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ACOUSTICAL REPORT

PROPOSED MIXED-USE DEVELOPMENT

50 LAWRENCE STREET, FRESHWATER NSW

Date: Friday, 19 March 2021

File Reference: 4095R20200317pd50LawrenceStFreshwater_DA_v3

DOCUMENT CONTROL

Project title	Acoustical Review Proposed mixed-use development 50 Lawrence Street, Freshwater NSW
Project number	4095
Document reference	4095R20200317pd50LawrenceStFreshwater_DA_v3
Document path	G:\Shared drives\KA Acoustics 2020\REPORT\Building General\4095 50 Lawrence Street, Freshwater\4095R20200317pd50LawrenceStFreshwater_DA_v3.docx

Version	Date	Author	Review	Notes
V1	08/05/2020	PD	NK	Report version 1 available for issue
V2	12/05/2020	PD	NK	Amended windows sizes
V3	19/03/2021	PD	NK	Amended drawings

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50 LAWRENCE STREET, FRESHWATER NSW

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1.0 INTRODUCTION

Koikas Acoustics Pty Ltd was engaged by Lawrence Street Nominees Pty Ltd to prepare an acoustical assessment for the proposed development at 50 Lawrence Street, Freshwater seeking approval for the construction of a new mixed-use building with an associated parking area.

For the DA proposal, the acoustic adequacy of the proposed design must be assessed in terms of standard planning guidelines issued by Northern Beaches Council in their Local Environment Plan (LEP) and Development Control Plan (DCP), and also in terms of other standard planning guidelines related to common sources of noise.

As per Council guidelines and other standard planning instruments, Koikas Acoustics has determined the following acoustical components require an assessment at the current DA stage:

1. Traffic noise associated with Lawrence and Oliver Street and its impact on future occupants of the development.
2. Mechanical plant noise emission from the proposed development to neighbouring dwellings.
3. Inter-tenancy sound insulation requirements for shared partitions within the building.

This report presents the results and findings of an acoustic assessment for the subject proposal. In-principle acoustic treatments and noise control recommendations are included (where required) so that the premises may operate in compliance with the nominated acoustic planning levels.

2.0 THE PROPOSAL

The development is proposed to occupy the site at 50 Lawrence Street, Freshwater. The application is for a multi-storey mixed-use building consisting of 2 commercial premises and 13 residential units within 4 above-ground floor levels. The current development design can be seen in architectural drawings as prepared by CKDS Architecture, detailed in Table 1. All calculations and noise modelled scenarios conducted for this assessment are referenced to these architectural drawings.

Table 1. Design drawings used in the assessment

Drawing Title	Drawing No.	Issue	Date	Project No.
Site Plan	DA-1002	D	02/03/2021	19045
Ground Floor Plan	DA-1101	D	02/03/2021	19045
Level 01 Plan	DA-1102	D	02/03/2021	19045
Level 02 Plan	DA-1103	D	02/03/2021	19045
Level 03 Plan	DA-1104	D	02/03/2021	19045
North/South Elevation	DA-2001	D	02/03/2021	19045
East/West Elevation	DA-2002	D	02/03/2021	19045
Glazing Schedule	DA-7101	D	02/03/2021	19045
Glazing Schedule	DA-7102	D	02/03/2021	19045

Notes

1. Detailed above are the plans and drawings available at the time of assessment. Where design changes are made without the prior knowledge of Koikas Acoustics, the assessment results and conclusions published within this report may be incorrect.

The development location is situated in a local town centre. The subject site is surrounded by commercial premises to the north and east, and residential to the south and west.

The subject site and surrounding properties are identified on the aerial photograph included in Figure 1.

Prevailing ambient noise conditions on-site and in the local area are generally the result of typical environmental noise such as distant traffic and localised domestic noise sources.

Figure 1. Aerial photo of the subject site and surrounding area (image source – Sixmaps)

3.0 AMBIENT NOISE SURVEY

Existing external ambient noise levels were measured by installing a sound level meter data logger in the planter area within the carpark at the rear of the site. A Type 1 precision BSWA 801 noise logger was used for the survey. The installed location in the car-park meant that the microphone was approximately 1.5 metres above ground level. This meter was placed to measure existing background and traffic noise levels that would be common for the rear of the site. The noise logging location is shown in figure 1.

The instrument was set-up to measure A-frequency and 'Fast' time-weighted noise levels. Noise level data was stored within the logger memory at 15-minutes intervals for one week between Friday 6th and Thursday 12th March 2020.

Calibration readings were taken before and after each survey with a NATA calibrated and certified Larson Davis CAL200 precision acoustic calibrator. No system drift was observed for this meter.

BOM weather records for the nearest available weather station indicate that inclement weather conditions did not adversely impact on the noise survey.

Table 2. Summary of noise logger results [dB]

Location	**Period, T** [1]	**Ambient noise level** LAeq	**Rating background level** LA90	**Traffic noise level** LAeq Period
50 Lawrence Street	Day	63	50	62
	Evening	61	45	
	Night	60	31	57
Notes 1.	The **NSW EPA NPI** refers to, **Daytime**: 7 am – 6 pm Monday to Saturday and 8 am to 6 pm Sunday and public holidays. **Evening**: 6 pm – 10 pm Monday to Sunday **Night**: 10 pm - 7 am Monday to Saturday and 10 pm to 8 am Sunday and public holidays. The **NSW EPA's RNP** refers to, **Daytime**: 7 am –10 pm Monday to Sunday **Night**: 10 pm - 7 am Monday to Sunday			

3.1 ATTENDED NOISE SURVEY

Attended noise measurements were conducted on Friday 13th March 2020 to quantify the noise levels of road traffic noise from Lawrence and Oliver Street. These measurements were then used to evaluate possible façade noise reduction measures to preserve the acoustic amenity of future occupants of the subject site.

Simultaneous measurements were taken within the car park and on the corner of Lawrence and Oliver Street to quantify the road traffic noise levels at each location. Each measurement was undertaken with an NTi XL2 sound level meter set to A-frequency weighting and fast time response. Surveys were conducted for durations deemed sufficient to represent the equivalent noise level without the influence of extraneous noise.

Attended noise measurement locations are shown in figure 1.

4.0 ACOUSTIC REQUIREMENTS

4.1 ROAD TRAFFIC NOISE – ISEPP/DOP

To accord with Clause 102 of the State Environmental Planning Policy (Infrastructure) 2007, hereafter referred to as ISEPP, development for the purpose of residential, place of public worship, hospital, educational facility or child care centre use must be designed to consider the indoor noise amenity of future occupants.

Where the development is for residential use, and the site is adjacent to a classified road that carries an annual daily traffic volume of more than 20,000 vehicles, and that the consent authority considers is likely to be impacted by road noise or vibration, maximum allowable indoor traffic noise levels are defined as:

- L_{Aeq} 35dB in any bedroom in the building between the hours of 10 pm and 7 am.
- L_{Aeq} 40dB elsewhere in the building (excluding a garage, kitchen bathroom or hallway) at any other time.

Although this road is not classified by ISEPP as having an annual daily traffic volume of more than 20,000 vehicles, Northern Beaches Council has specifically requested a road traffic noise assessment based on the ISEPP and NSW DoP criteria.

ISEPP requires that before any application is determined under which this clause applies, consideration must be given to guidelines that are issued by the Director-General. It is the understanding of Koikas Acoustics that the Director-General has issued guidelines relating to the determination of suitable indoor noise levels for development with open windows allowing natural ventilation of indoor areas. The Director-General has recommended under this condition (open windows) that indoor noise levels should not exceed:

- L_{Aeq} 45dB in any bedroom in the building between the hours of 10 pm and 7 am.
- L_{Aeq} 50dB elsewhere in the building (excluding a garage, kitchen bathroom or hallway) at any other time.

The NSW Department of Planning (DoP) supports the design targets of ISEPP and the Director-General guidelines within their road/rail noise guidelines (*Development near rail corridors and busy roads, Interim Guideline 2008*). The DoP guideline further defines the duration under which noise levels are assessed, being $L_{Aeq\ 9\ hours\ (10\ pm\ to\ 7\ am)}$ for bedrooms and $L_{Aeq\ 15\ hours\ (7\ am\ to\ 10\ pm)}$ elsewhere.

A summary of the applied traffic noise planning levels is included in Table 3.

Table 3. Design criteria for internal spaces			
Description	**Area**	**Period**	**L_{Aeq} (Period)]dB]**
Windows and doors closed	Bedrooms	10 pm to 7 am	35
	Living areas	at any time	40
Windows & doors open (natural ventilation)	Bedrooms	10 pm to 7 am	45
	Living areas	at any time	50
Notes 1.	The assessment period for bedrooms taken as 9 hours period between 10 pm and 7 am. The assessment period for living areas taken as 15 hours period between 7 am and 10 pm.		

4.2 EPA NOISE POLICY FOR INDUSTRY

Noise emission design targets have been referenced from the NSW Environmental Protection Authority Noise Policy (EPA) for Industry (NPfI). The NPfI replaces the former Industrial Noise Policy, also prepared by the EPA.

The NPfI is designed to assess environmental noise impacts associated with scheduled activities prescribed within the Protection of the Environment Operations Act 1997, Schedule 1. It is also commonly used as a reference tool for establishing suitable planning levels for noise generated by mechanical plant and equipment and noise emission from commercial operations.

The guideline applies limits on the short term intrusive nature of a noise or noise generating development (project intrusive noise level), as well as applying an upper limit on cumulative industrial noise emissions from all surrounding development/industry (project amenity noise level).

The most stringent of the project intrusive noise level and project amenity noise level is applied as the **project noise trigger level**. The project noise trigger level is the point, above which noise emission from a source or development site would trigger a management response.

To be able to define the more stringent of the intrusive and amenity noise levels, the underlying noise metrics must be the same. As the intrusive noise level is defined in terms of $L_{Aeq\ 15\ minutes}$ and the amenity noise level is defined in terms of $L_{Aeq\ Period}$, a correction +3dB correction is applied to the project amenity noise level to equate the $L_{Aeq\ Period}$ to $L_{Aeq\ 15\ minutes}$.

4.2.1 Protection of the Environment Operations (Noise Control) Regulation 2017

Clause 45 of the regulation requires that air conditioning units installed on residential premises must not emit noise that is audible within a habitable room in any other residential premises between the hours of 10 pm and 7 am (Monday to Friday) or 10 pm and 8 am (Saturday, Sunday and public holidays).

4.3 INTER-TENANCY NOISE

In Class 2 or 3 buildings, the BCA acoustical Performance Requirements state that separating walls and floors must provide insulation against the transmission of airborne or impact generated sound sufficient to prevent illness or loss of amenity for the occupants. Walls/floor partitions are considered to satisfy BCA Performance Requirements when:

- The laboratory tested acoustic rating that meets or exceeds the Deemed-to-Satisfy provisions of F5.4 to F5.7, or
- Complies with Specification F5.2, or
- Is tested on-site to achieve the minimum acoustic performance as defined within *Verification Methods* FV5.1 and FV5.2.

The Deemed-to-Satisfy provisions applying to this specific development are summarised below:

Table 4. BCA acoustic design requirements

Partition	Detail	Airborne	Impact
Floor	Separating SOU's, or an SOU from a plant room, lift shaft, stairway, public corridor, public lobby or the like, or part of a different classification	Rw + Ctr ≥ 50	Ln,w ≤ 62
Wall *See notes 1 and 2*	Separating SOU's	Rw + Ctr ≥ 50	Not applicable
	Separating a habitable room (other than a kitchen) in one SOU from a bathroom, sanitary compartment, laundry, kitchen in another SOU	Rw + Ctr ≥ 50	Discontinuous
	Separating an SOU from a plant room or lift shaft	Rw ≥ 50	Discontinuous
	Separating an SOU from a stairway, public corridor, public lobby or the like, or part of a different classification	Rw ≥ 50	Not applicable
Door	Located in a wall separating an SOU from a stairway, public corridor, public lobby or the like	Rw ≥ 30	Not applicable
Services	Duct, soil, waste or water supply pipes located in a wall or floor cavity and serves or passes through more than one SOU (including a stormwater pipe)	Rw + Ctr ≥ 40 (habitable) Rw + Ctr ≥ 25 (other)	Not applicable
Pumps	A flexible coupling must be used at the point of connection between the service's pipes in a building and any circulating or another pump.		
Notes 1.	Where a wall is to achieve a sound insulation rating and has a floor above, the wall must continue to either the underside of the floor or to the ceiling which has a comparable sound insulation rating to the wall.		
2.	Where a wall is to achieve a sound insulation rating and has a roof above, the wall must continue to either the underside of the roof or to the ceiling which has a comparable sound insulation rating to the wall.		
3.	As defined by the BCA, a 'habitable room' means a room used for normal domestic activities such as bedroom, living room, lounge room, music room, television room, kitchen dining room, study, playroom, family room, home theatre and sunroom.		

5.0 EXTERNAL NOISE INTRUSION ASSESSMENT

Calculating the level of traffic noise that is transmitted through a façade and into a room is dependent upon the external façade noise level, the sound insulation performance of the building façade (inclusive of all building components), and the level of acoustic absorption that is present within the subject room.

Following *AS3671-1989 Acoustics – Road traffic noise intrusion*, the prediction of façade traffic noise levels considers a forecast increase in traffic volumes over a 10 year planning period. In the absence of RMS traffic volume data for the specific road corridor, Koikas Acoustics has adopted a forecast 2% p.a. increase in traffic volumes over 10 years.

5.1 FAÇADE TRAFFIC NOISE LEVELS

A calibrated CadnaA noise model was used to predict external façade traffic noise levels. Maximum levels are predicted to be $L_{Aeq\ 15\ hour}$ 66dB / $L_{Aeq\ 9\ hour}$ 61dB along the western and northern façades of the building fronting Oliver and Lawrence Street. Reduced noise exposure along the sides of the building will result from the limited field of view of traffic and partial noise shielding from adjacent buildings. The least noise-exposed façade of the building is at the rear of the proposed building where a high level of noise shielding is generated by the subject building and surrounding buildings.

5.2 RECOMMENDED CONSTRUCTION MATERIALS

Indoor noise levels were calculated to determine the acoustic performance of the proposed building facade. The noise modelling and subsequent analysis conclude the following:

5.2.1 External walls

Table 5. External walls recommendations

Recommended construction	Area where the recommendation apply
• 60mm Pronto Panel • 35mm Air Gap • 92mm Steel Stud with 75mm glass wool insulation (14kg/m^3) • 13mm Standard Plasterboard	All External walls

5.2.2 Ceiling/roof

Table 6. Ceiling/roof recommendations

Recommended construction	Area where the recommendation apply
• 220mm Concrete Slab	All roof areas

5.2.3 Glass windows and doors

Recommendations for glass windows and doors are included in Table 7.

Table 7. Glazing recommendations

Level	Room	Glass recommendation	Seals
Level 01	Windows and doors fronting Oliver Street	12.38mm laminated glass	Q-lon and fin
	Windows fronting Lawrence Street	10.38mm laminated glass	Q-lon and fin
	Doors fronting Lawrence Street	10.38mm laminated glass	Q-lon and fin
	All other windows	4mm float glass	Q-lon and fin
	All other doors	4mm toughened glass	Q-lon and fin
Level 02	Windows and doors facing Lawrence and Oliver Street	10.38mm laminated glass	Q-lon and fin
	All other windows	4mm float glass	Q-lon and fin
	All other doors	4mm toughened glass	Q-lon and fin
Level 03	Windows facing Oliver Street	6.38mm laminated glass	Q-lon and fin
	All other windows	4mm float glass	Q-lon and fin
	All other doors	4mm toughened glass	Q-lon and fin

In addition to the minimum glass recommendation, the installed window/glazed door systems (inclusive or framing and seals) must achieve a minimum acoustic rating of:

- Rw 27 for 4mm thick toughened glass;
- Rw 29 for 4mm thick float glass;
- Rw 32 for 6.38mm laminated glass;
- Rw 34 for 10.38mm laminated glass;
- Rw 36 for 12.38mm laminated glass;
- and comply with Notes 1 to 5 below.

Koikas Acoustics notes that the recommendations provided in this report are for the minimum required glazing predicted to achieve satisfactory acoustic performance. Design factors such as safety, thermal or energy efficiency are outside the scope of this report and should be assessed accordingly. It is the Client's responsibility to ensure all glazed windows and sliding doors installed on-site to meet all building design requirements.

Notes

1. Window frames should be tightly fitted to the external wall minimising any air gaps. Any air gaps present should be packed with timber and an appropriate acrylic sealant such as Knauf Bindex (or approved equivalent).
2. All open-able windows and glazed door systems should be airtight when closed.
3. Q-lon type seals or the equivalent should be fitted along the perimeter of all glazing systems to minimise air gaps. For sliding glass systems that cannot incorporate Q-lon seals, heavy-duty fin-type seals such as Schlegel SilentFin could be used. If the windows/doors are not designed to be air-tight when closed, the reduced performance of the windows/doors could compromise the acoustic integrity of the building facade.
4. Recommended glass systems have been calculated based on current architectural drawings as established within this report.
5. High performing glazed window and door systems, can be supplied by Eco Aluminium. Mob 0475 770 272. Web: www.ecoaluminium.com.au. Other reputable suppliers can also be considered.

5.2.4 Ventilation

In the event of high external traffic noise levels, naturally ventilating rooms through the opening of windows and/or doors may not be suitable. This is due to the level of traffic noise being transmitted through the open doors resulting in a breach of the applied noise criterion.

As a general rule, where windows or doors opened sufficiently to provide natural ventilation to a room, the indoor noise level is 10dB below the outside noise level. Therefore, a window or sliding door to a room may be opened to provide natural ventilation where the outdoor noise level does not exceed 10dB above the “Windows open” criteria as detailed within this report.

For this development, all rooms directly fronting Oliver Street are not suitable for natural ventilation through open windows/doors. Therefore, windows and doors will need to be closed to achieve the acoustic criteria. The design of the ventilation to these rooms is to consider windows and doors being closed.

All other rooms may be naturally ventilated through open windows/doors.

For rooms requiring an alternate source of ventilation other than open windows/doors, the following may be considered (subject to review by a ventilation expert):

- Borrowed air from elsewhere in the dwelling/unit
- Incorporating a component of fresh air into a ducted air conditioning system
- Installing a small air supply fan and acoustically treated duct into a ceiling bulkhead
- Installing a wall-mounted ventilator such as the Acoustica Aeropac or similar

It is important to note that any proposed ventilation solution should be reviewed by a suitably qualified ventilation expert.

Any penetrations in the walls or roof to accommodate ventilation system/s should not impact the acoustic integrity of the building façade. An acoustical engineer should review any proposed ventilation solution that proposes a penetration of the building façade.

6.0 MECHANICAL PLANT AND BUILDING USE NOISE IMPACTS

Mechanical plant and equipment on this project could include air conditioning condensers units where they are installed in the development and other ventilation plant required for carpark levels and garbage rooms etc.

6.1 PROJECT NOISE TARGETS

This noise is assessed as per the planning levels contained within the NPfI. Acoustic planning levels are largely determined concerning the existing environmental noise levels. Noise surveys conducted for this assessment show that environmental noise levels can differ based on the location of a particular receiver and its orientation to major contributors of noise in the area, such as road corridors and commercial operations. The following NPfI planning levels apply for this project:

Table 8. NPfI planning levels

Period, T (Note 1)	Lawrence Street location							
	Intrusive		Amenity					
	RBL	RBL + 5	Area classification	Recommended amenity noise level	High traffic area	Project amenity noise level	+3dB correction	Project noise trigger level
Day	50	55	Urban	65	No	60	63	55
Evening	45	50	Urban	55	No	50	53	50
Night	31	36	Urban	50	No	45	48	36

Notes 1. The **NSW EPA NPI** refers to,
Daytime: 7 am – 6 pm Monday to Saturday and 8 am to 6 pm Sunday and public holidays.
Evening: 6 pm – 10 pm Monday to Sunday
Night: 10 pm - 7 am Monday to Saturday and 10 pm to 8 am Sunday and public holidays.

2. The amenity criterion is based on the area classification of the site as being 'urban' and has been corrected for an assessment in areas of high traffic and for existing industrial noise where applicable.

3. Project noise amenity level = recommended noise amenity level – 5dB, except where specific circumstances are met, such as high traffic.

Surrounding commercial properties must also not be exposed to noise that exceeds $L_{Aeq,\ Period\ (business\ hours)}$ 60dB during business hours.

6.2 DESIGN SCENARIOS

At this stage, a mechanical design is yet to be completed. A detailed mechanical plant noise impact assessment is to be provided once the final mechanical design and specification have been completed.

7.0 INTER-TENANCY NOISE

The following recommendations are expected to satisfy the relevant provisions of the BCA sound insulation requirements between tenancies. Options have been provided in all cases that consider a range of standard constructions.

All wall systems should be installed as per the general installation guidelines included in the BCA and as per relevant manufacturer installation guidelines/requirements.

Alternate systems and design may be considered to those recommended within this report provided that they are approved by an appropriately qualified acoustical engineer/consultant.

7.1 RECOMMENDED PARTITION WALLS

Table 9 recommends several partition wall systems that are capable of achieving the required acoustic performance.

Table 9. Recommended partition wall systems		
Wall type	**BCA standard**	**Construction**
Inter-tenancy wall	Rw + Ctr ≥ 50 Discontinuous	*Partition wall between sole-occupancy units – Separating a habitable room (other than a kitchen) in one unit from a bathroom, sanitary compartment, laundry or kitchen in an adjoining unit* **[AFS]** AFS 162 Logicwall, 20mm cavity, 64mm steel studs with 75mm thick Tontine TSB4 insulation within the stud cavity, 10mm Soundcheck. **[Masonry]** Two leaves of 110mm clay brick masonry, 50mm cavity between the leaves (where brick ties are used they are to be of the resilient type), 13mm cement render to each side. *BCA D.T.S.* **[Concrete]** 125mm concrete panel, 20mm cavity, 64mm steel studs, 70mm polyester insulation (9kg/m^3) between the studs, 13mm plasterboard fixed to studs. *BCA D.T.S.* **[Hebel]** 13mm Fyrchek, 75mm Hebel Powerpanel, 35mm cavity, 64mm steel studs with 100mm S6 polyester insulation, 13mm Fyrchek/Aquachek. **[Lightweight]** 2x64mm steel studs, 20mm cavity, 60mm polyester insulation (11kg/m3) positioned between one row of studs, 2x13mm fire resistant plasterboard each side.
	Rw + Ctr ≥ 50	*Partition wall between sole-occupancy units* **[AFS]** AFS 162 Logicwall panel, paint or render finish. **[AFS]** AFS 162 Logicwall panel, 28mm furring channel, Tontine TSB2 insulation within the framing cavity, 13mm plasterboard. **[Masonry / Hebel / Lightweight]** As above. **[Concrete]** 200mm concrete panel, 13mm cement render of each face. *BCA D.T.S.*
Common wall	Rw ≥ 50 Discontinuous	*Partition wall between sole-occupancy unit and plant room or lift shaft* As above for inter-tenancy wall partitions that satisfy discontinuous construction
	Rw ≥ 50	*Partition wall between sole-occupancy unit and stairway, public corridor, public lobby or the like or part of a different classification* **[AFS]** AFS 150 Logicwall panel, paint or render finish. **[AFS]** AFS 162 Logicwall panel, paint or render finish. **[Masonry]** Single leaf 150mm brick masonry with 13mm cement render on each face. **[Concrete]** 125mm thick concrete panel. **[Hebel]** 13mm Gyprock CD, 75mm Hebel Powerpanel, minimum 20mm cavity, 64mm steel framing with 50mm glass wool insulation, 13mm Gyprock CD. **[Lightweight]** 92mm steel studs, 60mm polyester insulation (11kg/m3) positioned between the studs, 2x13mm fire-resistant plasterboard each side.
Services shaft wall	Rw+Ctr ≥40	*Services shaft wall to habitable room within unit* **[Masonry]** 110mm brick masonry with 13mm cement render on each face. *BCA D.T.S.* **[Concrete]** 100mm thick concrete panel. *BCA D.T.S.* **[Lightweight]** 2x13mm plasterboard, pipe lagging (Soundlag 4525C, Acoustilag 45)
	Rw+Ctr ≥25	*Services shaft wall to non-habitable room within unit* **[Lightweight]** 2 layers of 13mm plasterboard

Notes:

1. Recommendations within the above table are based on published acoustic data obtained from the manufacturer's website.
2. Laboratory tests of the AFS 162 Logicwall on its own showed non-compliance with the BCA requirement of Rw + Ctr 50. However, an investigation by PKA Consulting concludes that the poor acoustic performance was due to factors not related to the wall system, but rather the test facility. It is expected that the acoustic performance will satisfy the BCA condition. This conclusion is supported by numerous field tests that indicate compliance with the BCA verification methods rating.
3. All installation of proprietary type wall systems must be in accordance with the relevant installation guidelines and manuals.
4. *BCA D.T.S.* = BCA Deemed-to-Satisfy construction. These wall systems are to be installed as per "Construction Deemed-to-Satisfy" notes included within Specification F5.2 of Volume One of the BCA. Where these systems are installed correctly in accordance with the BCA they do not require compliance testing to verify acoustic performance.

7.2 RECOMMENDED PARTITION FLOOR/CEILING

The following flooring systems could be considered to achieve the impact noise criteria listed in the Table above summarising the BCA/DCP requirements:

Table 18. Typical acoustical performance achieved with Uniroll underlays that would achieve or exceed the BCA & Council's requirements	
Floor Type	**Construction details or underlay type**
Carpet	Carpet over carpet underlay over ≥ 150 mm concrete slab will typically achieve L'nTw ≤ 40
Direct Stick Tiles	9 or 10 mm ceramic tiles over 5 mm adhesive over the underlay (specified below) + ≥150 mm concrete slab over 100 mm ceiling cavity and 13 mm plasterboard ceiling will typically achieve L'nTw ≤ 50
	RFC750 (4.5 mm) RF700 (4- 5- 10 mm)
Under Screed Tiles	9 or 10 mm ceramic tiles over 5 mm glue over 30 mm screed over the underlay RFC750 (4.5mm) or RF700 (5mm) + ≥150 mm concrete slab over 100 mm ceiling cavity and 13 mm plasterboard ceiling will typically achieve L'nTw ≤ 50
Direct Stick or Floating Flooring	***19 mm strip timber*** + adhesive + 15 mm ply + RFC700 (4, 5 or 10 mm) + ≥ 150 mm concrete slab over 100 mm ceiling cavity and 13 mm plasterboard ceiling will typically achieve L'nTw ≤ 50
	Engineered floating floor + 2 mm foam slip layer + RF700 (4, 5mm) + ≥ 150 mm concrete slab over 100 mm ceiling cavity and 13 mm plasterboard ceiling will typically achieve L'nTw ≤ 50
Direct Stick Vinyl Flooring	Vinyl flooring over + RF700 (3, 4, 5 or 10 mm) + ≥ 150 mm concrete slab over 100 mm ceiling cavity and 13 mm plasterboard ceiling will typically achieve L'nTw ≤ 55

Alternative underlays could also be considered.

The above recommendations also apply to balconies/terraces situated above indoor areas of apartments below.

All flooring and acoustic underlays should be installed as per relevant manufacturers installation and design guides.

Hard floor coverings such as tiles must not make contact with any walls or joinery such as kitchen benches, cupboards etc. During the installation of hard floor coverings, temporary spacers of 5 - 10 mm should be used to isolate the floor covering from walls and/or joinery with the resulting gaps filled with a suitable mastic type sealant or off-cut of rubber underlay material. Most acoustic underlay manufacturers include a construction detail in this regard that involves an upturn of the rubber underlay material at the wall/floor junction.

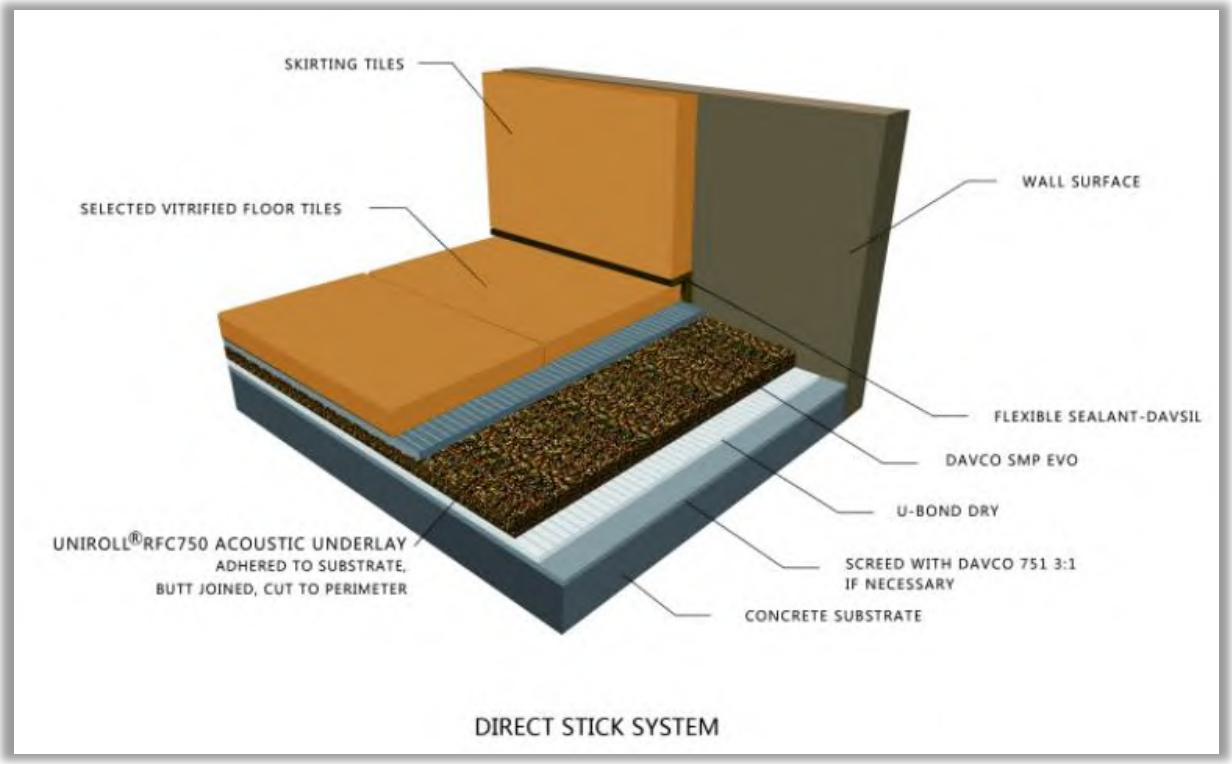
Alternative floor/ceiling systems could be considered provided that the acoustic performance is tested or assessed by a consulting acoustical engineer to be compliant with the sound insulation performance requirements of the BCA.

Verification of installed acoustic performance should be determined following the recommendation of Section 5.5 of this report. Flooring systems tested in a NATA or an equivalent International Laboratory Accreditation Cooperation Mutual Recognition Arrangement (ILAC MRA) certified laboratory and complying with the requirements of the BCA would not need to be tested in-situ for verification of installed acoustic performance. For flooring systems not tested by a NATA or ILAC MRA certified laboratory, it is recommended that before any flooring is installed, preliminary testing be undertaken at the subject site to ensure that the acoustic impact rating required is achieved. Impact noise test results can vary from site to site as many factors can influence the acoustic impact rating.

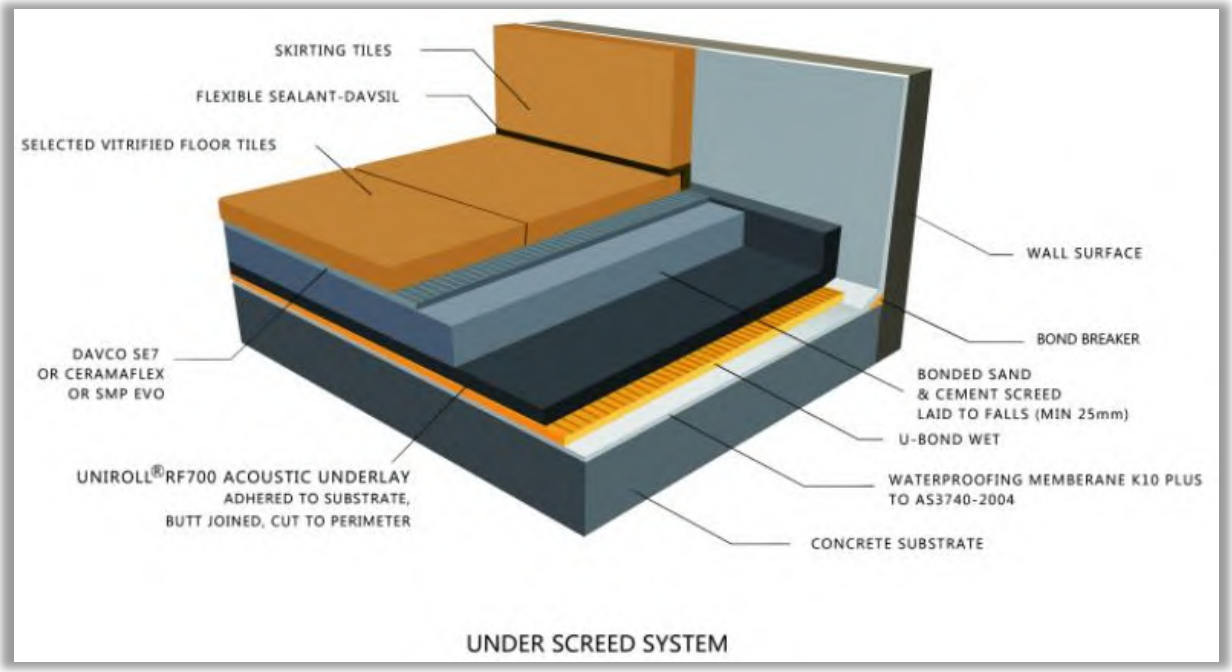
These include:

- the thickness of floor slabs,
- the air gap between the plasterboard ceiling and the concrete slab,
- the sealing between the plasterboard and the walls,
- the thickness and density of the plasterboard ceiling,
- the connections of the suspended ceiling grid to the concrete slab,
- the surface area of the floor,
- flanking paths,
- the wall types, and

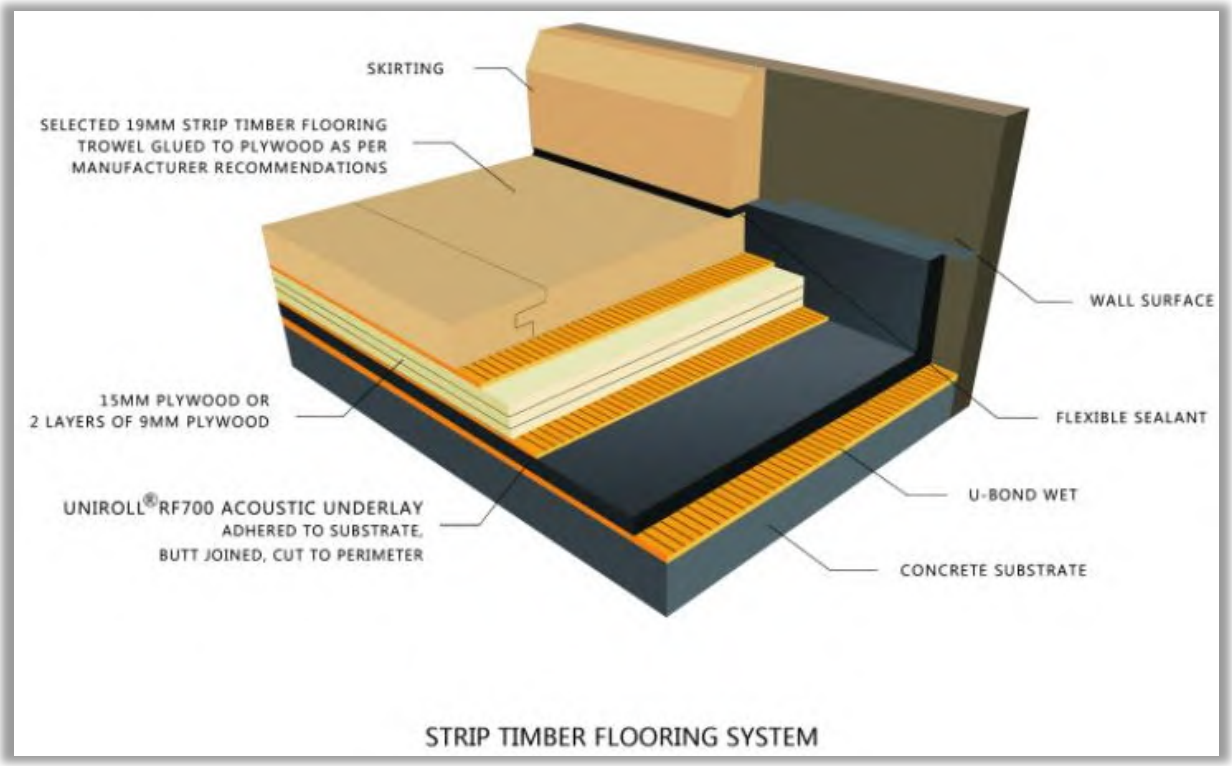
the junctions between the slab and the walls.



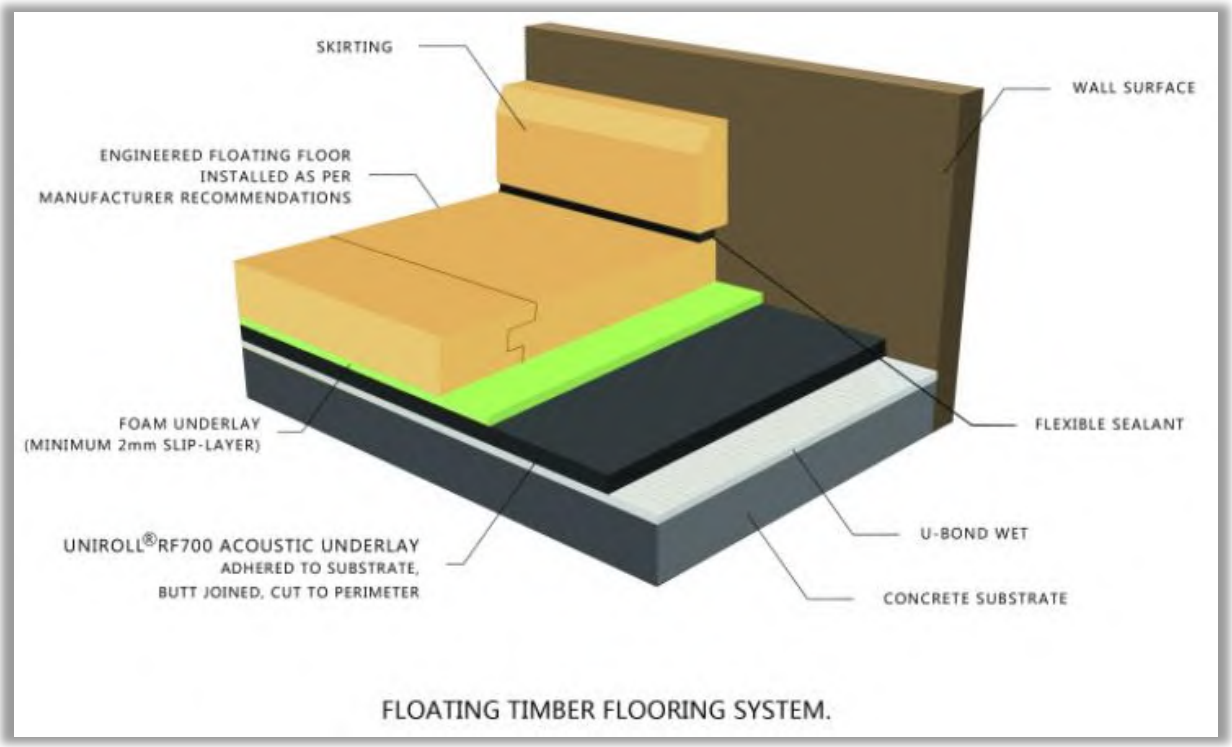
DIRECT STICK SYSTEM



UNDER SCREED SYSTEM



STRIP TIMBER FLOORING SYSTEM



FLOATING TIMBER FLOORING SYSTEM.

The above floor systems have been assessed to comply with the BCA airborne and impact sound insulation requirements. **The 'for construction' floor systems should be re-assessed at the detailed design stage.** Verification of installed acoustic performance should also be determined as per the recommendations of Section 7.5 of this report.

7.3 SOIL, WASTE, WATER SUPPLY PIPES

Where a duct, soil, waste or water supply pipe is located within a wall or ceiling cavity and serves or passes through one or more SOU's, the following separation details may be used to comply with the required acoustic rating:

Table 11. Services in cavity wall or ceiling

Option	Rating	Documented source	System detail
1	Rw + Ctr 25	CSR Red Book, Koikas Acoustics opinion	2 layers of 10mm plasterboard
2	Rw + Ctr 25	CSR Red Book	Acoustilag 45 and 13mm plasterboard wall/ceiling lining
3	Rw + Ctr 25	CSR Red Book	Unlagged pipes and 13mm Soundchek wall/ceiling lining. Alternatively, 2 layers of 16mm Fychek may be used as wall/ceiling lining
4	Rw + Ctr 40	CSR Red Book	Acoustilag 45 and 13mm Soundchek wall/ceiling lining. Alternatively, 2 layers of 16mm Fychek may be used as wall/ceiling lining
5	Rw + Ctr 40	Pyrotech Soundlag 4525C brochure	Soundlag 4525C and minimum 10mm plasterboard wall/ceiling lining
Notes:1. 2. 3.	The acoustic lagging material may be excluded by using Rehau Raupiano Plus pipe system. All installations as per the relevant manufacturers' specifications and requirements. Incorporating downlights into ceilings will impact on the acoustic rating of the partition system. Consultation should be made with an acoustic consultant in the event of downlights being proposed in the ceiling. The CSR Red Book provides some guidance on downlights being installed in a services partition system.		

The BCA further qualifies the acoustic requirements of services partitions with the following:

- Services must not be chased into concrete or masonry elements,
- An access door or panel must be firmly fixed to overlap the frame or rebate the frame by not less than 10mm and be fitted with proper sealing gasket along all edges and constructed of:
- Wood, particle board or block board not less than 38mm thick; or
- Compressed fibre reinforced cement sheeting not less than 9mm thick; or

- Other suitable material with a mass per unit area not less than 24kg/m2.
- A water supply pipe must only be installed in the cavity of discontinuous construction, and in the case of a pipe that serves only one SOU, must not be fixed to the wall leaf on the side adjoining any other SOU and have a clearance not less than 10mm to the other wall leaf.

7.4 SOUND ISOLATION OF PUMPS

A flexible coupling must be used at the point of connection between the service's pipes in a building and any circulation or another pump.

7.5 VERIFICATION OF ACOUSTIC PERFORMANCE

It is common for comparable floor/ceiling systems designs to achieve varying acoustic insulation and isolation ratings between buildings. This can be due to the quality of workmanship, attention to detail in sealing any penetrations, and the emergence of flanking sound transmission paths within a building. For this reason, one cannot categorically state that any partition will achieve a specific acoustic rating without conducting in-situ testing.

Koikas Acoustics recommends that in-situ testing is conducted on a representative, and fully installed floor/ceiling assembly (for all types of floor coverings – timber, tiles, carpet) to ensure adequate acoustic insulation and isolation is achieved, before installing all floors on all floor levels of the building.

8.0 CONCLUSION

Koikas Acoustics was requested to prepare an acoustic report for the proposed mixed-use development at 50 Lawrence Street, Freshwater. The acoustic report is to accompany a development application being submitted to the Northern Beaches Council.

The assessment considers potential noise impacts to future occupants of the development, and to surrounding residents such that acceptable acoustic amenity for the area is maintained.

Acoustic planning levels have been referenced from current ISEPP, NSW DoP, EPA, and BCA acoustic planning guidelines and requirements.

The included recommendations are based on designs prepared by CKDS Architecture.

The conclusions reached in this report should assist the Council in making their determination of the proposal in terms of compliance with the necessary acoustic design requirements. A further detailed acoustic report may be required for the CC submission should the building design be amended, or as required by Council.

Of the assessed components of noise, the following conclusions have been reached:

1. The building can be sufficiently insulated against existing external sources of noise in the area such as road traffic through the use of acoustic glazing. Recommended glazing systems are provided in this report. These recommendations should be verified before construction.
2. A detailed assessment of mechanical plant noise should be prepared for the subject development before construction.
3. Acoustic treatment options for the common floors and services partitions included within this report would be adequate for satisfying the sound insulation provisions of the BCA.

In our professional opinion, there is sufficient scope within the proposed building design to achieve the applied acoustic planning guidelines.

APPENDIX A

APPENDIX A

APPENDIX A

Daily Rainfall (millimetres)

WOOLI BEACH

Station Number: 058080 · State: NSW · Opened: 1963 · Status: Open · Latitude: 29.86°S · Longitude: 153.26°E · Elevation: 5 m

2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	*0*	*0*	*0.8*									
2nd	*0*	*0*	*0*									
3rd	*0*	*0*	*0*									
4th	*0*	*4.4*	*0*									
5th	*0*	*0*	*0.4*									
6th	*0.4*	*13.2*	*1.0*									
7th	*0*	*179.2*	*15.8*									
8th	*0*	*7.8*	*5.4*									
9th	*0*	*111.8*	*5.0*									
10th	*4.4*	*45.0*	*4.8*									
11th	*0*	*23.8*	*15.8*									
12th	*1.6*	*31.2*	*0.8*									
13th	*0*	*219.0*	*2.0*									
14th	*0*	*3.8*	*1.2*									
15th	*29.0*	*0.6*	*18.0*									
16th	*0.1*	*0*	*7.0*									
17th	*13.0*	*0.8*	*4.0*									
18th	*25.8*	*9.0*										
19th	*128.2*	*0*										
20th	*0*	*0*										
21st	*0*	*0*										
22nd	*0*	*15.2*										
23rd	*0*	*0.8*										
24th	*0*	*72.8*										
25th	*0*	*6.0*										
26th	*69.0*	*0*										
27th	*0*	*10.2*										
28th	*0*	*0.4*										
29th	*0*	*9.0*										
30th	*0*											
31st	*0*											
Highest daily	*128.2*	*219.0*	*18.0*									
Monthly Total	*271.5*	*764.0*										

↓ This day is part of an accumulated total
Quality control: 12.3 Done & acceptable, *12.3* Not completed or unknown

Product code: IDCJAC0009 reference: 59008793

Daily Rainfall (millimetres)

WOOLI BEACH

Station Number: 058080 · State: NSW · Opened: 1963 · Status: Open · Latitude: 29.86°S · Longitude: 153.26°E · Elevation: 5 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	147.9	175.1	172.6	140.6	154.6	131.0	57.3	57.0	50.0	83.0	117.8	108.4
Median	123.1	149.0	149.1	111.2	110.1	101.4	47.0	32.2	34.2	62.6	111.5	91.8
Highest daily	149.0	*219.0*	166.2	139.2	200.0	254.6	138.0	110.0	142.0	157.0	182.4	148.0
Date of highest daily	28th 2005	13th 2020	16th 2017	27th 1963	18th 1977	5th 2016	28th 1996	4th 2016	15th 1988	5th 2010	20th 2014	6th 1975

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

2) Gaps and missing data

Gaps may be caused by a damaged instrument, a temporary change to the site operation, or due to the absence or illness of an observer.

3) Further information

http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml.

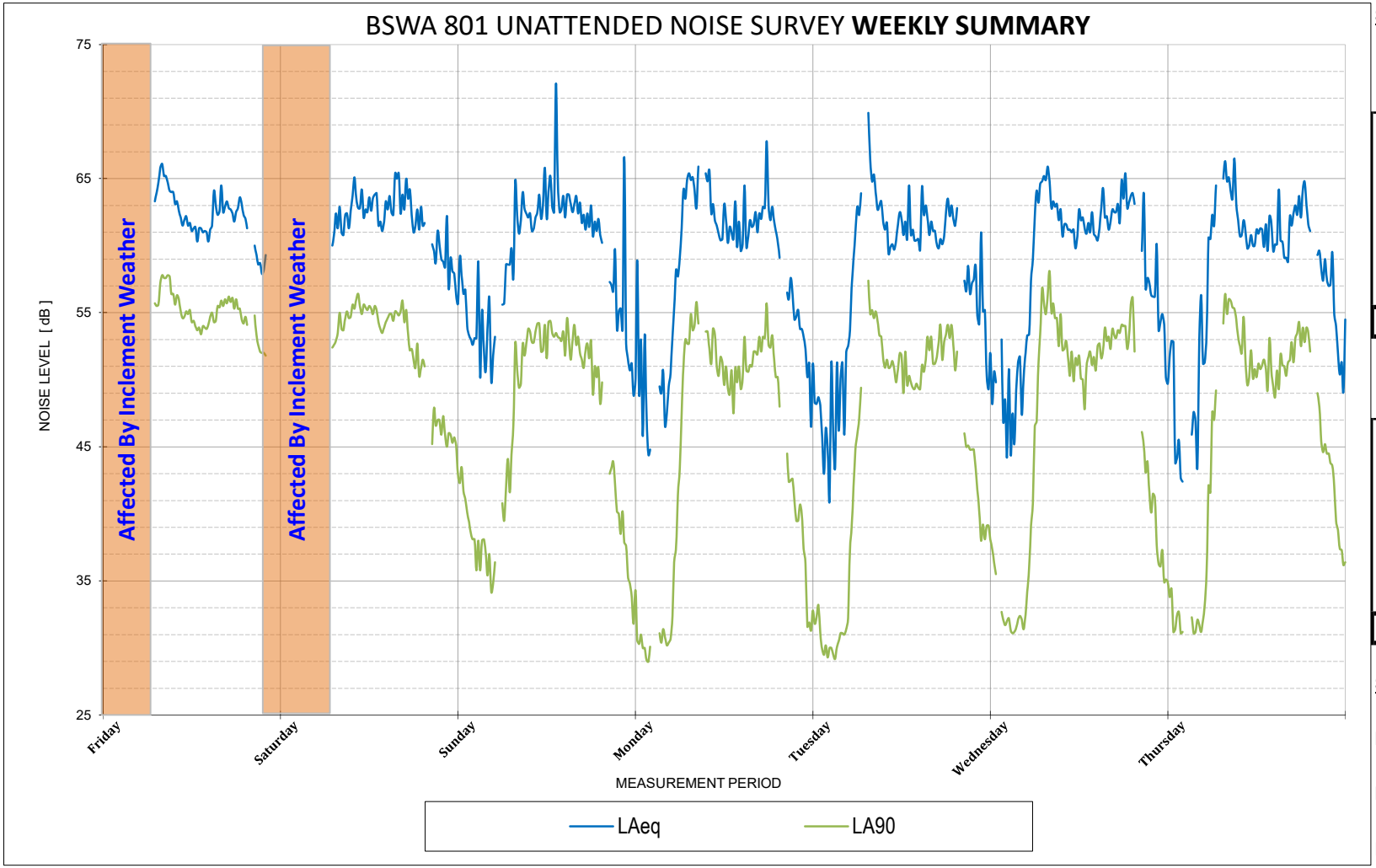
Product code: IDCJAC0009 reference: 59008793 Created on Tue 17 Mar 2020 14:16:25 PM EST

APPENDIX B

APPENDIX B

APPENDIX B

WEEKLY SUMMARY **LOGGER LOCATION:** 50 Lawrence Street, Freshwater (Rear) **PERIOD:** 6th to the 12th March 2020



Sundays and Public Holidays the hours change to 0800

SUMMARY OF AMBIENT LEVELS

	LA90 Daytime	*LA90* Evening	*LA90* Night-time
Day 1	54	52	N/A
Day 2	53	46	N/A
Day 3	50	41	36
Day 4	49	41	30
Day 5	49	45	29
Day 6	50	42	31
Day 7	49	45	31
RBL	**50**	**45**	**31**

	LAeq Daytime	*LAeq* Evening	*LAeq* Night-time
Day 1	63	61	N/A
Day 2	63	61	N/A
Day 3	64	60	57
Day 4	63	60	57
Day 5	63	61	56
Day 6	63	62	57
Day 7	62	61	56
Average	**63**	**61**	**60**

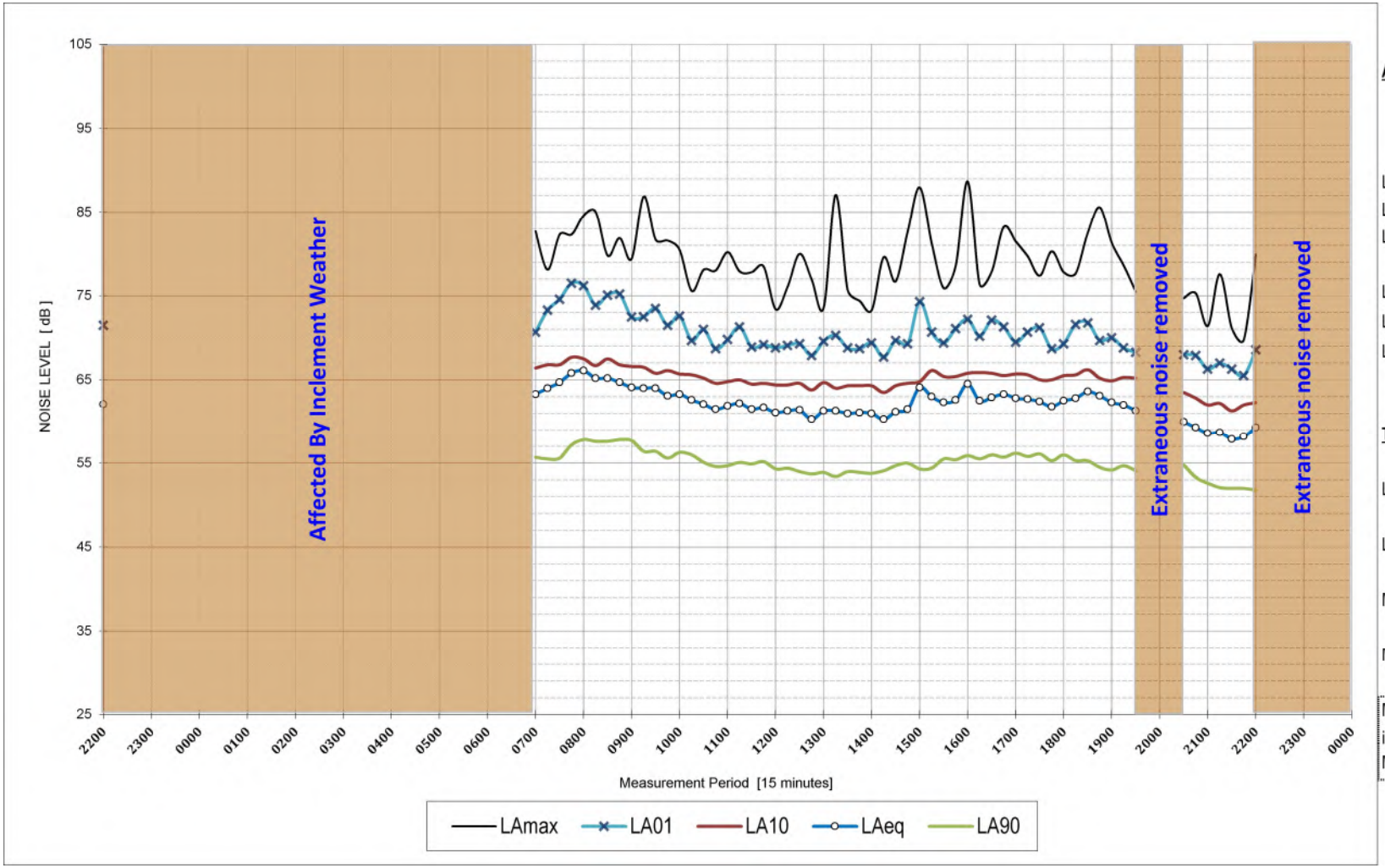
SUMMARY OF TRAFFIC LEVELS

LAeq 15 hrs	0700-2200	62	dB
LAeq 9 hrs	2200-0700	57	dB
Max LAeq 1 hr	0700-2200	64	dB
Max LAeq 1 hr	2200-0700	59	dB

Maximum noise events as defined in the Environmental Noise Management Manual 7 day average - [LAmax - LAeq ≥ 15]	22

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 1 **LOGGER LOCATION:** 50 Lawrence Street, Freshwater (Rear) **DATE:** Friday, 6 March 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	54	dB
LA90 Evening	1800-2200	52	dB
LA90 Night-time	2200-0700	N/A	dB
LAeq Daytime	0700-1800	63	dB
LAeq Evening	1800-2200	61	dB
LAeq Night-time	2200-0700	N/A	dB

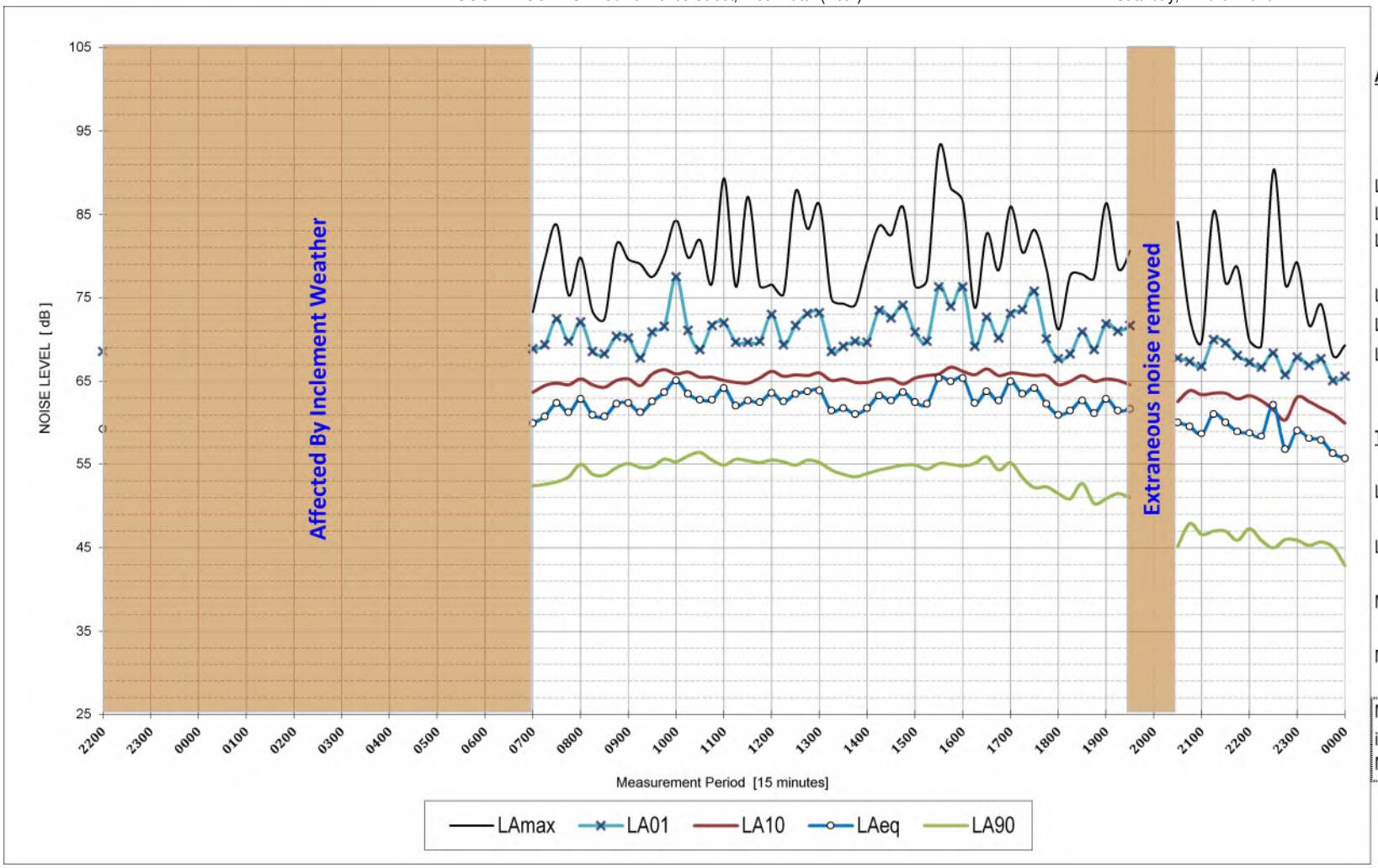
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	63	dB
LAeq 9 hours	2200-0700	N/A	dB
Max LAeq 1 hour	0700-2200	65	dB
Max LAeq 1 hour	2200-0700	N/A	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	1

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 2 **LOGGER LOCATION:** 50 Lawrence Street, Freshwater (Rear) **DATE:** Saturday, 7 March 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	53	dB
LA90 Evening	1800-2200	46	dB
LA90 Night-time	2200-0700	N/A	dB
LAeq Daytime	0700-1800	63	dB
LAeq Evening	1800-2200	61	dB
LAeq Night-time	2200-0700	N/A	dB

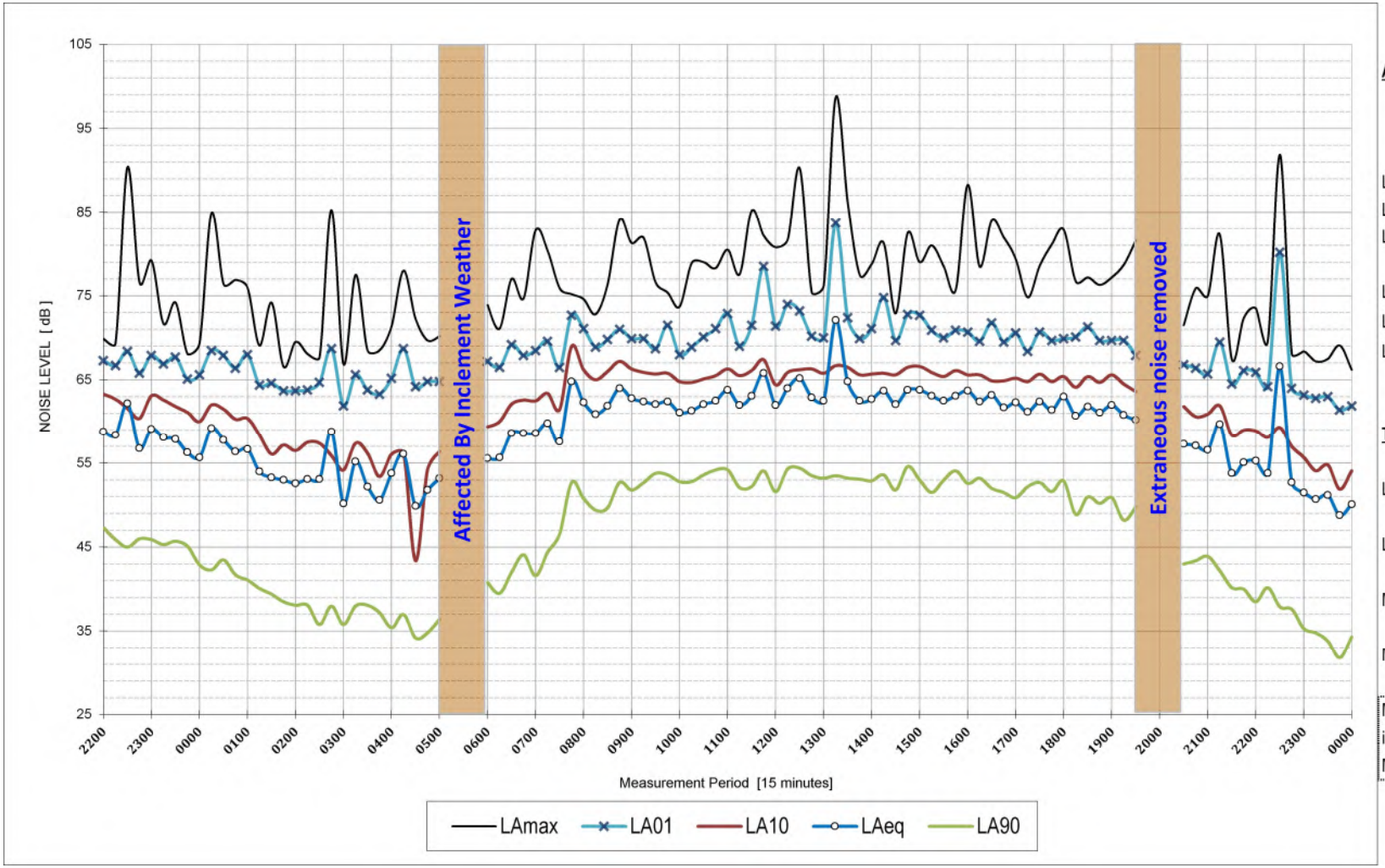
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	63	dB
LAeq 9 hours	2200-0700	N/A	dB
Max LAeq 1 hour	0700-2200	64	dB
Max LAeq 1 hour	2200-0700	N/A	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	1

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 3 **LOGGER LOCATION:** 50 Lawrence Street, Freshwater (Rear) **DATE:** Sunday, 8 March 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	50	dB
LA90 Evening	1800-2200	41	dB
LA90 Night-time	2200-0700	36	dB
LAeq Daytime	0800-1800	64	dB
LAeq Evening	1800-2200	60	dB
LAeq Night-time	2200-0800	57	dB

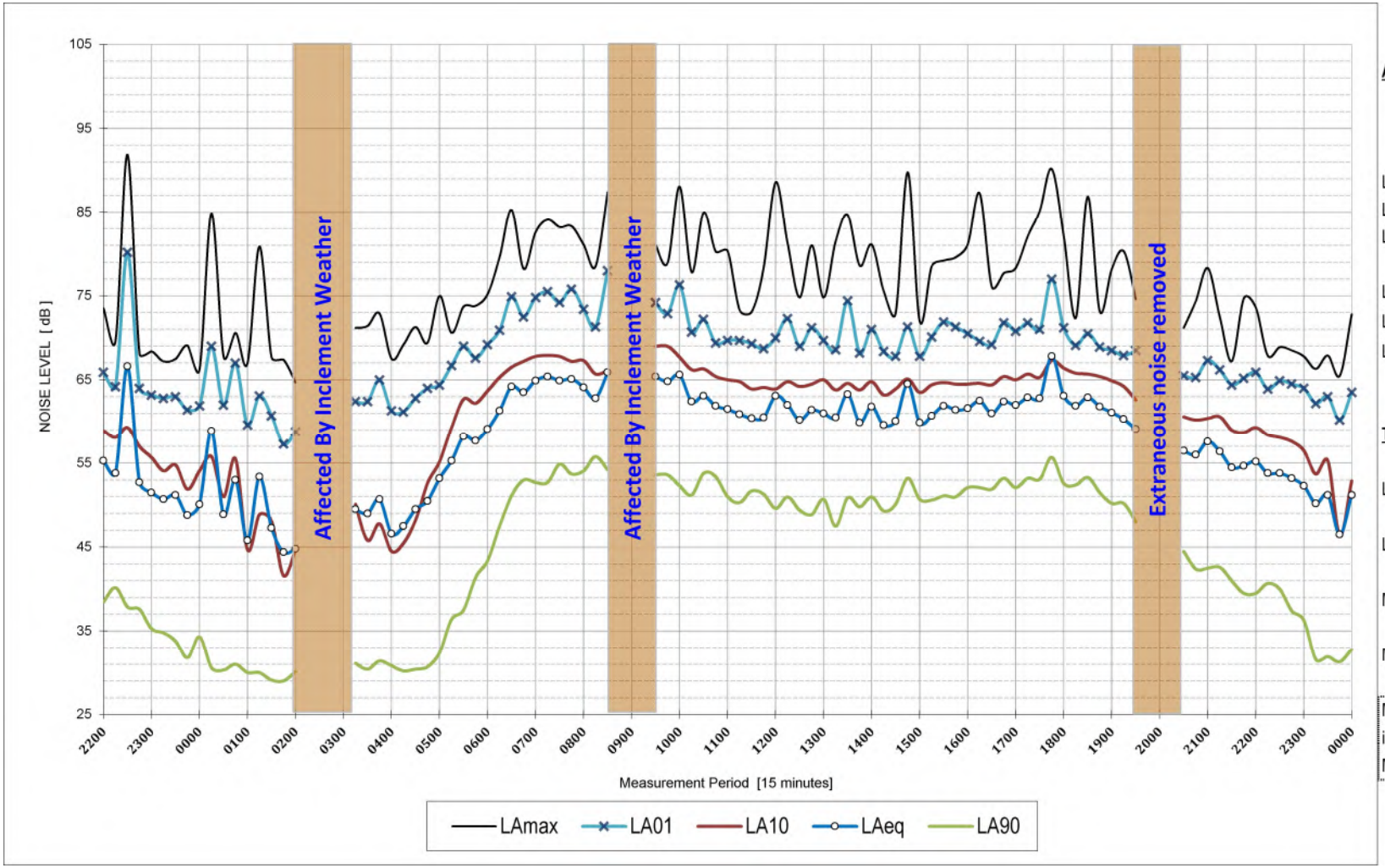
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	63	dB
LAeq 9 hours	2200-0700	57	dB
Max LAeq 1 hour	0700-2200	64	dB
Max LAeq 1 hour	2200-0700	58	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	26

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 4 **LOGGER LOCATION:** 50 Lawrence Street, Freshwater (Rear) **DATE:** Monday, 9 March 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0800-1800	49	dB
LA90 Evening	1800-2200	41	dB
LA90 Night-time	2200-0800	30	dB
LAeq Daytime	0700-1800	63	dB
LAeq Evening	1800-2200	60	dB
LAeq Night-time	2200-0700	57	dB

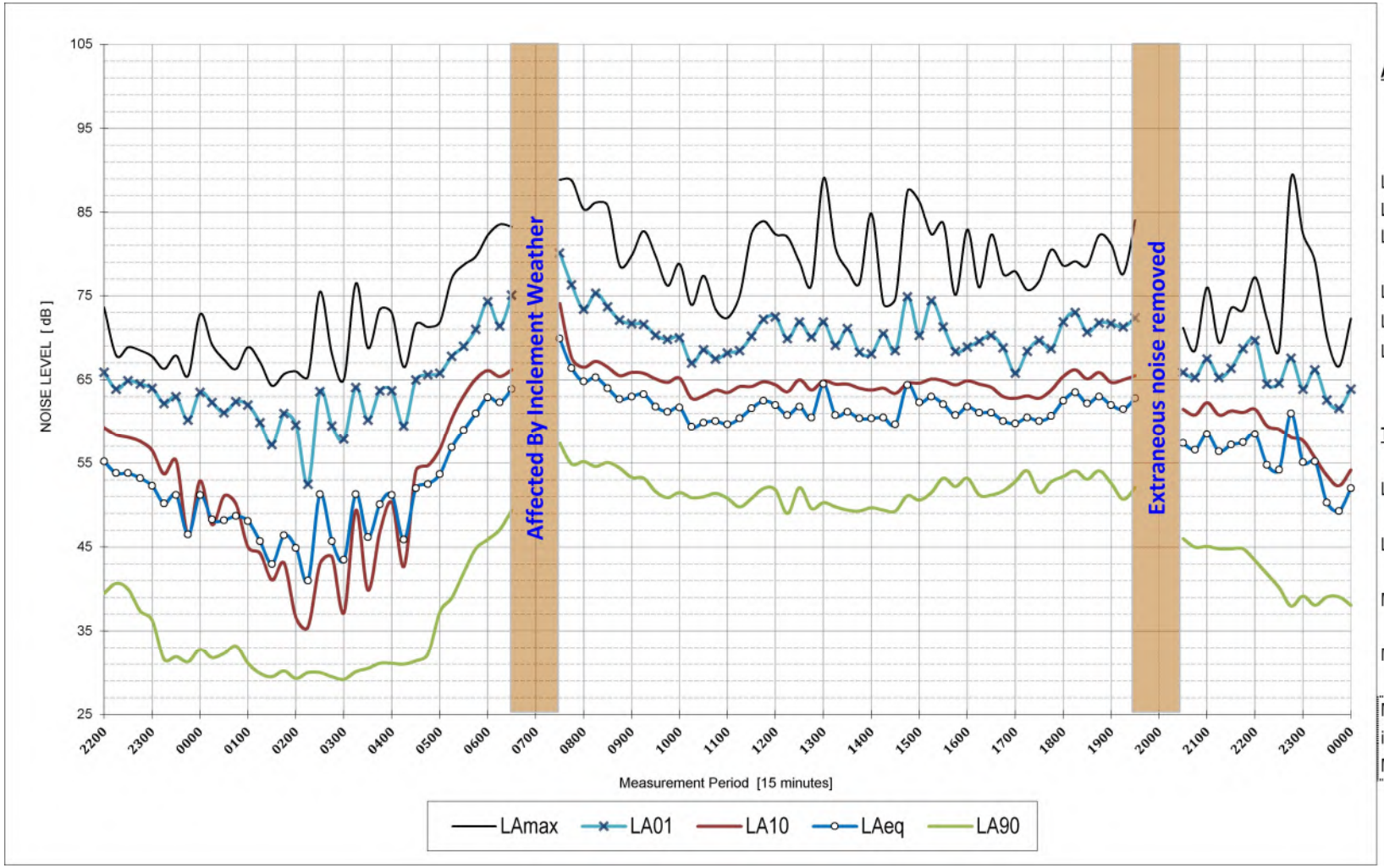
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	62	dB
LAeq 9 hours	2200-0700	57	dB
Max LAeq 1 hour	0700-2200	65	dB
Max LAeq 1 hour	2200-0700	61	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	31

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 5 **LOGGER LOCATION:** 50 Lawrence Street, Freshwater (Rear) **DATE:** Tuesday, 10 March 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	49	dB
LA90 Evening	1800-2200	45	dB
LA90 Night-time	2200-0700	29	dB
LAeq Daytime	0700-1800	63	dB
LAeq Evening	1800-2200	61	dB
LAeq Night-time	2200-0700	56	dB

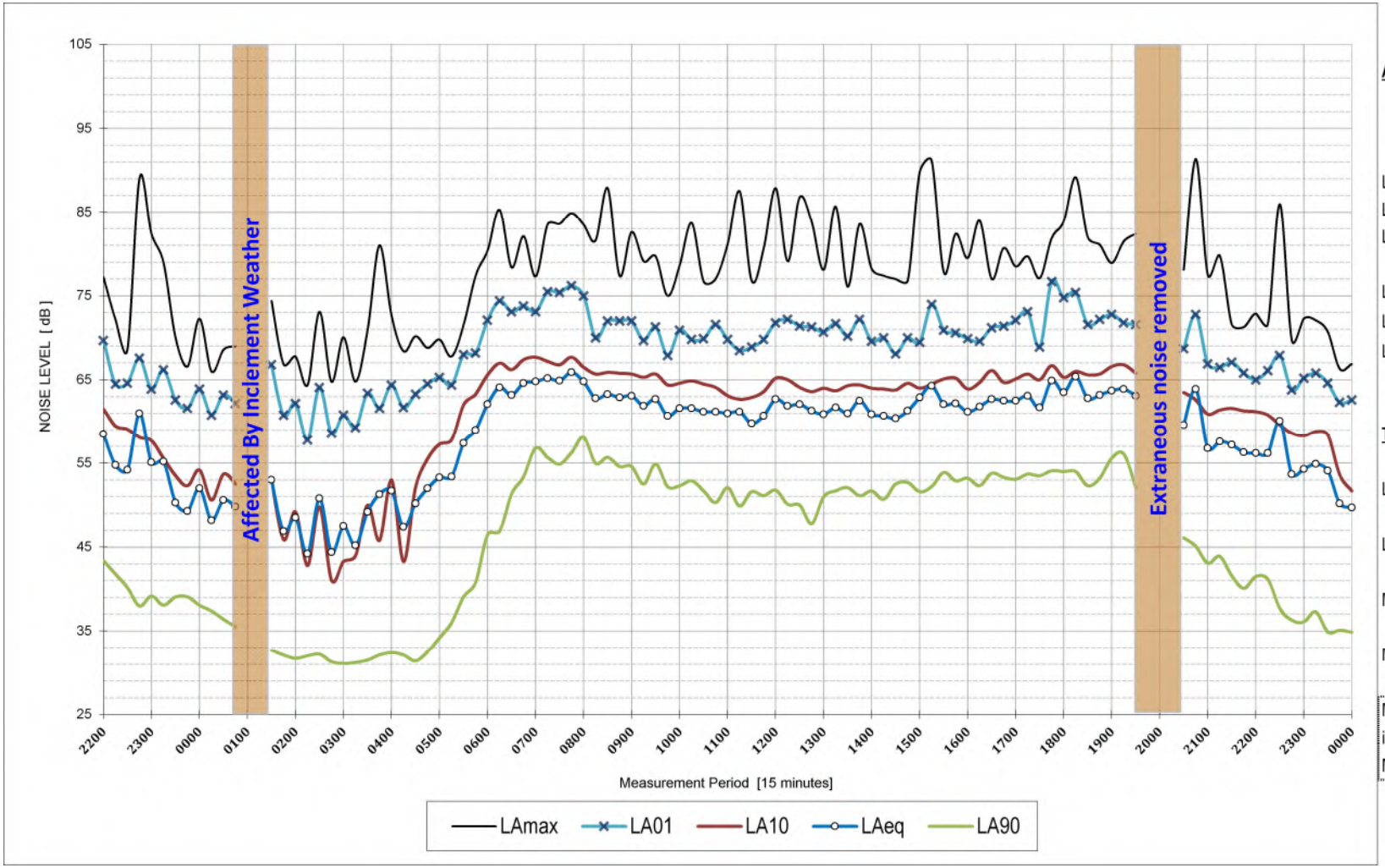
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	62	dB
LAeq 9 hours	2200-0700	56	dB
Max LAeq 1 hour	0700-2200	64	dB
Max LAeq 1 hour	2200-0700	58	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	34

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 6 **LOGGER LOCATION:** 50 Lawrence Street, Freshwater (Rear) **DATE:** Wednesday, 11 March 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	50	dB
LA90 Evening	1800-2200	42	dB
LA90 Night-time	2200-0700	31	dB
LAeq Daytime	0700-1800	63	dB
LAeq Evening	1800-2200	62	dB
LAeq Night-time	2200-0700	57	dB

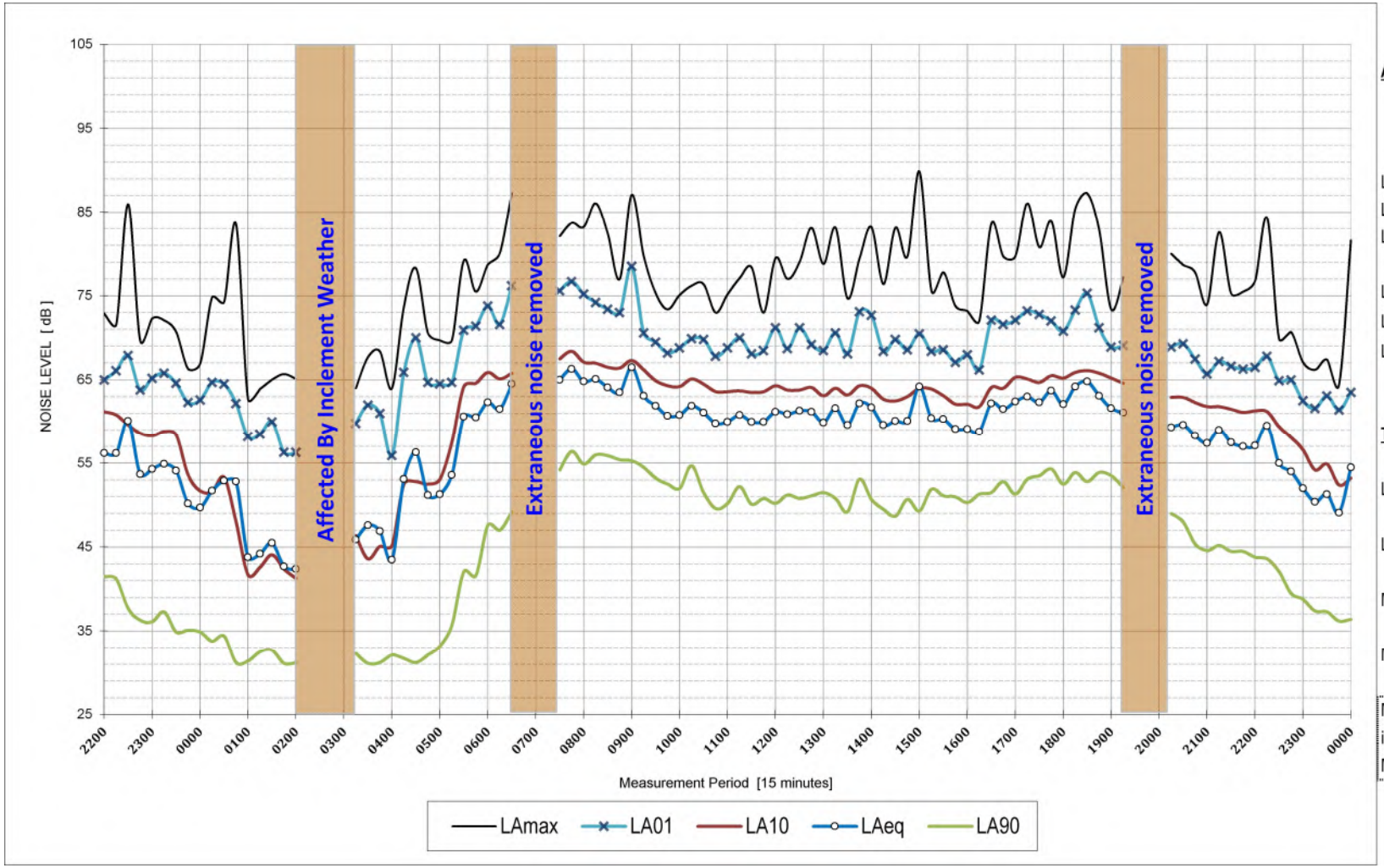
TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	62	dB
LAeq 9 hours	2200-0700	57	dB
Max LAeq 1 hour	0700-2200	64	dB
Max LAeq 1 hour	2200-0700	59	dB

Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	31

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

DAY 7 **LOGGER LOCATION:** 50 Lawrence Street, Freshwater (Rear) **DATE:** Thursday, 12 March 2020



AMBIENT NOISE METRICS

Descriptor	Period	Level	Units
LA90 Daytime	0700-1800	49	dB
LA90 Evening	1800-2200	45	dB
LA90 Night-time	2200-0700	31	dB
LAeq Daytime	0700-1800	62	dB
LAeq Evening	1800-2200	61	dB
LAeq Night-time	2200-0700	56	dB

TRAFFIC & MISC. NOISE METRICS

LAeq 15 hours	0700-2200	62	dB
LAeq 9 hours	2200-0700	56	dB
Max LAeq 1 hour	0700-2200	64	dB
Max LAeq 1 hour	2200-0700	59	dB

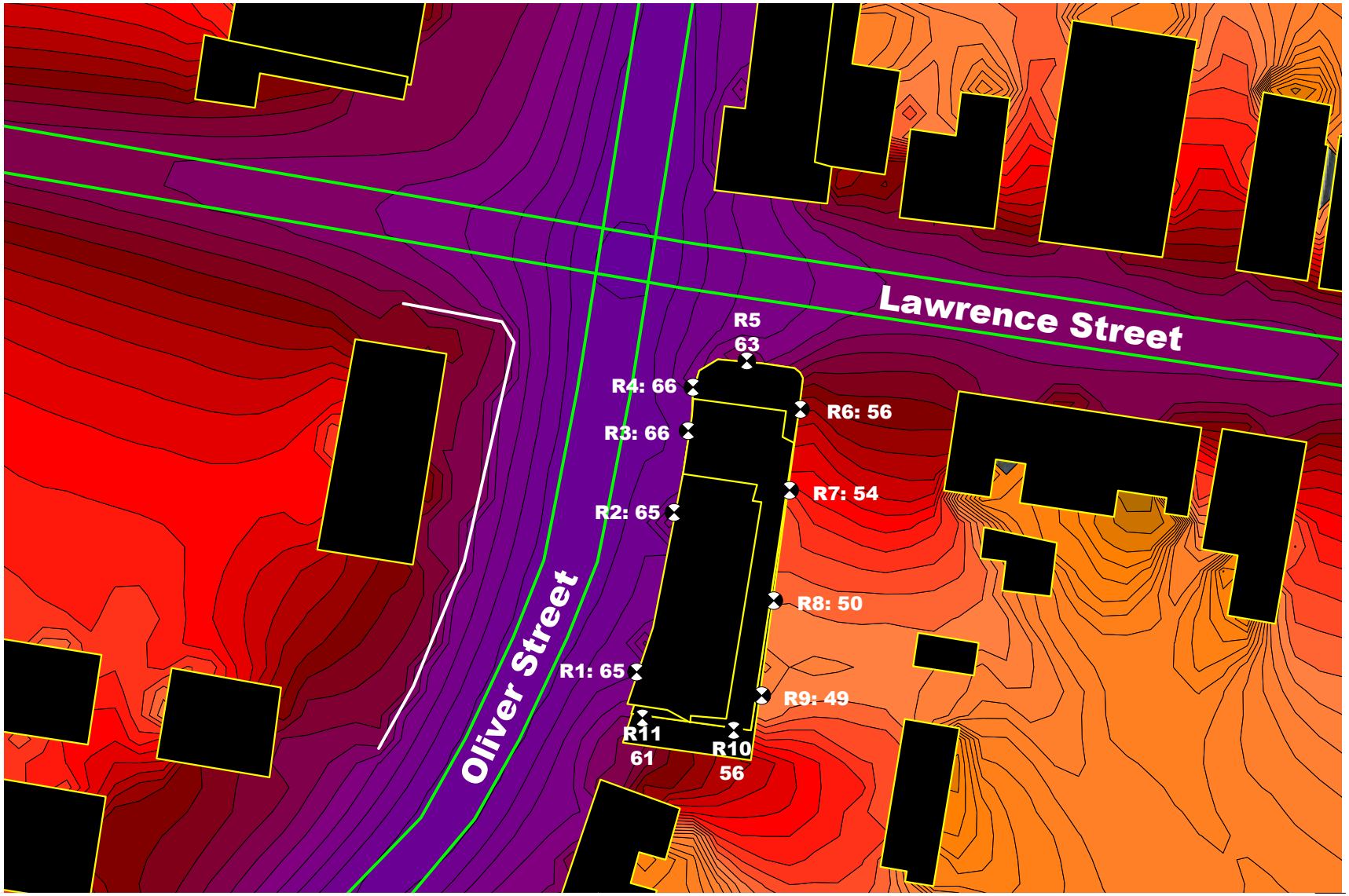
Maximum noise events as defined in the Environmental Noise Management Manual [LAmax - LAeq ≥ 15]	31

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

APPENDIX C

APPENDIX C

APPENDIX C



Scenario 1.1
(First Floor)
**** NOISE SOURCES ****

~ Lawrence Street
~ Oliver Street

Note:
- LAeq,15minutes noise contours and receiver points are at a height of 4.5 m above ground

- The maximum reading at the nearest resident is 66 dB.

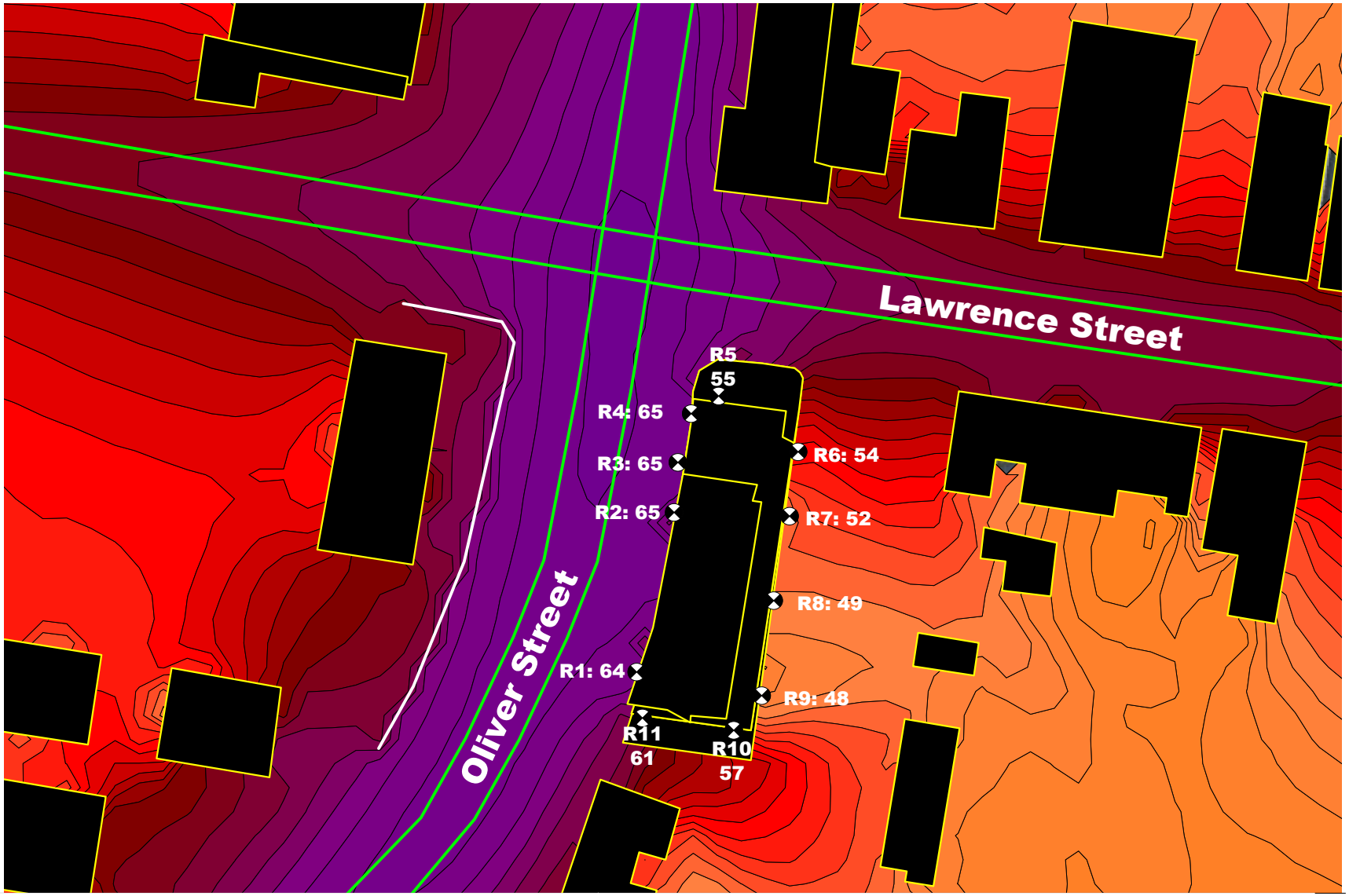
PRINT DATE: 30/04/20

Line Source
Building
Barrier
Contour Line
Receiver
Calculation Area

> 20.0 dB
> 30.0 dB
> 40.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
> 90.0 dB

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

JOB NUMBER: 4095
CLIENT: Lawrence Street Nominees Pty Ltd
SITE ADDRESS: 50 Lawrence Street, Freshwater NSW
ASSESSED TO: Development near rail corridors and busy roads
LIMITING CRITERIA: 35 dB(A) - Bedrooms (2200-0700)
40 dB(A) - Other



Scenario 1.2
(Second Floor)
**** NOISE SOURCES ****

~ Lawrence Street
~ Oliver Street

Note:
- LAeq,15minutes noise contours and receiver points are at a height of 7.5 m above ground

- The maximum reading at the nearest resident is 65 dB.

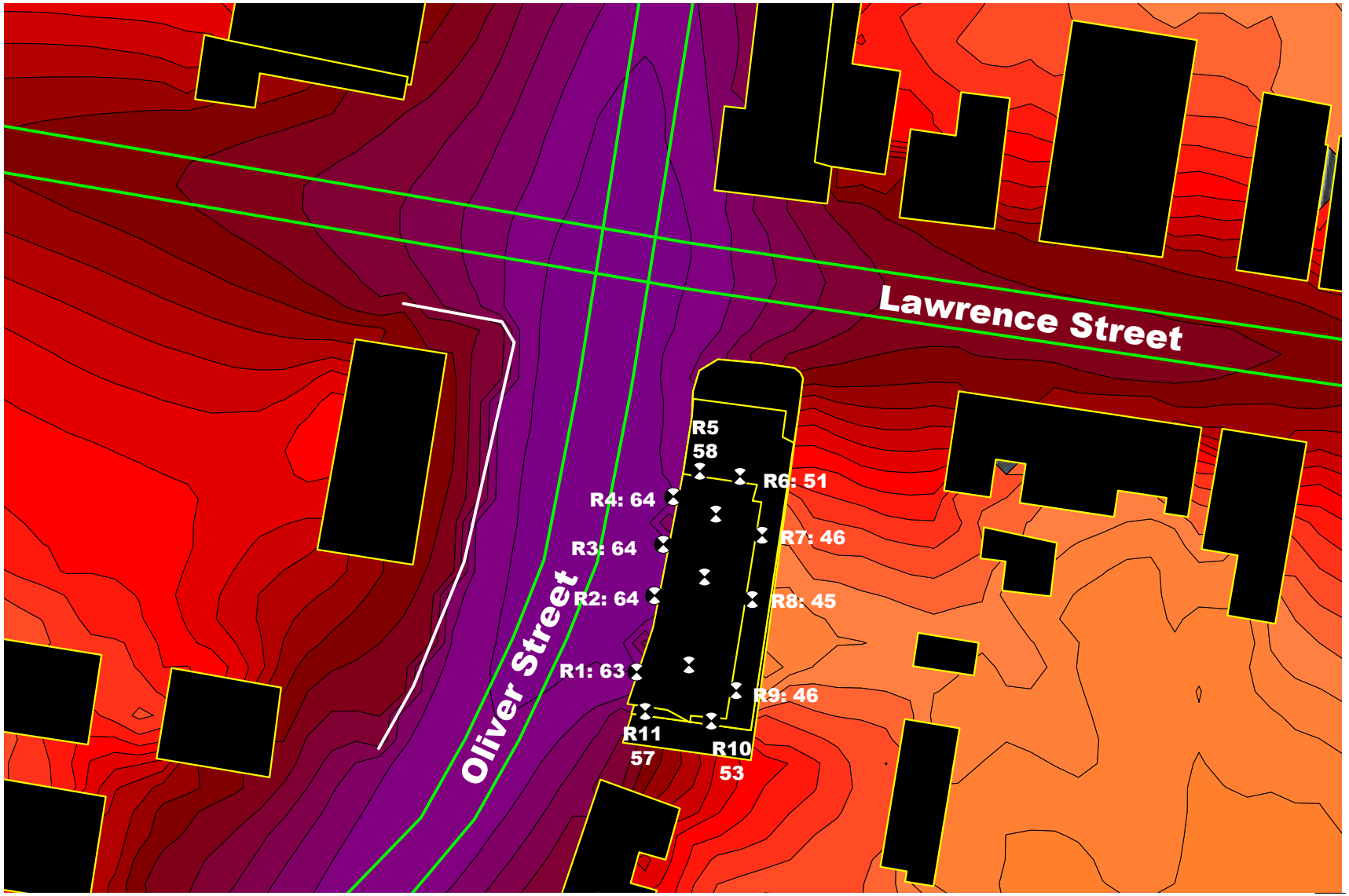
PRINT DATE: 30/04/20

Line Source
Building
Barrier
Contour Line
Receiver
Calculation Area

> 20.0 dB
> 30.0 dB
> 40.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
> 90.0 dB

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

JOB NUMBER: 4095
CLIENT: Lawrence Street Nominees Pty Ltd
SITE ADDRESS: 50 Lawrence Street, Freshwater NSW
ASSESSED TO: Development near rail corridors and busy roads
LIMITING CRITERIA: 35 dB(A) - Bedrooms (2200-0700)
40 dB(A) - Other



Scenario 1.3
(Third Floor)
**** NOISE SOURCES ****

~ Lawrence Street
~ Oliver Street

Note:
- LAeq,15minutes noise contours and receiver points are at a height of 10.5 m above ground

- The maximum reading at the nearest resident is 64 dB.

PRINT DATE: 30/04/20

Line Source
Building
Barrier
Contour Line
Receiver
Calculation Area

> 20.0 dB
> 30.0 dB
> 40.0 dB
> 50.0 dB
> 55.0 dB
> 60.0 dB
> 65.0 dB
> 90.0 dB

koikas acoustics PTY LTD
CONSULTANTS IN NOISE & VIBRATION

JOB NUMBER: 4095
CLIENT: Lawrence Street Nominees Pty Ltd
SITE ADDRESS: 50 Lawrence Street, Freshwater NSW
ASSESSED TO: Development near rail corridors and busy roads
LIMITING CRITERIA: 35 dB(A) - Bedrooms (2200-0700)
40 dB(A) - Other

APPENDIX D

APPENDIX D

APPENDIX D

TRAFFIC NOISE INTRUSION CALCULATIONS

Job *4095*
Client *Lawrence Street Nominees Pty Ltd*
Site *50 Lawrence Street, Freshwater*
Room *Unit 1 - Living*

ROOM DATA

H 2.8 m D 4.12 m
W 4.12 m V 47.5 m3

	63	125	250	500	1k	2k	4k	8k	Area
KLD, timber and tile floor, furnished (RT60, sec)	*0.6*	*0.6*	*0.6*	*0.7*	*0.7*	*0.7*	*0.6*	*0.6*	*0.64*
EXTERNAL FAÇADE 1 - NOISE LEVEL, LAeq, Period [dB] - West (R3)	47	54	55	57	60	58	57	51	65
STL 1 *60mm Pronto Panel + 35mm AG + 92mm SS w/75mm Insul + 13mm PB*	*20*	*37*	*51*	*56*	*69*	*79*	*84*	*88*	7.6
STL 2 *12.38mm Laminated Glass Window (W103, W102,W101)*	*24*	*29*	*32*	*36*	*38*	*34*	*38*	*43*	9.4
STL 3 *12.38mm Laminated Glass Door (D101)*	*24*	*29*	*32*	*36*	*38*	*34*	*38*	*43*	7.9
STL 4									
Noise through Component 1	31	21	8	5	-4	-16	-23	-33	31
Noise through Component 2	27	30	28	27	28	29	24	12	36
Noise through Component 3	27	29	27	26	27	28	23	12	36
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 1	**33**	**33**	**30**	**29**	**30**	**32**	**26**	**15**	**40**
EXTERNAL FAÇADE 2 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 2	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
EXTERNAL FAÇADE 3 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 3	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
EXTERNAL FAÇADE 4 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 4	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SUMMARY OF RESULTS

	Noise Transmission Through Each Façade LAeq,Period [dB]								
Frequency	63	125	250	500	1k	2k	4k	8k	Tot
Façade 1	33	33	30	29	30	32	26	15	40
Façade 2	0	0	0	0	0	0	0	0	0
Façade 3	0	0	0	0	0	0	0	0	0
Façade 4	0	0	0	0	0	0	0	0	0
CALCULATED INDOOR TRAFFIC NOISE LEVEL, LAeq, Period [dB]	**33**	**33**	**30**	**29**	**30**	**32**	**26**	**16**	**40**

TRAFFIC NOISE INTRUSION CALCULATIONS

Job *4095*
Client *Lawrence Street Nominees Pty Ltd*
Site *50 Lawrence Street, Freshwater*
Room *Unit 2 - Master Bedroom*

ROOM DATA
H 2.8 m D 3.27 m
W 3.55 m V 32.5 m3

		63	125	250	500	1k	2k	4k	8k	Area
	Bedroom, carpet floor, furnished (RT60, sec)	*0.4*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.33*
	EXTERNAL FAÇADE 1 - NOISE LEVEL, LAeq, Period [dB] - North (R5)	45	51	53	56	59	57	53	46	64
STL 1	*60mm Pronto Panel + 35mm AG + 92mm SS w/75mm Insul + 13mm PB*	*20*	*37*	*51*	*56*	*69*	*79*	*84*	*88*	14.8
STL 2	*4mm Float Glass Window (W106)*	*16*	*20*	*24*	*27*	*31*	*32*	*29*	*34*	1.6
STL 3	*10.38mm Laminated Glass Door (D102)*	*21*	*25*	*30*	*33*	*32*	*34*	*39*	*45*	6.0
STL 4										
	Noise through Component 1	31	20	8	6	-4	-16	-25	-37	31
	Noise through Component 2	25	27	25	25	24	21	20	8	33
	Noise through Component 3	26	28	25	25	29	25	16	3	34
	Noise through Component 4	0	0	0	0	0	0	0	0	0
	NOISE THROUGH FAÇADE 1	**33**	**31**	**28**	**28**	**30**	**26**	**21**	**9**	**38**
	EXTERNAL FAÇADE 2 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1										
STL 2										
STL 3										
STL 4										
	Noise through Component 1	0	0	0	0	0	0	0	0	0
	Noise through Component 2	0	0	0	0	0	0	0	0	0
	Noise through Component 3	0	0	0	0	0	0	0	0	0
	Noise through Component 4	0	0	0	0	0	0	0	0	0
	NOISE THROUGH FAÇADE 2	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	EXTERNAL FAÇADE 3 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1										
STL 2										
STL 3										
STL 4										
	Noise through Component 1	0	0	0	0	0	0	0	0	0
	Noise through Component 2	0	0	0	0	0	0	0	0	0
	Noise through Component 3	0	0	0	0	0	0	0	0	0
	Noise through Component 4	0	0	0	0	0	0	0	0	0
	NOISE THROUGH FAÇADE 3	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	EXTERNAL FAÇADE 4 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1										
STL 2										
STL 3										
STL 4										
	Noise through Component 1	0	0	0	0	0	0	0	0	0
	Noise through Component 2	0	0	0	0	0	0	0	0	0
	Noise through Component 3	0	0	0	0	0	0	0	0	0
	Noise through Component 4	0	0	0	0	0	0	0	0	0
	NOISE THROUGH FAÇADE 4	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SUMMARY OF RESULTS

	Noise Transmission Through Each Façade LAeq,Period [dB]								
Frequency	63	125	250	500	1k	2k	4k	8k	Tot
Façade 1	33	31	28	28	30	26	21	9	38
Façade 2	0	0	0	0	0	0	0	0	0
Façade 3	0	0	0	0	0	0	0	0	0
Façade 4	0	0	0	0	0	0	0	0	0
CALCULATED INDOOR TRAFFIC NOISE LEVEL, LAeq, Period [dB]	**33**	**31**	**28**	**28**	**30**	**26**	**22**	**11**	**38**

TRAFFIC NOISE INTRUSION CALCULATIONS

Job *4095*
Client *Lawrence Street Nominees Pty Ltd*
Site *50 Lawrence Street, Freshwater*
Room *Unit 2 - Bedroom 2*

ROOM DATA

H 2.8 m D 3.07 m
W 3.18 m V 27.3 m3

	63	125	250	500	1k	2k	4k	8k	Area
Bedroom, carpet floor, furnished (RT60, sec)	*0.4*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.33*
EXTERNAL FAÇADE 1 - NOISE LEVEL, LAeq, Period [dB] - East (R6)	39	42	46	49	52	50	43	30	56
STL 1 *60mm Pronto Panel + 35mm AG + 92mm SS w/75mm Insul + 13mm PB*	*20*	*37*	*51*	*56*	*69*	*79*	*84*	*88*	1.4
STL 2 *4mm Float Glass Window (W112)*	*16*	*20*	*24*	*27*	*31*	*32*	*29*	*34*	8.8
STL 3									
STL 4									
Noise through Component 1	16	1	-9	-11	-21	-33	-45	-62	16
Noise through Component 2	28	26	26	26	25	22	18	0	34
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 1	**28**	**26**	**26**	**26**	**25**	**22**	**18**	**5**	**34**
EXTERNAL FAÇADE 2 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 2	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
EXTERNAL FAÇADE 3 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 3	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
EXTERNAL FAÇADE 4 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 4	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SUMMARY OF RESULTS

	Noise Transmission Through Each Façade LAeq,Period [dB]								
Frequency	63	125	250	500	1k	2k	4k	8k	Tot
Façade 1	28	26	26	26	25	22	18	5	34
Façade 2	0	0	0	0	0	0	0	0	0
Façade 3	0	0	0	0	0	0	0	0	0
Façade 4	0	0	0	0	0	0	0	0	0
CALCULATED INDOOR TRAFFIC NOISE LEVEL, LAeq, Period [dB]	**28**	**26**	**26**	**26**	**25**	**22**	**18**	**8**	**34**

TRAFFIC NOISE INTRUSION CALCULATIONS

Job *4095*
Client *Lawrence Street Nominees Pty Ltd*
Site *50 Lawrence Street, Freshwater*
Room *Unit 2 - Kitchen/Living/Dining Room*

ROOM DATA

H 2.8 m D 5.2 m
W 5.6 m V 81.5 m3

	63	125	250	500	1k	2k	4k	8k	Area
KLD, timber and tile floor, furnished (RT60, sec)	*0.6*	*0.6*	*0.6*	*0.7*	*0.7*	*0.7*	*0.6*	*0.6*	*0.64*
EXTERNAL FAÇADE 1 - NOISE LEVEL, LAeq, Period [dB] - North (R5)	45	51	53	56	59	57	53	46	64
STL 1 *60mm Pronto Panel + 35mm AG + 92mm SS w/75mm Insul + 13mm PB*	*20*	*37*	*51*	*56*	*69*	*79*	*84*	*88*	0.9
STL 2 *10.38mm Laminated Glass window (W107, W108, W109, W110, W111)*	*21*	*25*	*30*	*33*	*32*	*34*	*39*	*45*	15.0
STL 3									
STL 4									
Noise through Component 1	17	6	-6	-7	-17	-29	-39	-50	17
Noise through Component 2	28	31	27	28	32	28	19	6	37
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 1	**29**	**31**	**27**	**28**	**32**	**28**	**19**	**7**	**37**
EXTERNAL FAÇADE 2 - NOISE LEVEL, LAeq, Period [dB] - East (R6)	40	43	47	50	53	51	44	31	57
STL 1 *60mm Pronto Panel + 35mm AG + 92mm SS w/75mm Insul + 13mm PB*	*20*	*37*	*51*	*56*	*69*	*79*	*84*	*88*	0.0
STL 2 *4mm Float Glass Window (D103)*	*16*	*20*	*24*	*27*	*31*	*32*	*29*	*34*	12.2
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	27	27	27	27	26	23	18	0	34
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 2	**27**	**27**	**27**	**27**	**26**	**23**	**19**	**6**	**34**
EXTERNAL FAÇADE 3 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 3	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
EXTERNAL FAÇADE 4 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 4	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SUMMARY OF RESULTS

	Noise Transmission Through Each Façade LAeq,Period [dB]								
Frequency	63	125	250	500	1k	2k	4k	8k	Tot
Façade 1	29	31	27	28	32	28	19	7	37
Façade 2	27	27	27	27	26	23	19	6	34
Façade 3	0	0	0	0	0	0	0	0	0
Façade 4	0	0	0	0	0	0	0	0	0
CALCULATED INDOOR TRAFFIC NOISE LEVEL, LAeq, Period [dB]	**31**	**32**	**30**	**31**	**33**	**29**	**22**	**11**	**39**

TRAFFIC NOISE INTRUSION CALCULATIONS

Job	*4095*
Client	*Lawrence Street Nominees Pty Ltd*
Site	*50 Lawrence Street, Freshwater*
Room	*Unit 5 - Kitchen/Living/Dining Room*

ROOM DATA

H	2.8	m	D	5.55	m
W	5.55	m	V	86.2	m3

		63	125	250	500	1k	2k	4k	8k	Area
	KLD, timber and tile floor, furnished (RT60, sec)	*0.6*	*0.6*	*0.6*	*0.7*	*0.7*	*0.7*	*0.6*	*0.6*	*0.64*
	EXTERNAL FAÇADE 1 - NOISE LEVEL, LAeq, Period [dB] - North (R5)	45	51	53	56	59	57	53	46	64
STL 1	*10.38mm Laminated Glass Door (D203)*	*21*	*25*	*30*	*33*	*32*	*34*	*39*	*45*	14.8
STL 2	*60mm Pronto Panel + 35mm AG + 92mm SS w/75mm Insul + 13mm PB*	*20*	*37*	*51*	*56*	*69*	*79*	*84*	*88*	1.4
STL 3										
STL 4										
	Noise through Component 1	28	31	27	28	32	28	19	5	37
	Noise through Component 2	19	8	-4	-5	-15	-27	-37	-48	19
	Noise through Component 3	0	0	0	0	0	0	0	0	0
	Noise through Component 4	0	0	0	0	0	0	0	0	0
	NOISE THROUGH FAÇADE 1	**28**	**31**	**27**	**28**	**32**	**28**	**19**	**7**	**37**
	EXTERNAL FAÇADE 2 - NOISE LEVEL, LAeq, Period [dB] - West (R4)	47	54	55	57	60	58	56	50	65
STL 1	*60mm Pronto Panel + 35mm AG + 92mm SS w/75mm Insul + 13mm PB*	*20*	*37*	*51*	*56*	*69*	*79*	*84*	*88*	8.5
STL 2	*10.38mm laminated glass Windows (W207, W208, W209)*	*21*	*25*	*30*	*33*	*32*	*34*	*39*	*45*	6.9
STL 3										
STL 4										
	Noise through Component 1	28	19	6	3	-7	-19	-26	-37	29
	Noise through Component 2	27	30	26	26	29	25	18	6	36
	Noise through Component 3	0	0	0	0	0	0	0	0	0
	Noise through Component 4	0	0	0	0	0	0	0	0	0
	NOISE THROUGH FAÇADE 2	**31**	**31**	**26**	**26**	**29**	**25**	**18**	**8**	**36**
	EXTERNAL FAÇADE 3 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1										
STL 2										
STL 3										
STL 4										
	Noise through Component 1	0	0	0	0	0	0	0	0	0
	Noise through Component 2	0	0	0	0	0	0	0	0	0
	Noise through Component 3	0	0	0	0	0	0	0	0	0
	Noise through Component 4	0	0	0	0	0	0	0	0	0
	NOISE THROUGH FAÇADE 3	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	EXTERNAL FAÇADE 4 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1										
STL 2										
STL 3										
STL 4										
	Noise through Component 1	0	0	0	0	0	0	0	0	0
	Noise through Component 2	0	0	0	0	0	0	0	0	0
	Noise through Component 3	0	0	0	0	0	0	0	0	0
	Noise through Component 4	0	0	0	0	0	0	0	0	0
	NOISE THROUGH FAÇADE 4	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SUMMARY OF RESULTS

	Noise Transmission Through Each Façade LAeq,Period [dB]								
Frequency	63	125	250	500	1k	2k	4k	8k	Tot
Façade 1	28	31	27	28	32	28	19	7	37
Façade 2	31	31	26	26	29	25	18	8	36
Façade 3	0	0	0	0	0	0	0	0	0
Façade 4	0	0	0	0	0	0	0	0	0
CALCULATED INDOOR TRAFFIC NOISE LEVEL, LAeq, Period [dB]	**33**	**34**	**30**	**30**	**34**	**30**	**22**	**11**	**40**

TRAFFIC NOISE INTRUSION CALCULATIONS

Job *4095*
Client *Lawrence Street Nominees Pty Ltd*
Site *50 Lawrence Street, Freshwater*
Room *Unit 5 - Bedroom 1*

ROOM DATA
H 2.8 m D 4.5 m
W 3 m V 37.8 m3

	63	125	250	500	1k	2k	4k	8k	Area
Bedroom, carpet floor, furnished (RT60, sec)	*0.4*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.33*
EXTERNAL FAÇADE 1 - NOISE LEVEL, LAeq, Period [dB] - West (R2)	47	53	55	57	60	57	56	50	65
STL 1 *60mm Pronto Panel + 35mm AG + 92mm SS w/75mm Insul + 13mm PB*	*20*	*37*	*51*	*56*	*69*	*79*	*84*	*88*	0.5
STL 2 *10.38mm Laminated Glass Window (W205)*	*21*	*25*	*30*	*33*	*32*	*34*	*39*	*45*	7.7
STL 3									
STL 4									
Noise through Component 1	17	6	-6	-9	-19	-32	-38	-48	18
Noise through Component 2	29	30	27	27	30	25	20	7	36
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 1	**29**	**30**	**27**	**27**	**30**	**25**	**20**	**9**	**36**
EXTERNAL FAÇADE 2 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 2	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
EXTERNAL FAÇADE 3 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 3	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
EXTERNAL FAÇADE 4 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 4	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SUMMARY OF RESULTS

	Noise Transmission Through Each Façade LAeq,Period [dB]								
Frequency	63	125	250	500	1k	2k	4k	8k	Tot
Façade 1	29	30	27	27	30	25	20	9	36
Façade 2	0	0	0	0	0	0	0	0	0
Façade 3	0	0	0	0	0	0	0	0	0
Façade 4	0	0	0	0	0	0	0	0	0
CALCULATED INDOOR TRAFFIC NOISE LEVEL, LAeq, Period [dB]	**29**	**30**	**27**	**27**	**30**	**25**	**20**	**10**	**36**

TRAFFIC NOISE INTRUSION CALCULATIONS

Job *4095*
Client *Lawrence Street Nominees Pty Ltd*
Site *50 Lawrence Street, Freshwater*
Room *Unit 5 - Bedroom 2*

ROOM DATA

H 2.8 m D 3 m
W 3.62 m V 30.4 m3

	63	125	250	500	1k	2k	4k	8k	Area
Bedroom, carpet floor, furnished (RT60, sec)	*0.4*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.33*
EXTERNAL FAÇADE 1 - NOISE LEVEL, LAeq, Period [dB] - West (R2)	47	53	55	57	60	57	56	50	65
STL 1 *60mm Pronto Panel + 35mm AG + 92mm SS w/75mm Insul + 13mm PB*	*20*	*37*	*51*	*56*	*69*	*79*	*84*	*88*	2.1
STL 2 *10.38mm Laminated Glass Window (W206)*	*21*	*25*	*30*	*33*	*32*	*34*	*39*	*45*	8.0
STL 3									
STL 4									
Noise through Component 1	25	13	2	-1	-11	-25	-31	-41	25
Noise through Component 2	30	32	28	28	31	26	21	8	37
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 1	**31**	**32**	**28**	**28**	**31**	**26**	**21**	**9**	**38**
EXTERNAL FAÇADE 2 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 2	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
EXTERNAL FAÇADE 3 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 3	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
EXTERNAL FAÇADE 4 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 4	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SUMMARY OF RESULTS

	Noise Transmission Through Each Façade LAeq,Period [dB]								
Frequency	63	125	250	500	1k	2k	4k	8k	Tot
Façade 1	31	32	28	28	31	26	21	9	38
Façade 2	0	0	0	0	0	0	0	0	0
Façade 3	0	0	0	0	0	0	0	0	0
Façade 4	0	0	0	0	0	0	0	0	0
CALCULATED INDOOR TRAFFIC NOISE LEVEL, LAeq, Period [dB]	**31**	**32**	**28**	**28**	**31**	**26**	**21**	**11**	**38**

TRAFFIC NOISE INTRUSION CALCULATIONS

Job *4095*
Client *Lawrence Street Nominees Pty Ltd*
Site *50 Lawrence Street, Freshwater*
Room *Unit 9 - Master Bedroom*

ROOM DATA

H 2.8 m D 3.8 m
W 3.3 m V 35.1 m3

	63	125	250	500	1k	2k	4k	8k	Area
Bedroom, carpet floor, furnished (RT60, sec)	*0.4*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.33*
EXTERNAL FAÇADE 1 - NOISE LEVEL, LAeq, Period [dB] - West (R4)	46	53	54	56	59	57	55	49	64
STL 1 *60mm Pronto Panel + 35mm AG + 92mm SS w/75mm Insul + 13mm PB*	*20*	*37*	*51*	*56*	*69*	*79*	*84*	*88*	3.9
STL 2 *6.38mm Laminated Glass Window (W301, W302)*	*18*	*22*	*27*	*30*	*33*	*32*	*36*	*40*	8.2
STL 3									
STL 4									
Noise through Component 1	26	16	3	0	-10	-22	-30	-40	26
Noise through Component 2	32	34	30	29	29	28	22	12	39
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 1	**33**	**34**	**30**	**29**	**29**	**28**	**22**	**12**	**39**
EXTERNAL FAÇADE 2 - NOISE LEVEL, LAeq, Period [dB] - Roof	37	42	43	43	45	41	36	26	50
STL 1 *220mm Concrete Roof*	*45*	*45*	*48*	*56*	*63*	*68*	*72*	*80*	12.5
STL 2									
STL 3									
STL 4									
Noise through Component 1	-3	2	0	-8	-13	-22	-31	-50	5
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 2	**5**	**6**	**6**	**5**	**5**	**5**	**5**	**5**	**8**
EXTERNAL FAÇADE 3 - NOISE LEVEL, LAeq, Period [dB] - Roof									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 3	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
EXTERNAL FAÇADE 4 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 4	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SUMMARY OF RESULTS

	Noise Transmission Through Each Façade LAeq,Period [dB]								
Frequency	63	125	250	500	1k	2k	4k	8k	Tot
Façade 1	33	34	30	29	29	28	22	12	39
Façade 2	5	6	6	5	5	5	5	5	8
Façade 3	0	0	0	0	0	0	0	0	0
Façade 4	0	0	0	0	0	0	0	0	0
CALCULATED INDOOR TRAFFIC NOISE LEVEL, LAeq, Period [dB]	**33**	**34**	**30**	**29**	**29**	**28**	**22**	**13**	**39**

TRAFFIC NOISE INTRUSION CALCULATIONS

Job *4095*
Client *Lawrence Street Nominees Pty Ltd*
Site *50 Lawrence Street, Freshwater*
Room *Unit 11 - Bedroom 2*

ROOM DATA

H 2.8 m D 3.9 m
W 3.9 m V 42.6 m3

	63	125	250	500	1k	2k	4k	8k	Area
Bedroom, carpet floor, furnished (RT60, sec)	*0.4*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.3*	*0.33*
EXTERNAL FAÇADE 1 - NOISE LEVEL, LAeq, Period [dB] - West (R4)	46	53	54	56	59	57	55	49	64
STL 1 *60mm Pronto Panel + 35mm AG + 92mm SS w/75mm Insul + 13mm PB*	*20*	*37*	*51*	*56*	*69*	*79*	*84*	*88*	1.9
STL 2 *6.38mm Laminated Glass Window (W307)*	*18*	*22*	*27*	*30*	*33*	*32*	*36*	*40*	7.4
STL 3									
STL 4									
Noise through Component 1	22	11	-1	-4	-14	-27	-34	-44	22
Noise through Component 2	30	32	29	28	28	27	21	11	37
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 1	**31**	**32**	**29**	**28**	**28**	**27**	**21**	**11**	**38**
EXTERNAL FAÇADE 2 - NOISE LEVEL, LAeq, Period [dB] - Roof	37	42	43	43	45	41	36	26	50
STL 1 *220mm Concrete Roof*	*45*	*45*	*48*	*56*	*63*	*68*	*72*	*80*	15.2
STL 2									
STL 3									
STL 4									
Noise through Component 1	-3	2	0	-8	-13	-22	-31	-50	5
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 2	**5**	**6**	**6**	**5**	**5**	**5**	**5**	**5**	**8**
EXTERNAL FAÇADE 3 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 3	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
EXTERNAL FAÇADE 4 - NOISE LEVEL, LAeq, Period [dB]									0
STL 1									
STL 2									
STL 3									
STL 4									
Noise through Component 1	0	0	0	0	0	0	0	0	0
Noise through Component 2	0	0	0	0	0	0	0	0	0
Noise through Component 3	0	0	0	0	0	0	0	0	0
Noise through Component 4	0	0	0	0	0	0	0	0	0
NOISE THROUGH FAÇADE 4	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SUMMARY OF RESULTS

	Noise Transmission Through Each Façade LAeq,Period [dB]								
Frequency	63	125	250	500	1k	2k	4k	8k	Tot
Façade 1	31	32	29	28	28	27	21	11	38
Façade 2	5	6	6	5	5	5	5	5	8
Façade 3	0	0	0	0	0	0	0	0	0
Façade 4	0	0	0	0	0	0	0	0	0
CALCULATED INDOOR TRAFFIC NOISE LEVEL, LAeq, Period [dB]	**31**	**32**	**29**	**28**	**28**	**27**	**21**	**13**	**38**