or ambience in the city at night	moderately loud	60 dB	CBD mall at lunch time	70 dB	The sound of a car passing on the street	loud	80 dB	Loud music played at home	90 dB	The sound of a truck passing on the street	very loud	100 dB	Indoor rock band concert	110 dB	Operating a chainsaw or jackhammer	extremely loud	120 dB	Jet plane take-off at 100m away	130 dB		threshold of pain	140 dB	Military jet take-off at 25m away
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dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.																																								
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.																																								

Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.
L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L _{eq} sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Architectural Drawings



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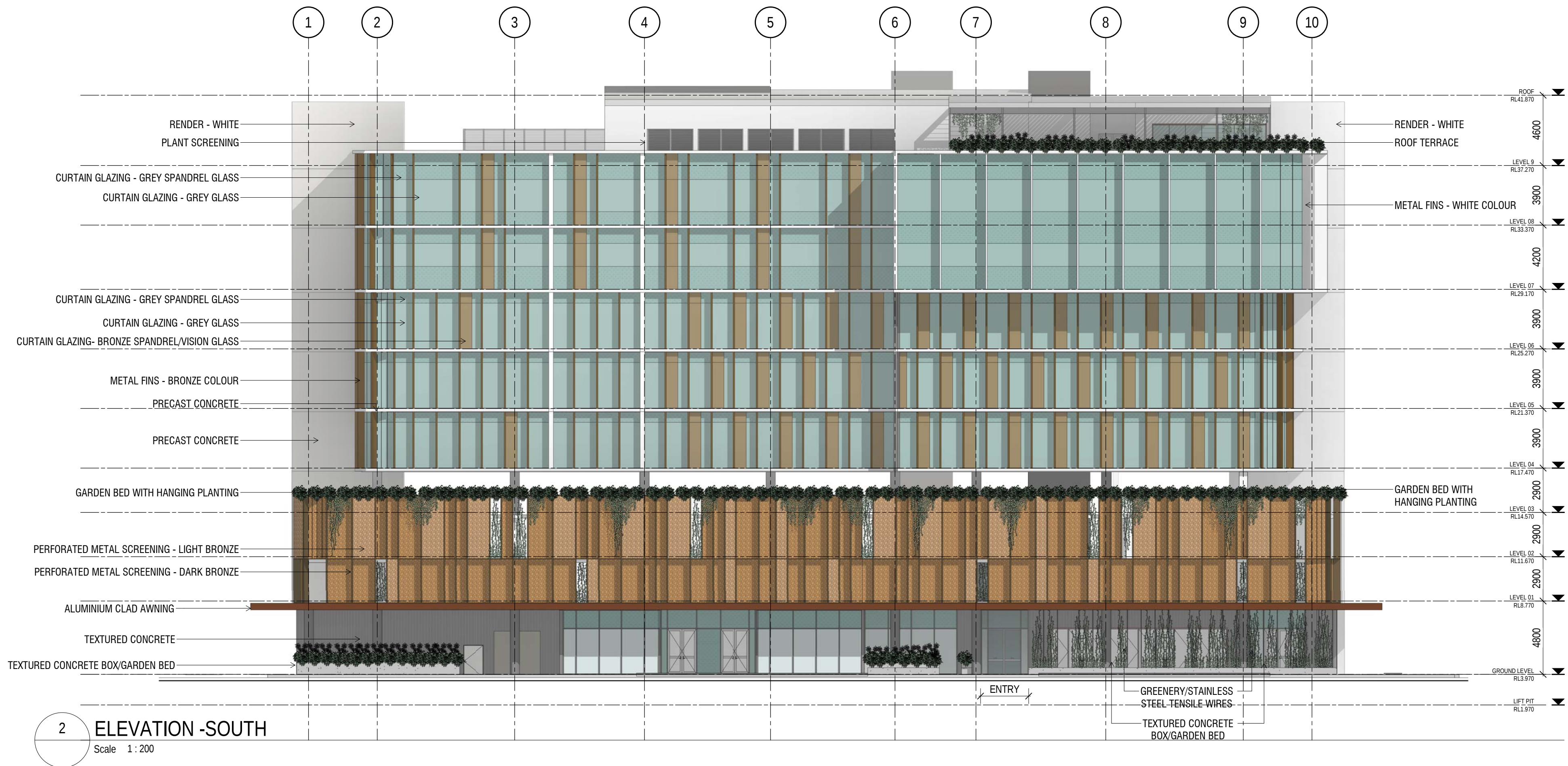
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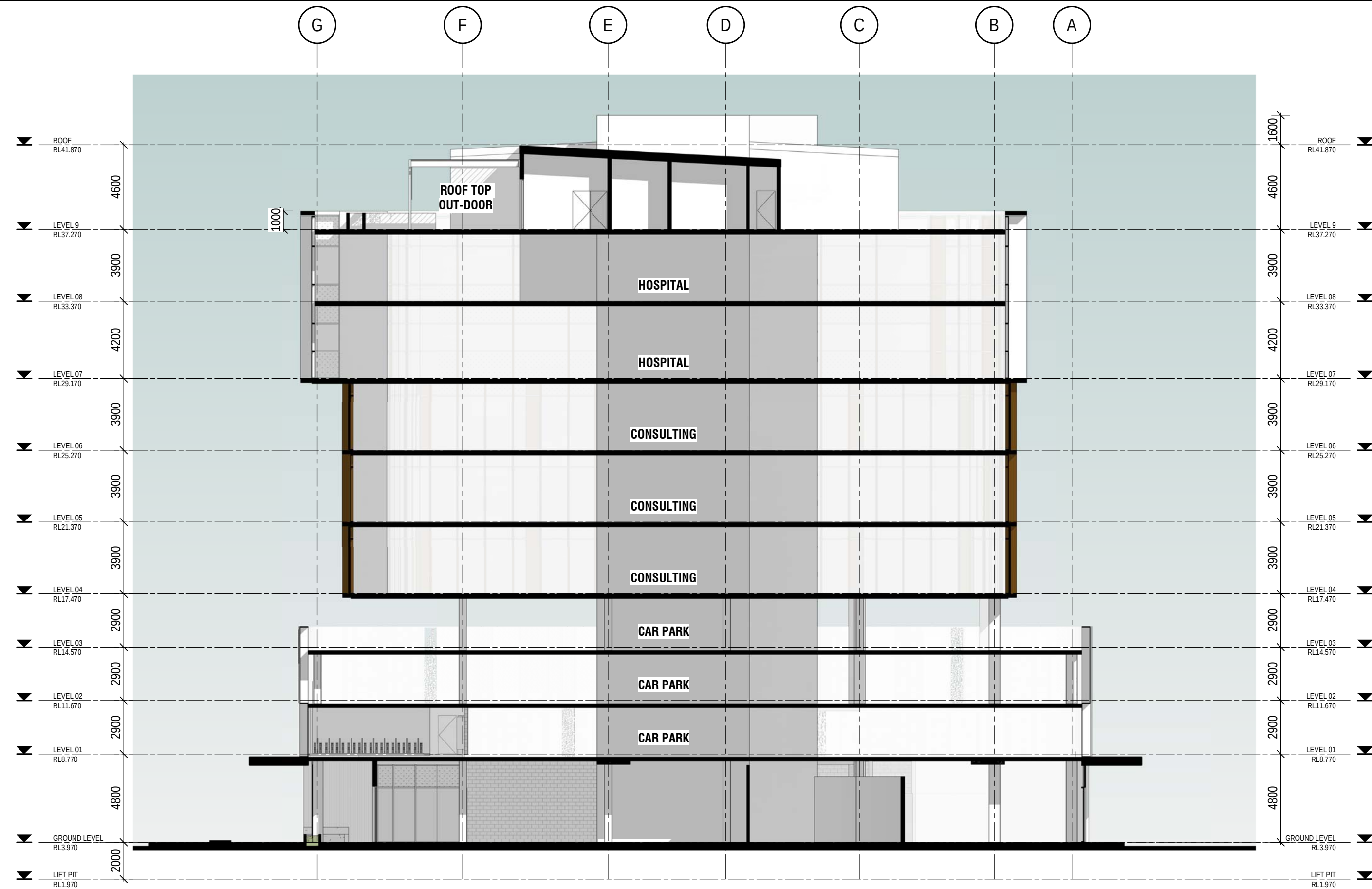
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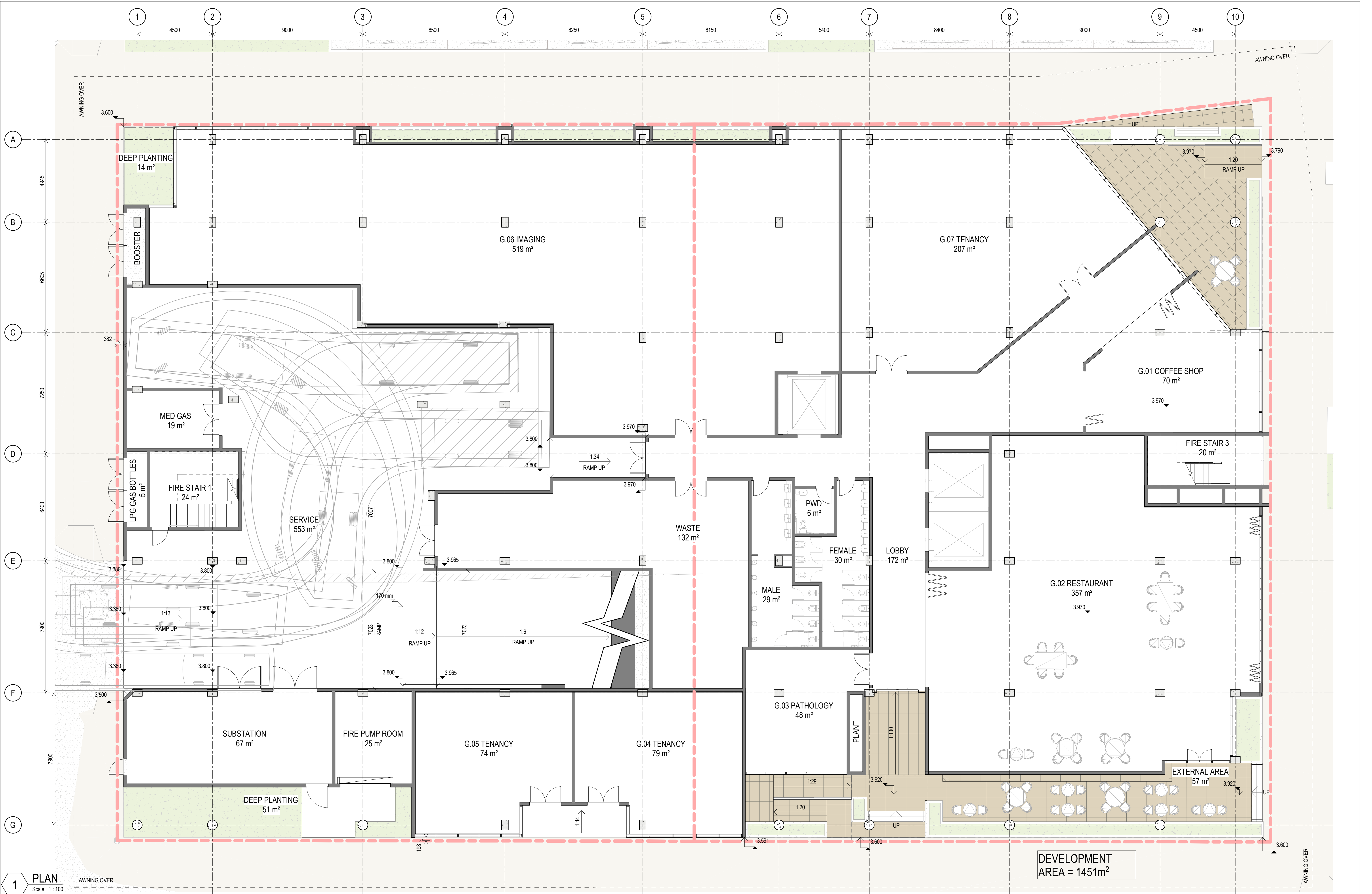
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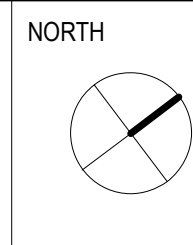
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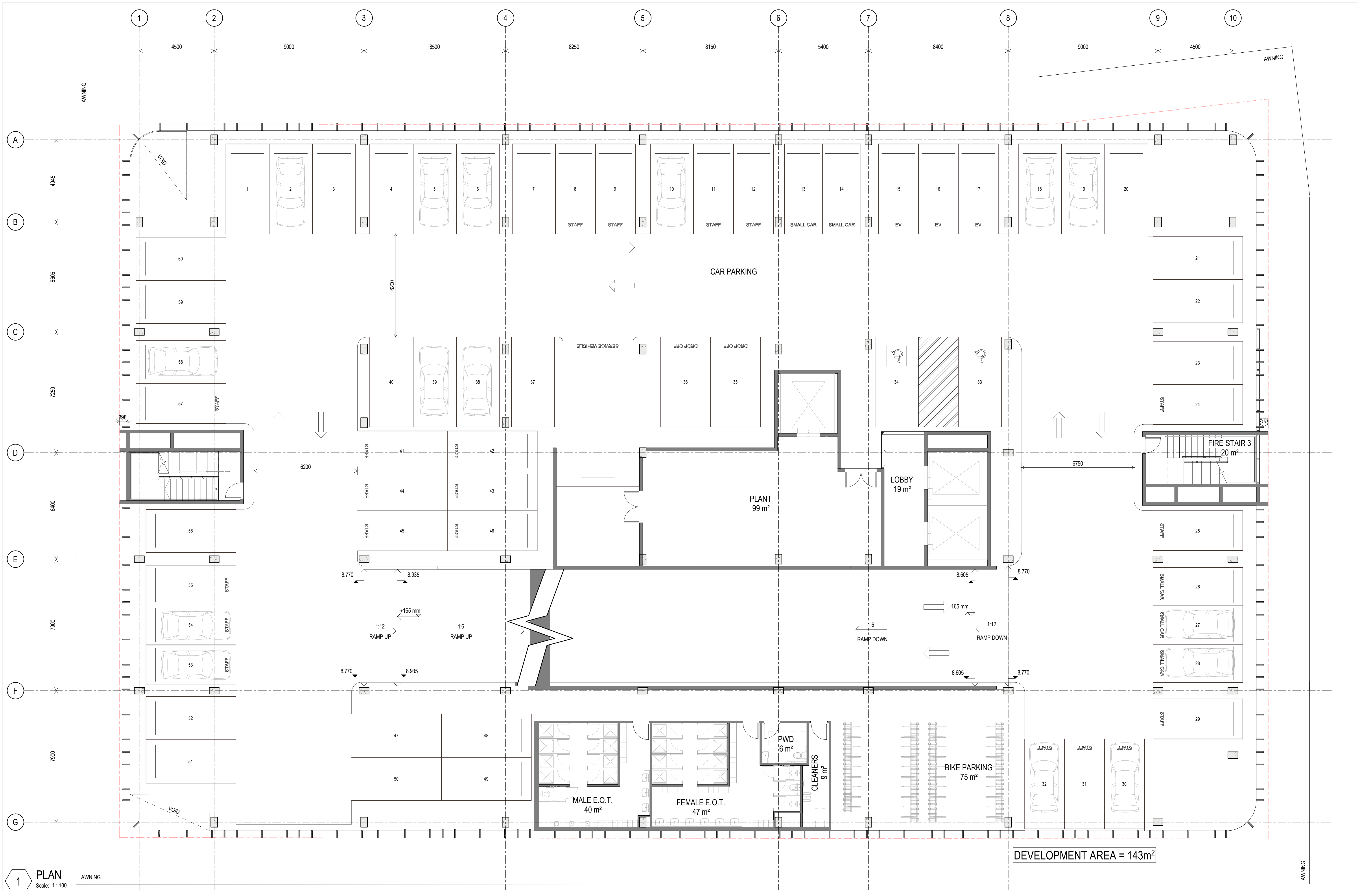
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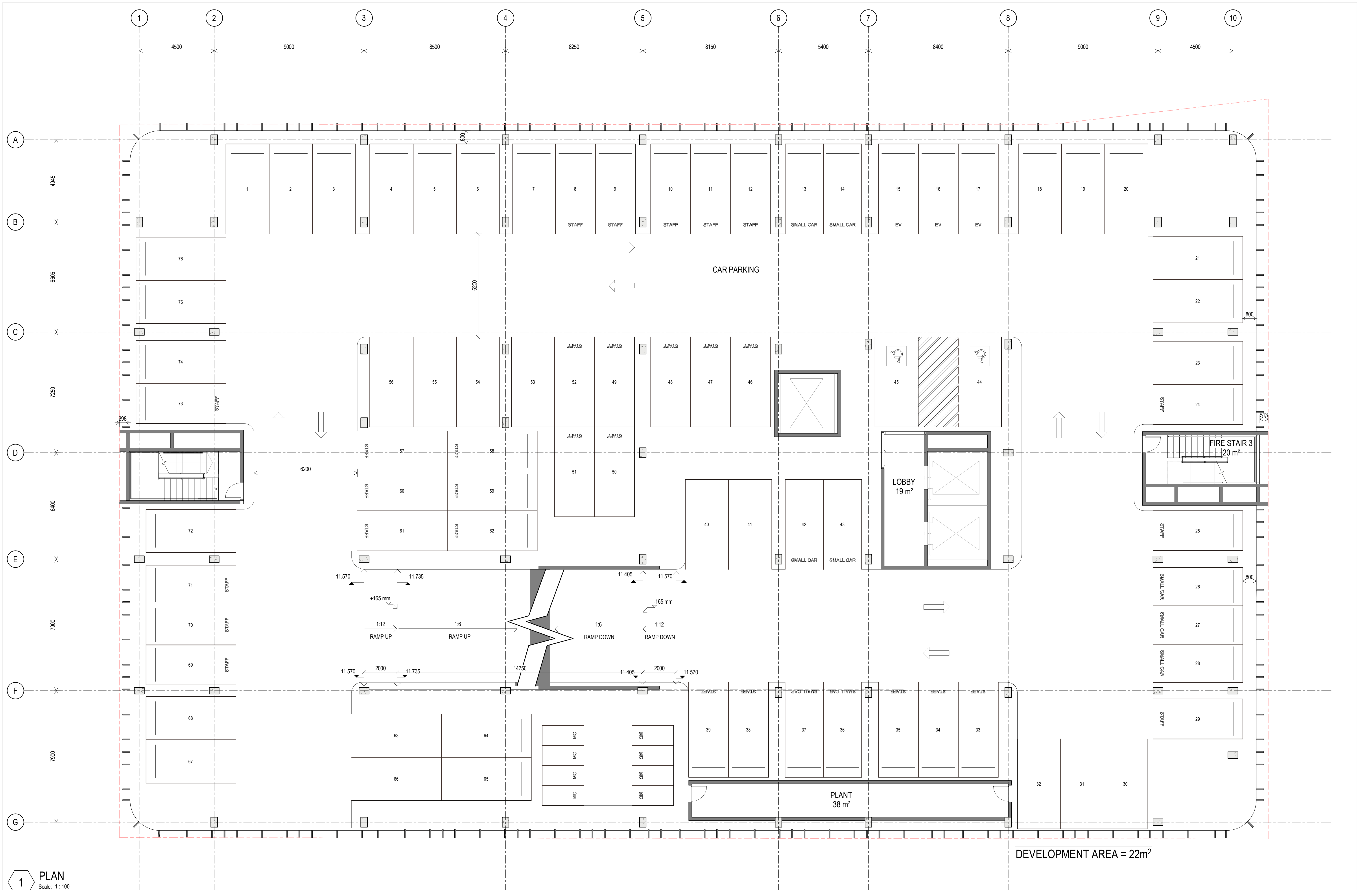
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B	CLIENT REVIEW	DSJ	IMP	10.09.21
C	FOR COORDINATION	DSJ	MP	16.09.21
D	SUN CENTRAL SUBMISSION	DH	PB	08.11.21

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STATUS

PRELIMINARY

0m

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NORTH

CLIENT

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BRISBANE

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bne@modedesign.com.au

ABN: 65 112 807 931

HSPC

HEALTH ARCHITECTS

PROJECT

PARKVIEW PLACE

Maroochydore Health Centre

DRAWING TITLE

FLOOR PLAN - LEVEL 03

DRAWN

DSJ

ISSUE

08/11/2021 12:03:24 PM

PROJECT No

20673

STAGE

DD

CHECKED

MP

SCALE @ A1

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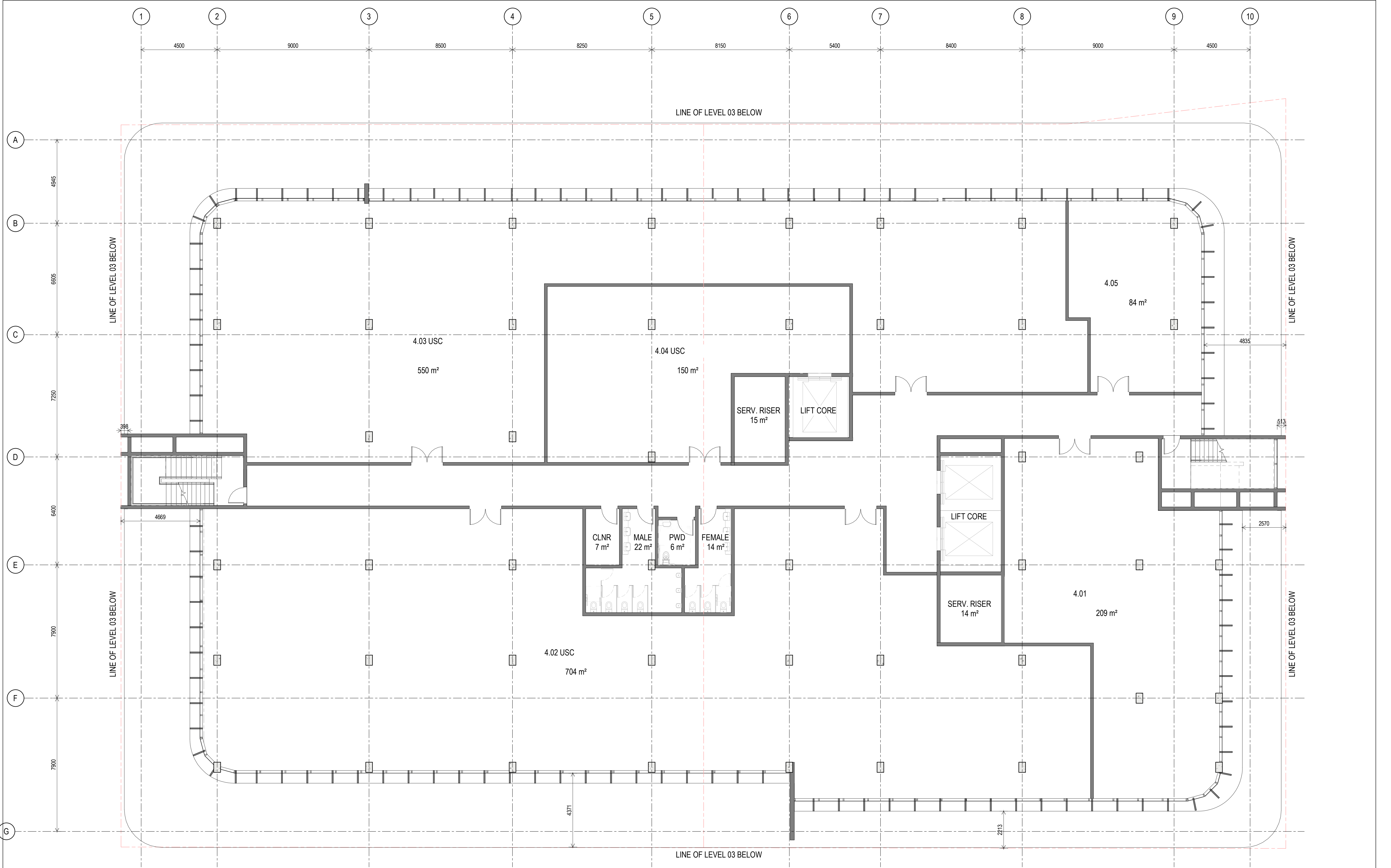
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MMX-AR-1003

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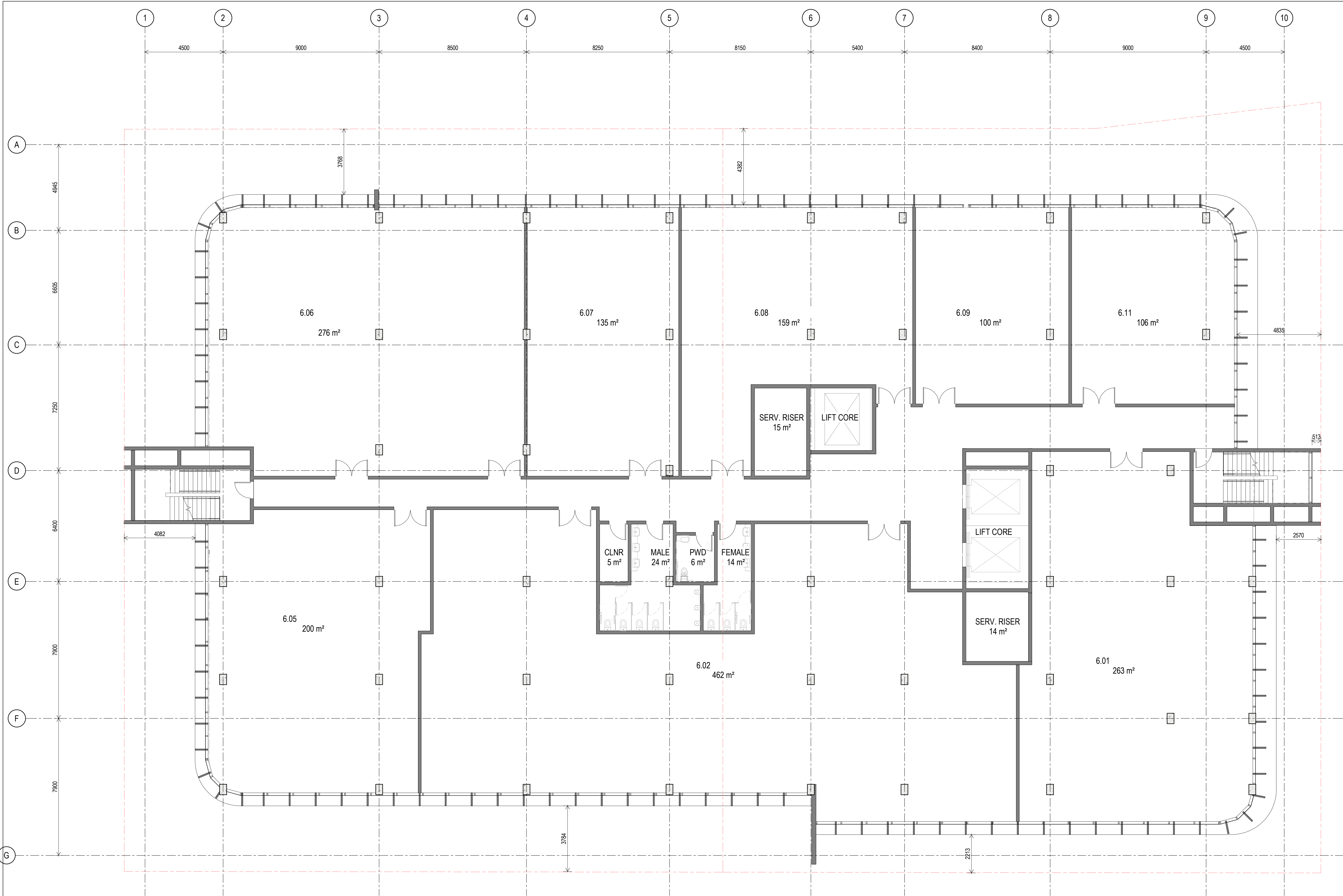


1

PLAN
Scale: 1:100

DEVELOPMENT AREA = 1973m²

REV	DESCRIPTION	AUTH	CHK	DATE	- These designs and plans are the copyright of MODE DESIGN Corp. Pty Ltd and cannot be reproduced without written permission. - Verify all dimensions on site prior to commencement of work. - DO NOT scale off these drawings. - Report any discrepancies to the architect before carrying out any work.	STATUS PRELIMINARY	NORTH	CLIENT BARWON INVESTMENT PARTNERS BARWON	BRISBANE Plaza Level, Mosaic 826 Ann St Fortitude Valley QLD 4006 T +61 7 3253 9900 bne@modedesign.com.au ABN: 65 112 807 931	HSPC HEALTH ARCHITECTS	PROJECT PARKVIEW PLACE Maroochydore Health Centre	DRAWING TITLE FLOOR PLAN - LEVEL 04	DRAWN DSJ	CHECKED MP	STAGE DD	DRAWING No MMX-AR-1004	REVISION D
A	DESIGN DEVELOPMENT	DSJ	IMP	27.08.21													
B	CLIENT REVIEW	DSJ	IMP	10.09.21													
C	FOR COORDINATION	DSJ	IMP	16.09.21													
D	SUN CENTRAL SUBMISSION	DH	PB	08.11.21													

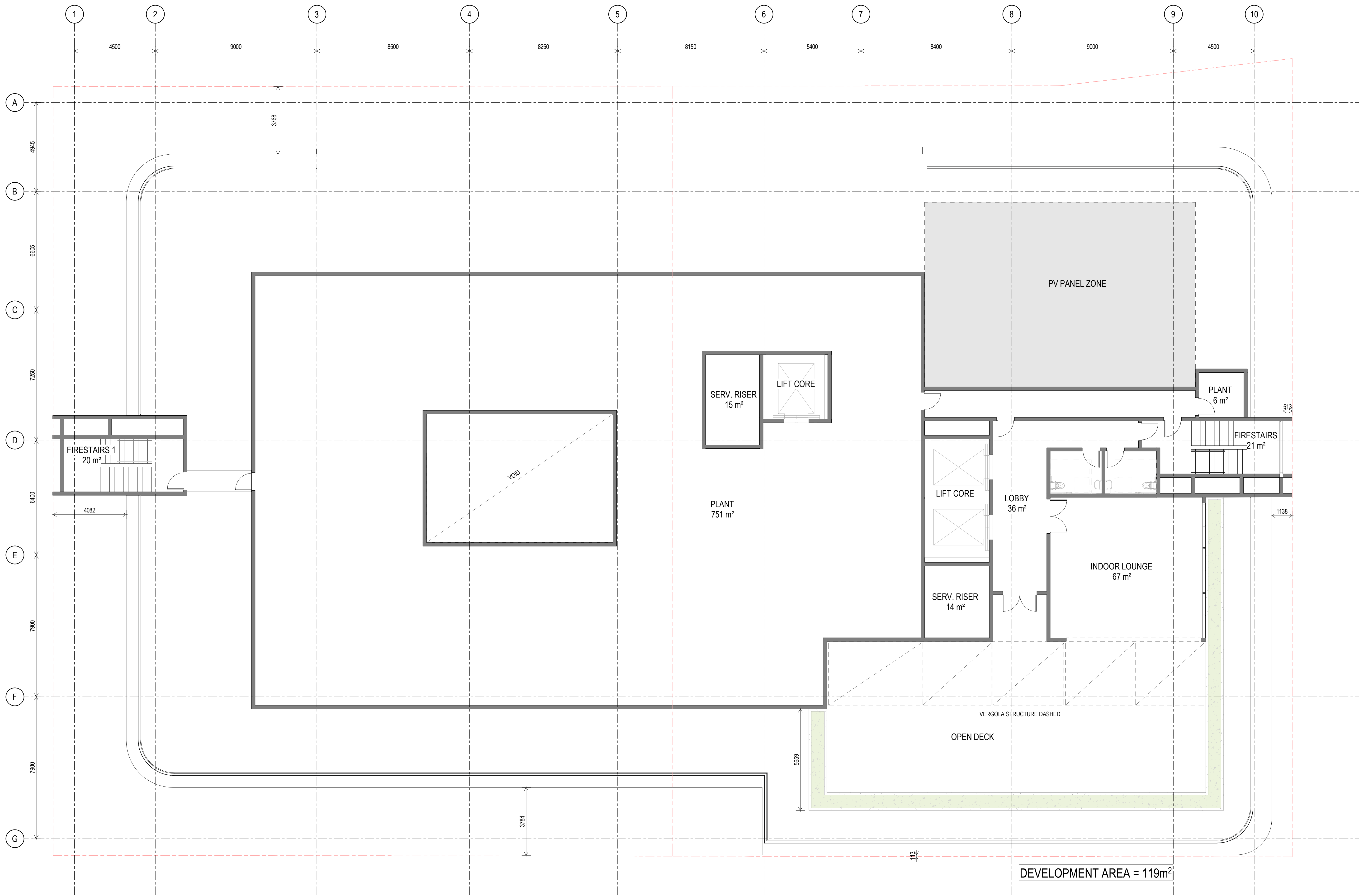




DEVELOPMENT AREA = 2098m²

REV	DESCRIPTION	AUTH	CHK	DATE	• These designs and plans are the copyright of MODE DESIGN Corp. Pty Ltd and cannot be reproduced without written permission. • Verify all dimensions on site prior to commencement of work. • DO NOT scale off these drawings. • Report any discrepancies to the architect before carrying out any work.	STATUS PRELIMINARY 0m12345	NORTH	CLIENT BARWON INVESTMENT PARTNERS	BRISBANE Plaza Level, Mosaic 826 Ann St Fortitude Valley QLD 4006 T +61 7 3253 9900 bne@modedesign.com.au ABN: 65 112 807 931	PROJECT PARKVIEW PLACE Maroochydore Health Centre	DRAWING TITLE FLOOR PLAN - LEVEL 07	DRAWN DSJ		CHECKED MP	
A	DESIGN DEVELOPMENT	DSJ	MP	27.08.21								ISSUE 08/11/2021 12:03:46 PM	SCALE @ A1 1: 100		
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C	FOR COORDINATION	DSJ	MP	16.09.21											
D	SUN DESIGN SUBMISSION	DH	PB	08.11.21											

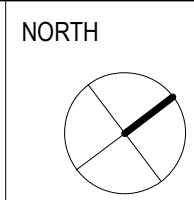
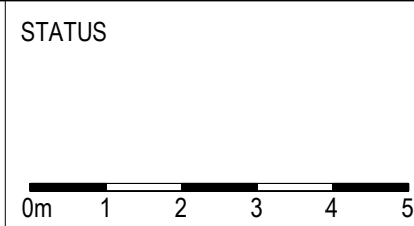
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DEVELOPMENT AREA = 119m²

REV	DESCRIPTION	AUTH	CHK	DATE
A	SUN CENTRAL SUBMISSION	DH	PB	08.11.21

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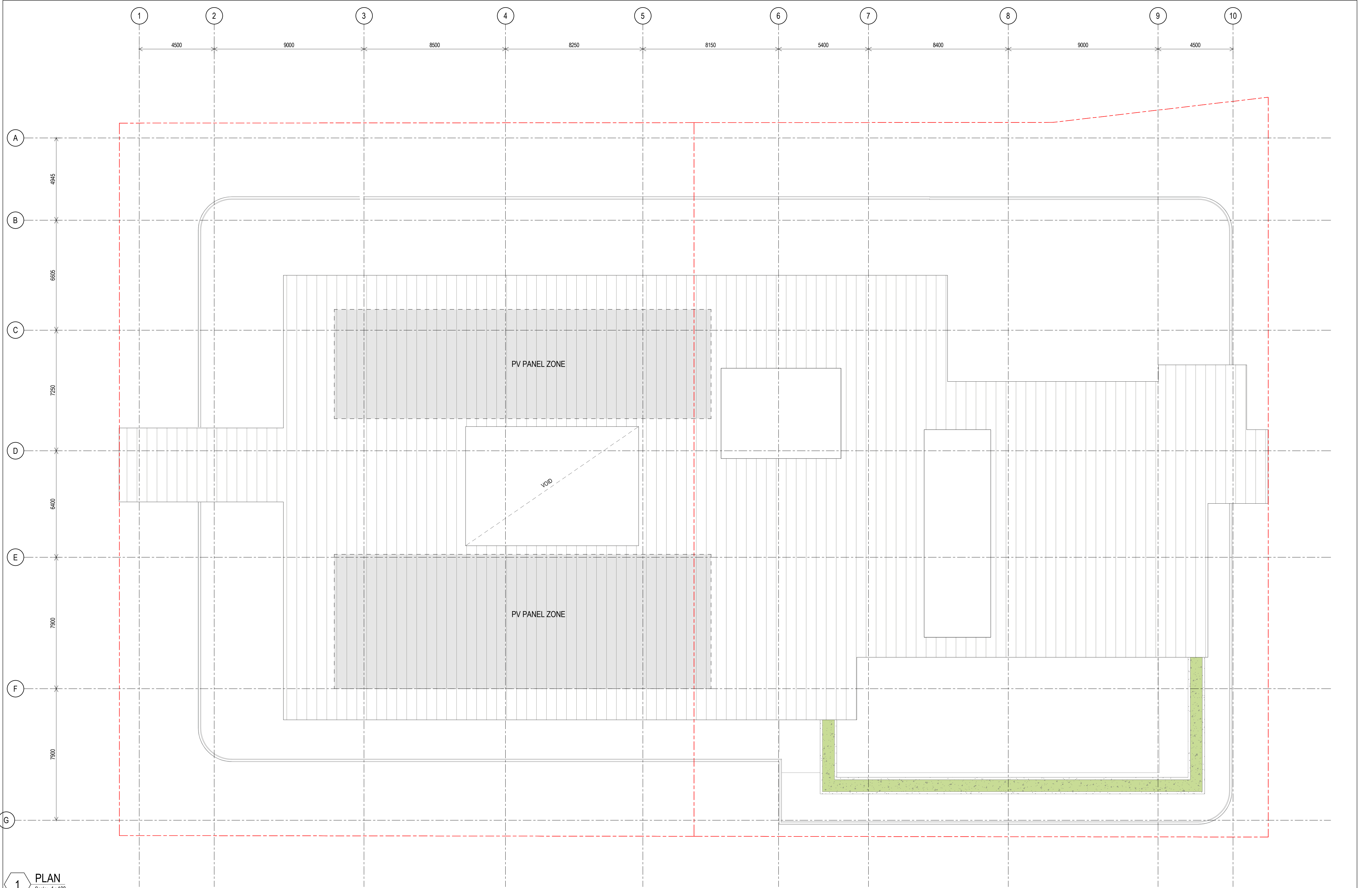
HSPC
HEALTH ARCHITECTS

PROJECT
PARKVIEW PLACE
Maroochydore Health Centre

DRAWING TITLE
FLOOR PLAN - LEVEL 09

DRAWN Author	CHECKED Checker
ISSUE 08/11/2021 12:05:39 PM	SCALE @ A1 1:100
PROJECT No 20673	STAGE DD
DRAWING No MMX-AR-1009	REVISION A

08/11/2021 12:05:39 PM



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PLAN

Scale: 1 : 100

REV	DESCRIPTION	AUTH	CHK	DATE
A	DESIGN DEVELOPMENT	DSJ	IMP	27.08.21
B	FOR COORDINATION	DSJ	IMP	16.09.21
C	SUN CENTRAL SUBMISSION	DH	PB	08.11.21

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STATUS

PRELIMINARY

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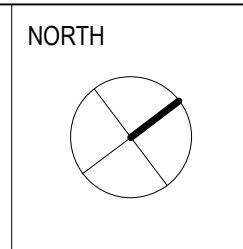
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PROJECT

PARKVIEW PLACE

Maroochydore Health Centre

DRAWING TITLE

ROOF PLAN

DRAWN	DSJ	CHECKED	MP
ISSUE	08/11/2021 12:04:04 PM	SCALE @ A1	1 : 100
PROJECT No	20673	STAGE	DD
DRAWING No	MMX-AR-1010	REVISION	C

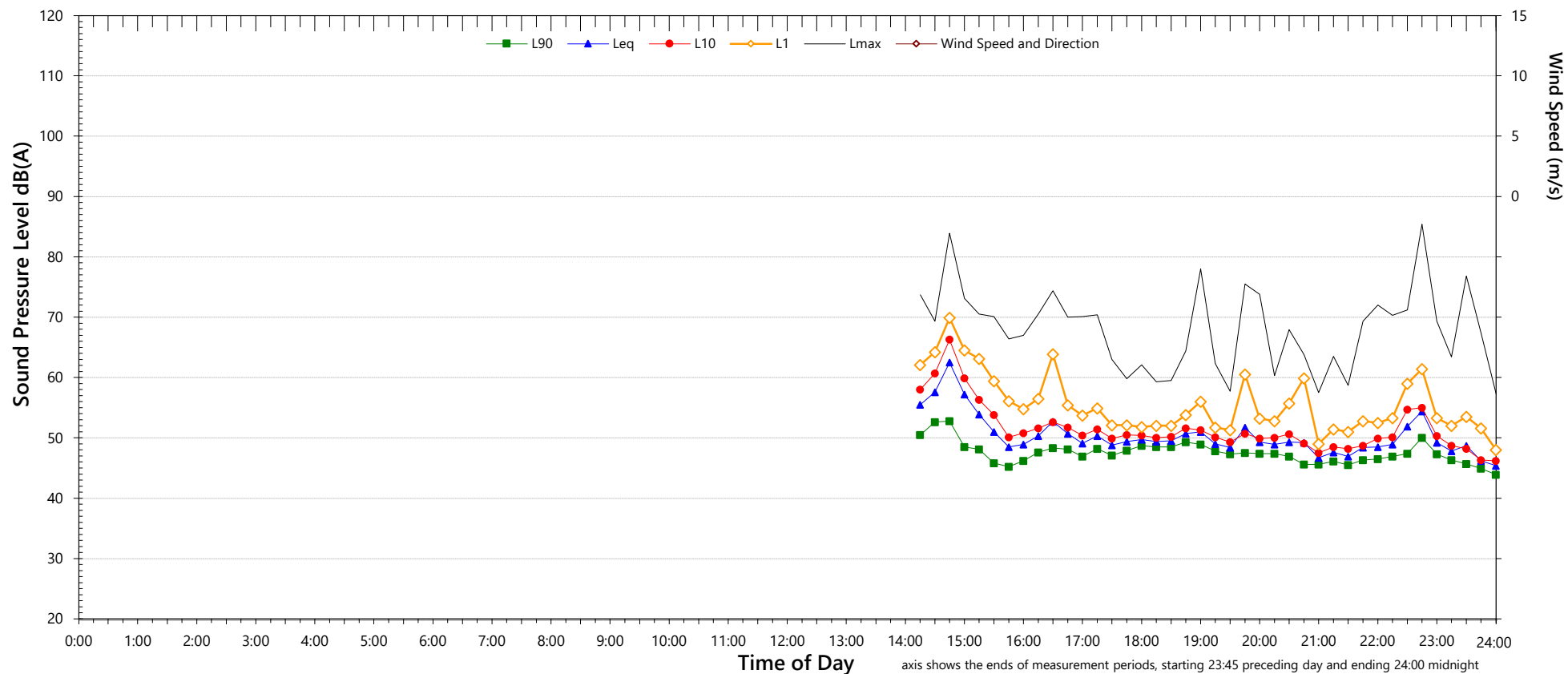
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APPENDIX C Ambient Noise Monitoring Results

Unattended Noise Monitoring Results

Mundoo Bvd Maroochydore (UTM: 909016mE, 7051462mS)

Friday, 25 June 2021



Representative Noise Levels			
Descriptor	Day	Evening	Night ²
	7am-6pm	6pm-10pm	10pm-7am
Lmax	70	65	59
L ₁	58	53	48
L ₁₀	54	50	45
L ₉₀	47	46	37
Leq	55	49	51

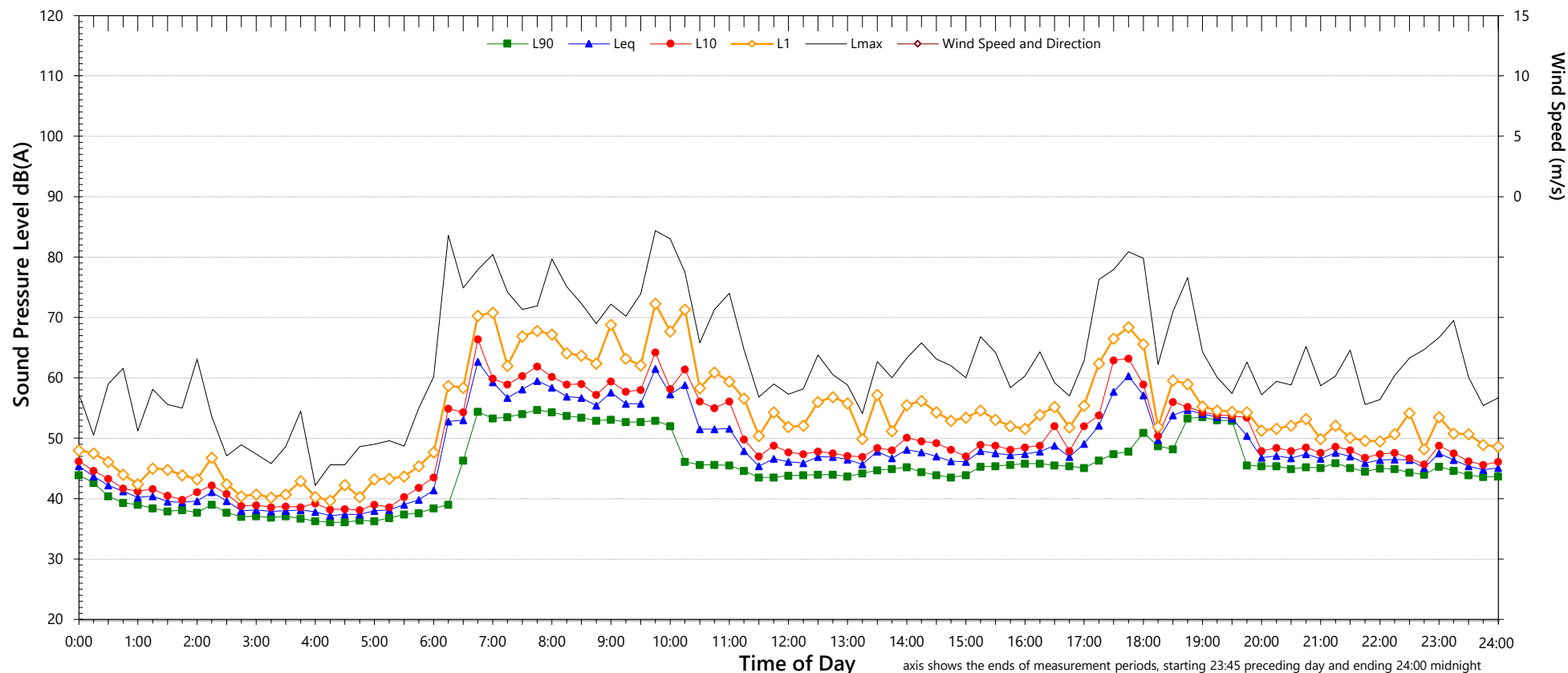
Notes:

1. Grey areas indicate periods of time that are either affected by rain, wind or other extraneous factors
2. Graphed & tabulated data measured in free-field

Unattended Noise Monitoring Results

Mundoo Bvd Maroochydore (UTM: 909016mE, 7051462mS)

Saturday, 26 June 2021



Representative Noise Levels			
Descriptor	Day	Evening	Night ²
	7am-6pm	6pm-10pm	10pm-7am
Lmax	67	62	58
L ₁	59	53	48
L ₁₀	53	51	44
L ₉₀	44	45	37
Leq	54	51	43

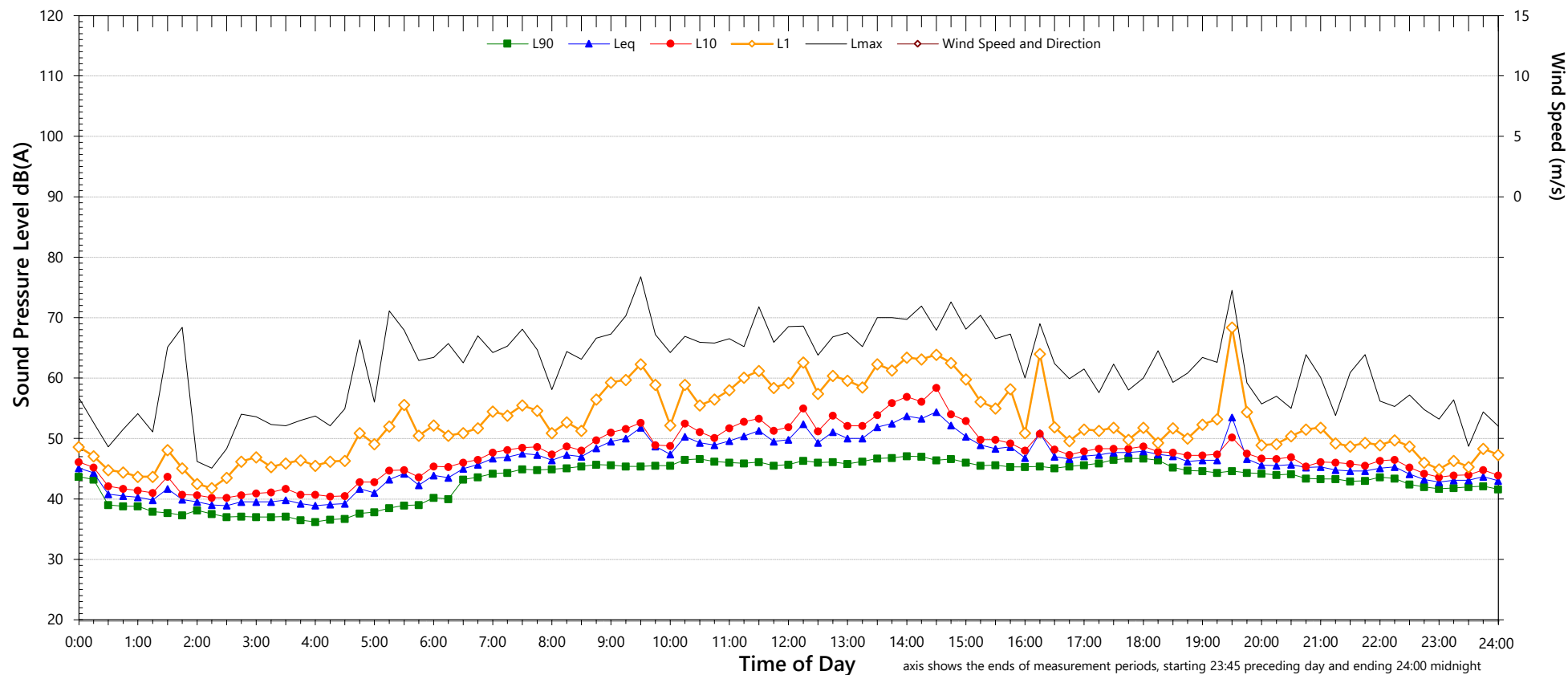
Notes:

1. Grey areas indicate periods of time that are either affected by rain, wind or other extraneous factors
2. Graphed & tabulated data measured in free-field

Unattended Noise Monitoring Results

Mundoo Bvd Maroochydore (UTM: 909016mE, 7051462mS)

Sunday, 27 June 2021



Representative Noise Levels			
Descriptor	Day	Evening	Night ²
	7am-6pm	6pm-10pm	10pm-7am
Lmax	66	61	61
L ₁	57	52	51
L ₁₀	51	47	46
L ₉₀	45	43	38
Leq	50	47	52

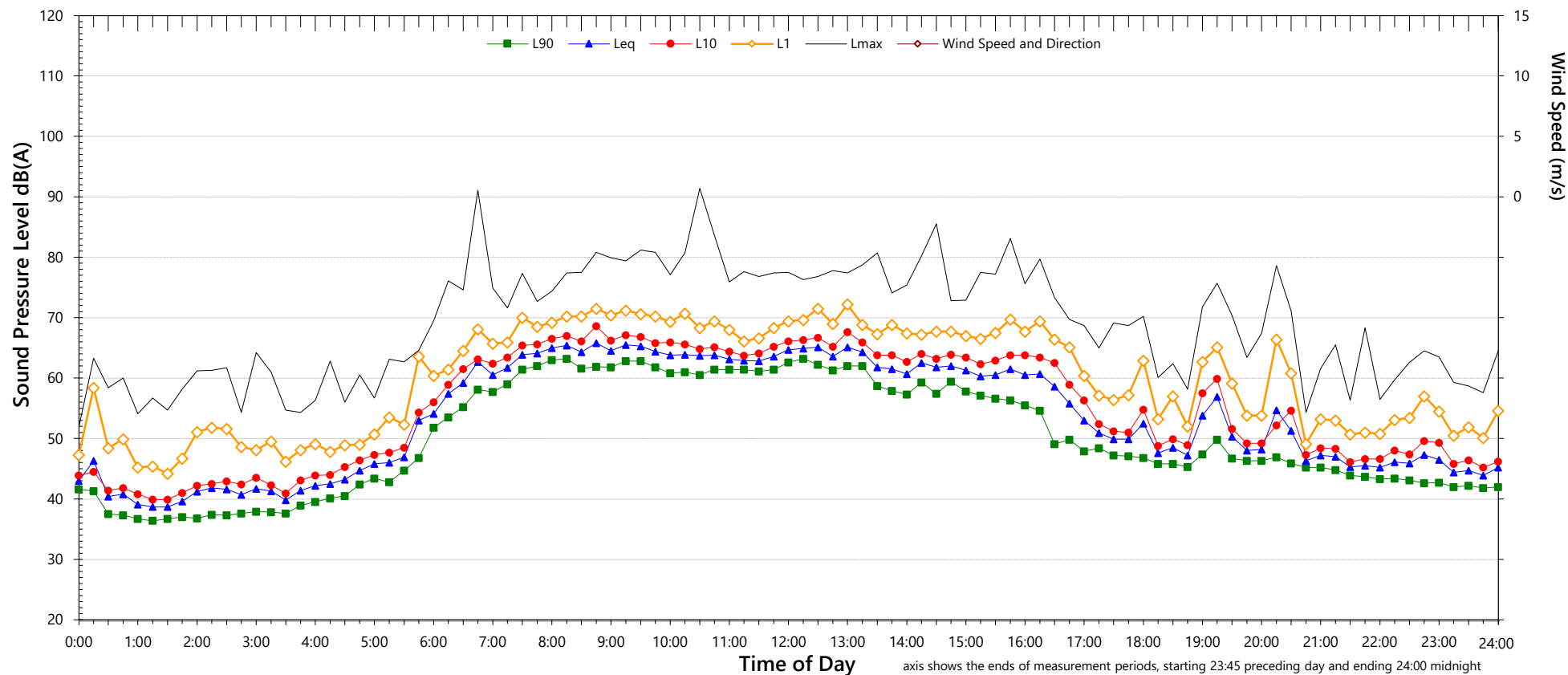
Notes:

1. Grey areas indicate periods of time that are either affected by rain, wind or other extraneous factors
2. Graphed & tabulated data measured in free-field

Unattended Noise Monitoring Results

Mundoo Bvd Maroochydore (UTM: 909016mE, 7051462mS)

Monday, 28 June 2021



Representative Noise Levels			
Descriptor	Day	Evening	Night ²
	7am-6pm	6pm-10pm	10pm-7am
Lmax	77	65	63
L ₁	68	56	54
L ₁₀	63	50	47
L ₉₀	55	44	38
Leq	63	51	53

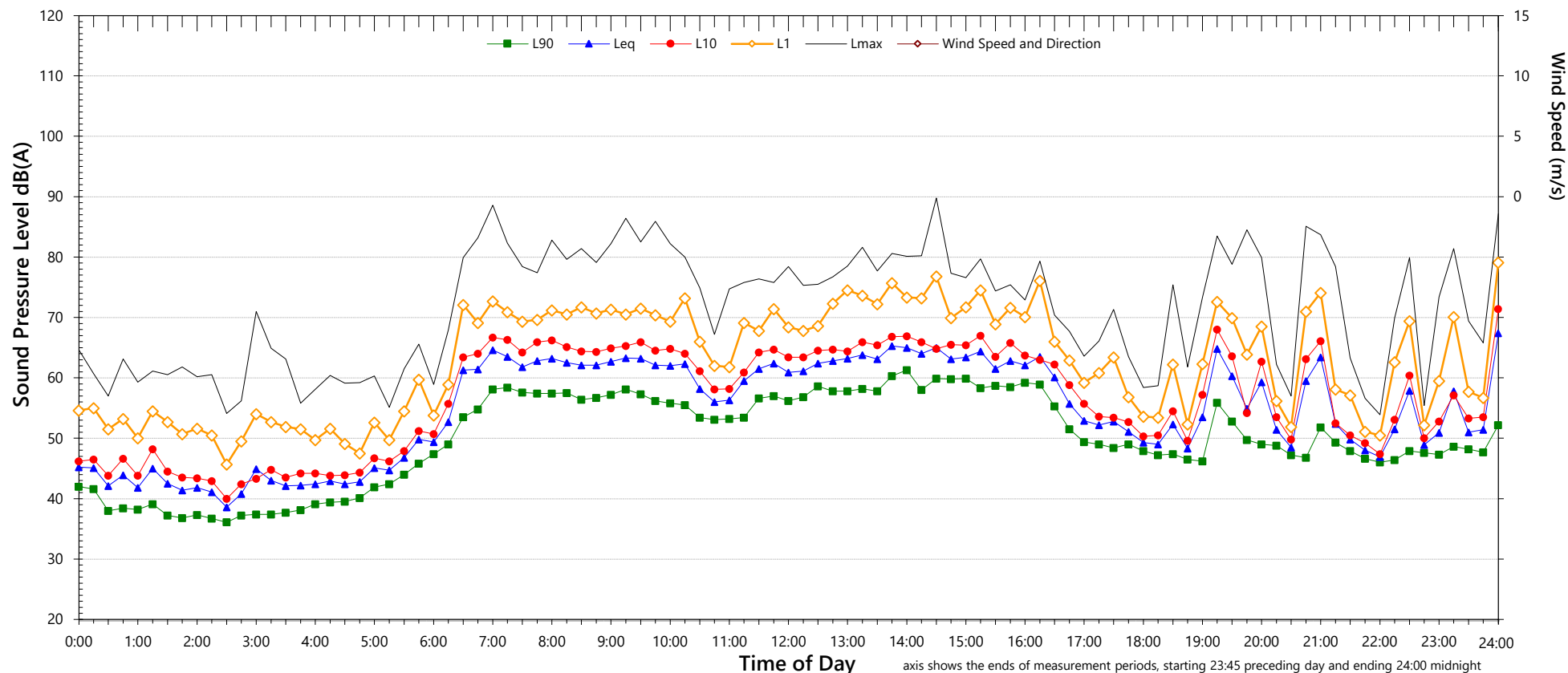
Notes:

1. Grey areas indicate periods of time that are either affected by rain, wind or other extraneous factors
2. Graphed & tabulated data measured in free-field

Unattended Noise Monitoring Results

Mundoo Bvd Maroochydore (UTM: 909016mE, 7051462mS)

Tuesday, 29 June 2021



Representative Noise Levels

Descriptor	Day	Evening	Night ²
	7am-6pm	6pm-10pm	10pm-7am
Lmax	77	71	73
L ₁	69	61	63
L ₁₀	63	56	57
L ₉₀	54	47	46
Leq	62	58	63

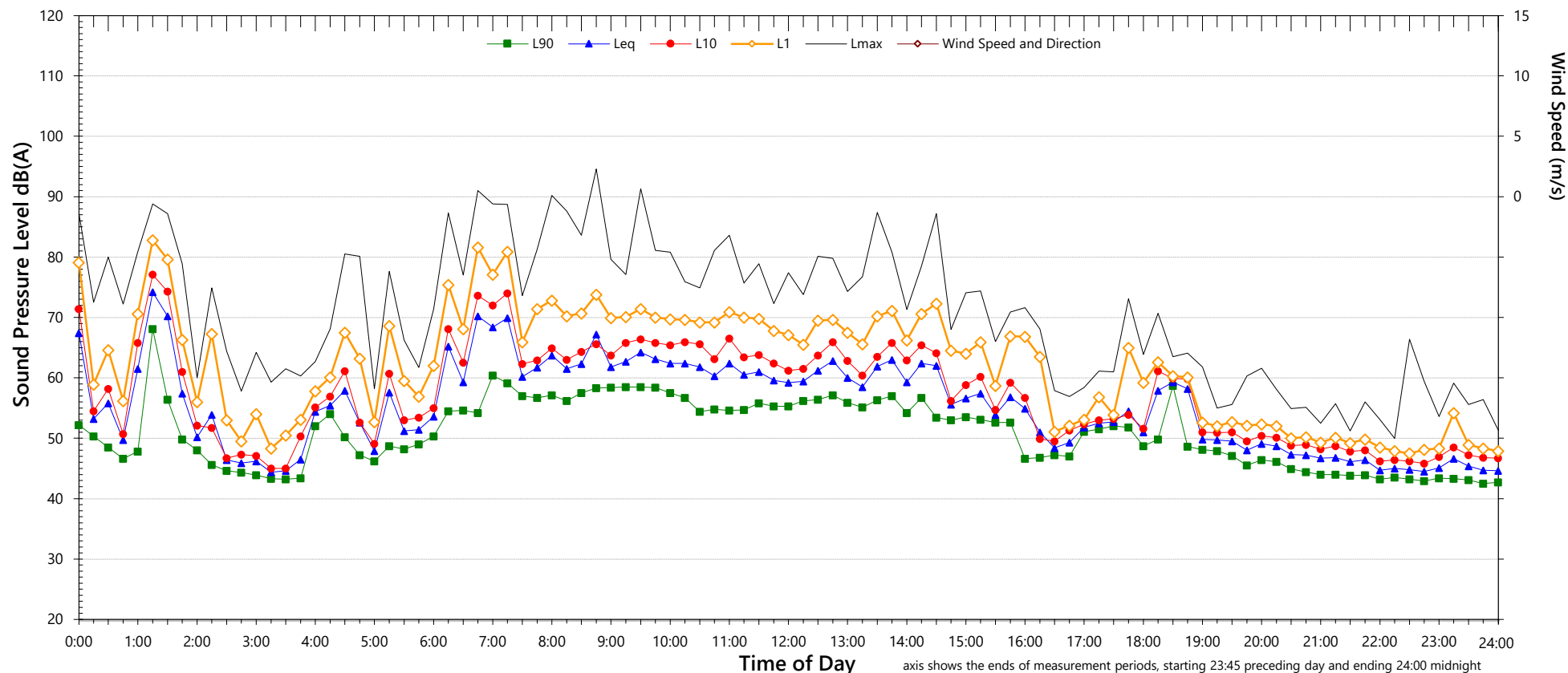
Notes:

1. Grey areas indicate periods of time that are either affected by rain, wind or other extraneous factors
2. Graphed & tabulated data measured in free-field

Unattended Noise Monitoring Results

Mundoo Bvd Maroochydore (UTM: 909016mE, 7051462mS)

Wednesday, 30 June 2021



Representative Noise Levels			
Descriptor	Day	Evening	Night ²
	7am-6pm	6pm-10pm	10pm-7am
Lmax	76	58	60
L ₁	67	53	50
L ₁₀	61	51	46
L ₉₀	52	44	37
Leq	61	53	51

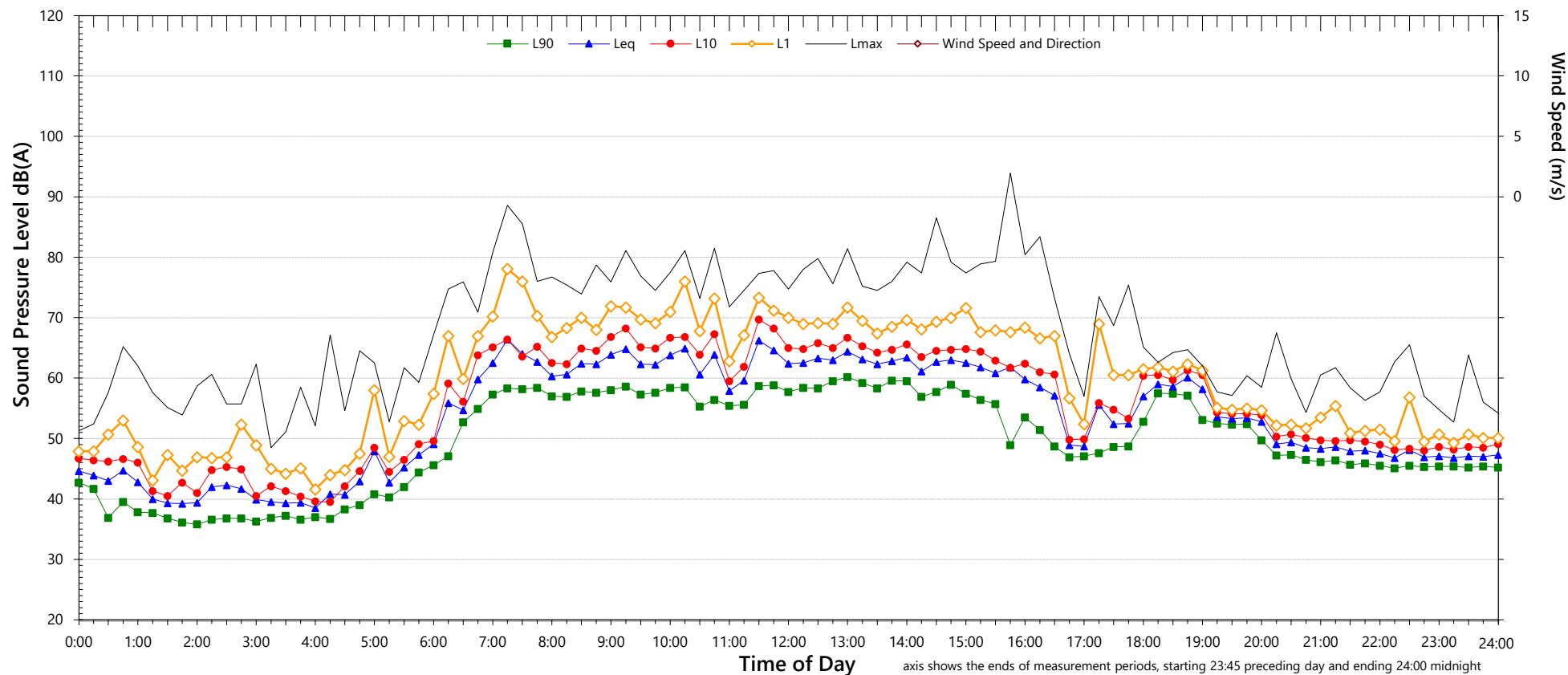
Notes:

1. Grey areas indicate periods of time that are either affected by rain, wind or other extraneous factors
2. Graphed & tabulated data measured in free-field

Unattended Noise Monitoring Results

Mundoo Bvd Maroochydore (UTM: 909016mE, 7051462mS)

Thursday, 1 July 2021



Representative Noise Levels			
Descriptor	Day	Evening	Night ²
	7am-6pm	6pm-10pm	10pm-7am
L _{max}	77	60	59
L ₁	68	55	51
L ₁₀	63	54	47
L ₉₀	53	46	40
Leq	62	55	48

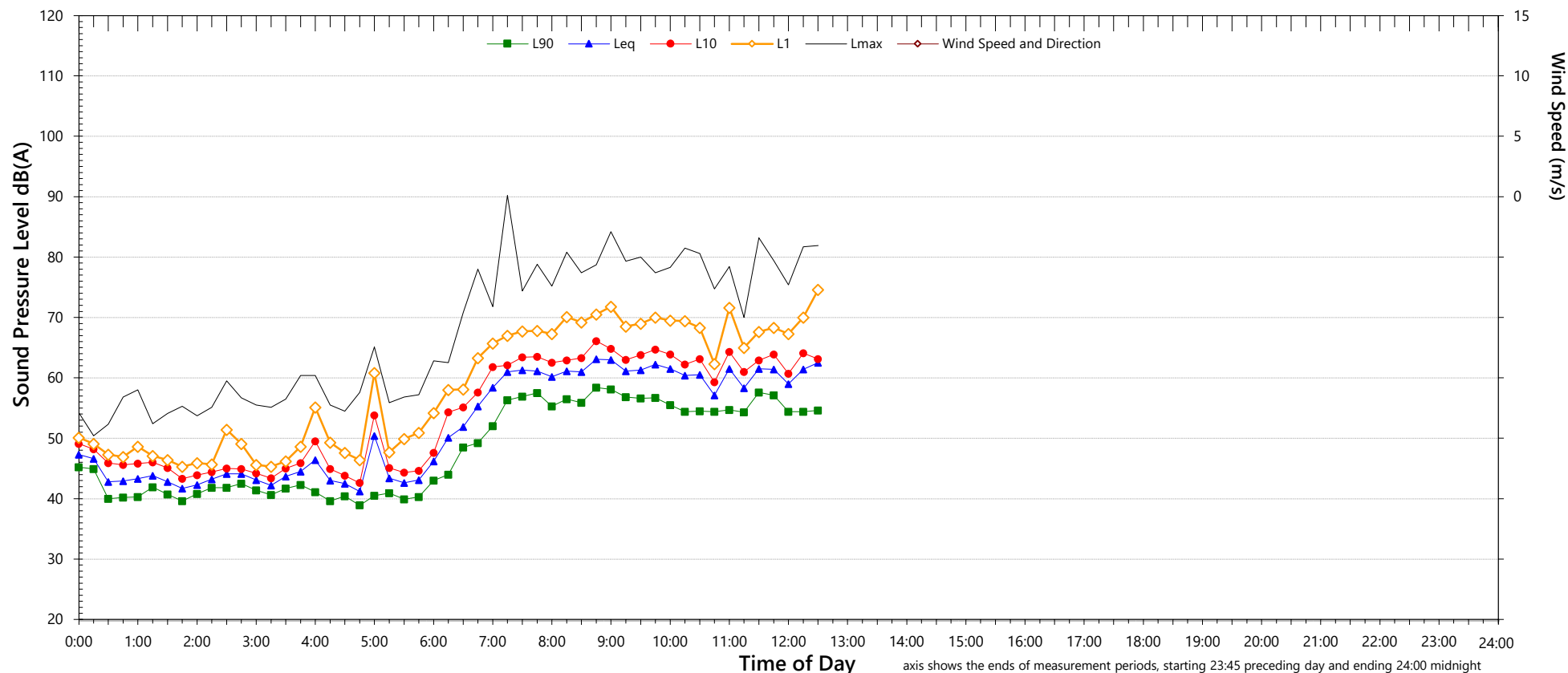
Notes:

1. Grey areas indicate periods of time that are either affected by rain, wind or other extraneous factors
2. Graphed & tabulated data measured in free-field

Unattended Noise Monitoring Results

Mundoo Bvd Maroochydore (UTM: 909016mE, 7051462mS)

Friday, 2 July 2021



Representative Noise Levels			
Descriptor	Day	Evening	Night ²
	7am-6pm	6pm-10pm	10pm-7am
Lmax	79	-	-
L ₁	69	-	-
L ₁₀	63	-	-
L ₉₀	55	-	-
Leq	61	-	-

Notes:

1. Grey areas indicate periods of time that are either affected by rain, wind or other extraneous factors
2. Graphed & tabulated data measured in free-field