LONGUEVILLE RESIDENTIAL AGED CARE FACILITY

16 NORTHWOOD ROAD

NORTHWOOD, NSW

ACOUSTIC REPORT

FOR

DEVELOPMENT APPROVAL

PATHWAYS PROPERTY GROUP PTY LTD

Client

EMF GRIFFITHS

Consulting Engineers

ISSUE B

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PROJECT NO. S2200251

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SECTION 1

SITE DESCRIPTION

SECTION 1.0 SITE DESCRIPTION

1.1 INTRODUCTION

EMF Griffiths have been commissioned to provide acoustic consultancy for the architectural and building services for the proposed new Pathways Longueville Aged Care Facility, 16 Northwood Road, Northwood, NSW 2066.

1.2 BACKGROUND

An acoustic assessment is required for the following elements: -

Noise Emissions

- Acoustic treatment required for mechanical services equipment mounted externally.
- Acoustic protection of neighbouring properties.
- Design in accordance with relevant codes and standards and in accordance with the Lane Cove Council requirements including: -
  - Office of Environment and Heritage (OEH) – NSW Noise Policy for Industry 2017.
- Other policies/guidelines/standards where relevant, including: -
  - Lane Cove Local Environmental Plan 2009.
  - Australian Standard AS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors.
  - NSW Environment Climate Change and Water – NSW Road Noise Policy (2011).

Airborne noise emissions from the site are required to be assessed for emission impacts at the adjacent neighbouring buildings and at the property boundary.

This assessment for the development application considers the following noise sources for intrusion and emission impacts: -

- The installed plant and the impact of these emissions at neighbouring properties.
- External noise emissions from activities at the subject site extension such as waste collection vehicle movements, operation of roller doors, use of outdoor pedestrian and recreation spaces.

Note: Retail and retail shops are not part of this DA acoustic report but they could be readily accommodated. Mechanical base building services from retail and retail shops are considered in this assessment.

Noise Intrusion

An acoustic assessment is required in accordance with BCA requirements and development related targets such as achieving indoor environment quality levels.

Intrusion impacts from the surrounding noise sources (such as noise from local roads, mechanical plant at adjacent sites, waste vehicle movements and on site vehicle movements) are to be assessed for site users and occupants.

This assessment considers the following: -

- External environmental noise measurement and external facade construction, architectural noise control measures and building services noise control measures required to achieve recommended noise levels within the development.
- Review of building layout drawings and mechanical services architectural schedules with respect to acoustic requirements of Australian Standard AS 2107.
- Review drawings and provide recommendations to limit the reverberant noise within the space, with particular attention to selection of finishes of ceiling and walls.

1.3 OBJECTIVES

Noise emission study as follows: -

- Identification of relevant guidelines, policies and design noise levels.
- Study of ambient noise at site to determine the existing noise amenity and relevant environmental noise criteria.
- Characterisation of noise emissions associated with the mechanical plant (including pumps and fan noise) and activities (e.g. on site vehicle movements) associated with the development.
- Acoustic design of noise control measures for mechanical ventilation. The noise emanating from the mechanical ventilation system shall be in accordance with the requirements of Appendix B of the Australia Standard AS 1055.2-1984 (Description and Measurement of Environmental Noise).
- Recommendations for noise mitigation measures. Acoustic design to be based on measured environmental noise statistical noise characterisation parameters accounting for: -
  - Tonality.
  - Frequency weighting.
  - Impulsive characteristics.
  - Fluctuations and temporal content.
  - Recommended maximum planning noise levels.
- Calculations to determine the extent of noise impact at the site boundary and to the nearest noise sensitive receivers.

Internal acoustic amenity study as follows: -

- Identification of target internal noise levels.
- Acoustic modelling, calculations and recommendations for appropriate noise attenuation measures to mitigate noise from external sources such as local traffic, internal building services, acoustic separation between different space use areas.
- Acoustic design in accordance with requirements of the Australian Standard AS 2107:2016 and BCA Section F.

1.4 SUBJECT SITE – LOCATION AND DESCRIPTION

The proposed development is located in Lane Cove, NSW. The aerial view below shows the site located adjacent to a residential and commercial area.

Figure 1.1: Aerial View of Subject Site (Google Maps)

The site is located within the neighbourhood centre and between high and low density residential zones under the Lane Cove Local Environment Plan (2017) as shown below: -

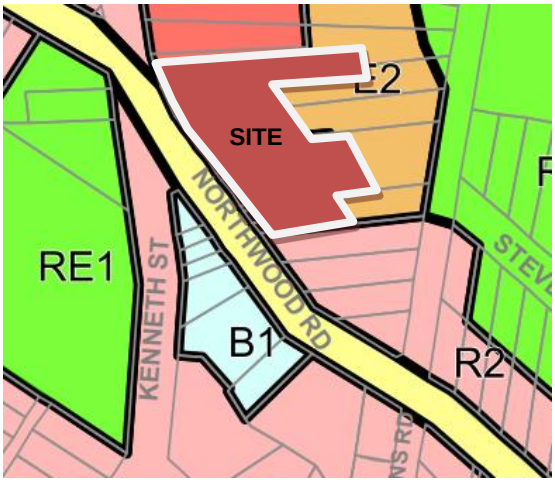

Figure 1.2: Aerial View of Subject Site
(http://lccweb.lanecove.nsw.gov.au/lepmaplist/PDF/4700_COM_LZN_004_010_20171013.pdf**)**

The proposed development will include one hundred and thirty-three (133) beds over four (4) levels with visitor car parks and also staff parking and retail shops. The proposed development extents are shown in the next figure: -

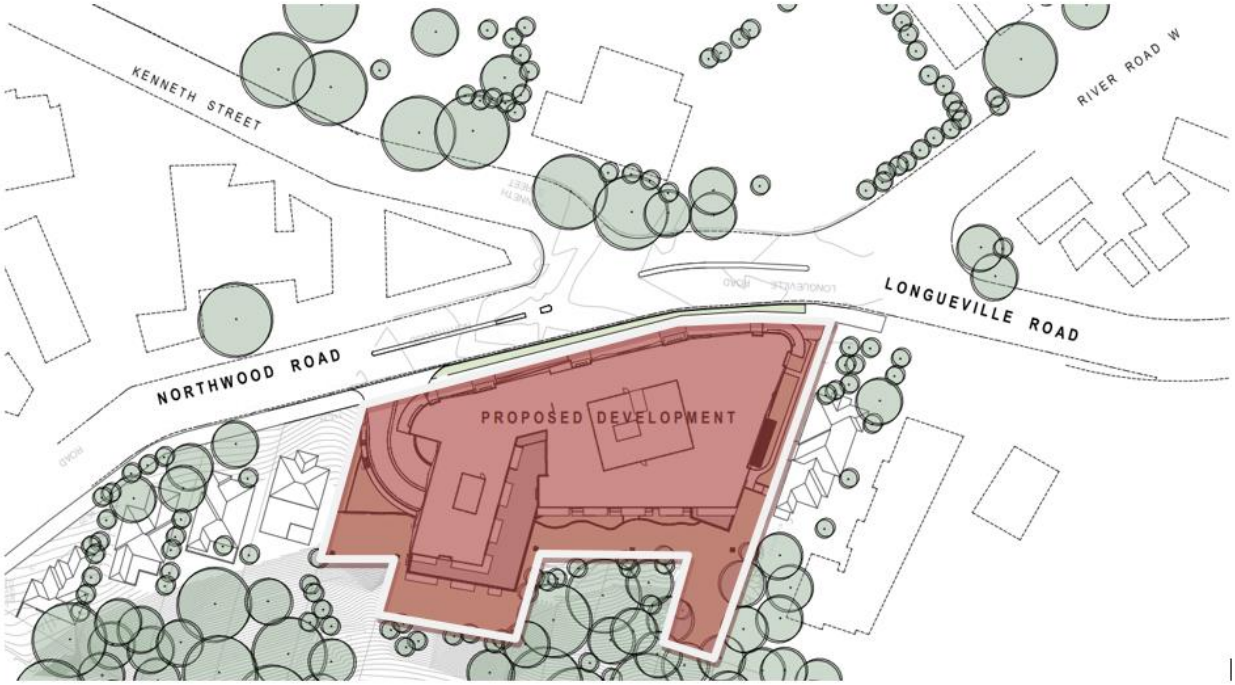

Figure 1.3: Site Plan

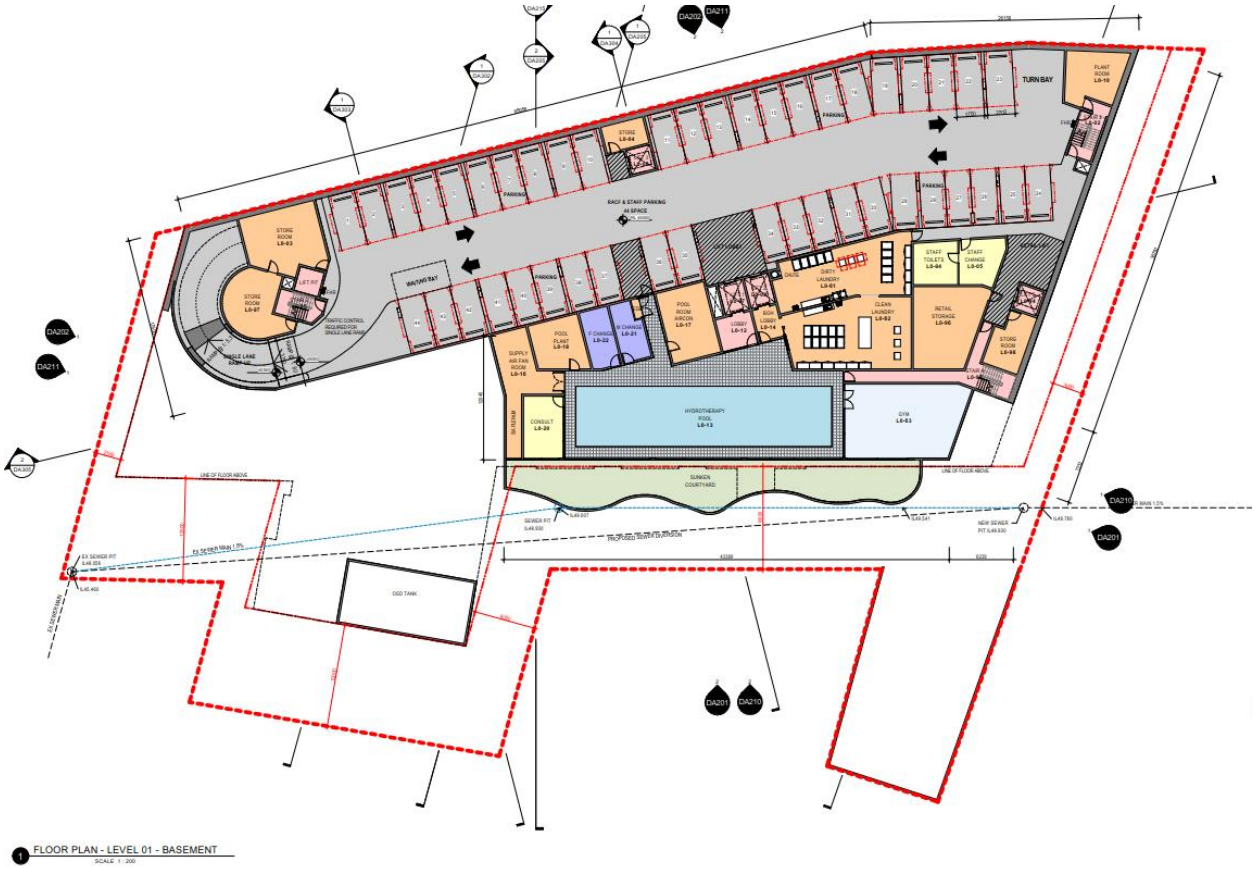

Figure 1.4: Level 1 (Basement)

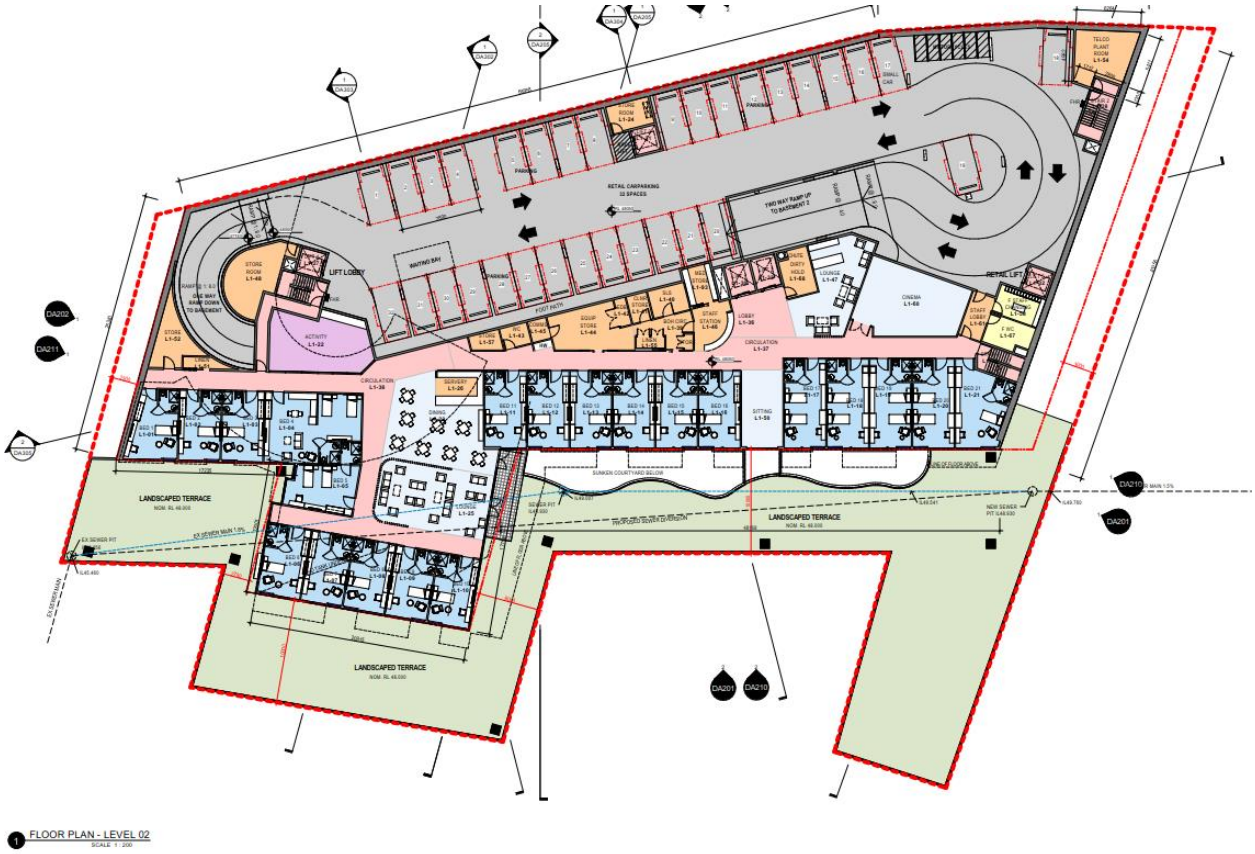

Figure 1.5: Level 2

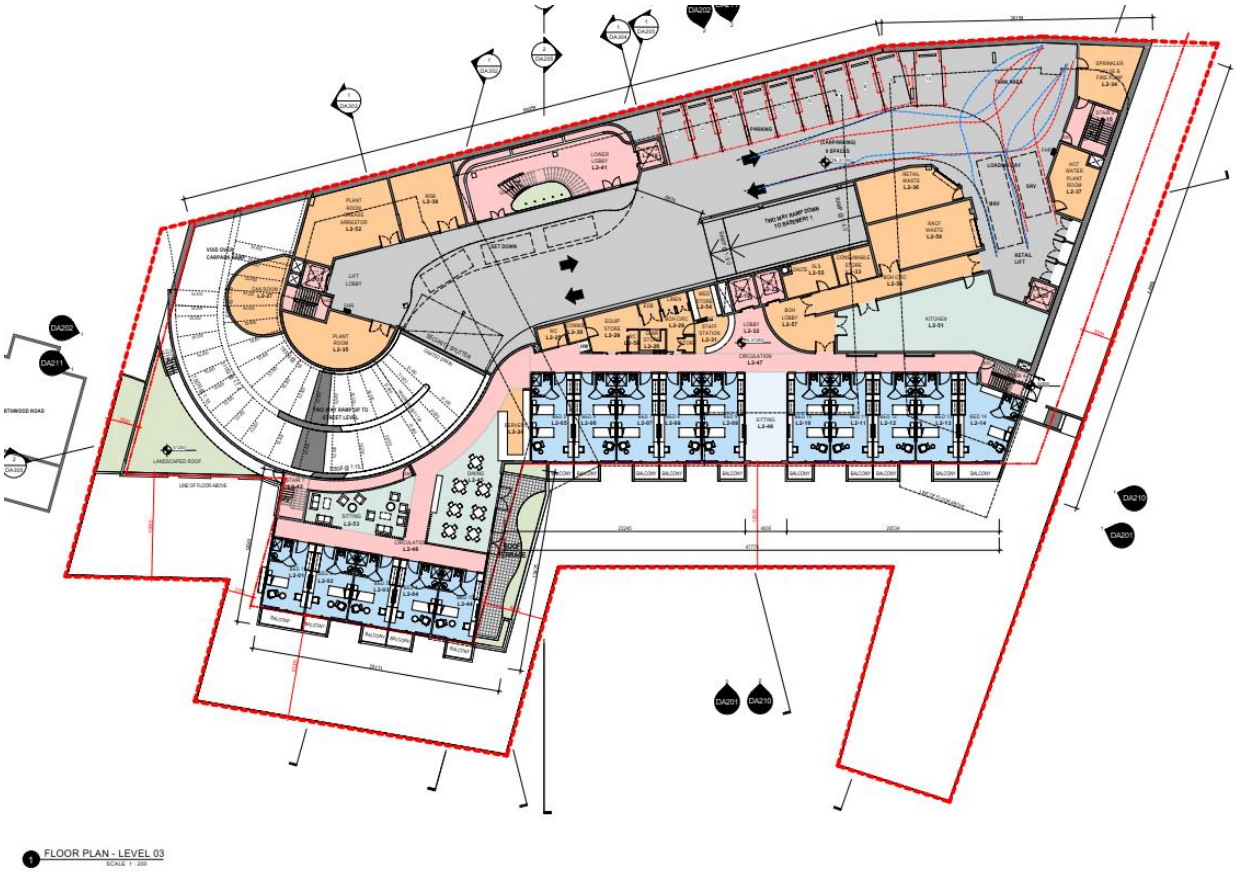

Figure 1.6: Level 3

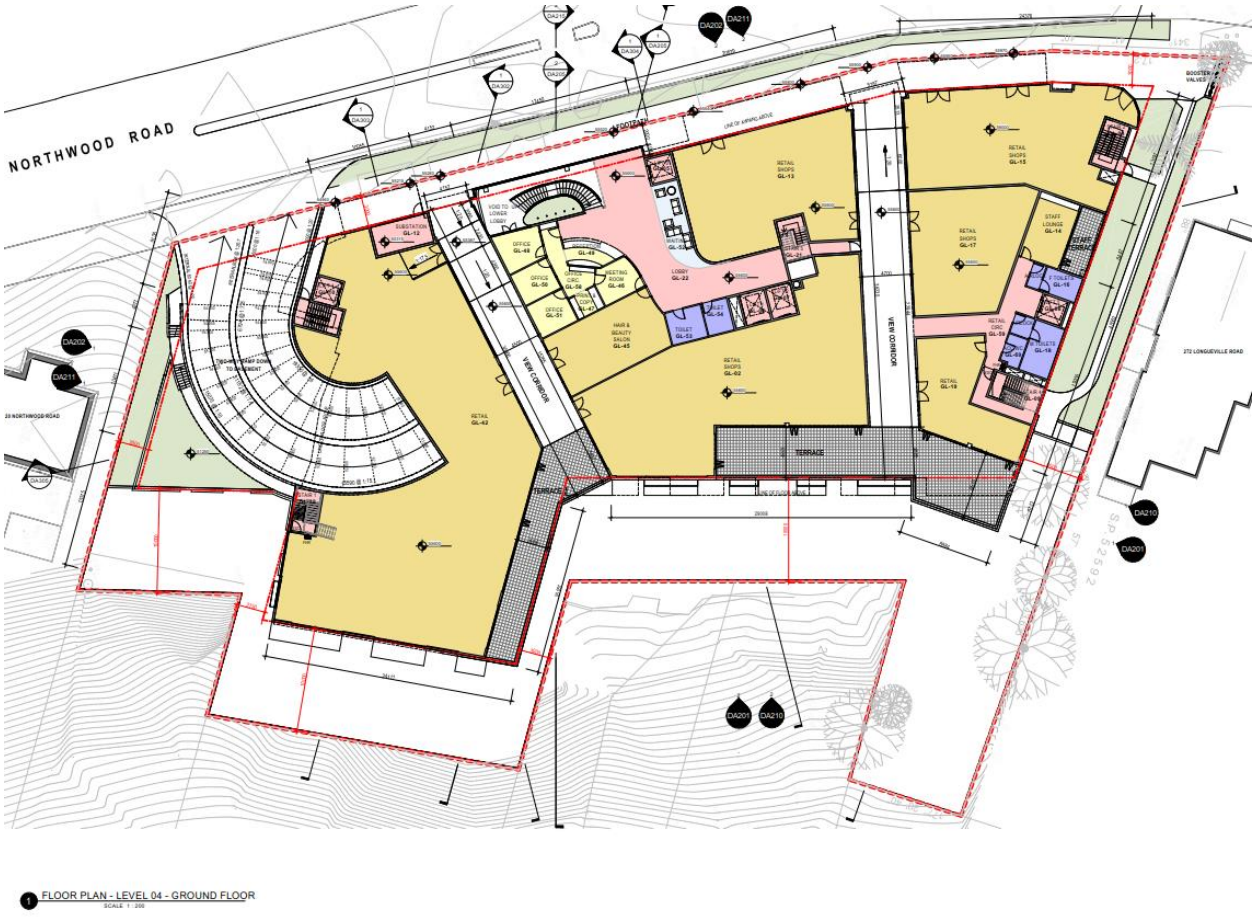

Figure 1.7: Level 4

Figure 1.8: Level 5

Figure 1.9: Level 6

SECTION 2

GENERAL AMENITY ISSUES

SECTION 2.0 GENERAL AMENITY ISSUES

2.1 EXISTING NOISE AMENITY

The subject site is in a suburban location with significant traffic noise from Longueville Road, Northwood Road and River Road W impacting the Western façade of the site.

There are sensitive residential receivers to north and south (R1 and R2), commercial ones to the west (C1 and C2) and Gore Creek natural reserve and golf course on the est. These sites represent the noise sensitive receivers used in the assessment and are also shown in the aerial photo below: -

Figure 2.1: Location of Significant Ambient Traffic Noise Sources

There are a variety of noise sources currently at the development site including: -

- Traffic Noise from Longueville Road, Northwood Road and River Road W. Minimal acoustic treatment of the façade is required to control road noise.
- Vehicle noise from passenger vehicles entering and leaving the subject site.

2.1.1 **Environmental Noise Survey**

Noise Levels were measured at the subject site (refer to the figures below showing location of the noise logger) to determine background noise levels around the subject site during daytime, evening and night-time periods over the weekend and during weekdays.

Figure 2.2: Location of Noise Measurement Equipment

The sound level measuring equipment was field calibrated before and after the measurement and was found to be within 0.1 dB of the reference signal. All instrumentation used in this assessment hold a current calibration certificate from a certified NATA calibration laboratory. The following instruments were used to measure the ambient noise levels: -

- Ngara ARL Noise Logger.
- Pulsar 105 Calibrator.

Ambient sound pressure levels were measured generally in accordance with Australian Standard AS 1055.1:1997 - 'Acoustics-description and measurement of environmental noise - Part 1: General Procedures'. Ambient noise levels were recorded at fifteen (15) minute intervals over the measurement period (from July 16 2020 to July 22 2020). The weather during the measurement is summarised in the following table, with data sourced from the Bureau of Meteorologyfrom the Sydney Observatory Hill weather station. The average wind speed was < 5 m/s and no extraneous noise was measured: -

Date	Day	Temps		Rain
		Min	Max	
		°C	°C	mm
16	Th	9.7	15.3	0
17	Fr	11.0	15.4	0.2
18	Sa	9.8	17.4	0.8
19	Su	8.2	20.3	0.2
20	Mo	9.7	18.9	0
21	Tu	8.1	17.7	0
22	We	7.1	19.5	0

Table 2.1: Weather Summary During Noise Survey

The 15-minute results for a typical 24-hour period are shown in Figure 2.3. The results are summarised below: -

Period	Time	Noise Level dB(A)			
		L_{Aeq}	L_{A90}	L_{A10}	RBL
Day	0700-1800	64	55	68	54
Evening	1800-2200	62	52	66	49
Night	2200-0700	59	34	66	32

Table 2.2: Noise Survey Results

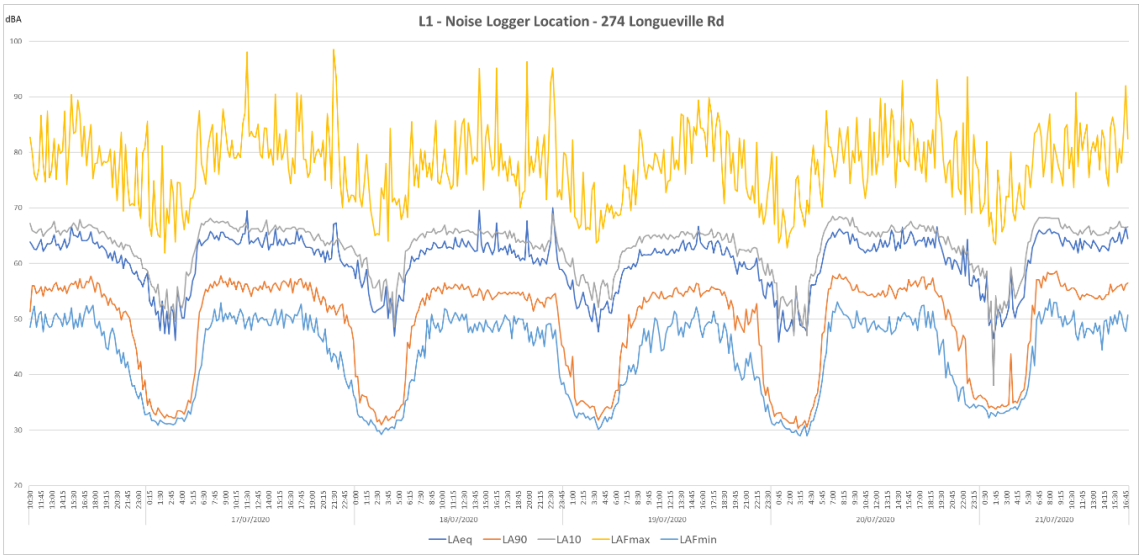

Figure 2.3: Environmental Noise Survey

The measured noise can be considered typical. There are a variety of existing noise sources currently at the development site including: -

- Traffic noise from local roads.
- Vehicle noise from passenger vehicles entering/leaving the adjacent developments.
- Waste vehicle noise.
- Noise from pedestrians walking.
- Noise from people using the adjacent recreation areas.
- Noise from non-residential uses of the site.

2.2 NOISE SOURCES

The locations of the noise sources associated with the proposed new development at the subject site are shown in the following figure: -

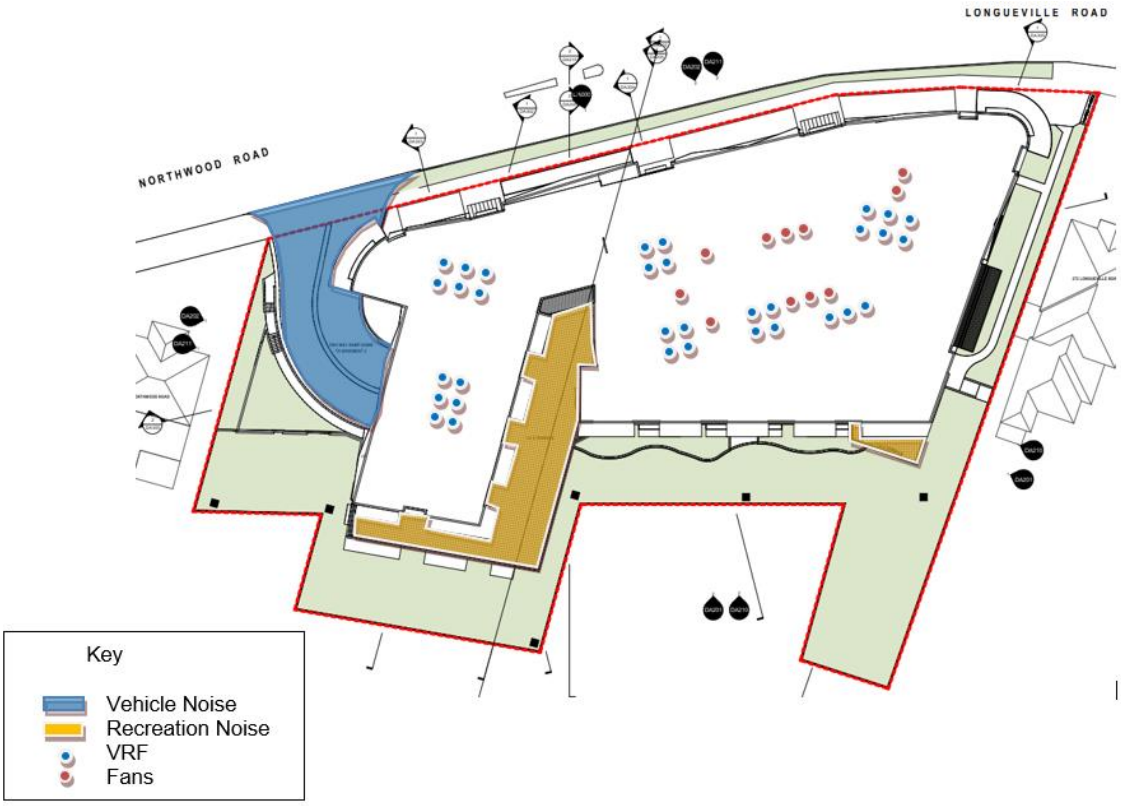

Figure 2.4: Location of Noise Sources

2.2.1 **Mechanical Plant**

External Noise Intrusion is considered in this report. In most cases the transmission path will be via airborne noise. In some circumstances, regenerated noise as a result of vibration may also be an issue. Intrusive noise can generally be classified as either continuous or intermittent. Continuous noise, even though it might vary from time to time, is measured using a procedure to determine its equivalence over a representative time period. The continuous measurement is normally expressed as L_{Aeq} whereas intermittent noise is measured as the arithmetic average of the maximum sound level readings expressed as $L_{Amax,avg}$. Mechanical plant equipment comprises continuous noise sources as follows: -

Mechanical Equipment	Frequency (Hz)		Sound Power Level dB								
	Operation Hours	No	63	125	250	500	1k	2k	4k	8k	Overall
VRF	24 hrs	33	83	80	77	76	73	65	59	54	86
Carpark Exh.	24 hrs	1	96	99	94	93	92	90	87	83	96
Loading Dock Exh.	24 hrs	1	93	90	92	92	89	83	78	72	93
Kitchen Exh.	24 hrs	1	93	91	95	100	99	95	89	83	93
Pool Hall Exh.	24 hrs	1	76	78	84	88	84	79	74	63	76
Laundry Exh.	24 hrs	1	76	78	84	88	84	79	74	63	76
Laundry Dryers	24 hrs	1	89	89	84	78	75	75	75	72	89
Retail KEF	TBC (24 hrs Assumed)	5	94	98	94	82	83	81	82	80	94
Press. Stairs	Emergency	3	93	94	90	93	86	85	81	76	93

**Manufacturers Data

Table 2.3: Sound Power and Number of Mechanical Plant

Note

1) The above values are based on preliminary selections and represent a maximum anticipated noise level. Acoustic data from final selections to be reviewed as the design is developed.

2) All the internal noise sources that are not causing any outdoor noise impact through the façade (i.e hydrotherapy pool pumps, mechanical unit, etc.) are not considered in this assessment. Internal noise controls and recommendations are included regarding internal noise impacts.

2.2.2 Waste and Car Park Vehicle Movements

The car parks are located within the building at Level 1 (Basement), Level 2 and Level 3 of the subject site. The noise due to entrance and exiting of the vehicles has been modelled. These noise sources are intermittent and typical sound power levels from these events are shown below: -

Description	L_{Amax}
Waste Vehicle Movement	100dB(A)
Internal Car Movement (entering/leaving) (includes emergency vehicles)	94dB(A)

Table 2.4: Sound Level Car Park Movements

Road traffic noise impact in this report is based on “Traffic and Parking Impact Assessment of Mixed Use Development at 4-18 Northwood Road and 274-274A Longueville Road, Lane Cove” dated on August 11 2020 from McLaren Traffic Engineering and Road Safety Consultants.

In summary we understand that the impact of the increase in traffic volume due to the redevelopment will be minimal as the existing traffic volume on site is already quite significant. The table paragraph is an excerpt from the McLaren Traffic Engineering and Road Safety Consultants: -

TABLE 8: NET CHANGE TRAFFIC GENERATION – PLANNING PROPOSAL

Scenario	Peak Period	Trips	Trip Distribution
Existing (1)	AM	- 33	- 20 in, - 13 out
	PM	- 64	- 32 in, - 32 out
Future(2)	AM	+ 43	+ 32 in, + 11 out
	PM	+ 106	+ 52 in, + 54 out
NET CHANGE	**AM**	**+ 10**	**+ 12 in, -2 out**
	PM	**+ 42**	**+ 20 in, + 22 out**

Note: (1) See **Table 6** for existing traffic generation breakdown based upon planning proposal rates.
(2) See **Table 4** for future traffic generation breakdown based upon planning proposal rates.

TABLE 9: NET CHANGE TRAFFIC GENERATION - RMS

Scenario	Peak Period	Trips	Trip Distribution
Existing(1)	AM	- 80	- 38 in, - 42 out
	PM	- 98	- 47 in, - 51 out
Future(2)	AM	+ 68	+ 26 in, + 42 out
	PM	+ 111	+ 63 in, + 48 out
NET CHANGE	**AM**	**- 12**	**-12 in, 0 out**
	PM	**+ 13**	**+16 in, - 3 out**

Note: (1) See **Table 7** for existing traffic generation breakdown based upon RMS rates.
(2) See **Table 5** for future traffic generation breakdown based upon RMS rates.

Note: Table 8 (worse case sceniario) has been used for this assessment.

2.2.3 Common Area Use and Private Outdoor Spaces

The associated intermittent noise sources from use of the outdoor balconies and roof terraces are detailed in the table below: -

Description	L_{Aeq}
People talking (loud conversation)*	70dB(A)

* Technischer Überwachungs-Verein Norddeutschland e.V., 1987

Table 2.5: Sound Levels of Common Area noise Sources

Note due the nature of the facility the outdoor terrace will not be a significant noise source. Development of operational management guidelines for use of any balconies are recommended to minimise any impact on adjacent properties.

SECTION 3

ACOUSTIC DESIGN CRITERIA

SECTION 3.0 ACOUSTIC DESIGN CRITERIA

3.1 BASIS OF DESIGN, LOCAL AUTHORITY, REGULATORY AND OTHER COMPLIANCES

The design will be provided to comply with the following requirements: -

- NSW Noise Policy for Industry (Jan 2017).
- Lane Cove Council Local Environmental Plan (2017).
- National Construction Code (NCC) 2015 Acoustic Part F5 Part F5 provisions for Class 2 buildings.
- The current issues of relevant Australian Standards and associated amendments including: -
  - AS 2107:2016 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors.
- AIRAH Guidelines for Services Noise.

The installation and all associated equipment shall comply with appropriate Australian Standards and any relevant codes current at the time of tender. This includesreference standards and codes listed in the prefaces to those standards, and standards and codes applicable with respect to all materials and workmanship associated with this project.

The completed installation shall be passed by Inspectors of the relevant statutory authorities prior to practical completion.

3.2 STATE NOISE CRITERIA

In NSW, noise pollution is regulated through the Protection of the Environment Operations Act 1997 (POEO Act). The POEO Act makes the Office of Environment and Heritage (OEH) the appropriate regulatory authority and therefore responsible for regulating noise from activities scheduled under the Act. The noise amenity at the site is to be governed by the Office of Environment and Heritage (OEH) policies and guidelines as follows: -

- NSW Noise Policy for Industry (2017) – This policy document provides guidance on the measurement and assessment of noise and acceptable noise levels for small commercial premises regulated by Councils.

The site is classified as an urban area under the policies and guidelines.

3.2.1 **Project Intrusiveness Noise Levels**

The project intrusiveness noise levels based on site measured (see section 2.1.1) noise levels are shown in the table below: -

Period	Time	Noise Level dB(A)	
		RBL	Project Intrusiveness Noise Level (RBL+5 dB) $L_{Aeq,\ 15min}$
Day	0700-1800	54	57
Evening	1800-2200	49	54
Night	2200-0700	32	37

Table 3.1: Intrusiveness Noise Criteria

3.2.2 **Amenity Noise Levels**

The following amenity noise levels are to be used in combination with the project intrusiveness noise level to assess the potential impact of noise, assess reasonable and feasible mitigation options, and subsequently determine achievable noise requirements: -

Receiver	Noise Amenity Area	Time of the Day	Recommended Amenity Noise Level LAeq, dB(A)
Residential	Urban	Day	60
		Evening	50
		Night	45
Active recreation area (e.g. school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65

Table 3.2: Noise Amenity Criteria

3.2.3 **Project Noise Trigger Levels**

The project noise levels (the lower of the project intrusiveness noise levels and the amenity noise levels) are shown in the table below: -

Period	Time	Noise Level dB(A)
		Project Noise Trigger Level $L_{Aeq,adj\ 15min}$
Day	0700-1800	57
Evening	1800-2200	54
Night	2200-0700	37

Table 3.3: Project Noise Trigger Levels Criteria

Note the project noise trigger level provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory requirement. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community, and so 'trigger' a management response, for example, further investigation of mitigation measures.

3.3 LOCAL AUTHORITY TRAFFIC NOISE INTRUSION CRITERIA

The Australian Standard AS/NZS 2107:2016 recommends the following interior noise level and reverberation targets for residential buildings in suburban areas or near minor roads.

Authority	Sensitive Use Area	Descriptor	Noise Goal, dB(A)	Reverberation Time
AS/NZS 2107:2016	Amenities	$L_{Aeq\ (8\text{-}hour)}$	45-55	0.4-0.6
	Sleeping Areas	$L_{Aeq\ (8\text{-}hour)}$	30-35	-
	Living Area / Lounges	$L_{Aeq\ (8\text{-}hour)}$	30-40	-
	Lobbies	$L_{Aeq\ (8\text{-}hour)}$	40-50	0.4-0.6
	Corridors	$L_{Aeq\ (8\text{-}hour)}$	45-50	0.6-0.8

Table 3.4: Recommended Internal Noise Levels and Reverberation Times

Lane Cove Council requires the noise level from air conditioning systems is not to be heard within a room in any other residential premises:

Before 8:00am or after 10:00pm on any Sunday or Public holiday; or

Before 7:00am or after 10:00pm. on any other day.

3.4 ACOUSTIC SEPARATION TARGETS

Construction of partitions between spaces as identified in the table below: -

Noise Tolerance in Receiving Room	Source Room Activity Noise			
	Very Low	Low	Medium	High
High	Rw 35	Rw 40	Rw 45	Rw 50
Medium	Rw 40	Rw 45	Rw 50	Rw 55
Low	Rw 45	Rw 50	Rw 55	Rw 60
Very Low	Rw 50	Rw 55	Rw 60	Rw 65

Table 3.5: Recommended Acoustic Separation Targets

3.5 BCA ACOUSTIC TARGETS

The design criteria for the apartments are governed by the provisions of the acoustic requirements of BCA Section F5.1 to F5.6 for a Class 9c Aged Care Building. The deemed-to-satisfy provisions for Parts F5.3 to F5.5 are detailed below: -

BCA Clause	Item	Criteria
F5.3 (b)	Determination of impact sound insulation rating for walls	A wall in a building required to have an impact sound insulation rating must be of two (2) or more separate leaves without rigid mechanical connection except at the periphery.
F5.4 (b)	Sound insulation of floors between units	A floor separating sole occupancy units must have an R_W of not less than forty-five (45).
F5.5 (c)	Sound Insulation of walls between units	A wall must have an R_W (airborne) of not less than forty-five (45) if it separates sole occupancy units; A wall must have an R_W (airborne) of not less than forty-five (45) if it separates a sole occupancy unit from a kitchen, bathroom, plant room, laundry, utilities or the like.
F5.5 (d)	Sound insulation of walls between laundry or kitchen and an adjoining room of SOU	Comply with F5.3(b) as above
F5.5 (e)	Sound insulation of walls with floors above	Wall to continue to the underside of the floor above or to have a ceiling that provides the sound insulation required for the wall.
F5.5 (f)	Sound insulation of walls with roofs above	Wall to continue to the underside of the roof above or to have a ceiling that provides the sound insulation required for the wall.
F5.6 (a) and (b)	Sound Insulation Rating of Services	If a duct, soil, waste or water supply pipe, including a duct or pipe that is located in a wall or floor cavity, serves or passes through more than one sole-occupancy unit, the duct or pipe must be separated from the rooms of any sole-occupancy unit by construction with an $R_w + C_{tr}$ (airborne) not less than: - (i) Forty (40) if the adjacent room is a habitable room (other than a kitchen); or (ii) Twenty-five (25) of the adjacent room is a kitchen or non-habitable room. If a stormwater pipe passes through a sole-occupancy unit it must be separated in accordance with (i) and (ii).
F5.7	Sound Isolation of Pumps	Flexible couplings to be used at the point of connection between the service pipes in the build and any circulating or other pumps.

Table 3.6: BCA Acoustic Design Criteria

All forms of construction detailed in the table above must be installed as follows: -

- Masonry – Units must be laid with all joints filled solid, including those between the masonry and any adjoining construction.
- Concrete slabs – Joints between concrete slabs or panels and any adjoining construction must be filled solid.
- Sheeting materials: -
  - If one (1) layer is required on both sides of a wall, it must be fastened to the studs with joints staggered on opposite sides.
  - If two (2) layers are required the second layer must be fastened over the first layer so that the joints do not coincide with those of the first layer.
  - Joints between sheets or between sheets and any adjoining construction must be taped and filled solid.
- Timber or steel-framed construction – perimeter framing members must be securely fixed to the adjoining structure: -
  - Bedded in a resilient compound.
  - The joints must be caulked so that there are no voids between the framing members and the adjoining structure.

Services: -

- Services must not be chased into concrete or masonry elements.
- A door or panel required to have a certain Rw + Ctr that provides access to a duct, pipe or other services must: -
  - Not open into any habitable room (other than a kitchen).
  - Be firmly fixed so as to overlap the frame or rebate of the frame by not let than 10mm, be fitted with a sealing gasket along all edges and be constructed of: -
    - Wood, particleboard or blockboard not less than 33mm thick.
    - Compressed fibre reinforced cement sheeting not less than 9mm thick.
    - Other suitable material with a mass per unit area not less than 24.2 kg/m^2.
  - A water supply pipe must: -
    - Only be installed in the cavity of discontinuous construction; and
    - In the case of pipe that serves only one (1) sole-occupancy unit, not be fixed to the wall leaf on the side adjoining any other sole-occupancy unit and have a clearance not less than 10mm to the other wall leaf.
  - Electrical outlets must be offset from each other: -
    - In masonry walling, not less than 100mm; and
    - In timber or steel framed walling, not less than 300mm.

SECTION 4

RECOMMENDATIONS

SECTION 4.0 RECOMMENDATIONS

4.1 NOISE IMPACT ASSESSMENT

4.1.1 Computer Modelling Method

A three-dimensional model was created using Cadna-A V2019 noise propagation software.

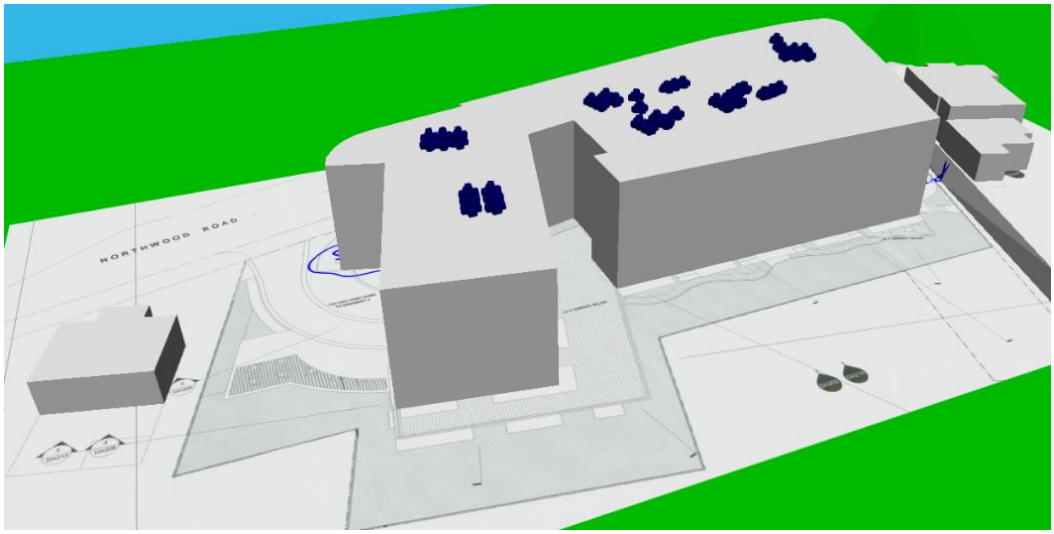

Figure 4.1: 3D Acoustic Model

The noise sources identified in Section 2.2.1 were added to the model in the appropriate locations. A three-dimensional noise map of the noise levels due to the sources was calculated.

4.1.2 Sound Power Levels of the Main Noise Sources

Sound power levels of the main sources, as detailed in this report were input into the model at the proposed locations.

4.1.3 Tonality and Impulsiveness Adjustment

Where tonal, duration, intermittency and low-frequency components are significant, a correction factor has been added in accordance with Fact Sheet C: Corrections for annoying noise characteristics of the noise policy for industry.

4.1.4 Noise Emission Calculations – All Site Noise Sources

The following noise impact levels have been calculated against the project noise trigger levels for noise emissions (from the noise sources detailed in this report and after noise controls were applied (see Section 4.1.5): -

	$L_{Aeq,adj(15\ min)}$					
	dB(A) Day		dB(A) Evening		dB(A) Night	
Location	Target	Result	Target	Result	Target	Result
R1 – 272 Longueville Rd	57	37	54	37	37	37
R2 – 20 Northwood Rd		36		36		36
C1 - Cnr River Road West &, Kenneth St	65	44	65	44	-	44
C2 – 1 to 7-9 Northwood Rd		46		46		46
Longueville Sporting Club	55	45	55	45	55	45
Natural Reserve and Golf Course		46		46		46

Table 4.1: All Site Noise Emission at Adjacent Noise Sensitive Receivers (External)

4.1.5 **Mechanical Plant - Noise Control Recommendations**

The previous section presented the noise impact levels predicted after applying the following noise controls to the mechanical plant: -

Mech Unit	Ref.	Noise Exceedance (dB)	Noise Control – Insertion Loss (IL) Type
Carpark	EF-R.01	9	Noise Attenuator or Lined Ductwork – Type II
Loading Dock	EF-R.02	5	Noise Attenuator or Lined Ductwork – Type I
Kitchen Exh	EF-R.03	13	Noise Attenuator or Lined Ductwork – Type I
Laundry Exh	EF-R.05	5	Noise Attenuator or Lined Ductwork – Type I
Laundry Exh	EF-R.06	9	Noise Attenuator or Lined Ductwork – Type II
Retail KEF	EF-R.07	7	Noise Attenuator or Lined Ductwork – Type II
Retail KEF	EF-R.08	7	Noise Attenuator or Lined Ductwork – Type II
Retail KEF	EF-R.09	7	Noise Attenuator or Lined Ductwork – Type II
Retail KEF	EF-R.10	9	Noise Attenuator or Lined Ductwork – Type II
Retail KEF	EF-R.05	11	Noise Attenuator or Lined Ductwork – Type II

Table 4.2: Recommended Mechanical Noise Control Treatments

The following insertion loss for Type I and II noise controls are presented on the following table. The required noise reduction could be achieved by installing noise attenuators, lined ductwork and also selecting quieter mechanical units.

Type	Insertion Loss (IL) dB							
	63	125	250	500	1k	2k	4k	8k
I	3	5	9	16	15	10	9	8
II	5	9	15	28	30	20	18	15

Table 4.3: Recommended Mechanical Noise Control Treatments

4.2 TRAFFIC NOISE ASSESSMENT

According to Section 2.2.2 as a worst case scenario it is noted that Transportation Consultant concluded that the number of vehicle movements will increase by up to ten (10) vehicles during morning period and forty-two (42) during evening time.

These increases represents a likely increase of traffic noise by <1 dB during the morning peak and <2 dB during the evening peak. The vehicle access ramp will have walls that will minisime the noise towards the nearest reciever R2 (20 Northwood Rd).

Therefore, NSW Road Noise Policy criteria will be met as the increase in road traffic noise doesn't exceed 2dB.

4.3 NOISE INTRUSION ASSESSMENT – FAÇADE TRAETMENTS

Element	Requirement	Minimum Construction
Glazing	Rw 30	6mm float glass with full perimeter acoustically rated seals.
Glazing	Rw 32	6.38mm laminated glass with full perimeter acoustically rated seals.
Walls	Rw 45	Refer appendix for typical construction
Roof	Anticon to be installed to reduce rain noise	75mm anticon blanket installed under colorbond roof with plasterboard ceiling below.
Floor/Walls to Mech Plant Deck	Rw+Ctr >70	150mm concrete slab. 75mm semi-rigid insulation (e.g. K10 soffit board). 300mm air gap. 10mm plasterboard ceiling on resilient mounts to suspended ceiling.

Table 4.4: Recommended Facade Treatments

4.4 BCA ACOUSTIC SEPARATION ASSESSMENT

Based on space types identified in the layouts the following constructions are recommended to meet the acoustic separation targets: -

Clause	Item	Proposed Minimum Construction
F5.4 (b)	Sound insulation of floors between units.	100mm minimum thick concrete slab thickness with vinyl covering.
F5.5 (c)	Sound insulation of walls between units.	One (1) x 13mm plasterboard on 76mm stud with 75mm glass wool insulation of 14kg/m^3. Two (2) x 13mm plasterboard on other face.
F5.5 (d)	Sound insulation of walls between a laundry or kitchen and an adjoining room of SOU.	One (1) x 13mm plasterboard on outer face of dual 76mm stud system with 20mm gap between studs and 50mm glass wool insulation of 11kg/m^3 cavity.
F5.5 (e)	Sound insulation of walls with floors above	Full height walls required for sound rated walls (or)
F5.5 (f)	Sound insulation of walls with roofs above.	One (1) x 13 fire rated plasterboard ceiling with 50mm thick 91 kg/m^3 insulation to 1200mm either side of wall. Wall lining to continue to minimum 100mm above ceiling.
F5.6	Sound insulation rating of services	**Services in Ceiling/Floor/Wall Cavities, Kitchens and Non Habitable Areas** Pipes to be lagged (e.g. CSR Acoustilag 45 or Pyrotech Soundlag 4525c equivalent) where duct, soil, waste or water supply pipes are located in the ceiling/floor/wall space and pass through more than one sole occupancy unit and: - • Acoustically sealed ceiling penetrations with surface mounted fittings at to be used or acoustically treated recessed light fittings. • Ceiling to comprise minimum single layer of 13mm plasterboard. • Risers to comprise minimum layer of 13mm plasterboard. OR

Clause	Item	Proposed Minimum Construction
		Unlagged pipes to comprise minimum outer layer of 13mm plasterboard with 75mm thick, 11kg/m3 glass wool insulation in cavity and acoustically sealed ceiling penetrations with surface mounted fittings to be used or acoustically treated recessed light fittings. **Services in Ceiling/Floor/Wall Cavities in Habitable Areas** Pipes to be lagged (e.g. CSR Acoustilag 45 or Pyrotech Soundlag 4525c equivalent) where duct, soil, waste or water supply pipes are located in the ceiling/floor/wallcavities and pass through more than one sole occupancy unit and: - • Acoustic sealed ceiling penetrations with surface mounted fittings are to be used or acoustically treated recessed light fittings. • Ceilings/walls to comprise minimum layer of 13mm plasterboard with 90mm thick, 10.5kg/m3 glass- wool insulation blanket. Unlagged pipes in risers to comprise minimum outer layer of 13mm plasterboard with 75mm thick, 11 kg/m3 glass wool insulation blanket in wall cavity and 13mm plasterboard inner layer and 50mm, 11 kg/m3 glass wood insulation in riser cavity.
F5.7	Sound isolation of pumps	Flexible couplings to be used at the point of connection between the service pipes in a building and any circulating or other pumps.

Table 4.5: Recommended Acoustic Separation Construction Performance

4.5 REVERBERATION ASSESSMENT

The potential recommended finishes and minimum acoustic properties to assist in achieving AS 2107:2016 Reverberation Times targets, are as follows: -

Hydrotherapy, Cinema, Kitchen, Activity Rooms, Lounge and Dinning Areas

Element	Requirement	Construction System Proposed
Ceiling	NRC 0.6 - 0.70	Acoustic rated mineral ceiling tile or equivalent.
Carpet	NRC 0.2 - 0.3	Commercial Grade Carpet
Wall Panels	NRC 0.45 – 0.65	12 mm thick polyester fibers

Table 4.6: Recommended Reverberation Performance

4.6 SERVICES ASSESSMENT

All mechanical and hydraulic services installations shall comply with the following requirements to ensure that noise and vibration from the plant is reduced to a minimum: -

- All rotary machinery shall be accurately balanced both statically and dynamically and shall be free from vibration at all operating speeds and during starting and stopping.
- Centrifugal and reciprocating rotating equipment shall be mounted on vibration absorbing mountings.
- All connections to rotating machinery, or assemblies containing machinery shall be rendered flexible by vibration hangers supporting ducting and piping systems, flexible connections between ductwork and fans, and in critical installations with flexible hose between pipes and pumps. If a flexible hose is not installed, adequate provision shall be made to take up the vibration in bends and pipe runs.
- Acoustic lining and/or attenuators shall be applied to critical sections of ducts and air handling units unless otherwise specified.

- Acoustic seals shall be provided where all pipes, ducts and conduits penetrate plantrooms or acoustic walls.
- Duct connections to vibrating mechanical plant shall be isolated by flexible PVC connections not less than 100mm long when fully stretched out.

Neoprene type mounts may be used for all static deflections up to and including 9mm however above that, combined springs and neoprene pads shall be used. Isolation efficiency and static deflection shall not be less than the following: -

Element	Minimum Construction
Treatment of Condenser Units	Resilient mounts. Flexible couplings to be used at the point of connection between the service pipes.
Treatment of mechanical Services Ductwork	Internally lined ductwork and attenuators as detailed in mechanical specification.
Risers	Refer appendices for typical detail and table in section of 4.2 for minimum construction.
Pumps	Install flexible coupling
Floor/Walls to Mech Plant Deck	Ceiling. 150mm concrete slab/blockwork wall. 75mm glasswool insulation. Air gap. 10mm plasterboard ceiling on resilient mounts to suspended ceiling. Walls: 25% perforated metal sheet in front of 50mm glass wool to 50% wall area.

Table 4.7: Recommended Services Performance

4.7 LIFT CORE TREATMENTS

Recommend noise control measures for minimising lift core noise is: -

- Maximise stiffness of lift cores to minimum vibration levels. Minimum 150mm thick in-situ concrete or 190mm thick core filled wall.
- Locate lift rail mounts on stiffest part of lift core structure: i.e. where shaft wall and floor slabs meet. Fixings to be located on the .centre line of the floor slab.

SECTION 5

TESTING ON COMPLETION

SECTION 5.0 TESTING ON COMPLETION

All SOUs to be tested for compliance with criteria for impact noise isolation, internal noise levels and noise separation. Measurements are to be taken adjacent to noise sources (risers; façade windows and service access hatches; walls adjacent to different use spaces such as plant rooms and laundries; supply and return air grilles).

Sound level meters used for testing to comply with Type 2 level instrumentation requirements as per AS 1259.2-1990.

SECTION 6

CONCLUSION

SECTION 6.0 CONCLUSION

This report presents the results of an acoustic assessment of operational noise emissions from the proposed new Pathways Longueville Aged Care Facility, 16 Northwood Road, Northwood NSW.

This report is part of the documentation package to be submitted to the Lane Cove Council as part of the Development Application for the proposed development.

The environmental noise intrusion criteria for the operation of the proposed development has been established based on Lane Cove Council and state policy guidelines.

The establishment of the noise criteria was based on AcousTech's noise survey, which monitored ambient and background noise levels using a long-term noise logger at the boundary of the potentially most-affected receivers.

Suitable noise control measures have been proposed to provide reasonable levels of noise amenity within the Longueville Residential Aged Care Facility development and at adjacent properties. The assessment has considered the noise from mechanical plant, noise sources associated with the development and external environmental noise.

The noise control measures recommended include: -

- Acoustic design of façade and services to minimise noise intrusions.
- Location of noise sensitive activities within the building and using intervening building structure to control noise emissions.
- Demand control of external A/C plant to minimise noise emissions.

We can confirm there will not be any adverse operational acoustic environmental impact. This assessment concludes that the proposed development should not be refused on the grounds of excessive noise generation.

APPENDIX A

FAÇADE AND INTERNAL NOISE SEPARATION ACOUSTIC REQUIREMENTS

SITE AREA 5003 m²

LEGEND

- PROPOSED EASEMENT
- EXISTING EASEMENT
- PROPOSED UPPER LEVEL ENVEOPE
- PROPOSED BASEMENT LEVEL ENVELOPE
- EXISTING EASEMENT
- PROPOSED SEWER DIVERSION
- EXISTING 150mm VCP SEWER TO BE REMOVED
- PROPOSED PLANTING

- AMENITIES
- BEDS
- BOH
- CARPARK
- CIRCULATION
- COMMUNAL
- EXTERNAL
- MULTI-PURPOSE
- NONE
- RETAIL
- SPECIALTY
- STAFF FACILITIES

Minimum Requirement

Walls

- Rw 35
- Rw 40
- Rw 45 Discontinuous
- Rw 45
- Rw 50

Glazing

- Rw 30
- Rw 32

Risers

- Rw +Ctr > 40
- Rw +Ctr > 25

1

PARKING SCHEDULE	
LEVEL	PARKING COUNT
BASEMENT LEVEL	44
LEVEL 2	38
LEVEL 3	10
Grand total: 92	

1 FLOOR PLAN - LEVEL 01 - BASEMENT
SCALE 1 : 200

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DRAWING TITLE
LEVEL 1 BASEMENT PARKING FLOOR PLAN

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DRAWN	Author
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DATE	31.07.2020

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1 FLOOR PLAN - LEVEL 02
SCALE 1 : 200

SITE AREA 5003 m²

LEGEND

- PROPOSED EASEMENT
- EXISTING EASEMENT
- PROPOSED UPPER LEVEL ENVEOPE
- PROPOSED BASEMENT LEVEL ENVELOPE
- EXISTING EASEMENT
- PROPOSED SEWER DIVERSION
- EXISTING 150mm VCP SEWER TO BE REMOVED
- PROPOSED PLANTING

- AMENITIES
- BEDS
- BOH
- CARPARK
- CIRCULATION
- COMMUNAL
- EXTERNAL
- MULTI-PURPOSE
- NONE
- RETAIL
- SPECIALTY
- STAFF FACILITIES

Minimum Requirement

Walls

- Rw 35
- Rw 40
- Rw 45 Discontinuous
- Rw 45
- Rw 50

Glazing

- Rw 30
- Rw 32

Risers

- Rw +Ctr > 40
- Rw +Ctr > 25

2

PARKING SCHEDULE

LEVEL	PARKING COUNT
BASEMENT LEVEL	44
LEVEL 2	38
LEVEL 3	10
Grand total: 92	

TOTAL BEDS

Mark	Count
BED	133

TOTAL BEDROOMS

LEVEL	CAREHOUSE	BED COUNT
LEVEL 2	BEDS	21
LEVEL 3	BEDS	15
LEVEL 5	BEDS	43
LEVEL 6	BEDS	43
TOTAL BEDROOMS		122

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DRAWING TITLE
LEVEL 2 FLOOR PLAN

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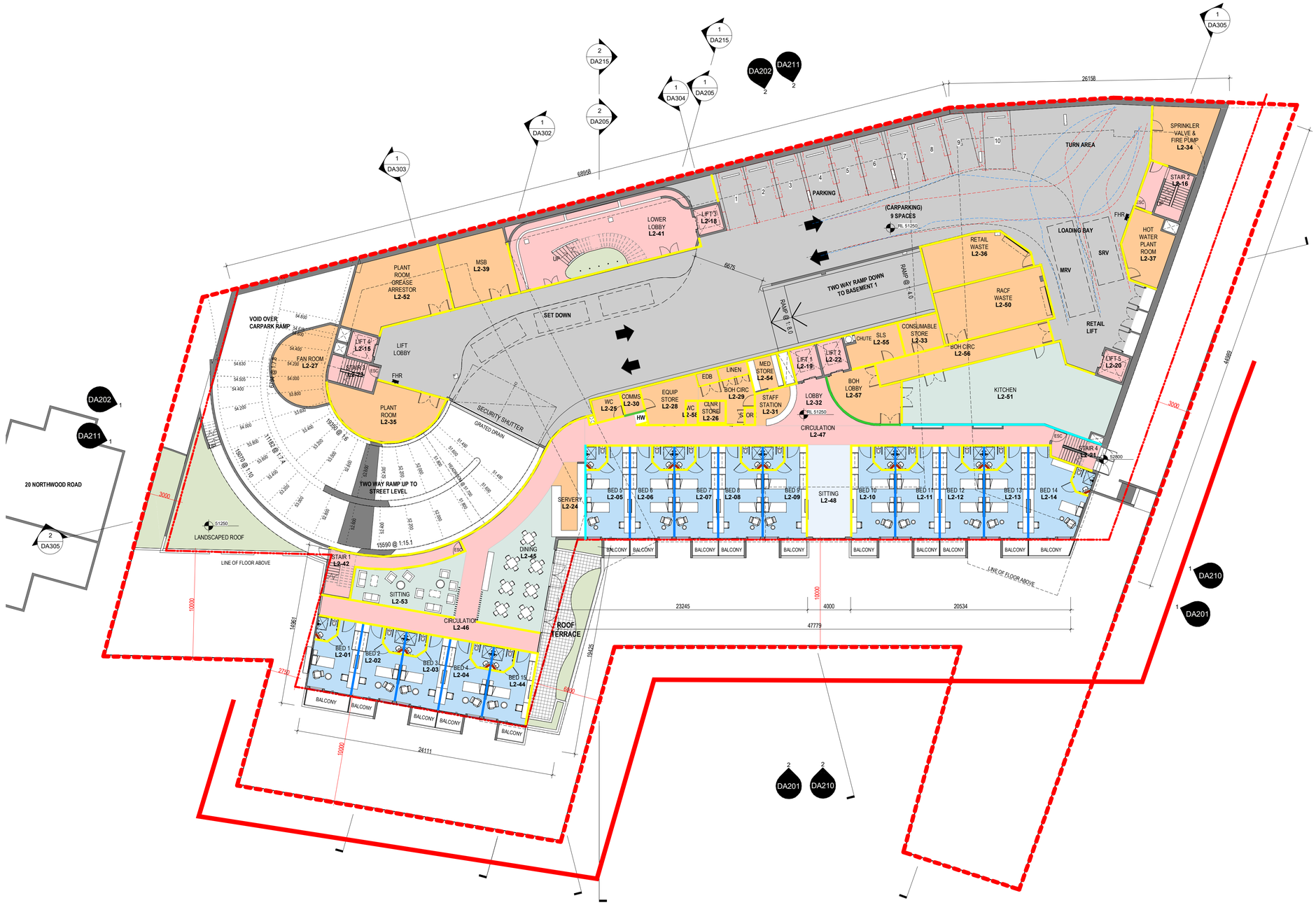
SITE AREA 5003 m²

LEGEND

- PROPOSED EASEMENT
- EXISTING EASEMENT
- PROPOSED UPPER LEVEL ENVEOPE
- PROPOSED BASEMENT LEVEL ENVELOPE
- EXISTING EASEMENT
- PROPOSED SEWER DIVERSION
- EXISTING 150mm VCP SEWER TO BE REMOVED
- PROPOSED PLANTING

- AMENITIES
- BEDS
- BOH
- CARPARK
- CIRCULATION
- COMMUNAL
- EXTERNAL
- MULTI-PURPOSE
- NONE
- RETAIL
- SPECIALTY
- STAFF FACILITIES



1 FLOOR PLAN - LEVEL 03
SCALE 1 : 200

Minimum Requirement

Walls

- Rw 35
- Rw 40
- Rw 45 Discontinuous
- Rw 45
- Rw 50

Glazing

- Rw 30
- Rw 32

Risers

- Rw +Ctr > 40
- Rw +Ctr > 25

3

TOTAL BEDS

Mark	Count
BED	133

TOTAL BEDROOMS

LEVEL	CAREHOUSE	BED COUNT
LEVEL 2	BEDS	21
LEVEL 3	BEDS	15
LEVEL 5	BEDS	43
LEVEL 6	BEDS	43
TOTAL BEDROOMS		122

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LEVEL 3 FLOOR PLAN

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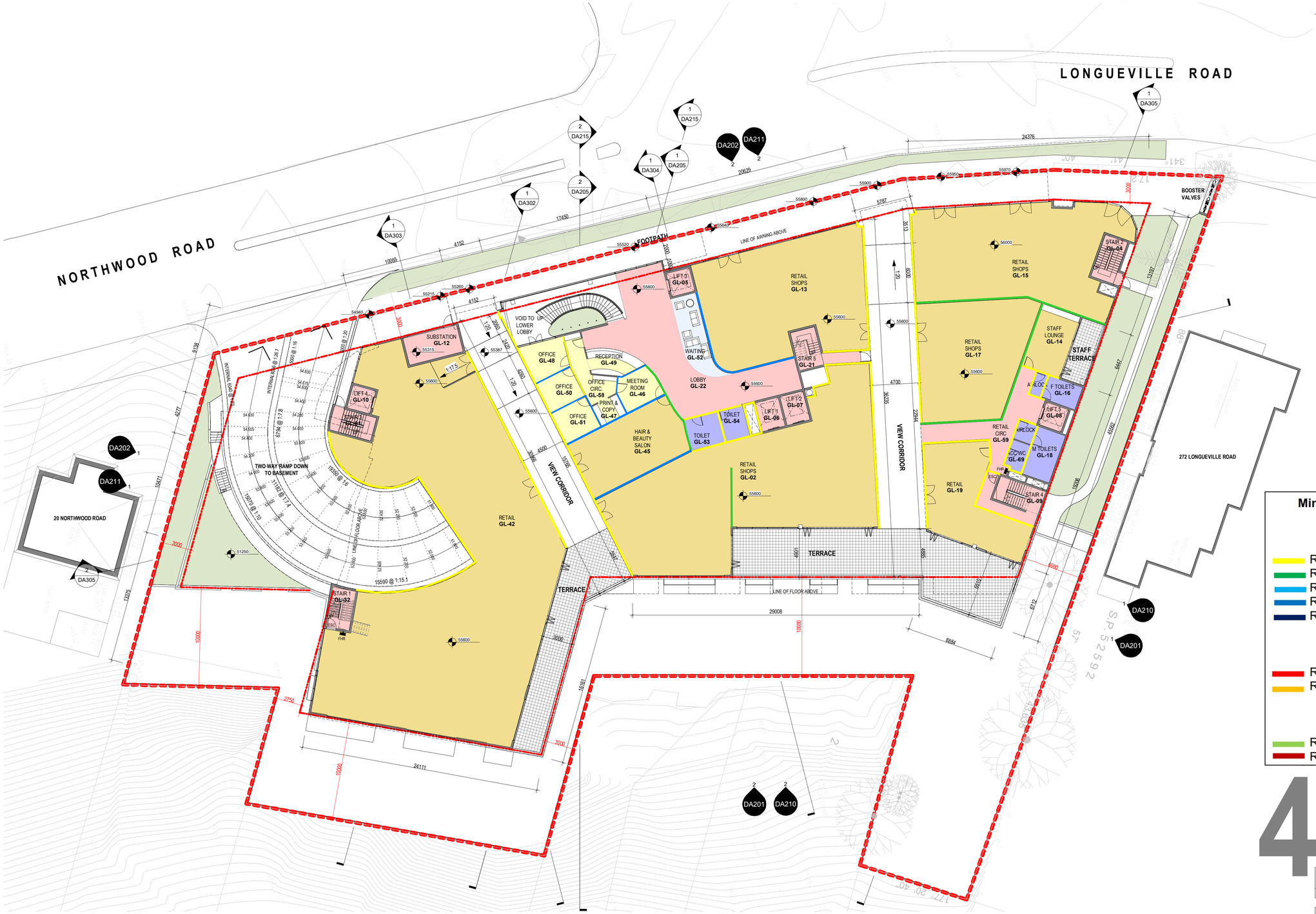

1 FLOOR PLAN - LEVEL 04 - GROUND FLOOR
SCALE 1 : 200

SITE AREA 5003 m²

LEGEND

- PROPOSED EASEMENT
- EXISTING EASEMENT
- PROPOSED UPPER LEVEL ENVEOPE
- PROPOSED BASEMENT LEVEL ENVELOPE
- EXISTING EASEMENT
- PROPOSED SEWER DIVERSION
- EXISTING 150mm VCP SEWER TO BE REMOVED
- PROPOSED PLANTING

- AMENITIES
- BEDS
- BOH
- CARPARK
- CIRCULATION
- COMMUNAL
- EXTERNAL
- MULTI-PURPOSE
- NONE
- RETAIL
- SPECIALTY
- STAFF FACILITIES

Minimum Requirement

Walls

- Rw 35
- Rw 40
- Rw 45 Discontinuous
- Rw 45
- Rw 50

Glazing

- Rw 30
- Rw 32

Risers

- Rw +Ctr > 40
- Rw +Ctr > 25

4

TOTAL BEDS

Mark	Count
BED	133

TOTAL BEDROOMS

LEVEL	CAREHOUSE	BED COUNT
LEVEL 2	BEDS	21
LEVEL 3	BEDS	15
LEVEL 5	BEDS	43
LEVEL 6	BEDS	43
TOTAL BEDROOMS		122

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LEVEL 4 GROUND FLOOR PLAN

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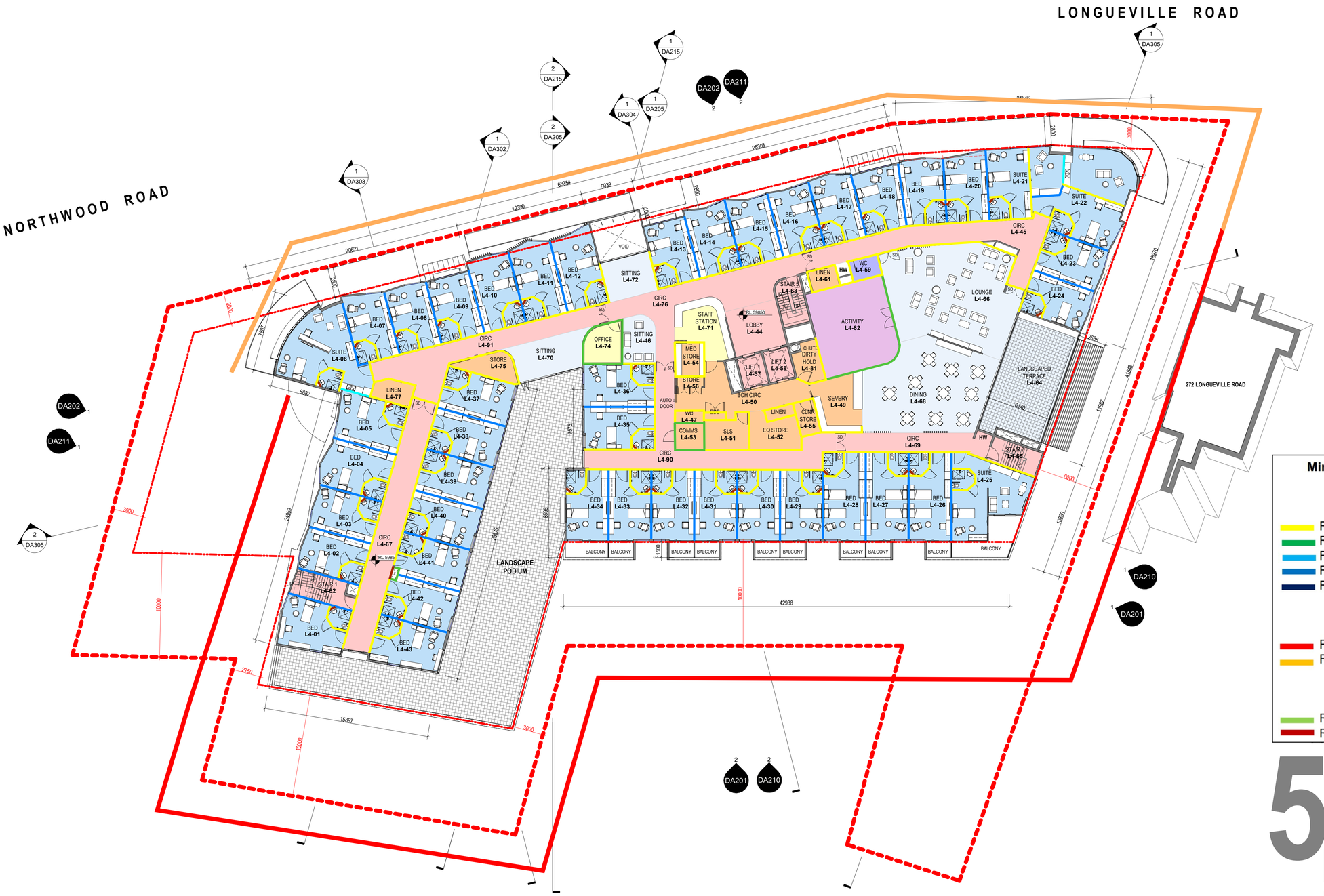

1 FLOOR PLAN - LEVEL 05
SCALE 1 : 200

SITE AREA 5003 m²

LEGEND

- PROPOSED EASEMENT
- EXISTING EASEMENT
- PROPOSED UPPER LEVEL ENVEOPE
- PROPOSED BASEMENT LEVEL ENVELOPE
- EXISTING EASEMENT
- PROPOSED SEWER DIVERSION
- EXISTING 150mm VCP SEWER TO BE REMOVED
- PROPOSED PLANTING

- AMENITIES
- BEDS
- BOH
- CARPARK
- CIRCULATION
- COMMUNAL
- EXTERNAL
- MULTI-PURPOSE
- NONE
- RETAIL
- SPECIALTY
- STAFF FACILITIES

Minimum Requirement

Walls

- Rw 35
- Rw 40
- Rw 45 Discontinuous
- Rw 45
- Rw 50

Glazing

- Rw 30
- Rw 32

Risers

- Rw +Ctr > 40
- Rw +Ctr > 25

5

TOTAL BEDS

Mark	Count
BED	133

TOTAL BEDROOMS

LEVEL	CAREHOUSE	BED COUNT
LEVEL 2	BEDS	21
LEVEL 3	BEDS	15
LEVEL 5	BEDS	43
LEVEL 6	BEDS	43
TOTAL BEDROOMS		122

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LEVEL 5 FLOOR PLAN

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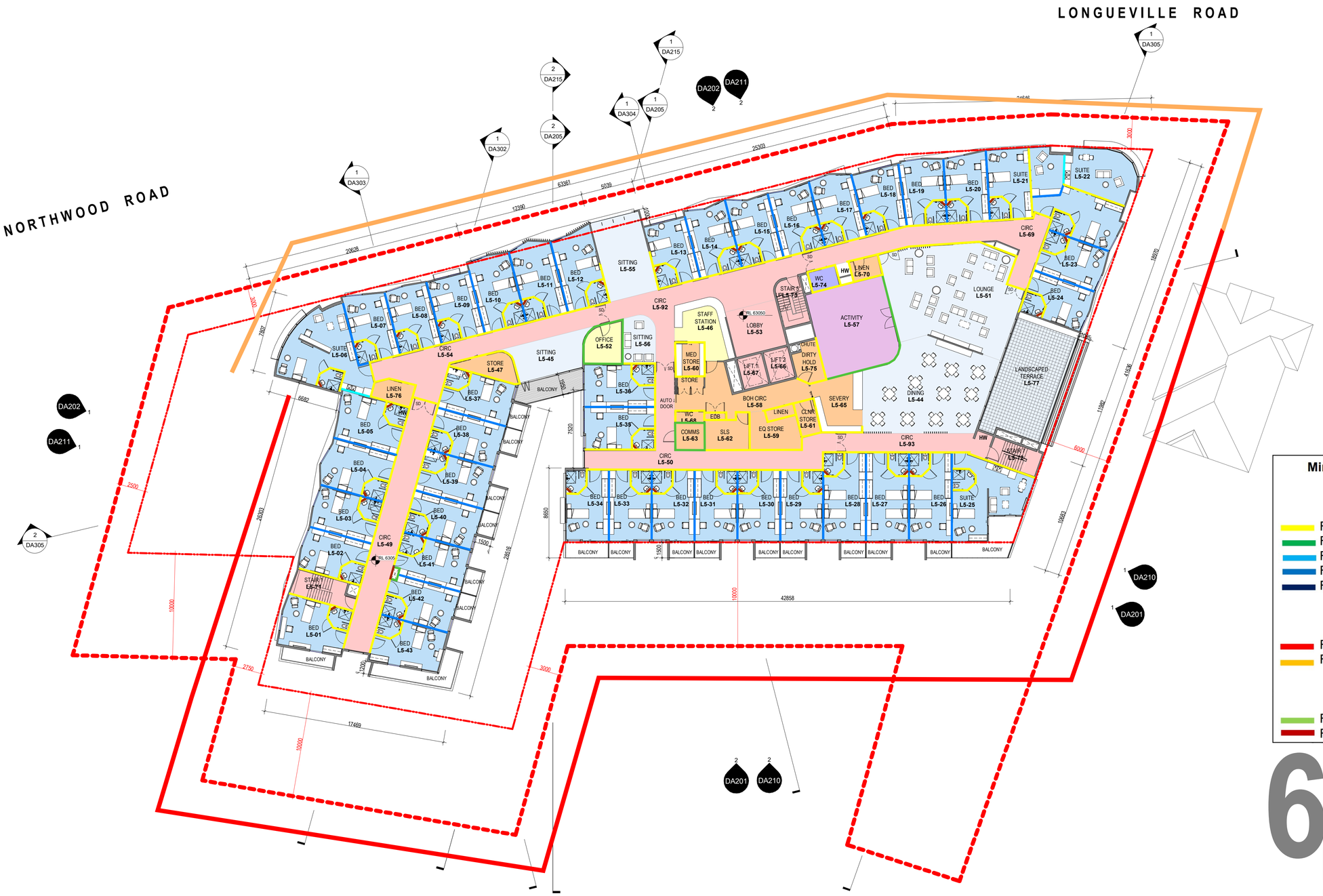

1 FLOOR PLAN - LEVEL 06
SCALE 1 : 200

SITE AREA 5003 m²

LEGEND

- PROPOSED EASEMENT
- EXISTING EASEMENT
- PROPOSED UPPER LEVEL ENVEOPE
- PROPOSED BASEMENT LEVEL ENVELOPE
- EXISTING EASEMENT
- PROPOSED SEWER DIVERSION
- EXISTING 150mm VCP SEWER TO BE REMOVED
- PROPOSED PLANTING

- AMENITIES
- BEDS
- BOH
- CARPARK
- CIRCULATION
- COMMUNAL
- EXTERNAL
- MULTI-PURPOSE
- NONE
- RETAIL
- SPECIALTY
- STAFF FACILITIES

Minimum Requirement

Walls

- Rw 35
- Rw 40
- Rw 45 Discontinuous
- Rw 45
- Rw 50

Glazing

- Rw 30
- Rw 32

Risers

- Rw +Ctr > 40
- Rw +Ctr > 25

6

TOTAL BEDS

Mark	Count
BED	133

TOTAL BEDROOMS

LEVEL	CAREHOUSE	BED COUNT
LEVEL 2	BEDS	21
LEVEL 3	BEDS	15
LEVEL 5	BEDS	43
LEVEL 6	BEDS	43
TOTAL BEDROOMS		122

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DRAWING TITLE
LEVEL 6 FLOOR PLAN

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DRAWN	Author
PROJECT PRINCIPLE	M. RALPH
DATE	31.07.2020

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APPENDIX B

ACOUSTIC DETAILS - WALLS/FLOORS/CEILINGS

Sound Insulation Prediction (v8.0.9)

Program copyright Marshall Day Acoustics 2015

- Key No. 3639

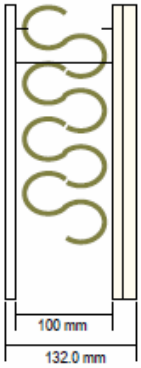
Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.: Notes:

Date: 31 Mar 16 Initials:guyb

File Name: external wall.ixl



Rw 51 dB
C -3 dB
C_{tr} -9 dB
D_{nTw} 53 dB

System description

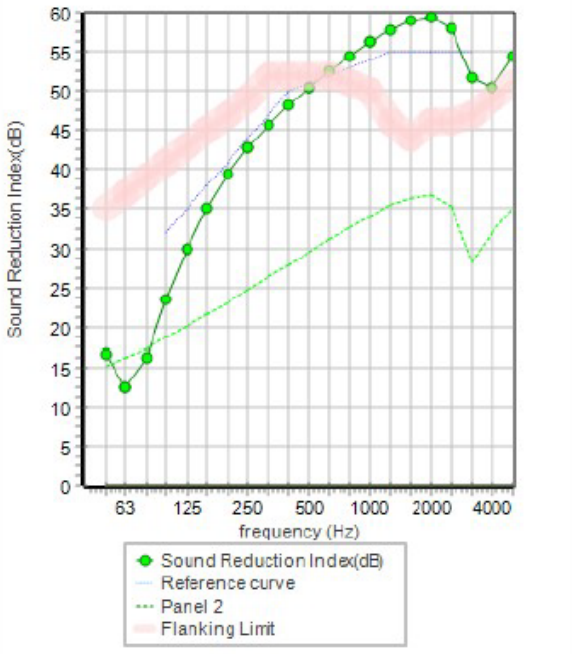
Panel 1 : 1 x 9.0 mm James Hardie ComTex (ρ:1360 kg/m3,E:7.4GPa,η:0.02)

Cavity: Steel stud (1.0-1.6 mm): Stud spacing 600 mm , Infill NEW GENERATION Soundscreen R2.5 Thickness 88 mm (ρ:26 kg/m3, Rf:13300 Pa.s/m2)
Panel 2 + 1 x 10.0 mm mm Plasterboard (ρ:710 kg/m3,E:2GPa,η:0.01) + 1 x 13.0 mm mm Plasterboard (ρ:710 kg/m3,E:2GPa,η:0.01)

Mass-air-mass resonant frequency =61 Hz

frequency (Hz)	R(dB)	R(dB)
50	17	
63	12	15
80	16	
100	23	
125	30	27
160	35	
200	39	
250	43	42
315	46	
400	48	
500	50	50
630	53	
800	54	
1000	56	56
1250	58	
1600	59	
2000	59	59
2500	58	
3150	52	
4000	51	52
5000	54	

Panel Size 2.7x4 m; Mass 30.9 kg/m2



Sound Insulation Prediction (v8.0.9)

- Key No. 3639

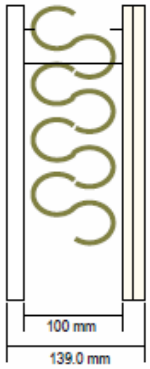
Margin of error is generally within Rw +/- 3 dB

Job Name:

Job No.: Page No.: Notes:

Date: 31 Mar 16 Initials:guyb

File Name: external wall 2 .ixl



Rw	53 dB
C	-2 dB
C_{tr}	-8 dB
D_{nTw}	55 dB

System description

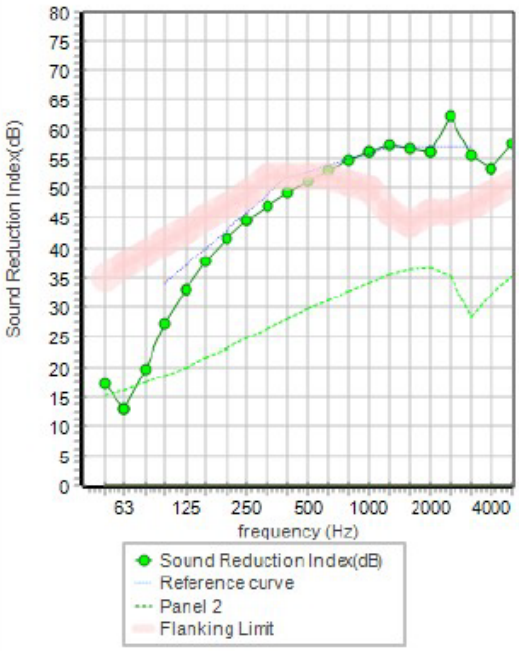
Panel 1 : 1 x 16.0 mm James Hardie Linea (ρ:1150 kg/m3,E:5.2GPa,η:0.02)

Cavity: Steel stud (1.0-1.6 mm): Stud spacing 600 mm , Infill NEW GENERATION Soundscreen R2.5 Thickness 88 mm (ρ:26 kg/m3, Rf:13300 Pa.s/m2)
Panel 2 + 1 x 10.0 mm mm Plasterboard (ρ:710 kg/m3,E:2GPa,η:0.01) + 1 x 13.0 mm mm Plasterboard (ρ:710 kg/m3,E:2GPa,η:0.01)

Mass-air-mass resonant frequency =55 Hz

frequency (Hz)	R(dB)	R(dB)
50	17	
63	13	16
80	20	
100	27	
125	33	31
160	38	
200	41	
250	44	44
315	47	
400	49	
500	51	51
630	53	
800	55	
1000	56	56
1250	57	
1600	57	
2000	56	58
2500	62	
3150	56	
4000	53	55
5000	57	

Panel Size 2.7x4 m; Mass 37.0 kg/m2



Rainfall Noise Prediction (v8.0.9)

- Key No. 3639

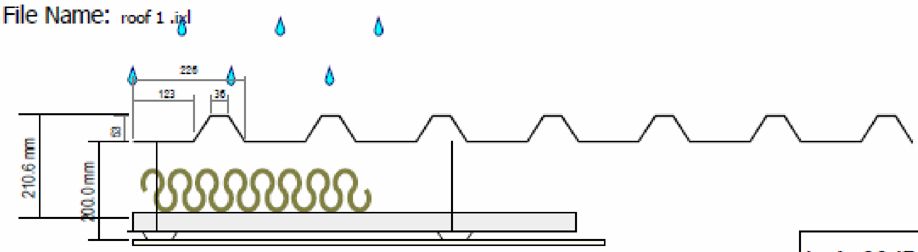
Margin of error for Rainfall Noise Prediction is generally within +/- 5 dBA

Job Name:

Job No.: Page No.: Notes:

Date: 31 Mar 16 Initials:guyb

File Name: roof 1 .ixl



LpA 39dB

System description

Natural Rain: Rainfall 40 mm/hr
Panel 1 : 1 x 0.6 mm Roof Cladding Multispan (ρ:7800 kg/m3,E:2.1E02GPa,η:0.01)

Cavity: [illegible] R2.5 Thickness 88 mm (ρ:26 kg/m3, Rf:13300 Pa.s/m2)
Panel 2 + 1 x 10.0 mm mm Plasterboard (ρ:710 kg/m3,E:2GPa,η:0.01)

Panel Size 2.4x2.4 m
Room volume 50 m3, Reveberation time 0.5 s

Mass-air-mass resonant frequency =75 Hz

frequency (Hz)	(dB)	(dB)
50	37	
63	41	44
80	39	
100	34	
125	31	36
160	29	
200	27	
250	25	31
315	26	
400	28	
500	29	33
630	30	
800	30	
1000	31	35
1250	31	
1600	30	
2000	29	34
2500	27	
3150	23	
4000	23	27
5000	20	

Impact Sound Prediction (v8.0.9)

- Key No. 3639

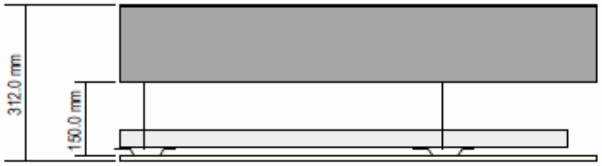
Margin of error for Impact Sound Prediction is generally within Ln,w +/- 5 dB

Job Name:

Job No.: Page No.: Notes:

Date: 31 Mar 16 Initials:guyb

File Name: floor .ixl



Ln,w 62 dB
C_1 -2 dB

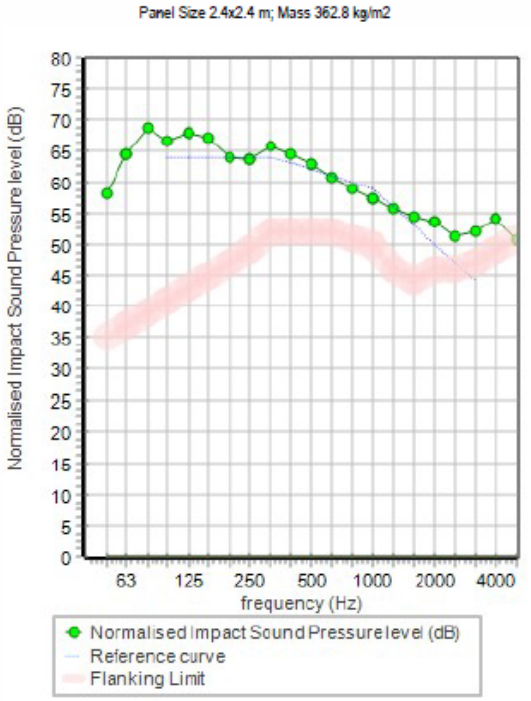
System description

Floor Cover: None (Measured)
Panel 1 : 1 x 152.0 mm Concrete (ρ:2340 kg/m3,E:11GPa,η:0.04)

Cavity: Suspended light steel grid: Stud spacing 600 mm
Panel 2 + 1 x 10.0 mm mm Plasterboard (ρ:710 kg/m3,E:2GPa,η:0.01)

Mass-air-mass resonant frequency =70 Hz

frequency (Hz)	Ln(dB)	Ln(dB)
50	58	
63	64	70
80	69	
100	66	
125	68	72
160	67	
200	64	
250	64	69
315	66	
400	65	
500	63	68
630	61	
800	59	
1000	57	62
1250	56	
1600	54	
2000	54	58
2500	51	
3150	52	
4000	54	57
5000	51	



Rw 35 Type Wall

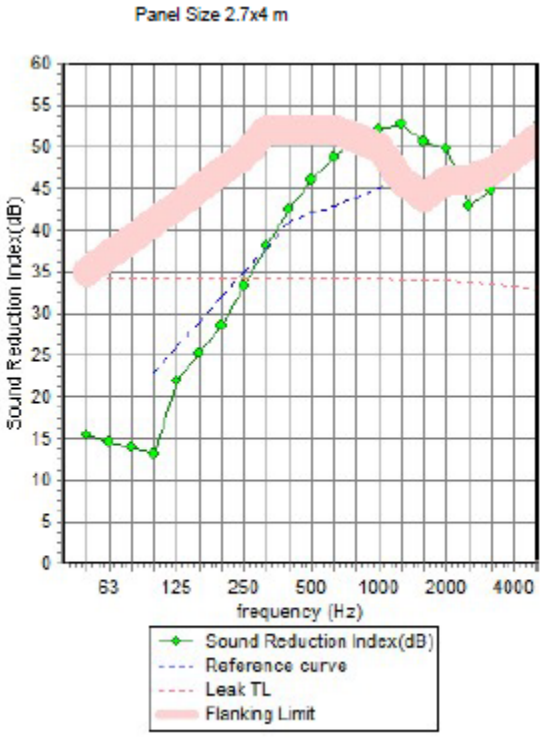
System description

Panel 1 Outer layer: 1 x 13.0 mm KNAUF 13mm MastaShield Plasterboard- (m=8.4 kg/m2, fc=2699 Hz, Damping=0.01) Profile

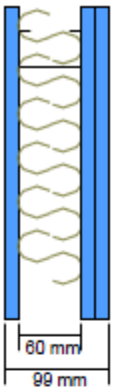
Cavity: Steel stud (0.55mm) @ 600 mm , Infill NEW GENERATION Soundscreen R1.7 Thickness 60 mm
Panel 2 Inner layer: 1 x 13.0 mm KNAUF 13mm MastaShield Plasterboard- (m=8.4 kg/m2, fc=2699 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =101 Hz

frequency (Hz)	R(dB)	R(dB)
50	16	
63	14	15
80	14	
100	13	
125	22	17
160	25	
200	29	
250	33	32
315	38	
400	43	
500	46	45
630	49	
800	51	
1000	52	52
1250	53	
1600	51	
2000	50	46
2500	43	
3150	45	
4000	49	48
5000	52	



Rw 45 Type Wall



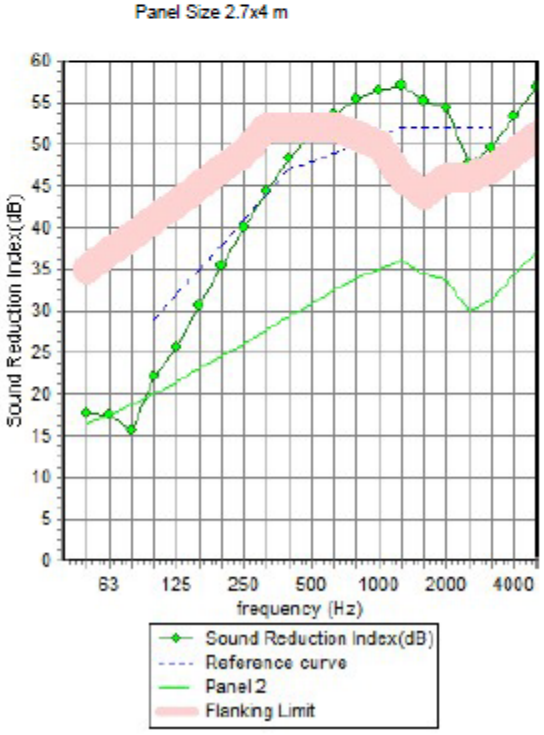
System description

Panel 1 Outer layer: 1 x 13.0 mm KNAUF 13mm MastaShield Plasterboard- (m=8.4 kg/m2, fc=2699 Hz, Damping=0.01) Profile

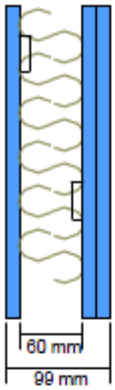
Cavity: Steel stud (0.55mm) @ 600 mm , Infill NEW GENERATION Soundscreen R1.7 Thickness 60 mm
Panel 2 Inner layer: 1 x 13.0 mm KNAUF 13mm FireShield Plasterboard- (m=10.4 kg/m2, fc=2684 Hz, Damping=0.01) Profile
Panel 2 Outer layer: 1 x 13.0 mm KNAUF 13mm MastaShield Plasterboard (m=8.4 kg/m2, fc=2699 Hz, Damping=0.01)

Mass-air-mass resonant frequency =86 Hz

frequency (Hz)	R(dB)	R(dB)
50	18	
63	17	17
80	16	
100	22	
125	26	25
160	31	
200	35	
250	40	38
315	44	
400	48	
500	51	51
630	54	
800	55	
1000	57	56
1250	57	
1600	55	
2000	54	51
2500	48	
3150	49	
4000	53	52
5000	57	



Rw 45-50 Discontinuous



Rw	50 dB
C	-4 dB
C_{tr}	-11 dB

System description

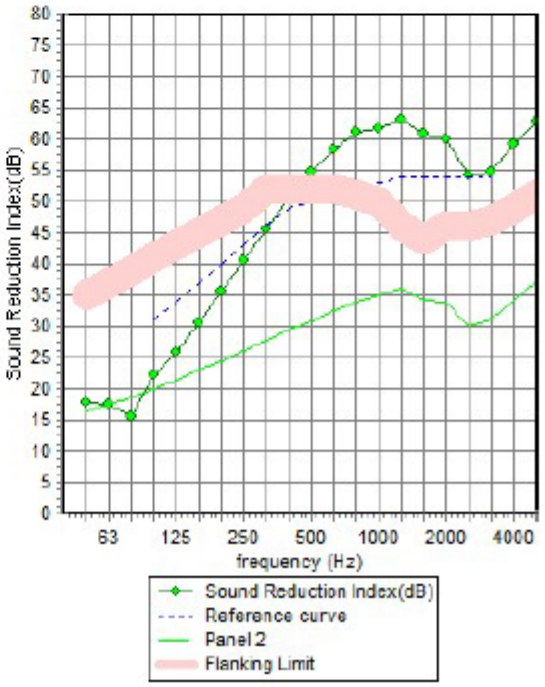
Panel 1 Outer layer: 1 x 13.0 mm KNAUF 13mm MastaShield Plasterboard- (m=8.4 kg/m2, fc=2699 Hz, Damping=0.01) Profile

Cavity: Staggered Steel stud @ 600 mm , Infill NEW GENERATION Soundscreen R1.7 Thickness 60 mm
Panel 2 Inner layer: 1 x 13.0 mm KNAUF 13mm FireShield Plasterboard- (m=10.4 kg/m2, fc=2684 Hz, Damping=0.01) Profile
Panel 2 Outer layer: 1 x 13.0 mm KNAUF 13mm MastaShield Plasterboard (m=8.4 kg/m2, fc=2699 Hz, Damping=0.01)

Mass-air-mass resonant frequency =86 Hz

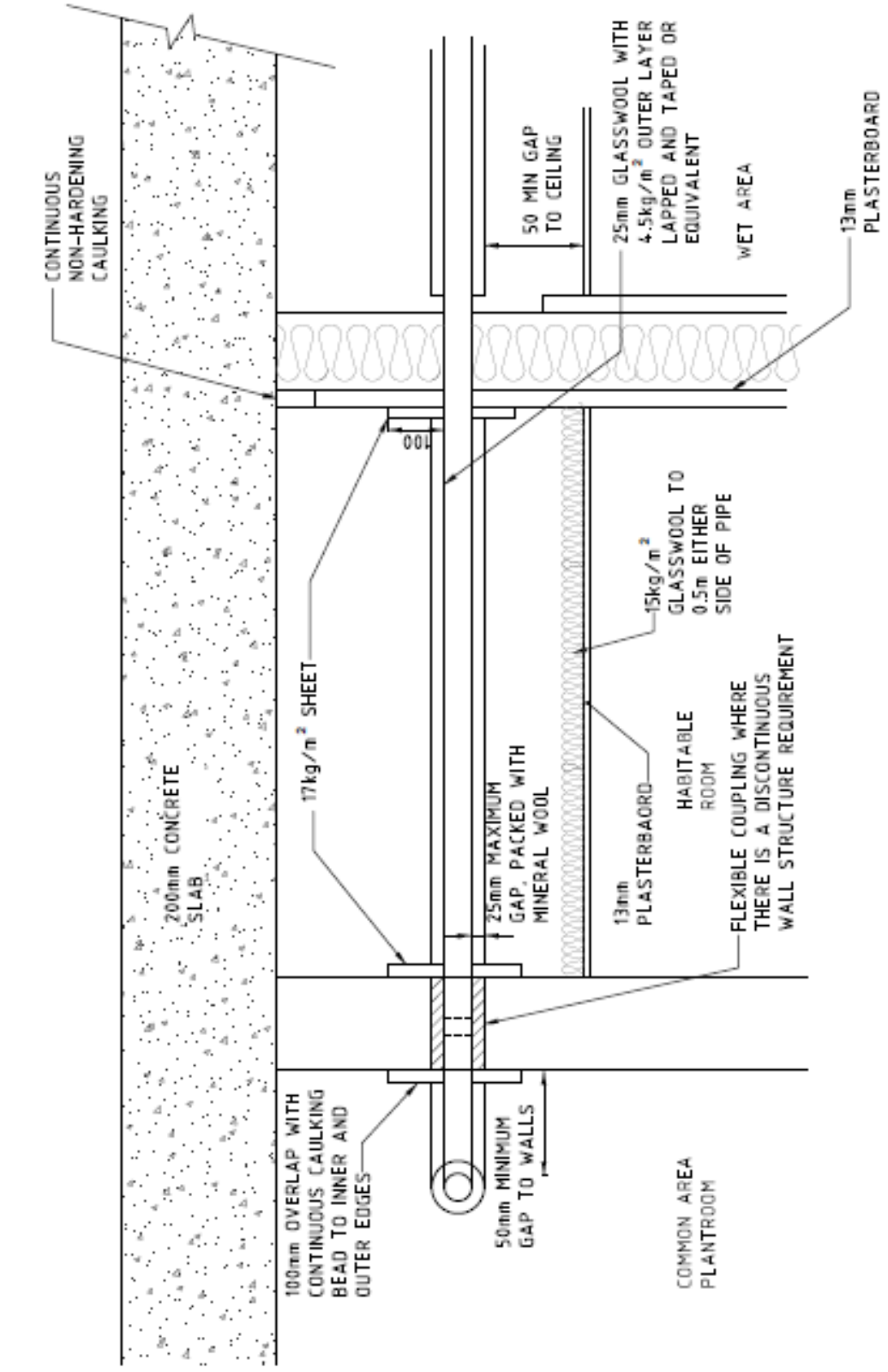
frequency (Hz)	R(dB)	R(dB)
50	18	
63	17	17
80	16	
100	22	
125	26	25
160	31	
200	36	
250	41	39
315	46	
400	51	
500	55	53
630	58	
800	61	
1000	62	62
1250	63	
1600	61	
2000	60	57
2500	54	
3150	55	
4000	59	58
5000	63	

Panel Size 2.7x4 m

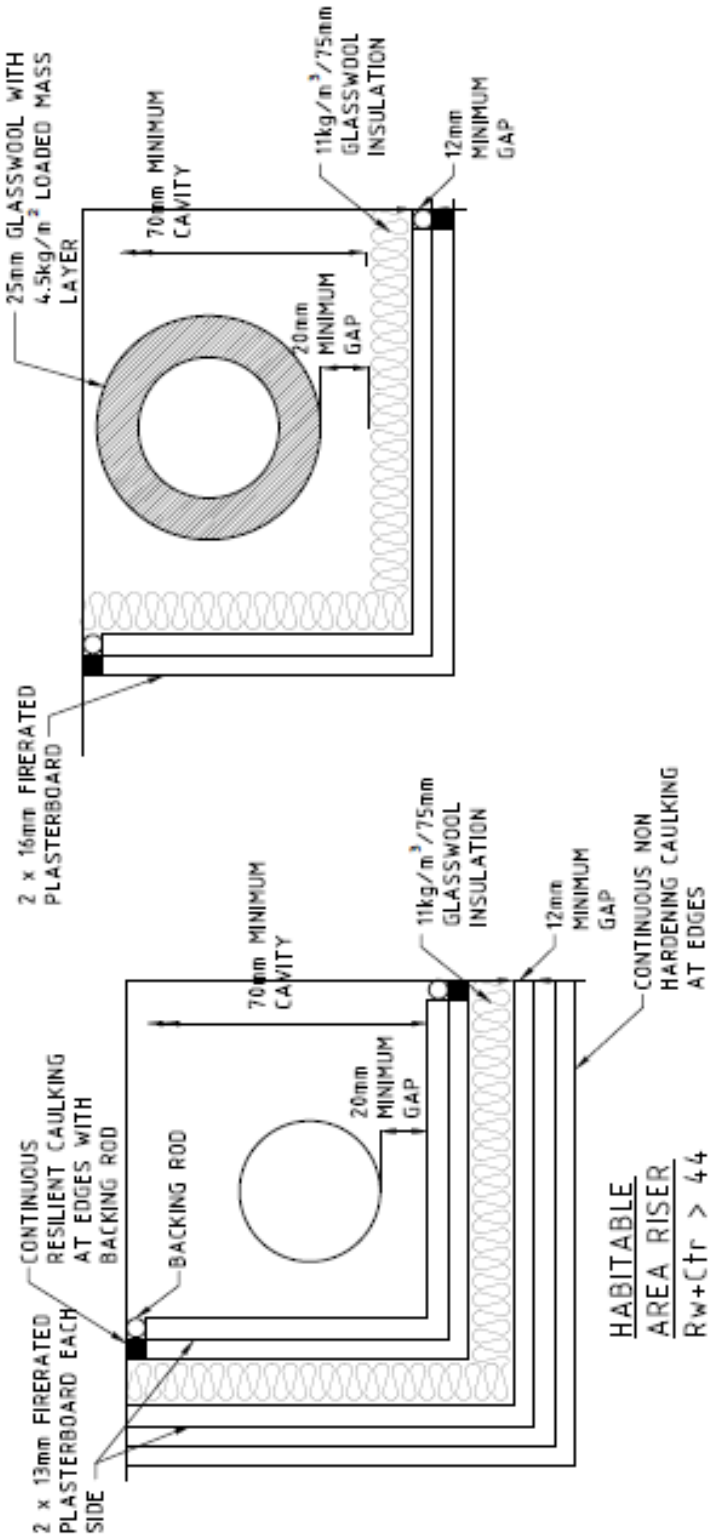


APPENDIX C

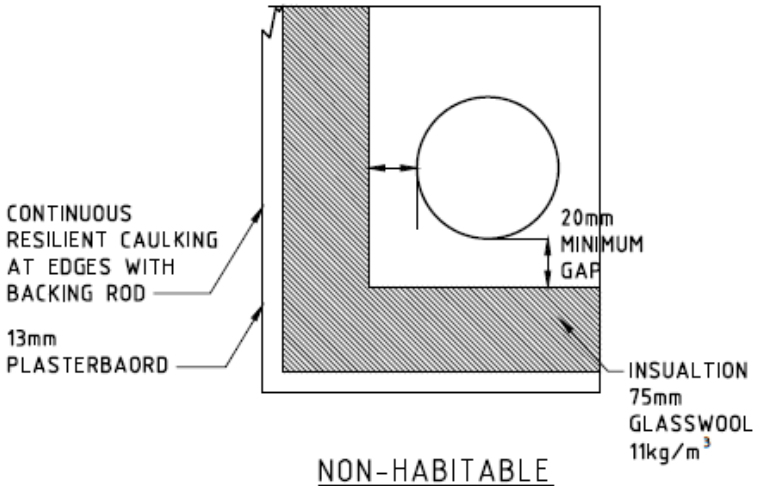
ACOUSTIC DESIGN ELEMENTS - SERVICES



A	REPORT ISSUE	CK	GB	19.04.13	ACOUSTIC SERVICES SERVICE PIPE SOUND INSULATION	emf griffiths	SCALE NTS / DATE – / DRAWN CK / CHECKED GB / PROJECT No 212092 / DRAWING No SK-AC-01 / No IN SET – / REV A

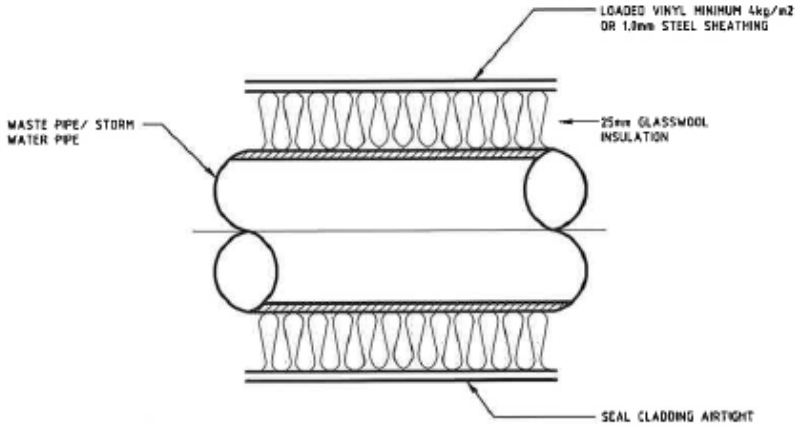


A	REPORT ISSUE	CK	GB	19.04.13	ACOUSTIC SERVICES RISER SOUND INSULATION	emf griffiths	SCALE NTS / DRAWN CK / PROJECT No 212092 / DATE – / CHECKED GB / DRAWING No SK-AC-05 / REV A



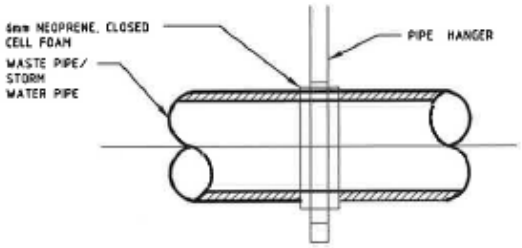
NON-HABITABLE
AREA RISER
Rw+Ctr > 25

A	REPORT ISSUE	CK	GB	19.04.13	ACOUSTIC SERVICES NON-HABITABLE AREA RISER	emf griffiths	SCALE NTS / DATE –
							DRAWN CK / CHECKED GB
							PROJECT No 212092 / DRAWING No SK-AC-10
REV	DESCRIPTION	DR	CHK	DATE			No IN SET – / REV A



(REFER SPECIFICICATIONS AND DRAWINGS FOR EXTENT)

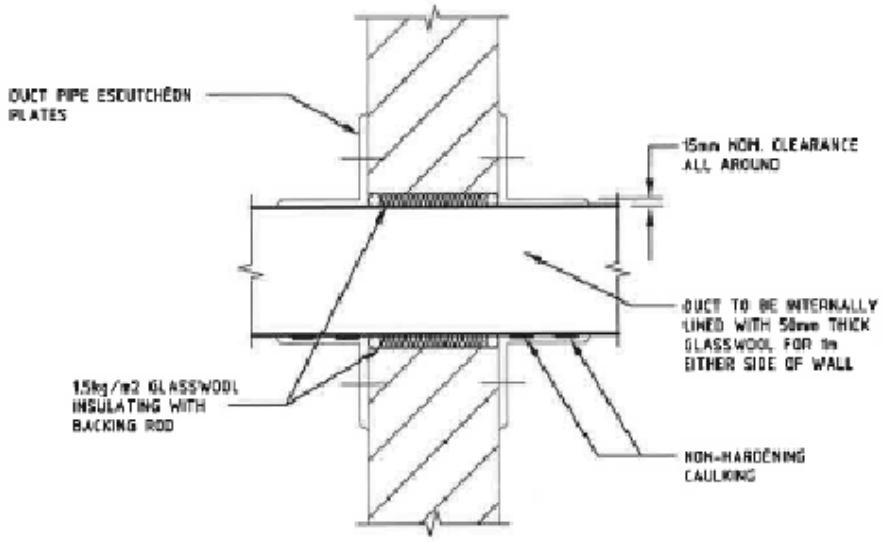
PIPE CLADDING



(REFER SPECIFICICATIONS AND DRAWINGS FOR EXTENT)

ISOLATION AT PIPE SUPPORTS.

A	PRELIMINARY ISSUE	CK	GB	xx.xx.14	ACOUSTIC SERVICES PIPEWORK ISOLATION	emf griffiths	SCALE NTS / DATE –
							DRAWN CK / CHECKED GB
							PROJECT No 211647 / DRAWING No SK-AC-10
REV	DESCRIPTION	DR	CHK	DATE			No IN SET – / REV A



A	PRELIMINARY ISSUE	CK	GB	xx.xx.14
REV	DESCRIPTION	DR	CK	DATE

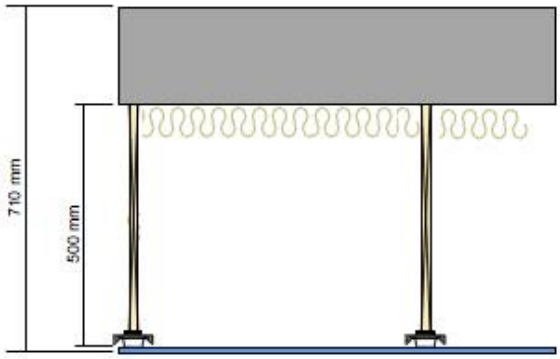
ACOUSTIC SERVICES

PIPE/DUCT PENETRATION

emf griffiths

SCALE NTS	DATE –
DRAWN CK	CHECKED GB
PROJECT No 211647	DRAWING No SK-AC-07
No IN SET –	REV A

Level 6- Mech Plant deck



Rw 78 dB
C -2 dB
C_{tr} -7 dB

System description

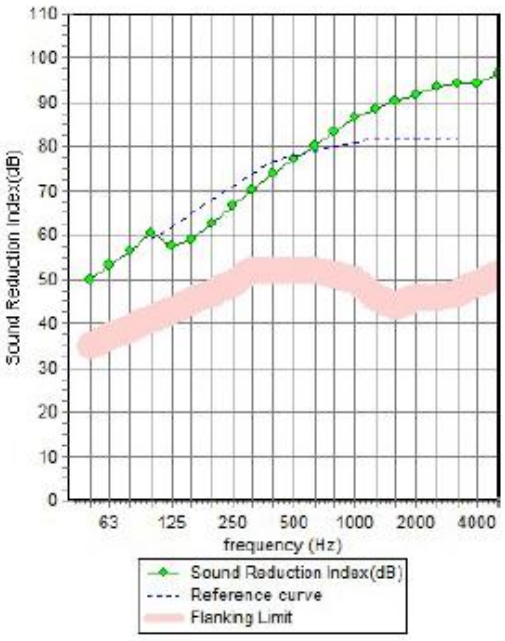
Panel 1 Outer layer: 1 x 200.0 mm Concrete- (m=468.0 kg/m2, fc=150 Hz, Damping=0.01) Profile

Cavity: Rubber Isolation Clip @ 600 mm , Infill R2.3 75mm Semi-rigid Thickness 75 mm
Panel 2 Inner layer: 1 x 10.0 mm KNAUF 10mm SpanShield (ceiling)- (m=6.8 kg/m2, fc=3727 Hz, Damping=0.01) Profile

Mass-air-mass resonant frequency =28 Hz

frequency (Hz)	R(dB)	R(dB)
50	50	
63	53	52
80	56	
100	61	
125	57	59
160	59	
200	63	
250	66	65
315	70	
400	74	
500	77	76
630	80	
800	83	
1000	87	86
1250	89	
1600	90	
2000	92	92
2500	93	
3150	94	
4000	94	95
5000	97	

Panel Size 2.7x4 m



APPENDIX D

GLOSSARY

APPENDIX D GLOSSARY

A–frequency weighting: An adjustment made to sound level measurement, by means of an electronic filter, in line with international standards. This approximates the response of the human ear at lower sound pressure levels and our hearing is less sensitive at very low and very high frequencies.

AGL: Height above ground level measured with respect to the underlying ground surface.

dB Decibel:, which is 10 times the logarithm (base 10) of the ratio of a given sound pressure to a reference pressure; used as a unit of sound.

L_{Aeq}: Equivalent sound pressure level – the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.

$L_{Aeq,adj,1hr,\ assessment}$: The noise level representing the 'average maximum' one-hour noise level during the assessment period (day, night and evening) Adjusted for low frequency content, tonality and impulsivity.

$L_{Aeq,\ adj,day}$: The overall LAeq noise level for the daytime period (0700-1800). Adjusted for low frequency content, tonality and impulsivity.

$L_{Aeq,\ adj,\ evening}$: The overall LAeq noise level for the evening period (1800-2200). Adjusted for low frequency content, tonality and impulsivity.

$L_{Aeq,\ adj,\ night}$: The overall LAeq noise level for the night- time period (2200-0700). Adjusted for low frequency content, tonality and impulsivity.

$L_{Aeq\ (8\text{-}hour)}$: The overall LAeq noise level for the night- time period (2200-0600). Adjusted for low frequency content, tonality and impulsivity.

$L_{Aeq\ (1\text{-}hour\ max)}$: The noise level representing the maximum one-hour noise level during the assessment period (day, night and evening). Adjusted for low frequency content, tonality and impulsivity.

$L_{A10\ (Time)}$: The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.

$L_{A10\ (1\ hour)}$: The LA10 level measured over a 1-hour period.

$L_{A10\ (12\ hour)}$: The arithmetic average of the LA10 levels for the 12-hour period between 0600 and 1800 hours on a normal working day.

$L_{A10\ (18\ hour)}$: The arithmetic average of the LA10 levels for the 18-hour period between 0600 and 2400 hours on a normal working day. It is a common traffic noise descriptor.

$L_{A90\ (Time)}$: The A-weighted sound pressure level that is exceeded for 90 per cent of the time over which a given sound is measured. This is considered to represent the background noise e.g. LA90 (15 min).

$L_{AMax\ (Time)}$: The maximum sound level recorded during a specified time interval.

$L_{AMin\ (Time)}$: The minimum sound level recorded during a specified time interval.