

57-61 Archer Street, Chatswood

Noise and Vibration Impact Assessment for SSDA

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4				

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1 EXECUTIVE SUMMARY

This report has been prepared to accompany a detailed State Significant Development (SSD) development application (DA) for a proposed mixed use infill affordable housing development at 57-61 Archer St & 34 Albert Ave, Chatswood (SSD-72891212).

The Minister for Planning and Public Spaces, or their delegate, is the consent authority for the SSDA and this application is lodged with the NSW Department of Planning, housing and Infrastructure (NSW DPHI) for assessment.

This report has been prepared in response to the requirements contained within the Planning Secretary’s Environmental Assessment Requirements (SEARs) dated 5 July 2024.

The specific SEARs that this report has been prepared in relation to is listed within Table 1.

Table 1 SEARS Requirements

ISSUE AND ASSESSMENT REQUIREMENT	DOCUMENT	SECTION OF THIS REPORT WHICH RESPONDS TO THE SEARS REQUIREMENT
Provide a noise and vibration assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented.	Noise and vibration impact assessment	Section 7 Section 8

This report concludes that the proposed development is acceptable and warrants approval subject to the implementation of the mitigation measures outlined in Section 9.

Following implementation of the mitigation measures, the remaining noise and vibration impacts are appropriate.



2 INTRODUCTION

This report has been prepared to accompany a SSDA for a mixed-use development located at 57-61 Archer Street and 34 Albert Avenue, Chatswood, within the Willoughby LGA. The site has a total area of 2,644.7m² and consists of two lots which are legally identified as SP81015 and SP101358.

In summary, the purpose of this report is to:

- Identify surrounding noise-sensitive receivers;
- Identify relevant standards and guidelines and to establish noise and vibration project requirements for the construction and operation of the site;
- Provide a noise and vibration assessment for the operation of the site, which discusses both noise emissions from the proposed development (including traffic generation), and noise intruding into the development from road and rail; and
- Provide a noise and vibration assessment for the construction of the site, which discusses the expected construction stages, expected machinery / activities involved;
- Outline mitigation measures and recommendations to ensure project noise and vibration requirements are satisfied.

3 PROJECT SITE

The location of the proposal, noise monitoring and measurement positions, and the surrounding noise-sensitive receivers are shown in Figure 1. The noise-sensitive receivers have been delineated into receiver catchments (RCs) as noted in Figure 1. Receiver catchments have been identified with a detailed description in Table 2 below.

Figure 1: Acoustic site plan identifying the surrounding noise-sensitive receivers and noise monitoring locations



Table 2: Description of nearby noise sensitive receiver catchments

RECEIVER CATCHMENT	DESCRIPTION
R1 – Residential	Existing residential development situated along Archer Street.
R2 – Residential	Existing residential developments situated along Bertram Street.
C1 – Commercial	Existing commercial development situated along Albert Avenue.
E1 - Educational	Existing child care centre on Albert Avenue.

4 METHODOLOGY

To assess the noise and vibration impacts of the proposed development, the following process was carried out:

- Identify and classify the surrounding noise and vibration sensitive receivers surrounding the proposed development;
- Identify and classify the noise and vibration sources generated by the proposed development, together with external noise and vibration sources impacting on the proposed development;
- Carry out site noise investigations to quantify the background noise levels local to the proposed development;
- Determine the project noise and vibration criteria applicable to the proposed development in accordance with relevant standards and guidelines;
- Assess the operational and construction noise and vibration impacts of the noise and vibration sources generated by the proposed development to the surrounding noise-sensitive receivers, together with any impacts on the occupants of the proposed development; and
- Provide details of mitigation measures required to alleviate noise and vibration impacts to achieve the project noise and vibration criteria.

The following operational noise and vibration assessments were conducted as part of this noise and vibration impact assessment:

- Road noise intrusion into the development from traffic movement on surrounding local roads;
- Noise and vibration impact of mechanical plant and equipment serving the proposed development on surrounding noise and vibration sensitive receivers; and
- Noise impacts of additional traffic on surrounding local roads generated by the proposed development.

The following construction noise and vibration assessments were conducted as part of this noise and vibration impact assessment:

- Noise generated during the construction of the proposed development and associated impacts on the surrounding noise sensitive receivers; and
- Vibration generated during the construction of the proposed development and associated impacts on the surrounding vibration sensitive receivers.

The noise and vibration assessments conducted as part of this report have been assessed to the noise and vibration criteria established in the following guidelines, standards and policies:

- AS/NZS 2107:2016 “Acoustics - Recommended design sound levels and reverberation times for building interiors”;
- NSW Noise Policy for Industry (NPI) 2017;
- State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021;
- Development Near Rail Corridors and Busy Roads – Interim Guideline;
- NSW Road Noise Policy (RNP), 2011;
- Interim Construction Noise Guideline (ICNG) 2009;
- Assessing vibration: A Technical Guideline 2006;
- British Standard BS5228 – Part 1:1997 “Noise and Vibration Control on Construction and Open Sites.”;
- British Standard BS7358:1993 “Evaluation and Measurement for Vibration in Buildings”;
- German Standard DIN4150 – Part 3: “Structural vibration in buildings – Effects on structures”.



5 NOISE MONITORING

5.1 INSTRUMENTATION

The equipment used for the noise survey was the following:

- 3 x NSRT mk3 Sentry Noise Loggers
- Bruel and Kjaer Sound calibrator Type 4231 (S/N: 3029638)

All equipment was calibrated before and after the measurements and no significant drift was found. All equipment carries current traceable calibration certificates that can be provided upon request.

5.2 LONG-TERM NOISE MONITORING

Long term noise monitoring has been undertaken for the project site at locations shown in Figure 1 to measure the background and ambient noise that is representative of the surrounding noise and vibration sensitive receivers. Detailed graphical noise monitoring data is presented in 36.

5.2.1 Background Noise

Background noise levels and subsequent Rating Background Noise Level (RBL) have been established in accordance with the Noise Policy for Industry 2017 using the results of the noise monitoring at locations LT1-LT3 as indicated in Figure 1. The local ambient noise environment is typical of an Urban residential environment (as described by the NPfI).

Table 3: Unattended noise monitoring results

LOCATION	MEASURED EQUIVALENT CONTINUOUS NOISE LEVEL – L_{EQ} dB(A)			MEASURED RATING BACKGROUND NOISE LEVELS – L_{90} dB(A)		
	DAY	EVENING	NIGHT	DAY	EVENING	NIGHT
LT1	68	68	60	53	48	41
LT2	57	57	52	44	42	37
LT3	64	62	57	54	48	41

General Note: Noise Policy for Industry (NPfI) assessment periods – Daytime: 7:00 am to 6:00 pm Monday to Saturday, 8:00 am to 6:00 pm Sundays and Public Holidays; Evening: 6:00 pm to 10:00 pm; Night: 10:00 pm to 8:00 am Monday to Saturday, 10:00 pm to 8:00 am Sundays and Public Holidays.

5.2.2 Traffic Noise

In addition to background noise, long-term noise monitoring was also conducted at the project site to establish traffic noise levels respectively for the site and have been summarised in Table 4.

Table 4: Long-term traffic noise monitoring results

LOCATION	MEASURED NOISE LEVELS, $L_{Aeq,period}$ dB(A)	
	DAY (7AM – 10PM)	NIGHT (10PM – 7AM)
LT1	68	60
LT2	63	53
LT3	64	57

6 PROJECT NOISE AND VIBRATION CRITERIA

The project noise and vibration criteria has been established considering the following documents:

- AS/NZS 2107:2016 “Acoustics - Recommended design sound levels and reverberation times for building interiors”;
- NSW Noise Policy for Industry (NPI) 2017;
- State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021;
- Development Near Rail Corridors and Busy Roads – Interim Guideline;
- NSW Road Noise Policy (RNP), 2011;
- Interim Construction Noise Guideline (ICNG) 2009;
- Assessing vibration: A Technical Guideline 2006;
- British Standard BS5228 – Part 1:1997 “Noise and Vibration Control on Construction and Open Sites.”;
- British Standard BS7358:1993 “Evaluation and Measurement for Vibration in Buildings”; and
- German Standard DIN4150 – Part 3: “Structural vibration in buildings – Effects on structures”.

6.1 PLANNING SECRETARY’S ENVIRONMENTAL ASSESSMENT REQUIREMENTS (SEAR’S)

The SEAR’s acoustic requirements for the development are as follows:

12. Noise & Vibration

Provide a noise and vibration assessment prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The assessment must detail construction and operational noise and vibration impacts on nearby sensitive receivers and structures and outline the proposed management and mitigation measures that would be implemented.

6.2 EXTERNAL NOISE EMISSIONS

6.2.1 NSW EPA Noise Policy for Industry (NPI) 2017 – Industrial Noise (Plant and Equipment)

The NSW EPA’s Noise Policy for Industry (NPI) 2017 has been implemented to assess the noise impacts of mechanical plant and equipment, as well as other industrial noise sources on the surrounding receiver catchments.

The NPI sets out a framework for the derivation of project noise trigger levels that are used to assess the potential impacts of noise from industry (and industrial noise sources) and indicate the noise level at which feasible and reasonable noise management measures should be considered.

This policy applies to noise sources from activities listed in Schedule 1 of the POEO Act and those regulated by the EPA. This includes noise sources from mechanical plant and equipment within the proposed redevelopment, for which this policy will be applied.

The project noise trigger level provides a benchmark for assessing a proposal, where if exceeded, indicates a potential noise impact on the community and so triggers a management response such as additional mitigation measures. The project noise trigger level is the lower (the more stringent) value of the project intrusiveness noise level and project amenity noise level determined in Sections 2.3 and 2.4 of the NPI, respectively.

Project Intrusiveness Noise Level

The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (in terms of L_{Aeq}) measured over a 15-minute period does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. The project intrusiveness noise level is only applicable to surrounding residential receivers.



To account for the temporal variation of background noise levels, the method outlined in Fact Sheet A of the NPI establishes a method in determining the Rating Background Noise Level (RBL) to be used in the assessment.

The intrusiveness noise level is determined as follows:

$$L_{Aeq,15min} \text{ (Intrusiveness Criteria)} = \text{Rating Background Noise Level (RBL)} + 5 \text{ dB(A)}$$

Where the RBLs established in accordance with Fact Sheet A are lower than the values presented in Table 5 for each assessment period, the values presented in Table 5 shall be used for that particular assessment period. These result in the minimum intrusiveness noise levels provided in Table 5.

Table 5: Minimum assumed RBLs and project intrusiveness noise levels

TIME OF DAY	MINIMUM ASSUMED RBL - dB(A)	MINIMUM PROJECT INTRUSIVENESS NOISE LEVELS - $L_{Aeq,15min}$ dB(A)
Day	35	40
Evening	30	35
Night	30	35

Table 6 provides the project intrusiveness noise levels applicable to each of the surrounding residential noise-sensitive receivers based on the measured background noise levels provided in Section 5.

Table 6: Project intrusiveness noise level criteria for each residential receiver

RECEIVER CATCHMENT	TIME OF DAY	MEASURED RBL - dB(A)	PROJECT INTRUSIVENESS NOISE LEVELS - $L_{Aeq,15min}$ dB(A)
R1 ¹	Day	44	49
	Evening	42	47
	Night	37	42
R2 ²	Day	54	59
	Evening	48	53
	Night	41	46

Note 1 – Based on the results of long-term unattended noise monitoring at monitoring position LT2.

Note 2 – Based on the results of long-term unattended noise monitoring at monitoring position LT3.

Project Amenity Noise Level

The recommended amenity noise levels represent the objective for total industrial noise at a receiver location, whereas the project amenity noise level represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

$$\text{Project Amenity Noise Level} = \text{Recommended Amenity Noise Level (see Table 7)} - 5 \text{ dB(A)}$$

The following exceptions to the above method to derive the project amenity noise level apply:

- In areas with high traffic noise levels. Where the level of transport noise, road traffic noise in particular is high enough to make noise from an industrial source inaudible, the project amenity noise level shall be set at 15 dB(A) below the measured $L_{Aeq,period(traffic)}$ for the particular assessment period
- In proposed developments in major industrial clusters
- Where the resultant project amenity noise level is 10 dB(A) or more lower than the existing industrial noise level. In this case the project amenity noise levels can be set at 10 dB(A) below existing industrial noise levels if it can be demonstrated that existing industrial noise levels are unlikely to reduce over time

- Where cumulative industrial noise is not a necessary consideration because no other industries are present in the area, or likely to be introduced into the area in the future. In such cases the relevant amenity noise level is assigned as the project amenity noise level for the development

The recommended amenity noise level, project amenity noise level, and converted project amenity noise level for comparison with the intrusiveness criteria (from time of day period to 15-minute) is provided for each surrounding receiver catchment in Table 7.

Table 7: Project amenity noise level criteria for each receiver catchment

RECEIVER CATCHMENT	RECEIVER TYPE	TIME OF DAY	RECOMMENDED AMENITY NOISE LEVEL - $L_{Aeq,period}$ dB(A)	PROJECT AMENITY NOISE LEVEL - $L_{Aeq,period}$ dB(A)	PROJECT AMENITY NOISE LEVEL - $L_{Aeq,15min}$ dB(A)
R1	Residential – Urban ¹	Day	60	55	58
		Evening	50	45	48
		Night	45	40	43
R2	Residential – Urban ¹	Day	60	55	58
		Evening	50	45	48
		Night	45	40	43
C1	Commercial	When in use	65	60	63
E1	Educational	Noisiest 1 hour period when in use	35 (internal)	-	-

Note 1: Urban residential as classified in Table 2.3 of the Noise Policy for Industry (NPI) 2017.

Sleep Disturbance and Maximum Noise Level Assessment

Where the proposed redevelopment night-time noise levels generated at a residential location exceed either:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB(A), whichever is greater, and/or
- L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB(A), whichever is greater,

a detailed maximum noise level event assessment should be undertaken.

Corrections for Annoying Noise Characteristics – Noise Policy for Industry Fact Sheet C

Fact Sheet C contained within the Noise Policy for Industry outlines the correction factors to be applied to the source noise level at the receiver before comparison with the project noise trigger levels established within this report, to account for the additional annoyance caused by these modifying factors.

The modifying factor corrections should be applied having regard to:

- The contribution noise level from the premises when assessed/measured at a receiver location, and
- The nature of the noise source and its characteristics (as set out in Fact Sheet C)

Table C1 within Fact Sheet C sets out the corrections to be applied for any assessment in-line with the NPI. The corrections specified for tonal, intermittent and low-frequency noise are to be added to the

measured or predicted levels at the receiver before comparison with the project noise trigger levels. The adjustments for duration are to be applied to the criterion.

Project Noise Trigger Levels

Table 8 presents the project intrusiveness and project amenity noise levels for each period, and each receiver catchment, as well as the resultant project noise trigger levels (PNTLs) that shall be applied for any assessment of impacts of mechanical plant and equipment noise on the surrounding receiver catchments.

Table 8: Project noise trigger levels (PNTL) to be applied to each surrounding receiver type

RECEIVER CATCHMENT	RECEIVER TYPE	TIME OF DAY	PROJECT INTRUSIVENESS NOISE LEVEL - $L_{Aeq,15min}$ dB(A)	PROJECT AMENITY NOISE LEVEL - $L_{Aeq,15min}$ dB(A)	SLEEP DISTURBANCE NOISE LEVEL - dB(A)	PROJECT NOISE TRIGGER LEVEL - $L_{Aeq,15min}$ dB(A)
R1	Residential – Urban	Day	49	58	N/A	49
		Evening	47	48	N/A	47
		Night	42	43	42dB(A) L_{eq} and 52dB(A) L_{max}	42
R2	Residential – Urban	Day	59	58	N/A	58
		Evening	53	48	N/A	48
		Night	46	43	46dB(A) L_{eq} and 56dB(A) L_{max}	43
C1	Commercial	When in use	N/A	63	N/A	63
E1	Educational	Noisiest 1 hour when in use	N/A	N/A	N/A	35 (internal)

6.3 INTERNAL NOISE LEVELS

6.3.1 Willoughby Development Control Plan & Local Environmental Plan

Section C.14 of the DCP states:

Development located in the vicinity of a rail corridor or busy road needs to take into consideration the provisions of the State Environmental Planning Policy (Infrastructure) 2007 and the NSW Department of Planning “Development Near Rail Corridors and Busy Roads- Interim Guideline)

It is noted that State Environmental Planning Policy (Infrastructure) 2007 has been superseded by SEPP 2021. The requirements of SEPP 2021 are detailed below.

6.3.2 SEPP (Transport and Infrastructure) 2021

Clause 2.120 of SEPP 2021 states the following requirements for the impact of road noise or vibration on non-road development:

2.120 Impact of road noise or vibration on non-road development

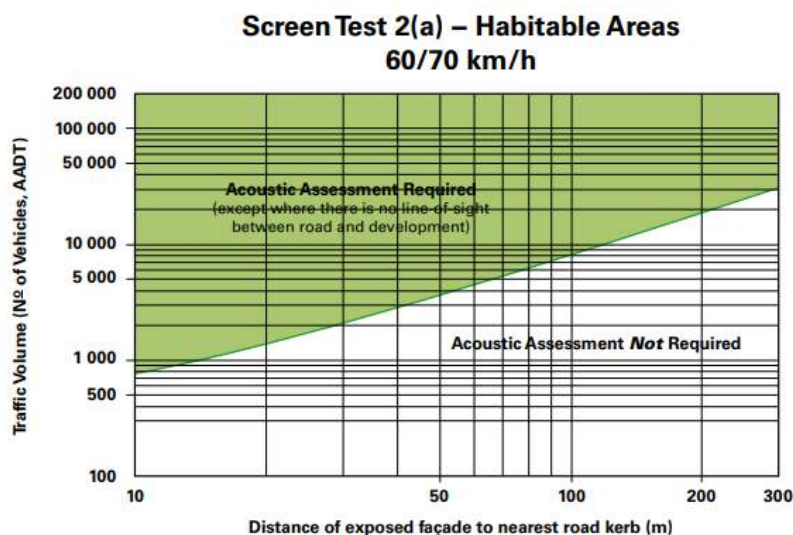
- (1) *This section applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 20,000 vehicles (based on the traffic volume data published on the website of TfNSW) and that the consent authority considers is likely to be adversely affected by road noise or vibration—*
 - (a) *residential accommodation,*
 - (b) *a place of public worship,*
 - (c) *a hospital,*
 - (d) *an educational establishment or centre-based childcare facility.*
- (2) *Before determining a development application for development to which this section applies, the consent authority must take into consideration any guidelines that are issued by the Planning Secretary for the purposes of this section and published in the Gazette.*
- (3) *If the development is for the purposes of residential accommodation, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded—*
 - (a) *in any bedroom in the residential accommodation—35 dB(A) at any time between 10 pm and 7 am,*
 - (b) *anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time.*
- (3A) *Subsection (3) does not apply to a building to which State Environmental Planning Policy (Housing) 2021, Chapter 3, Part 7 applies.*
- (4) *In this section, freeway, tollway and transitway have the same meanings as they have in the Roads Act 1993.*

6.3.3 Development Near Rail Corridors and Busy Roads – Interim Guideline

Road Noise Assessment

Figure 2 has been extracted from the Interim Guideline and provides a screening test for noise sensitive developments that takes into account the volume of traffic and the distance between the proposed development and the busy road. Clause 2.120 of the State Environmental Planning Policy (Transport and Infrastructure) 2021, through which the Interim Guideline road noise criteria applies through, only applies for roads with an annual average daily traffic volume (AADT) of more than 20,000 vehicles, or if the road is a freeway, tollway or transitway. The screen test has been conducted to establish that an acoustic assessment is required.

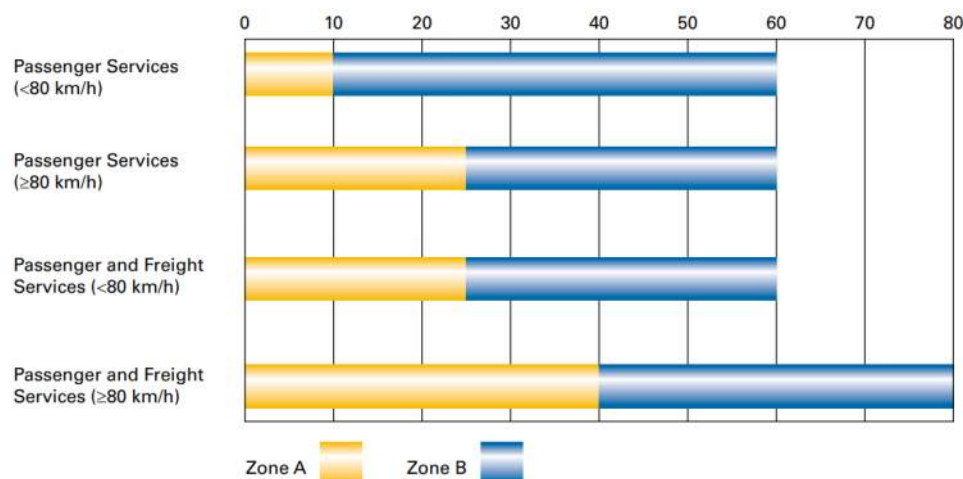
Figure 2: Screen tests for habitable areas of multiple dwellings (noting that any exposed facade is direct line-of-sight)



Rail Noise Assessment

Figure 3 which has been extracted from the Interim Guideline provides guidance as to the level of assessment required when noise sensitive developments are located in the vicinity of existing rail lines. Zones A and B are indicative acoustic assessment zones where sensitive land-uses are likely to be adversely affected.

Figure 3: Acoustic assessment zones based on distance (m) of noise-sensitive development from operation track (not corridor)



Given the proposed development boundary is located 500 metres from the nearest rail corridor, an assessment of rail noise to the facades of the proposed development is not required.

Criteria – Road & Rail Noise

The Interim Guideline details the application of the SEPP 2007, which we note has been superseded by SEPP 2021. In addition, the Interim Guideline also recommends the following in relation to the assessment of ventilation by means of opened windows or doors:

If internal noise levels with windows or doors open exceed the criteria by more than 10dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia.

Table 9 provides a summary of the criteria established in accordance with the Interim Guideline and SEPP 2021.

Table 9: Summary of internal noise criteria from the Interim Guideline and SEPP 2021

TYPE OF HABITABLE SPACE	APPLICABLE TIME PERIOD	INTERNAL NOISE LEVEL CRITERIA – WINDOWS/DOORS CLOSED	INTERNAL NOISE LEVEL CRITERIA – WINDOWS/DOORS OPEN
Sleeping areas (bedrooms)	10:00pm – 7:00am	35 dB(A) $L_{Aeq}(9\text{hour})$	45 dB(A) $L_{Aeq}(9\text{hour})$
Living rooms	At any time	40 dB(A) $L_{Aeq}(15\text{hour})$	50 dB(A) $L_{Aeq}(15\text{hour})$

6.4 TRAFFIC NOISE GENERATION

The L_{Aeq} noise level or the “equivalent continuous noise level” correlates best with the human perception of annoyance associated with traffic noise.

Road traffic noise impact is assessed in accordance with the NSW Road Noise Policy (RNP). The criterion (Table 3 – Road Traffic Noise Assessment Criteria for Residential Land Uses) divides land use developments into different categories and lists the respective criteria for each case. The category that is relevant to the proposed use of the site is shown below in Table 10.

Table 10: NSW RNP – Traffic Noise Assessment Criteria

ROAD CATEGORY	TYPE OF PROJECT/LAND USE	ASSESSMENT CRITERIA – dB(A)	
		DAY (7AM – 10PM)	NIGHT (10PM – 7AM)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	L_{Aeq} , (15 hour) 55	L_{Aeq} , (15 hour) 50
	2. Existing residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial roads	L_{Aeq} , (15 hour) 60	L_{Aeq} , (15 hour) 55
	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments		
Local Roads	4. Existing residences affected by noise from new local road corridors	L_{Aeq} , (1 hour) 55	L_{Aeq} , (1 hour) 50
	5. Existing residences affected by noise from redevelopment of existing local roads		
	6. Existing residences affected by additional traffic on existing local roads generated by land use developments		

In the event that the traffic noise at the site is already in excess of the criteria noted above, the NSW RNP states that the primary objective is to reduce the existing level through feasible and reasonable measures to meet the criteria above.

If this is not achievable, Section 3.4.1 of the RNP states that for existing residences affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise should be limited to 2 dB above that of the corresponding ‘no build option’.

Also, the inherent quality of noise from vehicles on public roads arriving to and departing from the site would be indistinguishable from other traffic noise on public roads.

6.5 CONSTRUCTION NOISE CRITERIA

6.5.1 Interim Construction Noise Guideline (ICNG)

The noise criteria outlined within the ICNG has been adopted for the assessment of noise emissions from the construction of the proposed redevelopment.

Airborne Noise – Residential Receiver Catchments

The airborne noise criteria for surrounding residential receiver catchments have been extracted from Table 2 in the ICNG and is presented in Table 11 below.

Table 11: NSW ICNG construction noise criteria for surrounding residential receiver catchments (RC3 and RC4)

TIME OF DAY	MANAGEMENT LEVEL $L_{Aeq,15min}^1$	HOW TO APPLY
Recommended Standard Hours: Monday – Friday 7am – 6pm	Noise Affected RBL + 10dB	The noise-affected level represents the point above which there may be some community reaction to noise. - Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. - The proponent should also inform all potentially impacted residences of the nature of works to be carried out, the expected noise levels and duration as well as contact details.
Saturday 8am – 1pm No work on Sundays or public holidays	Highly Noise Affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. - Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur in, taking into account: - Times identified by the community when they are less sensitive to noise (such as before and after school, for works near schools, or mid-morning or mid-afternoon for works near residences) - If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside Recommended Standard Hours	Noise Affected RBL + 5dB	- The proponent should apply all feasible and reasonable work practices to meet the noise affected level. - Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. - For guidance on negotiating agreements see section 7.2.2.

Note 1: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level.

Airborne Noise – Non-Residential Receiver Catchments

The airborne noise criteria for surrounding receiver catchments have been extracted from Table 3 in the ICNG and is presented in Table 12 below.

Table 12: NSW ICNG construction noise criteria for surrounding hospital receiver catchments

LAND USE	MANAGEMENT LEVEL (APPLIES WHEN BEING USED)
	$L_{Aeq,15min}$
Commercial	70 dB(A)
Education	45 dB(A) - Internal 55 dB(A) - External

Ground-borne Noise – Residential Receiver Catchments

Ground-borne noise is noise generated by vibration transmitted through the ground into a structure, such as an excavator with a hydraulic hammer attachment, or impact/bore piling. The following ground-borne noise levels for residences have been extracted from Section 4.2 of the ICNG and indicate when management actions should be implemented.

- Evening (6pm to 10pm) – Internal Noise Level: $L_{Aeq,15min}$ 40 dB(A); and
- Night-time (10pm to 7am) – Internal Noise Level: $L_{Aeq,15min}$ 35 dB(A).

An assessment of ground-borne noise to these levels is only required when the ground-borne noise levels are higher than airborne noise levels, and for surrounding residential receiver catchments. The ground-borne noise levels are for evening and night-time periods only. The levels shall be assessed at the centre of the most affected habitable room.

6.6 CONSTRUCTION VIBRATION CRITERIA

It is important for vibration emissions from vibration-intensive equipment utilised during the construction works be managed to maintain appropriate levels of human comfort, and to avoid both cosmetic and structural damage. The vibration limits proposed in the ensuing sub-sections aid in achieving this outcome.

6.6.1 Human Comfort

The office of Environment and Heritage (OEH) developed a document, “Assessing Vibration: A Technical Guideline” in February 2006 to assist in preventing people from exposure to excessive vibration levels from construction and operation of a development within buildings. The guideline does not however address vibration induced damage to structures or structure-borne noise effects. Vibration and its associated effects are usually classified as continuous, impulsive or intermittent.

Continuous and Impulsive Vibration

Structural vibration in buildings can be detected by occupants and can affect them in many ways including reducing their quality of life and also their working efficiency. Complaint levels from occupants of buildings subject to vibration depend upon their use of the building and the time of the day.

Maximum allowable magnitudes of building vibration with respect to human response are shown in Table 13. It should be noted that the human comfort for vibration is more stringent than the building damage criteria.

Table 13: Preferred and maximum weighted RMS values for continuous and impulsive vibration acceleration (m/s²) 1-80 Hz

LOCATION	ASSESSMENT PERIOD ¹	PREFERRED VALUES		MAXIMUM VALUES	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous vibration					
Critical areas ²	Day- or night time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night time	0.020	0.014	0.040	0.028
Impulsive vibration					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night time	0.64	0.46	1.28	0.92

Note 1: Daytime is 7:00am to 10:00pm and night time is 10:00pm to 7:00am

Note 2: Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of this policy, and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472-1992

Intermittent Vibration Criteria

Disturbance caused by vibration will depend on its duration and its magnitude. This methodology of assessing intermittent vibration levels involves the calculation of a parameter called the Vibration Dose Value (VDV) which is used to evaluate the cumulative effects of intermittent vibration. Various studies support the fact that VDV assessment methods are far more accurate in assessing the level of disturbance than methods which is only based on the vibration magnitude.

Table 14: Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

LOCATION	DAYTIME ¹		NIGHT-TIME ¹	
	PREFERRED VALUE	MAXIMUM VALUE	PREFERRED VALUE	MAXIMUM VALUE
Critical areas ²	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80

Note 1: Daytime is 7:00am to 10:00pm and night time is 10:00pm to 7:00am

Note 2: Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of this policy, and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472-1992

6.6.2 Cosmetic Damage

Structural vibration thresholds are set to minimize the risk of cosmetic surface cracks and lie below the levels that have the potential to cause damage to the main structure. Table 15 presents guide values for building vibration, based on the vibration thresholds above which cosmetic damage has been demonstrated outlined within BS7385-Part 2:1993. These values are evaluated to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as 95% probability of no effect.

Table 15: Transient vibration guide values for cosmetic damage – BS 7385-2:1993

TYPE OF BUILDING	PEAK PARTICLE VELOCITY IN FREQUENCY RANGE OF PREDOMINANT PULSE (PPV)	
	4 Hz TO 15 Hz	15 Hz AND ABOVE
Reinforced or framed structures Industrial or light commercial type buildings	50mm/s	N/A
Unreinforced or light framed structures Residential or light commercial type buildings	15mm/s	20mm/s (50mm/s at 40Hz and above)

6.6.3 Structural Damage

Ground vibration criteria is defined in terms of the levels of vibration emission from the construction activities which will avoid the risk of damaging surrounding buildings or structures. It should be noted that human comfort criteria are normally expressed in terms of acceleration whereas structural damage criteria are normally expressed in terms of velocity.

Most specified structural vibration levels are defined to minimize the risk of cosmetic surface cracks and are set below the levels that have the potential to cause damage to the main structure. Structural damage criteria are presented in German Standard DIN4150-Part 3 "Structural vibration in buildings – Effects on structures" and British Standard BS7385-Part 2: 1993 "Evaluation and Measurement for Vibration in Buildings". Table 16 indicates the vibration limits presented in DIN4150-Part 3 to ensure structural damage doesn't occur.

Table 16: Guideline value of vibration velocity, v_i , for evaluating the effects of short-term vibration – DIN4150-3

LINE	TYPE OF STRUCTURE	VIBRATION VELOCITY, V_i , IN mm/s			
		FOUNDATION			PLANE OF FLOOR OF UPPERMOST FULL STOREY
		AT A FREQUENCY OF			
		LESS THAN 10HZ	10 TO 50HZ	50 TO 100HZ*	ALL FREQUENCIES
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that, because of their particular sensitivity to vibration, do not correspond to those listed in lines 1 and 2 and are of great intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

*For frequencies above 100Hz, at least the values specified in this column shall be applied

7 OPERATIONAL NOISE AND VIBRATION ASSESSMENT

7.1 TRAFFIC NOISE INTRUSION

An acoustic assessment of road and rail noise emissions to the façade of the proposed development is required in accordance with the NSW ISEPP and DPIE's Development near Rail Corridors and Busy Roads – Interim Guideline, as outlined in Section 6.3. A preliminary façade noise model of the development to predict the road noise incident on the facades of the development.

Appendix B provides façade noise maps to present the predicted noise levels to the proposal from the road noise sources on each of the facades of the proposal developments: The modelling takes into account building shielding, directivity and calculations for railway and road noise. The incident noise level provided can be considered the “worst-case” noise level. To simplify the acoustic façade requirements across the development, an acoustic facade type (AFT) has been assigned to typical glazing arrangements in Table 17..

On the basis that the above minimum acoustic performances for façade glazing assemblies are implemented, the internal noise levels are predicted to satisfy the acoustic requirements of the SEPP 2021 and the DoP Interim Guideline. The façade acoustic requirements will be refined once the architectural design is progressed into detailed design.

Table 17: Acoustic Facade Categories & Glazing Arrangements

ACOUSTIC FAÇADE TYPE	REQUIRED ACOUSTIC RATING (R_w , C_{tr})	TYPICAL EQUIVALENT GLASS
1	32, -2	6.38mm Laminated Glass
2	35, -2	10.38mm Laminated Glass
3	38, -3	12.76mm Laminated Glass

Table 18: Acoustic performance requirements for glass to habitable spaces for various total glazing areas - bedrooms

FAÇADE NOISE RANGE	TOTAL GLAZING SURFACE AREA FOR SPACE			
	4m ²	6m ²	8m ²	10m ²
BEDROOM AREAS				
64 – 66 dBA	3	3		
62 – 64 dBA	3	3	3	3
60 – 62 dBA	2	3	3	3
58 – 60 dBA	1	2	3	3
56 – 58 dBA	1	1	2	2
< 58 dBA	1	1	1	1

Table 19: Acoustic performance requirements for glass to habitable spaces for various total glazing areas – living areas

FAÇADE NOISE RANGE	TOTAL GLAZING SURFACE AREA FOR SPACE			
	0-5m ²	5-10m ²	10-15m ²	15-20m ²
LIVING AREAS				
64 - 66 dBA	1	2	2	2
62 – 64 dBA	1	1	1	2
60 – 62 dBA	1	1	1	1
< 60 dBA	1	1	1	1

7.2 TRAFFIC NOISE GENERATION

A traffic noise generation assessment has been conducted based on peak hourly vehicle movements. These volumes have been modelled and provided in the Transport Impact Assessment by Stantec. Noise levels based on the traffic movements along Archer Street and Albert Avenue have been summarised below in Table 20.

Table 20: Summary of peak traffic movements on Walpole Street

TYPE	TOTAL PEAK TRAFFIC VOLUMES – ALBERT AVENUE (VEHICLES/HOUR)		TOTAL PEAK TRAFFIC VOLUMES – ARCHER STREET (VEHICLES/HOUR)	
	AM	PM	AM	PM
Existing traffic	640	850	918	912
Additional traffic generated from development	31	27	31	27
Predicted increase in traffic noise, dB(A)	< 2	< 2	< 2	< 2

The predicted increase in traffic noise has been based on the methodologies given in the UK Department of Transport 'Calculation of Road Traffic Noise' (CoRTN) document. This model describes noise emitted by constant traffic flows. The model uses standard curves to approximate vehicle noise levels. It also assumes the traffic can be broken into two broad categories: cars, and heavy vehicles. The source sound levels used in this project to model traffic noise levels are contained within the calculation algorithms of the noise model. The values presented in Table 20 compare the existing noise levels estimated by the model with the estimated noise levels expected from an increase in vehicle movements associated with the proposed development.

As shown in Table 20, the predicted increase in peak traffic noise due to the development is less than 2dB(A), which is within the limits outlined in the Road Noise Policy criteria (as described in our summary in Section 6.4). For this reason, we have determined that the traffic generated by the proposed development will not have an adverse impact on the surrounding residents.

7.3 LOADING DOCK

An assessment of the noise generated by general loading dock activities for the project site has been conducted to determine the impacts on the surrounding noise receivers. At the time of writing, a E-LAB has not been advised of the operational constraints of the carpark and loading dock. In this instance, we have used the following assumptions in our assessment:

- Sound power levels are as per Table 21
- Loading dock and carpark are accessible at all times, including the night
- 1 HRV enters or exits the development in a 15-minute period at all times
- HRV engines are switched off when parked
- HRV airbrakes are only released inside the loading dock

We advise that once more information on the carpark and loading dock is provided, a detailed assessment is recommended. Detailed information such as times of operation, compaction, MRV and truck frequency and movements would be required for more accuracy in such an assessment.

Table 21 presents the typical sound power level (SWL) associated with general loading dock activities.

Table 21: Typical sound power levels

ACTIVITIES	SOUND POWER LEVEL – dB(A)
MRV Idling – $L_{Aeq,period}$	95
MRV Engine Start – $L_{Aeq,period}$	102
Air Brakes – $L_{Aeq,period}$	113
Reversing Alarm – $L_{Aeq,period}$	111
MRV Manoeuvring @ 10km/hr – $L_{Aeq,period}$	91

7.3.1 Predicted Noise Levels

The noise generated by the activities during a 15-minute period have been predicted to the facades of the surrounding receiver catchments and are summarised below in Table 22. Attenuation factors from distance, barriers, etc. have been applied where applicable.

Table 22: Predicted Noise Levels at Most Affected Receiver Catchment

RECEIVER CATCHMENT	PREDICTED NOISE LEVEL dB(A)	PROJECT NOISE TRIGGER LEVEL dB(A)			COMPLIES (YES/NO)
		DAY	EVENING	NIGHT	
R1	< 49	49	47	42	Yes (day only)
R2	< 49	58	48	43	Yes (day only)

Based on our assumptions and assessment, the predicted noise levels at the surrounding residential receiver catchments are expected to comply with the project noise trigger levels established in Section 6.2.

7.4 CARPARK USAGE

It is proposed that all carparking be situated in an enclosed carpark accessed via Neridah Street on ground floor and continuing through basement levels. As such, it can be reasonably expected that the use of the carparking will not have noise impact on the nearest noise sensitive receivers and noise level criteria in Section 6.2 will be met.

7.5 MECHANICAL SERVICES

At this stage of the proposed development, the design has not progressed enough for mechanical plant and equipment selections are yet to be made. During the design development stage of the project, the mitigation measures outlined below should be considered when preparing the mechanical services, to ensure compliance with the external noise emissions criteria established in Section 6.2.

7.6 RETAIL & COMMERCIAL NOISE EMISSION

At the time of writing, the tenants for the retail and commercial spaces have not been determined and therefore the usage / type of activities for these spaces are unknown.

Future usage of the retail and commercial spaces may be subject to a separate development application and detailed assessment of their expected operation and activities may be required by Willoughby Council. The selected tenants may be required by Council to submit a separate Development Application based on use.

Notwithstanding the above, we understand the heritage house located at 34 Albert Avenue will be converted into a food and drink premises which has been approved under DA2024/68 (temporary use of the space as a display suite with ancillary café). The operation of this space will be subject to the approved trading hours by Willoughby City Council, being:

- Weekdays: 9am to 5pm
- Saturdays: 9am to 4pm
- Sundays & Public Holidays: 9am to 4pm

8 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

8.1 PROPOSED CONSTRUCTION ACTIVITIES

In this assessment, the noise impact from the construction works are considered, which are expected to comprise of the following stages:

- Early works: demolition of existing buildings
- Civil works: excavation, retention and foundation
- Structural works: construction, façade, finishes and services.

The construction works are expected to occur during the following hours (in line with the NSW ICNG):

- Monday to Friday: 7:00am to 6:00pm;
- Saturday: 8:00am to 1:00pm; and
- Sunday and public holidays: no work.

8.2 EXPECTED CONSTRUCTION EQUIPMENT

The noise sources likely to be associated with the works listed in the previous section of this report are presented in Table 23. The equipment noise levels have been extracted from AS2436:2010 “Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites”.

Table 23: Cumulative impact – construction equipment noise levels

STAGES	EQUIPMENT	QUANTITY	SOUND POWER LEVEL – dB(A)	ACOUSTICAL USAGE FACTOR (%)	USAGE IN 15-MINUTE PERIOD (MINUTES)	TIME CORRECTED SOUND POWER LEVEL– dB(A) L _{Aeq,15min}
Early works - Demolition	Jackhammer	1	113	20	3	106
	Powered hand tool	1	102	50	7.5	99
	Excavator 30 tonne	1	110	40	6	106
	Excavator breaker	1	115	40	6	111
	Bobcat	1	107	70	10.5	105
	Cherry picker	1	102	50	7.5	99
	General Truck	1	108	40	6	104
Excavation, Retention and Foundation	Excavator 30 tonne	1	110	40	6	106
	Excavator breaker	1	115	40	6	111
	Jackhammer	1	113	20	3	106
	Powered hand tool	3	102	50	7.5	104
	Concrete pump	1	109	50	7.5	106

STAGES	EQUIPMENT	QUANTITY	SOUND POWER LEVEL – dB(A)	ACOUSTICAL USAGE FACTOR (%)	USAGE IN 15-MINUTE PERIOD (MINUTES)	TIME CORRECTED SOUND POWER LEVEL– dB(A) L_{Aeq,15min}
	Mobile crane	2	110	16	2.4	102
	Bored piling	1	110	16	2.4	102
	Generator	1	104	20	3	97
	Truck	2	108	40	6	107
Structural Works & Façade and Finishes	Powered hand tool	10	102	50	7.5	99
	Concrete pump	1	109	50	7.5	106
	Mobile crane	2	110	16	2.4	102

8.3 NOISE MODELLING AND ASSUMPTIONS

In order to assess the noise impact from the site during the various construction stages, a noise model was prepared using commercial software SoundPLAN v8.2, which is a comprehensive software package for conducting three-dimensional complex noise propagation modelling. Using the software, a 3D model of the site and its surroundings was constructed including the nearby buildings, and the construction plant and equipment were positioned as noise sources. Within the model, the effects of the environment (built and natural) on propagation of sound were considered to reliably estimate the resulting noise effects on the surrounding noise sensitive receivers.

The noise model represents the ‘reasonable’ worst case periods of construction activities, meaning that all the equipment of each stage is operating simultaneously during a 15-minute observation period.

The assumptions that were made within the assessment include the following:

- The predicted noise levels represent the worst-case scenario for each receiver;
- The mitigation measures outlined in Section 9.3 are implemented; and
- Neutral weather conditions;

8.4 PREDICTED NOISE LEVELS

The predicted noise levels have been presented in Table 24 to Table 26 and have been assessed to the construction noise criteria established in Section 6.6. The noise contour maps produced by the three-dimensional noise propagation modelling are provided in Appendix C.

Table 24: Predicted noise levels – Scenario 1: Demolition

RECEIVER	PREDICTED NOISE LEVEL RANGE dB(A) $L_{Aeq,15min}$	NOISE MANAGEMENT LEVEL dB(A) $L_{Aeq,15min}$	NOISE MANAGEMENT LEVEL EXCEEDANCE dB	EXCEEDS HIGHLY NOISE AFFECTED LEVEL (YES/NO)
R1	70 - 75	54	Up to 21	No
R2	75 – 80	64	Up to 16	Yes
C1	65 - 70	70	N/A	No
E1	65 - 70	55	Up to 15	No

Table 25: Predicted noise levels – Scenario 2: Civil Works - Excavation, Retention & Foundations

RECEIVER	PREDICTED NOISE LEVEL RANGE dB(A) $L_{Aeq,15min}$	NOISE MANAGEMENT LEVEL dB(A) $L_{Aeq,15min}$	NOISE MANAGEMENT LEVEL EXCEEDANCE dB	EXCEEDS HIGHLY NOISE AFFECTED LEVEL (YES/NO)
R1	75 - 80	54	Up to 26	Yes
R2	80 - 85	64	Up to 21	Yes
C1	70 - 75	70	Up to 5	No
E1	70 - 75	55	Up to 20	No

Table 26: Predicted noise levels – Scenario 3: Structural works & Façade and Finishes

RECEIVER	PREDICTED NOISE LEVEL RANGE dB(A) $L_{Aeq,15min}$	NOISE MANAGEMENT LEVEL dB(A) $L_{Aeq,15min}$	NOISE MANAGEMENT LEVEL EXCEEDANCE dB	EXCEEDS HIGHLY NOISE AFFECTED LEVEL (YES/NO)
R1	70 - 75	54	Up to 21	No
R2	75 – 80	64	Up to 16	Yes
C1	65 - 70	70	N/A	No
E1	65 - 70	55	Up to 15	No

9 MITIGATION MEASURES

9.1 LOADING DOCK

Use of the loading dock should be limited between the day time hours of 7am to 6pm only.

9.2 MECHANICAL SERVICES

Mitigation measures for the mechanical plant should be considered during the Design Development stage so as to comply with the noise emission criteria established in Section 6.2. and internal noise levels in Section 6.3. These amelioration measures could include, but are not limited to the following:

- Positioning mechanical plant away from nearby noise sensitive receivers;
- Acoustic attenuators fitted to duct work;
- Screening around mechanical plant;
- Acoustic insulation within duct work;
- Acoustically insulated bends fitted to duct work; and
- Reselection of mechanical plant.

9.3 CONSTRUCTION NOISE AND VIBRATION

9.3.1 General Acoustic Recommendations for Construction

According to AS 2436 – 2010 “Guide to noise and vibration control on construction, demolition and maintenance sites” the following techniques could be applied to minimize the spread of noise and vibrations to the potential receivers.

Noise

If a process that generates significant noise levels cannot be avoided, the amount of noise reaching the receiver should be minimized. Two ways of achieving this are to either increase the distance between the noise source and the receiver or to introduce noise reduction measures such as screens.

Physical methods to reduce the transmission of noise between the site works and residences, or other sensitive land uses, are generally suited to works where there is longer-term exposure to the noise. Practices that will reduce noise from the site include:

- Increasing the distance between noise sources and sensitive receivers;
- Reducing the line-of-sight noise transmission to residences or other sensitive land uses using temporary barriers (stockpiles, shipping containers and demountable offices can be effective barriers);
- Constructing barriers that are part of the project design early in the project to introduce the mitigation of site noise; and
- Installing purpose-built noise barriers, acoustic sheds and enclosures.

Screening

On sites where distance is limited, the screening of noise may be beneficial, and this should be taken into account during the planning stages.

If structures such as stores, site offices and other temporary buildings are situated between the noisiest part of the site and the nearest dwellings, some of the noise emission from the site can be reduced. If these buildings are occupied, sound insulation measures may be necessary to protect workers inside the buildings.

A hoarding that includes a site office on an elevated structure offers superior noise reduction when compared with a standard (simple) hoarding. The acoustic performance is further enhanced when the hoarding is a continuous barrier.

Storage of building materials or the placement of shipping containers between the noise source and any noise-sensitive area may also provide useful screening and the same is true of partially completed or demolished buildings. A noisy, stationary plant can be placed in a basement, the shell of which has been completed, provided reverberant noise can be controlled. Where compressors or generators are used in closed areas, it is necessary to ensure that the exhaust gases are discharged directly to the outside air and that there is good cross-ventilation to prevent the build-up of poisonous carbon monoxide fumes and to allow an adequate air supply to maintain efficiency when operating the equipment.

Where such noise barriers are not practical, a worthwhile reduction in noise can be obtained by siting the plant behind and as close as possible to mounds of earth, which may effectively screen any noise-sensitive areas from the plant. These can often be designed into the construction schedule or site arrangement for future landscaping.

Water pumps, fans and other plant equipment that operate on a 24-hour basis may not be an irritating source of noise during the day but may be problematic at night. They should therefore be effectively screened by either situating them behind a noise barrier or by being positioned in a trench or a hollow in the ground provided this does not generate reverberant noise. In such cases, however, adequate ventilation should also be ensured. Long, temporary earth embankments can provide quite an effective noise screen for mobile equipment moving, for example, on a haulage road. When the earthworks are complete, the earth mounds should be removed, if possible, with smaller, quieter excavators. A noise barrier may be a more reliable method of noise control than the imposition of restrictions on throttle settings.

In many cases it is not be practical to screen earthmoving operations effectively, but it may be possible to partially shield a construction plant or to build-in at the early stages protective features required to screen traffic noise. Where earth noise barriers are not practical due to lack of space, consideration should be given to the possibility of constructing temporary screens from wood or any equivalent material in surface density.

The usefulness of a noise barrier will depend upon its length, its height, its position relative to the source and to the receiver, and the material from which it is made. A barrier designed to reduce noise from a moving source should extend beyond the last property to be protected to a distance of not less than ten times the shortest measurement from the property to the barrier. A barrier designed to reduce noise from a stationary source should, where possible, extend to a distance beyond the direct line between the noise source and the receiver to a distance equal to ten times the effective barrier height, which is the height above the direct line between source and receiver.

If the works are predominately within nominally closed structures, careful consideration should be given to reducing noise breakout at any openings.

Crane (diesel operated)

An appropriate silencer on the muffler and acoustic screen around the engine bay are recommended to attenuate the noise from it.



Reversing and warning alarms

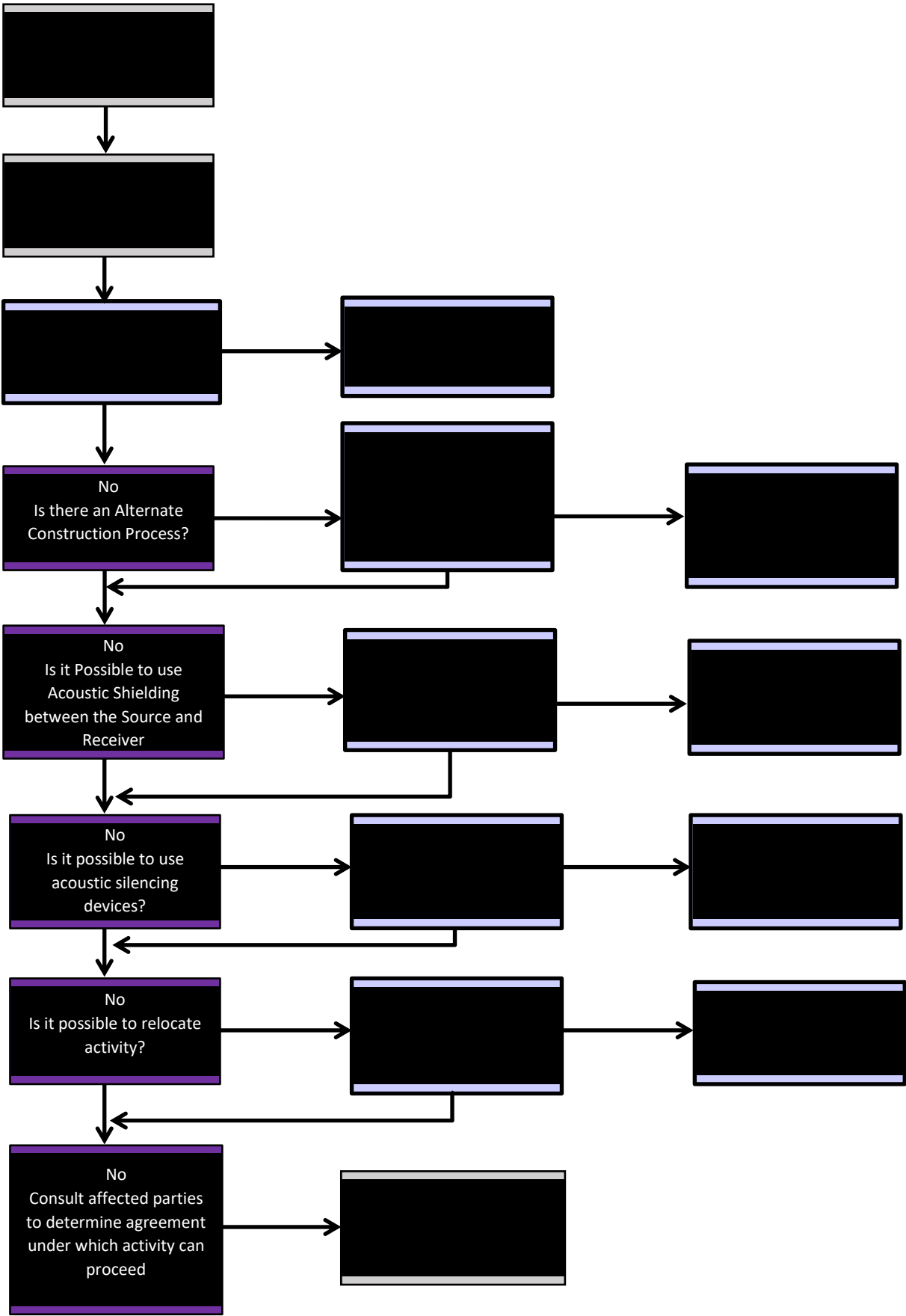
Community complaints often involve the intrusive noise of alarms commonly used to provide a safe system of work for vehicles operating on a site. Beeper reversing alarm noise is generally tonal and may cause annoyance at significant distances from the work site.

There are alternative warning alarms capable of providing a safe system of work that are equal to or better than the traditional 'beeper', while also reducing environmental noise impacts. The following alternatives should be considered for use on construction sites as appropriate:

- Broadband audible alarms incorporating a wide range of sound frequencies (as opposed to the tonal frequency 'beep') are less intrusive when heard in the neighbourhood;
- Variable-level alarms reduce the emitted noise levels by detecting the background noise level and adjusting the alarm level accordingly;
- Non-audible warning systems (e.g. flashing lights, reversing cameras) may also be employed, providing safety considerations, are not compromised;
- Proximity alarms that use sensors to determine the distance from objects, such as people or structures, and generate an audible alarm in cabin for the driver; and
- Spotters or observers.

The above methods should be combined, where appropriate.

Figure 4: Noise mitigation management flow chart



9.3.2 Noise & Vibration Monitoring Strategy

General Methodology

Noise and vibration levels should be monitored from time to time to ensure that noise generated as a result of remediation and construction activities does not disturb local businesses and residents.

Monitoring may be in the form of regular checks by the builder or indirectly by an acoustic consultant engaged by the builder and in response to any noise or vibration complaints. Where noise and vibration criteria are being exceeded or in response to valid complaints, noise and / or vibration monitoring should be undertaken. This would be performed inside the premises of the affected property and on site adjacent to the affected receivers.

Monitoring is to be undertaken by an experienced noise and vibration monitoring professional or an acoustic consultant. The results of any noise or vibration monitoring are to be provided to the relevant party or person in a timely manner allowing the builder to address the issue and respond to the complaints.

Noise and vibration monitoring can take two forms:

- Short term monitoring; and
- Long-term monitoring.

Short-term monitoring

Short-term monitoring consists of attended monitoring when critical stages of the construction are occurring. This normally provides real-time assistance and guidance to the subcontractor on site letting them know when the noise and vibration criteria are exceeded allowing the selection of alternative method on construction or equipment selection in order to minimise noise and vibration impacts.

Long-term monitoring

Similarly, long-term monitoring uses noise and vibration loggers providing real-time alerts to the builder / site manager when the noise and vibration criteria are exceeded.

Typically, the noise and vibration loggers stay on site for a period of several months for the critical construction stages of the project. Sometimes the period of construction noise and vibration monitoring is dictated by the local authorities through the DA conditions.

Both methodologies are complementary and normally used simultaneously providing a significant amount of data via the long-term monitoring but also providing information on the sources of noise and vibration generating exceedances via the short-term or attended monitoring.

Noise & Vibration Monitoring Program

A monitoring programme for the construction works is proposed in Table 27. The monitoring programme is to be carried out during the likely noisiest periods during each construction phase as agreed with the Acoustic engineer and Contractor.

Refer to Figure 5 for the receiver locations corresponding the monitoring locations. The monitoring locations differ from the locations nominated to establish background noise, as these are based on the worst affected receiver within in each receiver catchment area.

Figure 5: Proposed monitoring locations



Table 27: Noise and vibration monitoring programme

CONSTRUCTION PHASE	LOCATION REFERENCE	MONITORING REQUIRED
Early Works – Demolition & Dismantle Excavation, Retention and Foundation Structural Works & Façade and Finishes	R1 R2 E1	Noise and vibration
Early Works – Demolition & Dismantle	C1	Vibration
Excavation, Retention and Foundation	C1	Noise and Vibration

10 CONCLUSION

This noise and vibration report has been prepared by E-LAB Consulting to accompany a SSDA for the proposed mixed-use development at 57-61 Archer St & 34 Albert Ave, Chatswood (SSD-72891212).

The following operational noise and vibration assessments were conducted as part of this noise and vibration impact assessment:

- Noise impact from road traffic noise on the proposed development;
- Noise impacts from the operation of the development;
- Noise and vibration impact of mechanical plant and equipment serving the proposed development on surrounding noise and vibration sensitive receivers; and
- Noise impacts of additional traffic on surrounding local roads generated by the proposed development.

The following construction noise and vibration assessments were conducted as part of this noise and vibration impact assessment:

- Noise generated during the construction of the proposed development and associated impacts on the surrounding noise sensitive receivers; and
- Vibration generated during the construction of the proposed development and associated impacts on the surrounding vibration sensitive receivers.

To assess each of the acoustic considerations for the proposed redevelopment, noise and vibration criteria has been established in Section 6 in accordance with the following documents:

- AS/NZS 2107:2016 “Acoustics - Recommended design sound levels and reverberation times for building interiors”;
- NSW Noise Policy for Industry (NPI) 2017;
- State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021;
- Development Near Rail Corridors and Busy Roads – Interim Guideline;
- NSW Road Noise Policy (RNP), 2011;
- Interim Construction Noise Guideline (ICNG) 2009;
- Assessing vibration: A Technical Guideline 2006;
- British Standard BS5228 – Part 1:1997 “Noise and Vibration Control on Construction and Open Sites.”;
- British Standard BS7358:1993 “Evaluation and Measurement for Vibration in Buildings”; and
- German Standard DIN4150 – Part 3: “Structural vibration in buildings – Effects on structures”.

Having given regard to the analysis conducted within this report, it is the finding of this noise and vibration impact assessment that the proposed redevelopment is compliant with the relevant noise and vibration criteria controls for this type of development, and it is expected to comply with the applicable regulations with regards to noise and vibration, particularly those listed above.

It is recommended the development application for the proposed redevelopment is not rejected on the basis of noise and vibration, under the implementation of the mitigation measures outlined within the report.

Appendix A Noise Monitoring Data

Figure 6: Long-term noise monitoring data graph (LT1)

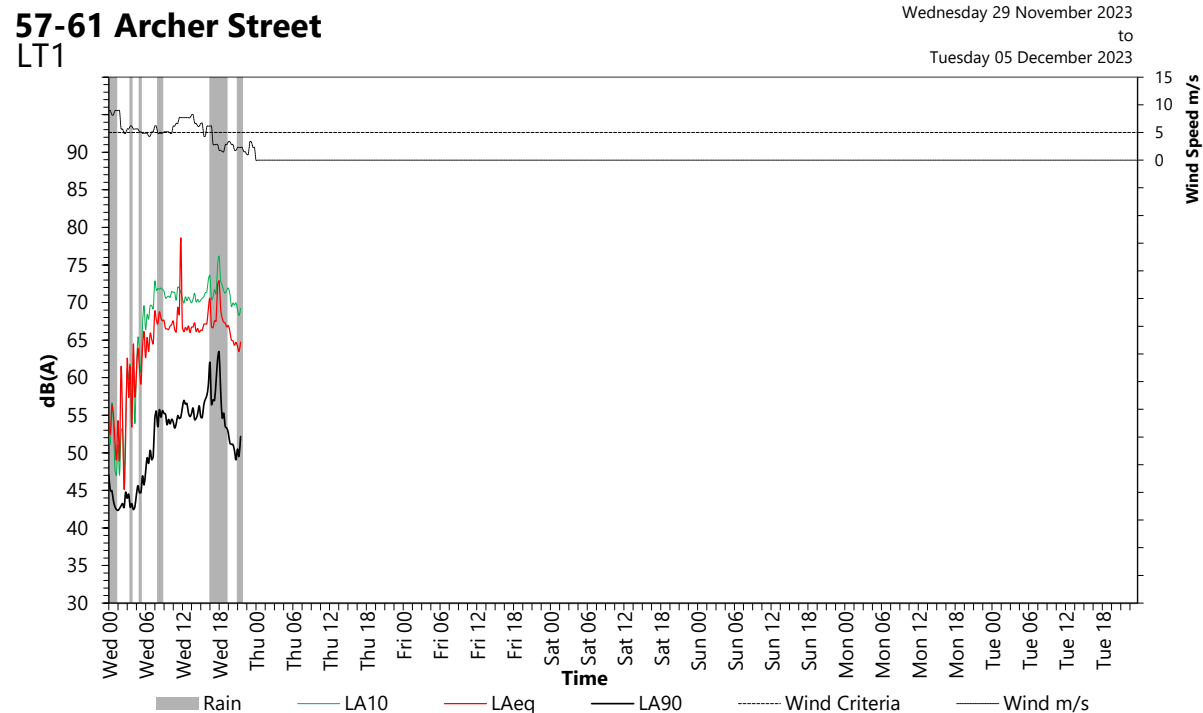
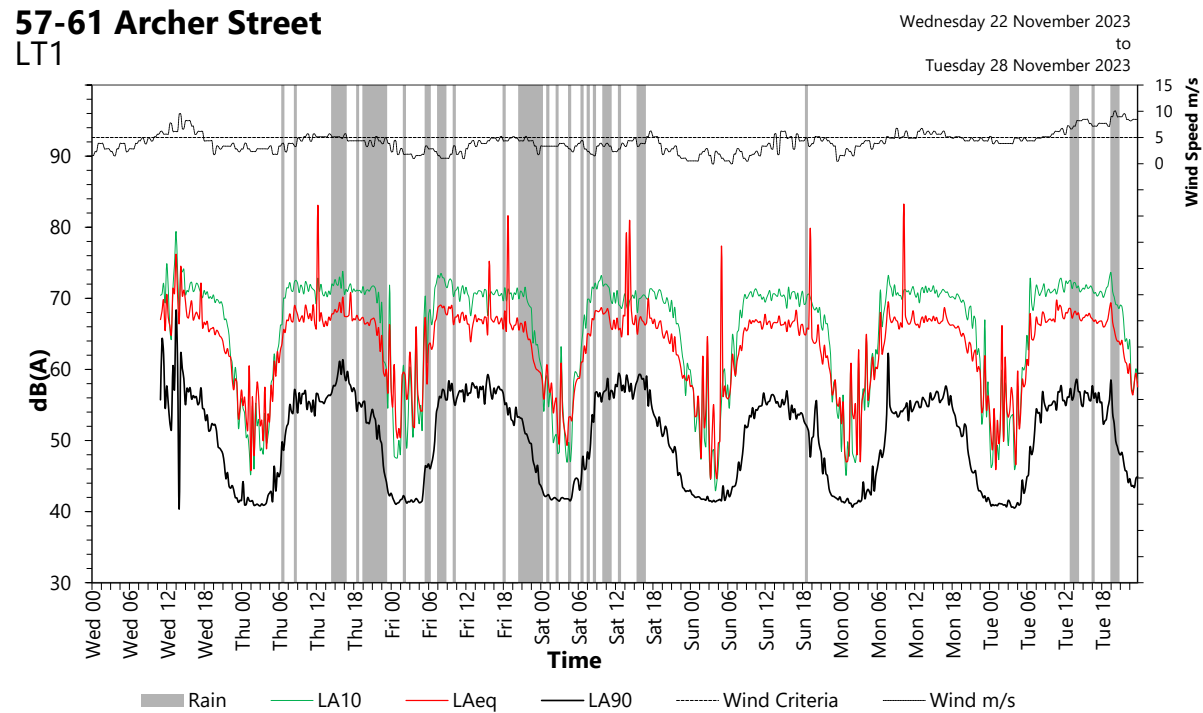


Figure 7: Long-term noise monitoring data graph (LT2)

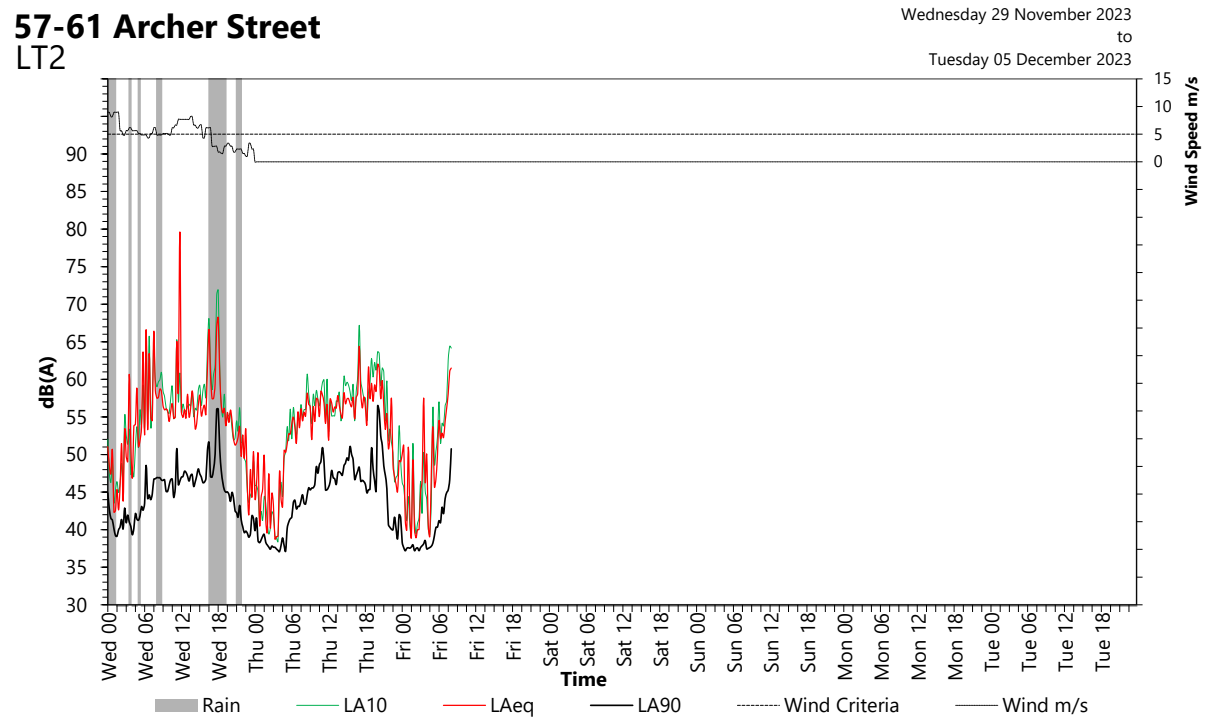
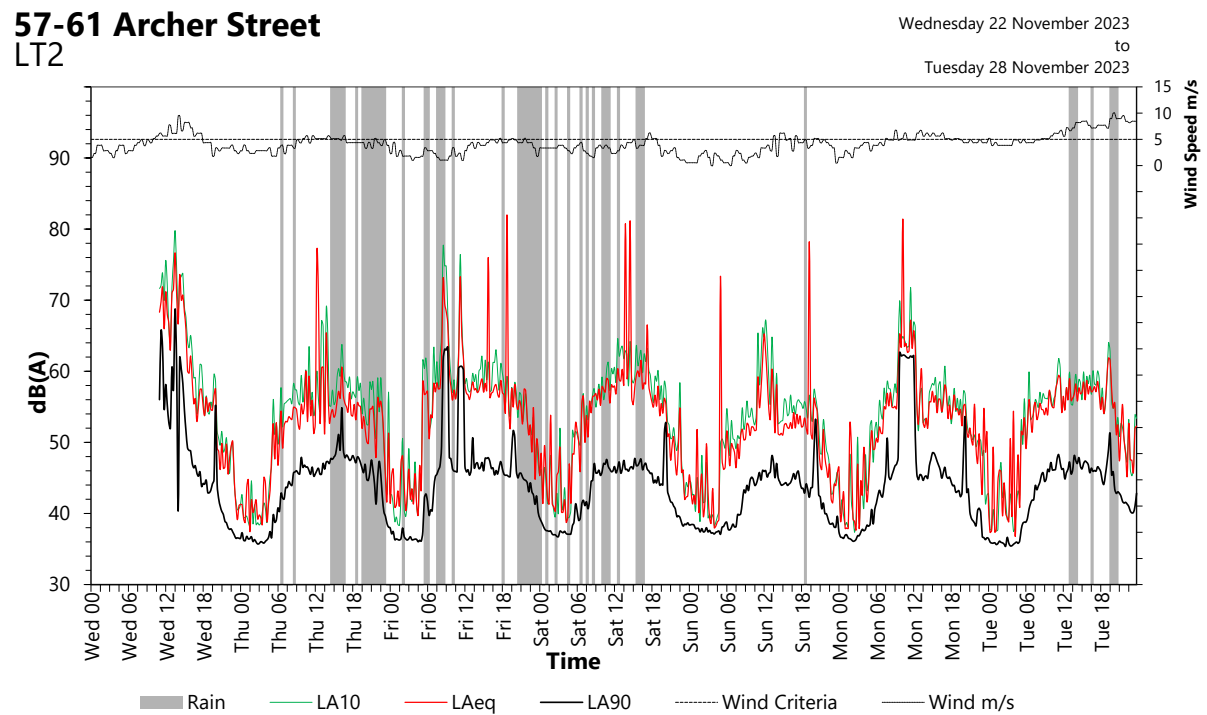
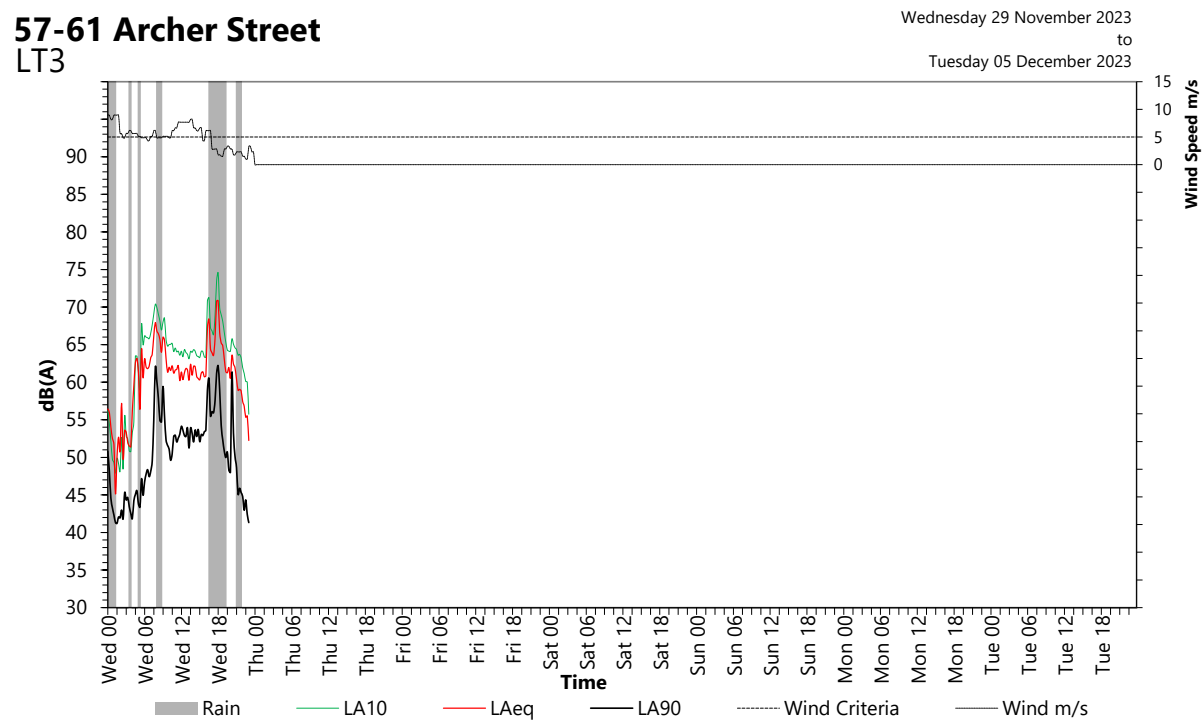
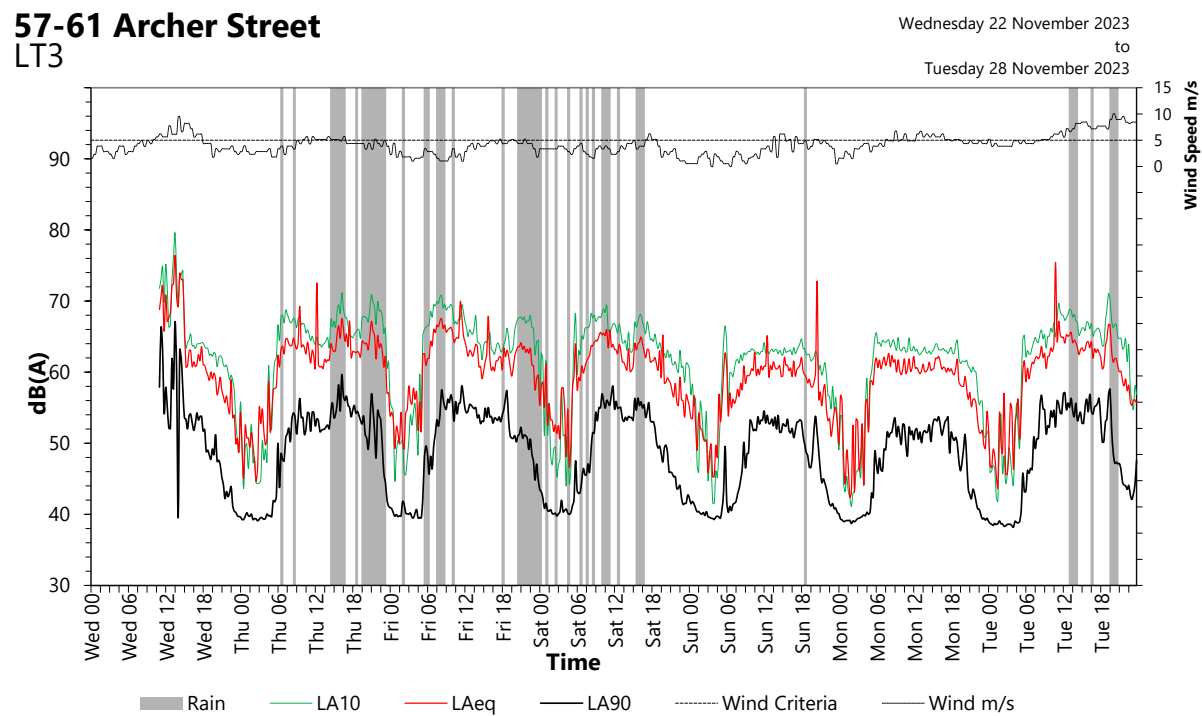
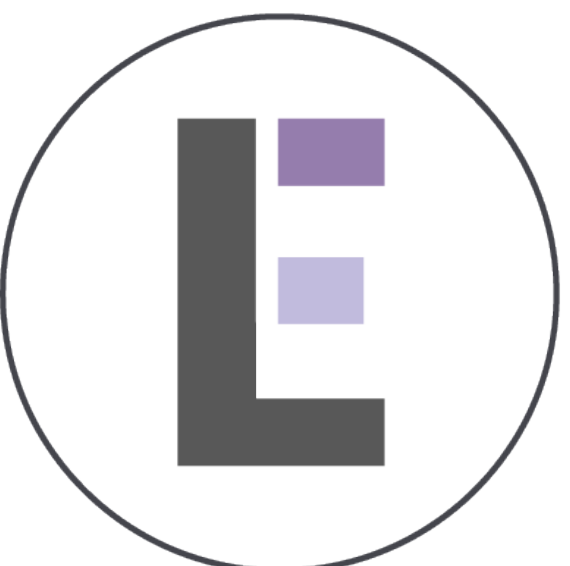


Figure 8: Long-term noise monitoring data graph (LT3)



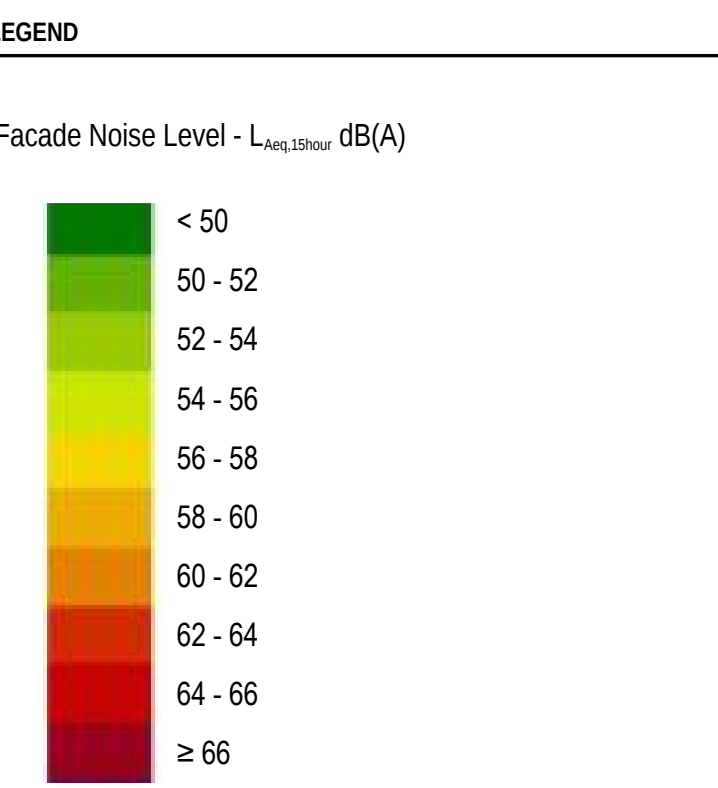
Appendix B **Façade Noise Map**



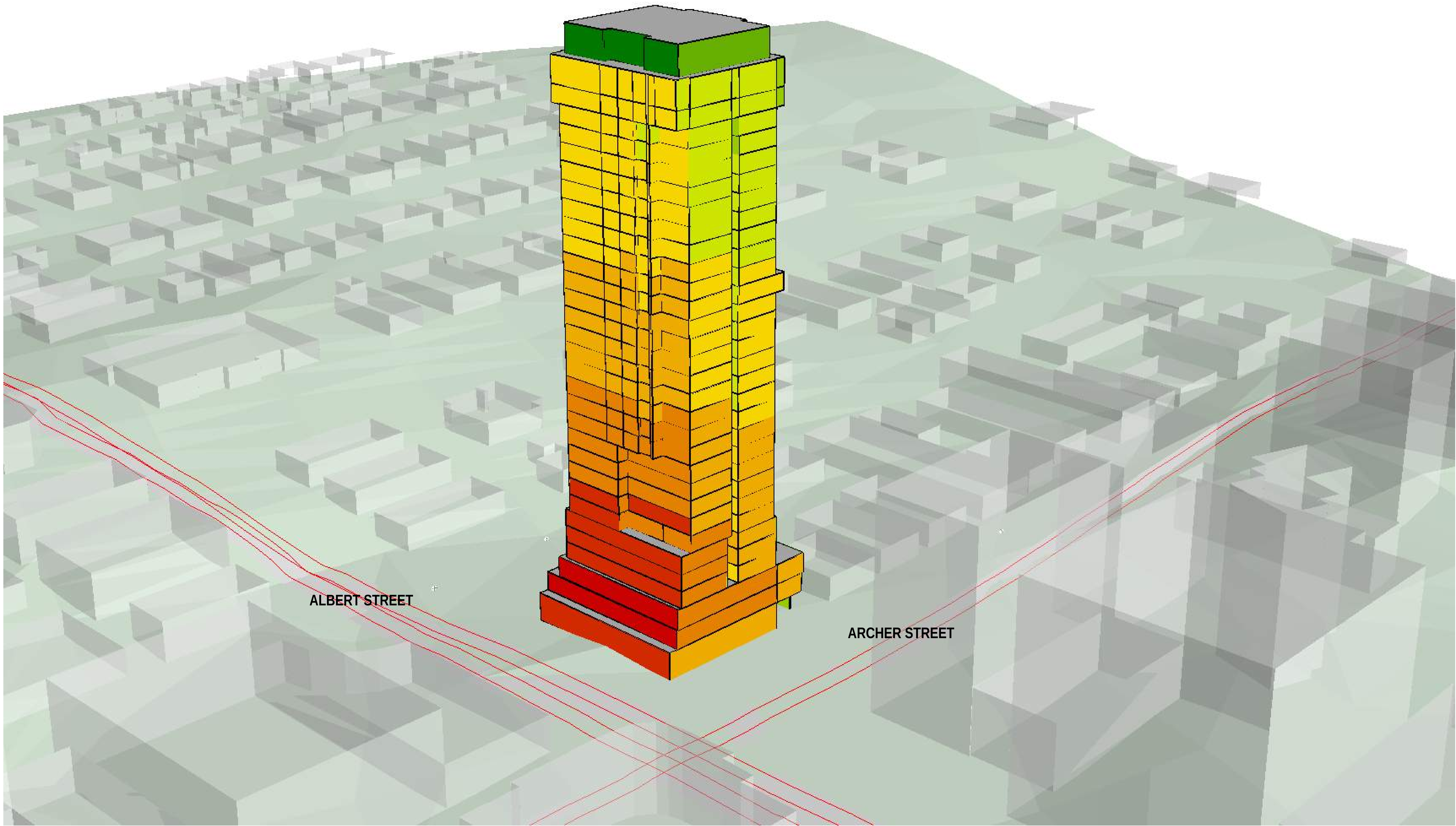


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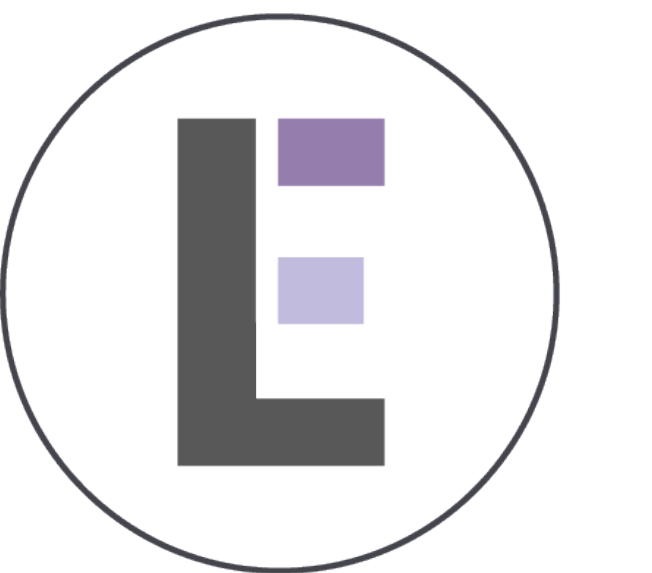
ISSUE	DATE	STATUS
1	02/09/2024	For Information



NOTES

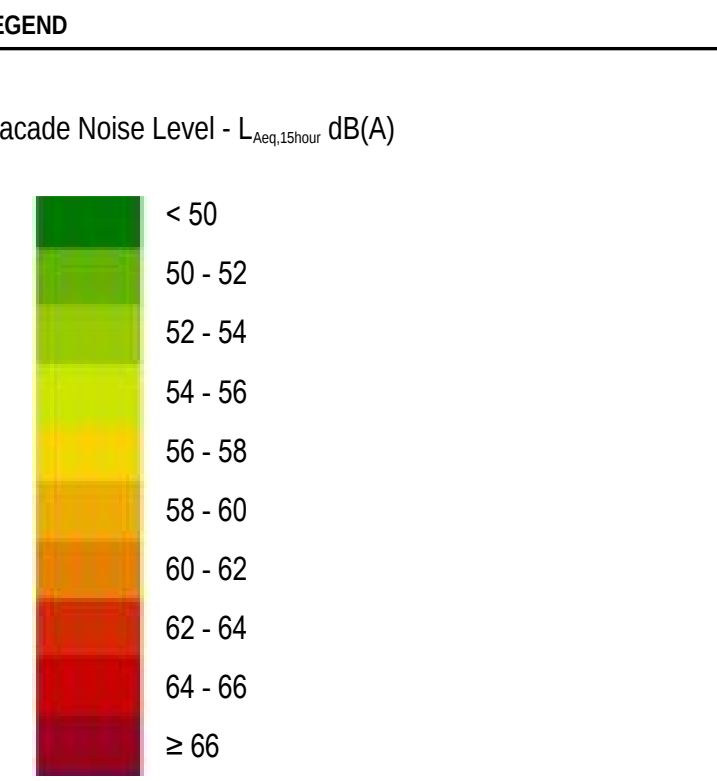


PROJECT	57 - 61 ARCHER STREET CHATSWOOD
PROJECT NO.	P01003
ARCHITECT	
CLIENT	CHATSWOOD PROPERTY PTY LTD
SCALE	NTS
STATUS	FOR INFORMATION
DRAWING	FACADE NOISE MAPS
	DAYTIME VIEW 1
DISCIPLINE	ACOUSTICS AND VIBRATION
DRAWING NUMBER	AC-DWG-100-01-01
REVISION	001

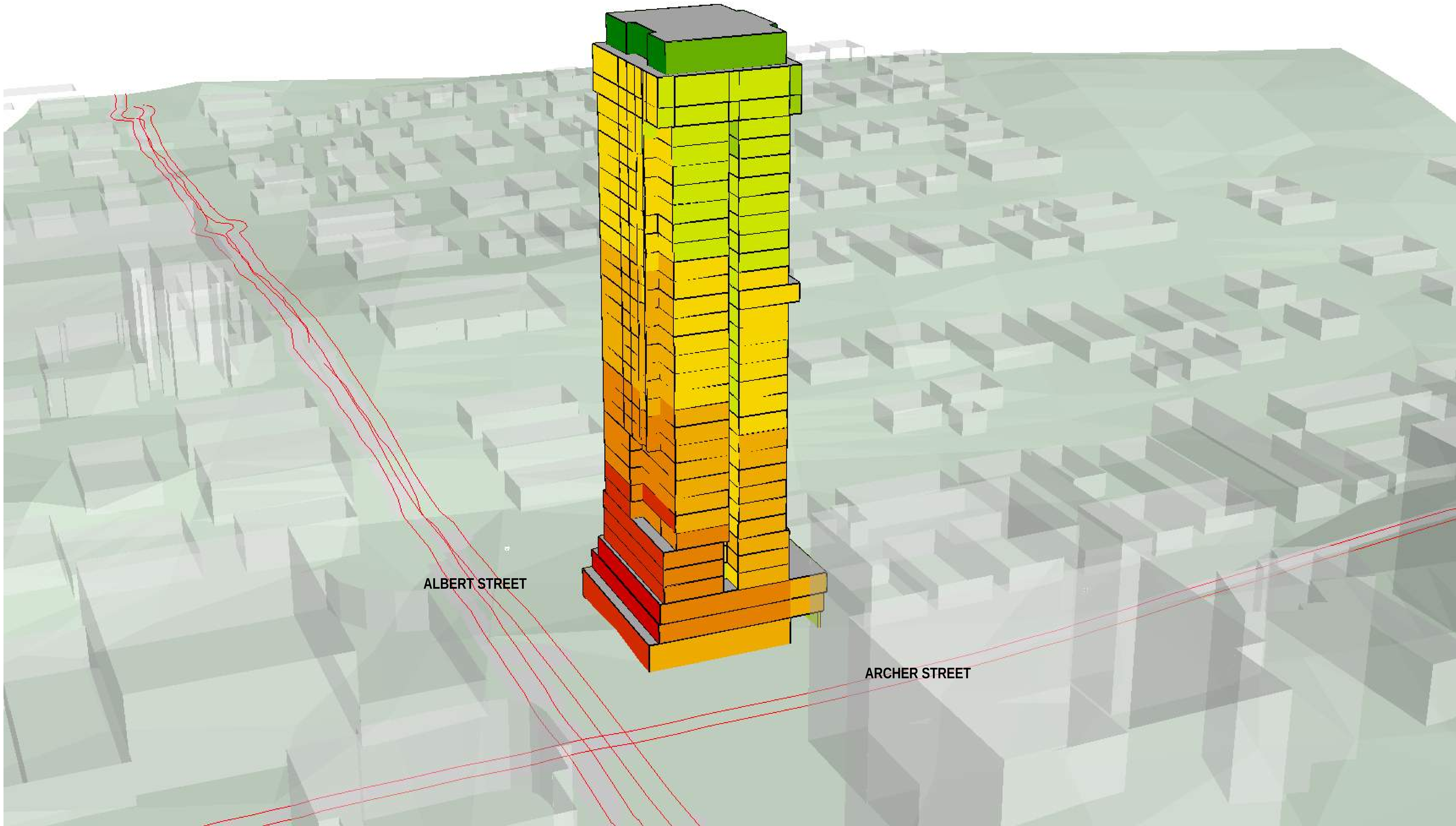


E-LAB CONSULTING

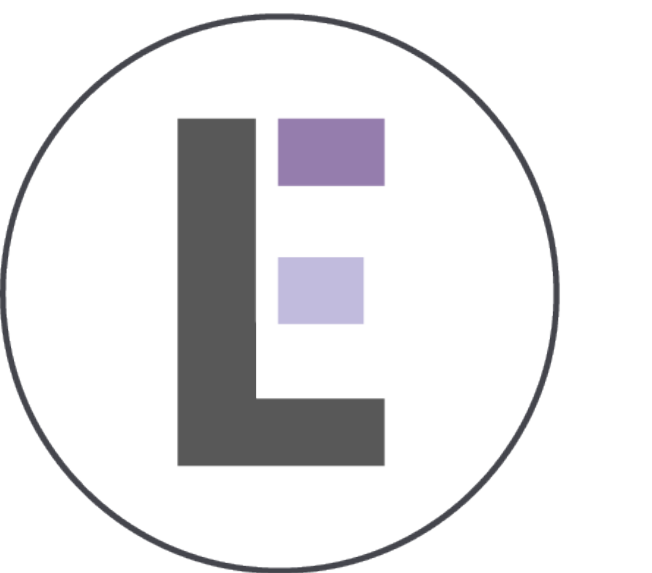
ISSUE	DATE	STATUS
1	02/09/2024	For Information



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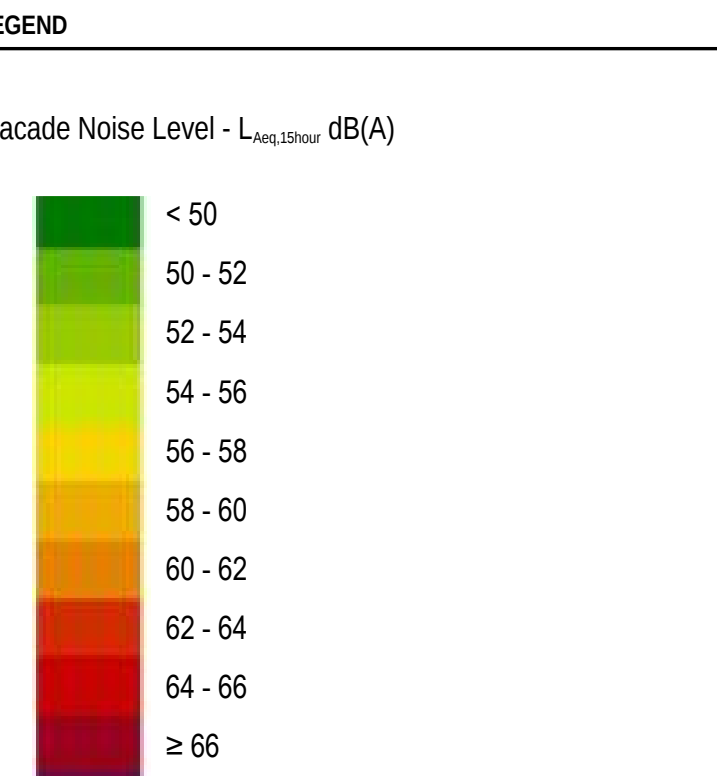


PROJECT	57-61 ARCHER STREET CHATSWOOD
PROJECT NO.	P01003
ARCHITECT	
CLIENT	CHATSWOOD PROPERTY PTY LTD
SCALE	NTS
STATUS	FOR INFORMATION
DRAWING	FACADE NOISE MAPS
	DAYTIME VIEW 2
DISCIPLINE	ACOUSTICS AND VIBRATION
DRAWING NUMBER	AC-DWG-100-01-02
REVISION	001

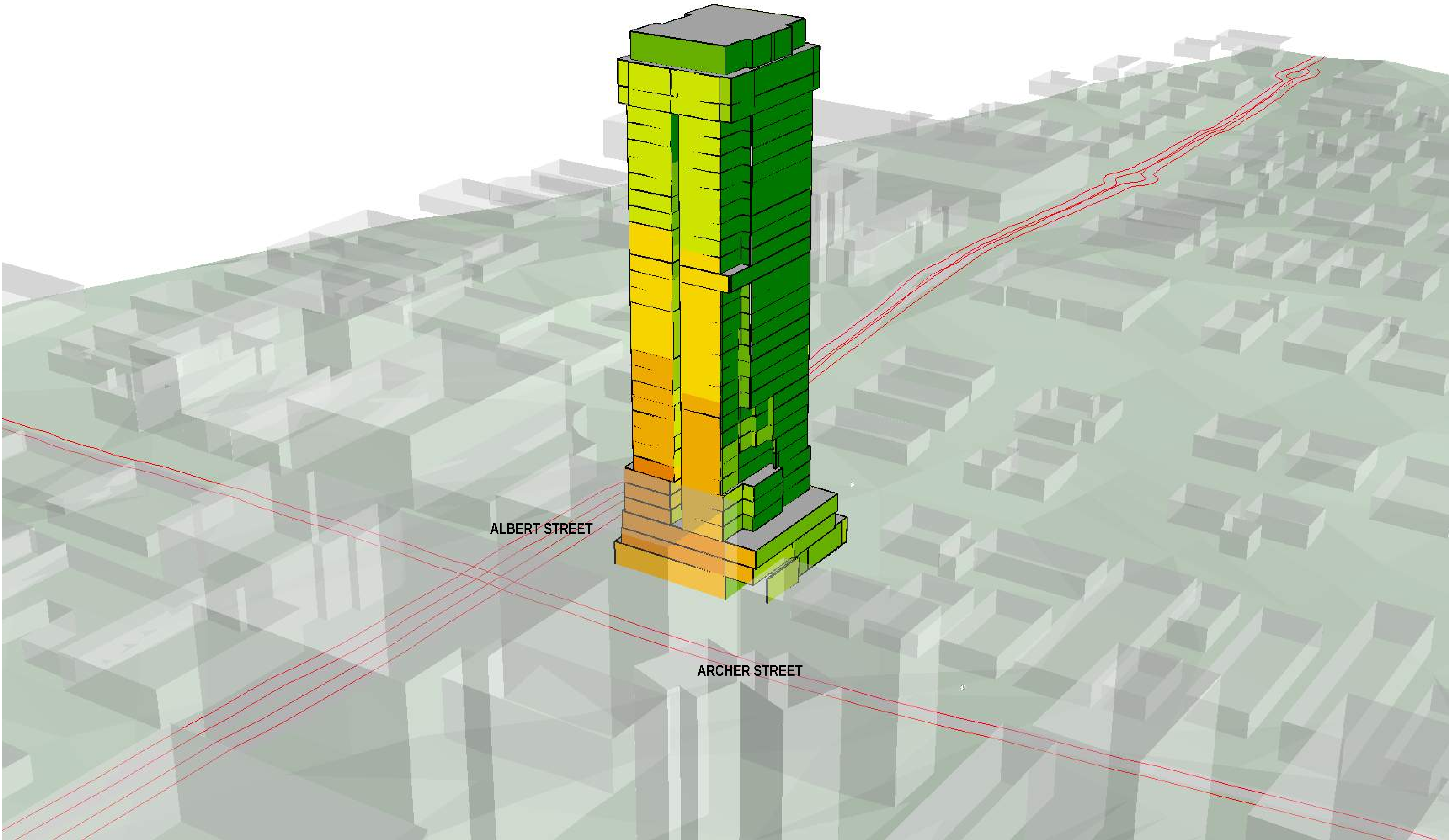


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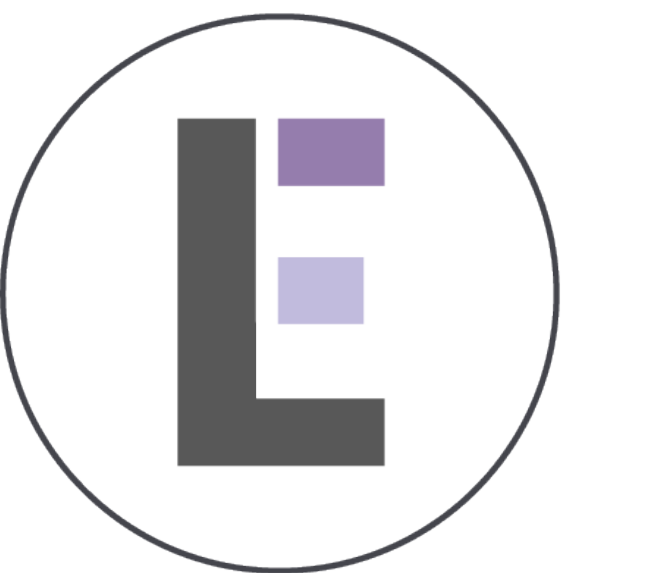
ISSUE	DATE	STATUS
1	02/09/2024	For information



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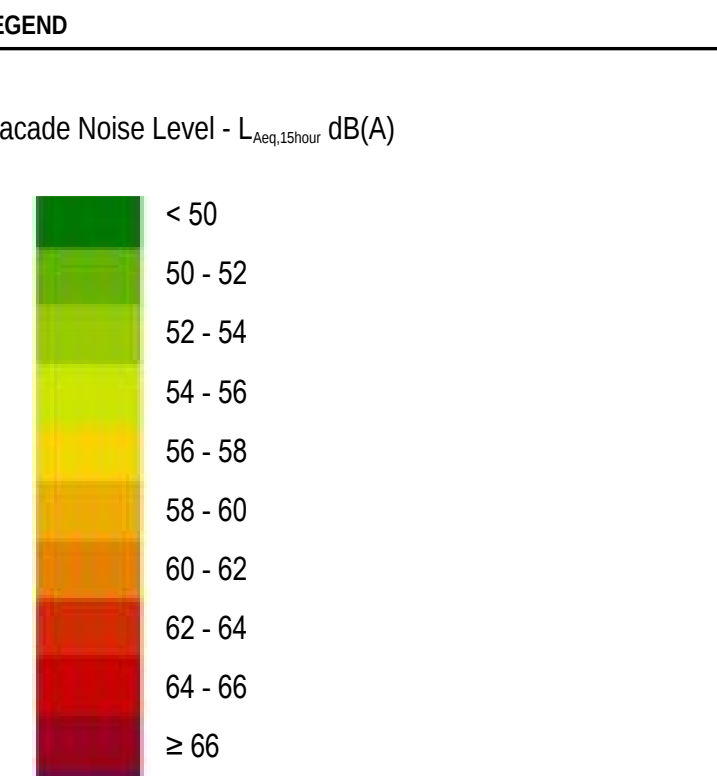


PROJECT	57 - 61 ARCHER STREET CHATSWOOD
PROJECT NO.	P01003
ARCHITECT	
CLIENT	CHATSWOOD PROPERTY PTY LTD
SCALE	NTS
STATUS	FOR INFORMATION
DRAWING	FACADE NOISE MAPS
	DAYTIME VIEW 3
DISCIPLINE	ACOUSTICS AND VIBRATION
DRAWING NUMBER	AC-DWG-100-01-03
REVISION	001



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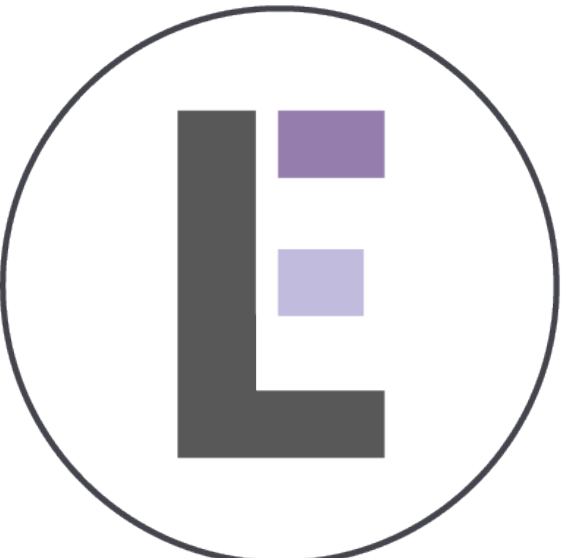
ISSUE	DATE	STATUS
1	02/09/2024	For information



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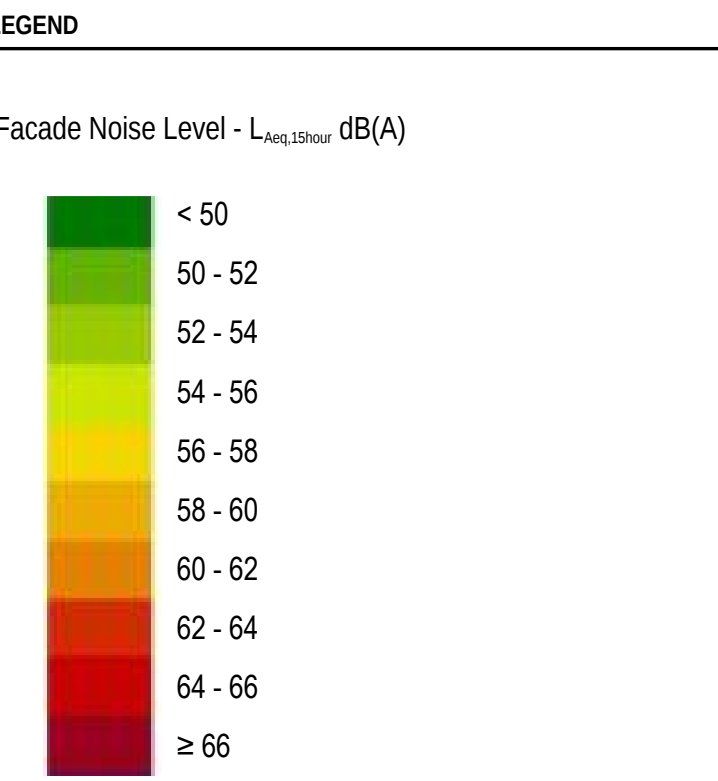


PROJECT	57 - 61 ARCHER STREET CHATSWOOD
PROJECT NO.	P01003
ARCHITECT	
CLIENT	CHATSWOOD PROPERTY PTY LTD
SCALE	NTS
STATUS	FOR INFORMATION
DRAWING	FACADE NOISE MAPS
	DAYTIME VIEW 4
DISCIPLINE	ACOUSTICS AND VIBRATION
DRAWING NUMBER	AC-DWG-100-01-04
REVISION	001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	02/09/2024	For information



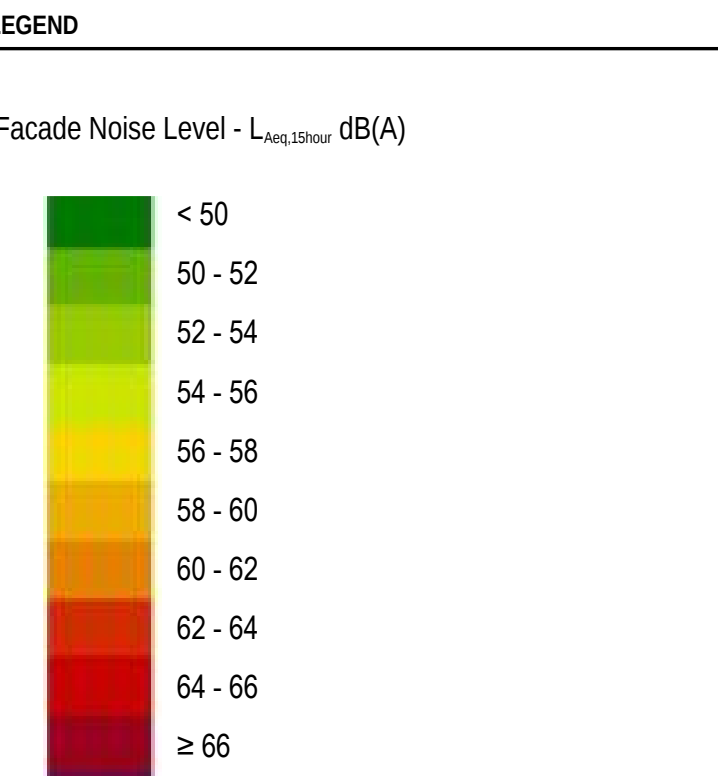
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PROJECT	57 - 61 ARCHER STREET CHATSWOOD
PROJECT NO.	P01003
ARCHITECT	
CLIENT	CHATSWOOD PROPERTY PTY LTD
SCALE	NTS
STATUS	FOR INFORMATION
DRAWING	FACADE NOISE MAPS
DAYTIME VIEW 5	
DISCIPLINE	ACOUSTICS AND VIBRATION
DRAWING NUMBER	AC-DWG-100-01-05
REVISION	001

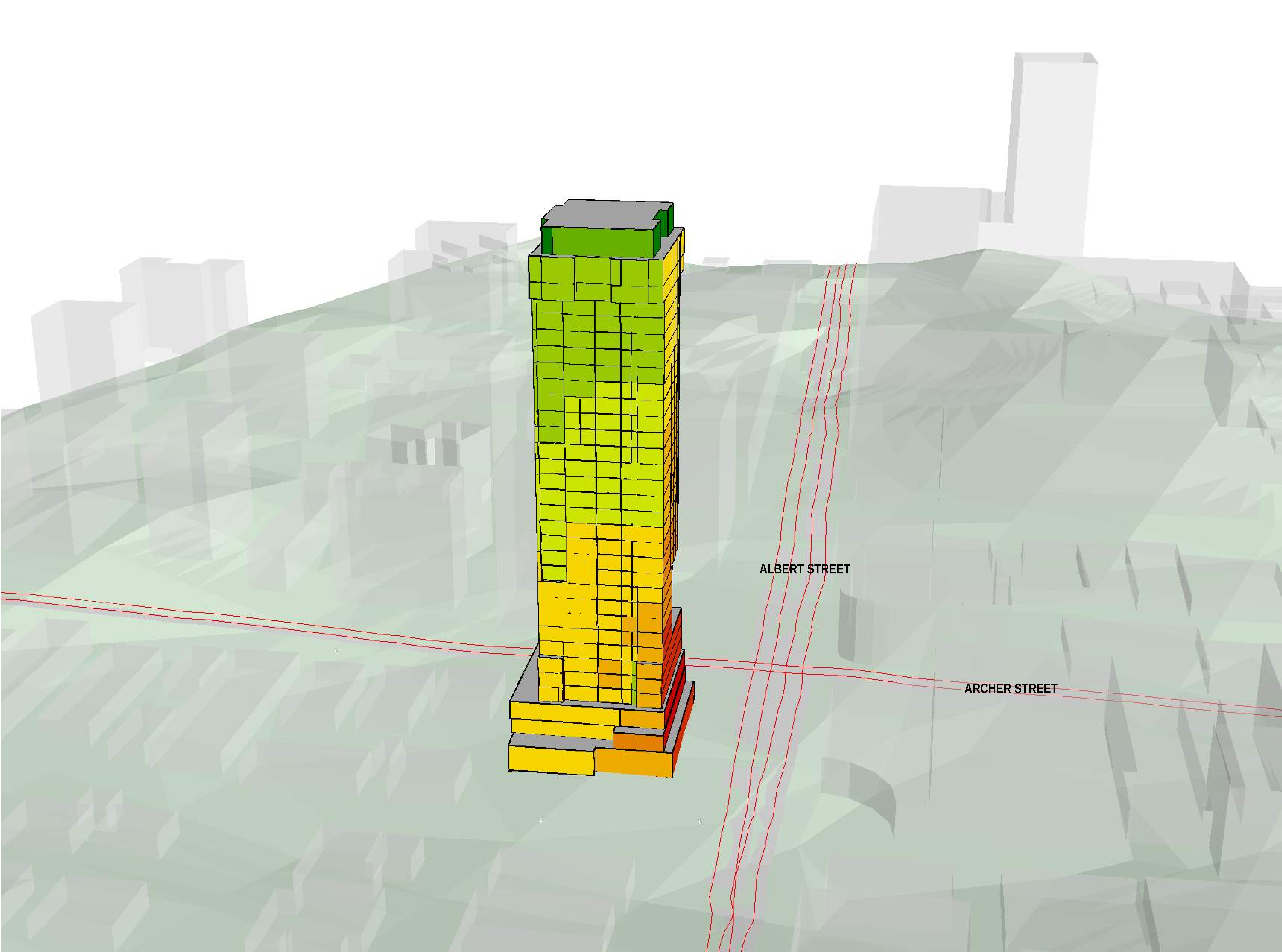


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ISSUE	DATE	STATUS
1	02/09/2024	For information



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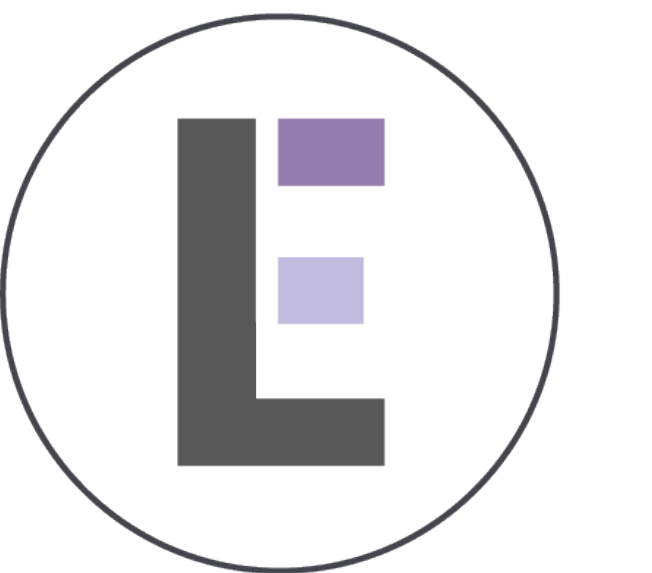
PROJECT	57 - 61 ARCHER STREET CHATSWOOD
PROJECT NO.	P01003
ARCHITECT	
CLIENT	CHATSWOOD PROPERTY PTY LTD
SCALE	NTS
STATUS	FOR INFORMATION
DRAWING	FACADE NOISE MAPS
	DAYTIME VIEW 6
DISCIPLINE	ACOUSTICS AND VIBRATION
DRAWING NUMBER	AC-DWG-100-01-06
REVISION	001



$$\text{Academe Noise Level} = L_{Aeq,15\text{hour}} \text{ dB(A)}$$

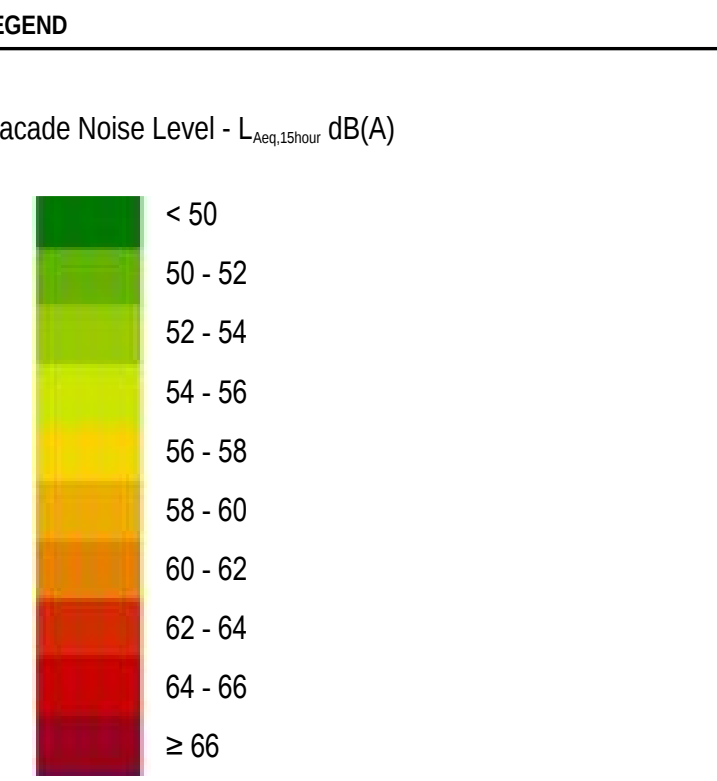

DRAWING NUMBER	REVISION
C-DWG-100-02-01	001





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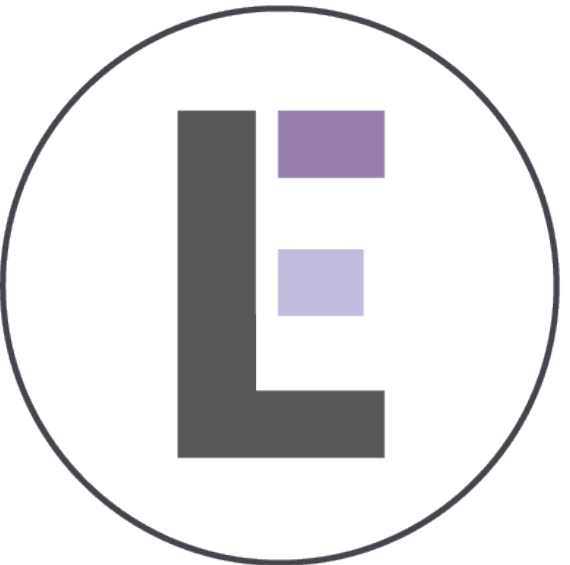
ISSUE	DATE	STATUS
1	02/09/2024	For information



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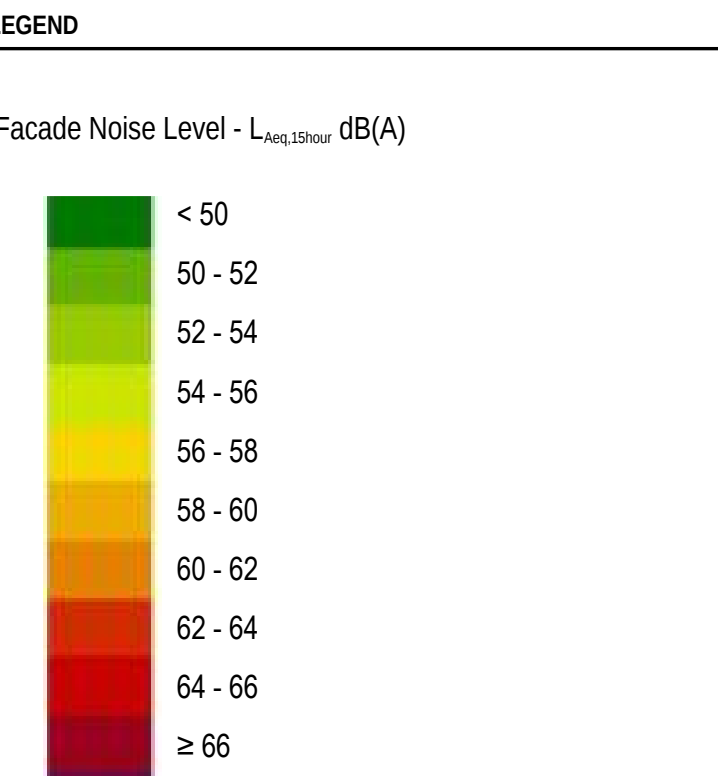


PROJECT	57 - 61 ARCHER STREET CHATSWOOD
PROJECT NO.	P01003
ARCHITECT	
CLIENT	CHATSWOOD PROPERTY PTY LTD
SCALE	NTS
STATUS	FOR INFORMATION
DRAWING	FACADE NOISE MAPS
	NIGHTTIME VIEW 2
DISCIPLINE	ACOUSTICS AND VIBRATION
DRAWING NUMBER	AC-DWG-100-02-02
REVISION	001



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ISSUE	DATE	STATUS
1	02/09/2024	For information



NOTES

PROJECT
57-61 ARCHER STREET CHATSWOOD

PROJECT NO.
P01003

ARCHITECT

CLIENT
CHATSWOOD PROPERTY PTY LTD

SCALE
NTS

STATUS
FOR INFORMATION

DRAWING
FACADE NOISE MAPS
NIGHTTIME VIEW 3

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER AC-DWG-100-02-03	REVISION 001
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LEGEND

Acad. Noise Level = $L_{Aeq,15hour}$ dB(A)

ARCHER STREET

PROJECT
7 - 61 ARCHER STREET CHATSWOODPROJECT NO.
01003

ARCHITECT

CLIENT
HATSWOOD PROPERTY PTY LTD

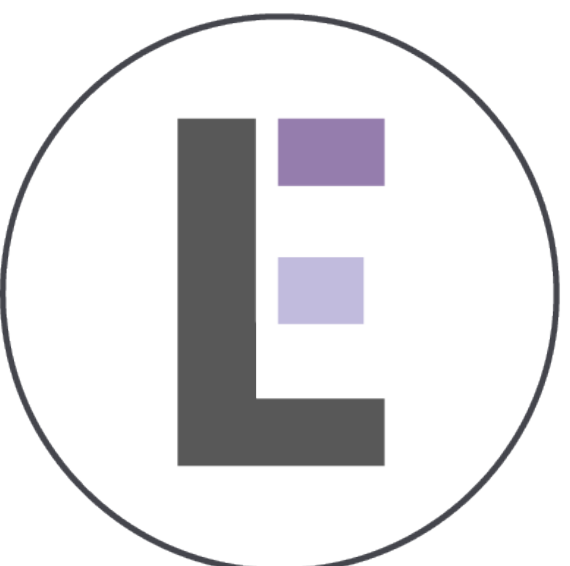
SCALE
TS

STATUS
FOR INFORMATION

DRAWING
ACADE NOISE MAPS
NIGHTTIME VIEW 4

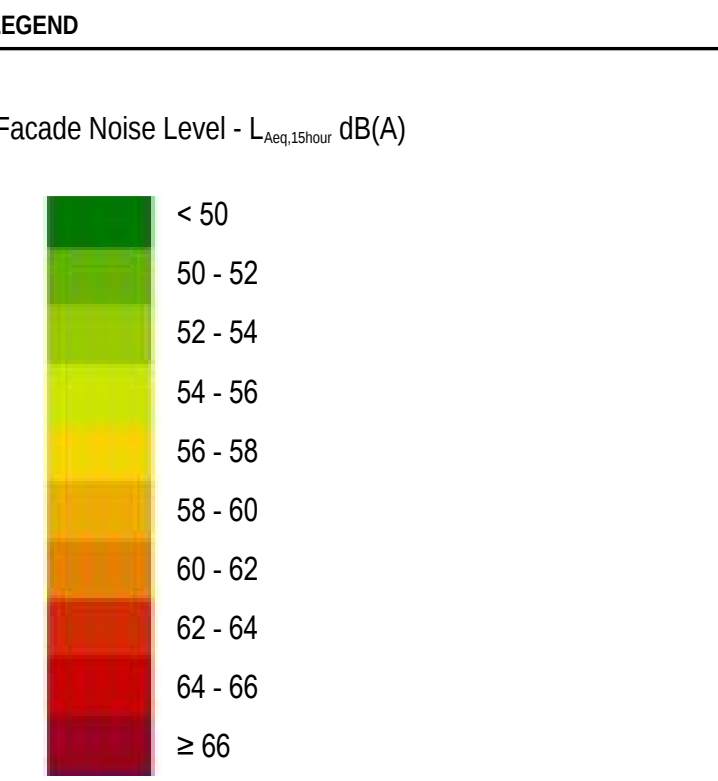
SCIENCE

DRAWING NUMBER	REVISION
C-DWG-100-02-04	001

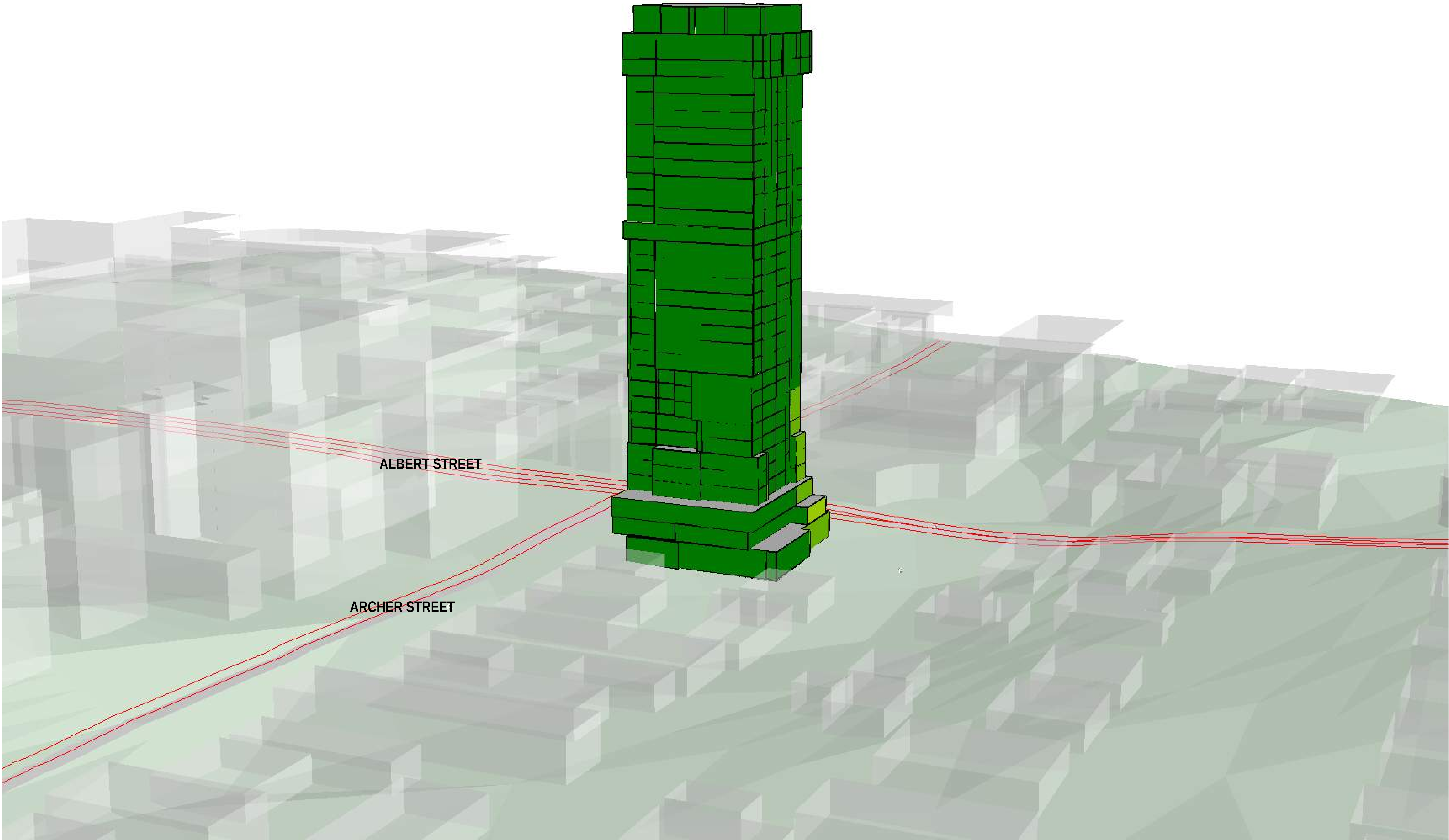


E-LAB CONSULTING

ISSUE	DATE	STATUS
1	02/09/2024	For information



NOTES



PROJECT	57 - 61 ARCHER STREET CHATSWOOD
PROJECT NO.	P01003
ARCHITECT	
CLIENT	CHATSWOOD PROPERTY PTY LTD
SCALE	NTS
STATUS	FOR INFORMATION
DRAWING	FACADE NOISE MAPS
	NIGHTTIME VIEW 5
DISCIPLINE	ACOUSTICS AND VIBRATION
DRAWING NUMBER	AC-DWG-100-02-05
REVISION	001



LEGEND

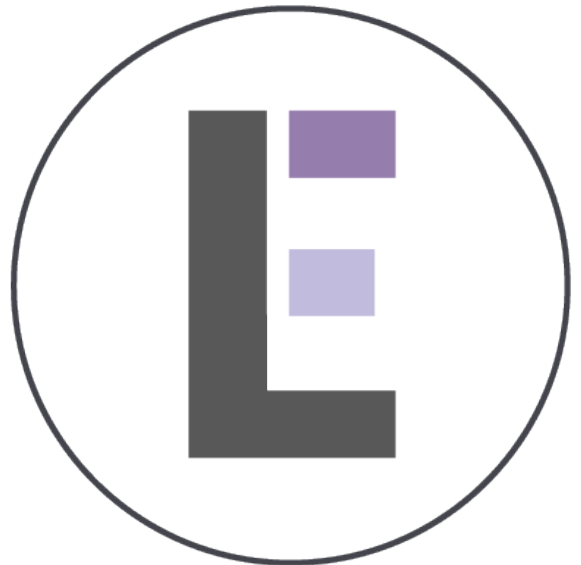
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DRAWING NUMBER	REVISION
C-DWG-100-02-06	001



Appendix C **Construction Noise Contour Map**





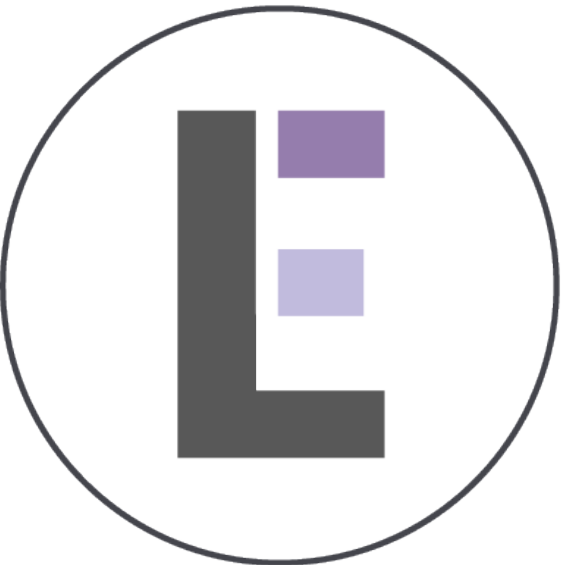
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ISSUE	DATE	STATUS
1	02/09/2024	For information

LEGEND	
Predicted Noise Level - L _{Aeq,15min} (dB(A))	
■	< 45
■	45 - 50
■	50 - 55
■	55 - 60
■	60 - 65
■	65 - 70
■	70 - 75
■	75 - 80
■	80 - 85
■	≥ 85

NOTES

PROJECT 57 - 61 ARCHER STREET CHATSWOOD	
PROJECT NO. P01003	
ARCHITECT	
CLIENT CHATSWOOD PROPERTY PTY LTD	
SCALE NTS	
STATUS FOR INFORMATION	
DRAWING CONSTRUCTION NOISE CONTOUR MAP - DEMOLITION	
DISCIPLINE ACOUSTICS AND VIBRATION	
DRAWING NUMBER AC-DWG-200-01-01	REVISION 001



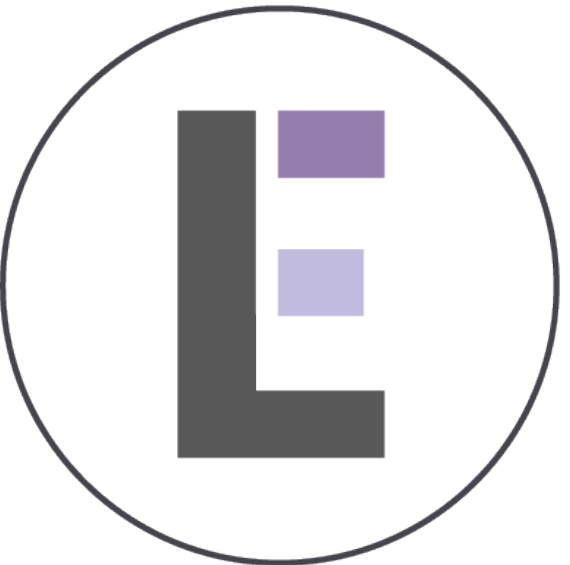
E-LAB CONSULTING

ISSUE	DATE	STATUS
1	02/09/2024	For information

LEGEND	
Predicted Noise Level - LAeq,15min (dB(A))	
< 45	45 - 50
50 - 55	55 - 60
60 - 65	65 - 70
70 - 75	75 - 80
80 - 85	≥ 85

NOTES

PROJECT	57 - 61 ARCHER STREET CHATSWOOD
PROJECT NO.	P01003
ARCHITECT	
CLIENT	CHATSWOOD PROPERTY PTY LTD
SCALE	NTS
STATUS	FOR INFORMATION
DRAWING	CONSTRUCTION NOISE CONTOUR MAP - CIVIL WORKS
DISCIPLINE	ACOUSTICS AND VIBRATION
DRAWING NUMBER	AC-DWG-200-01-02
REVISION	001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	02/09/2024	For information

LEGEND	
Predicted Noise Level - LAeq,15min (dB(A))	
< 45	Blue
45 - 50	Dark Blue
50 - 55	Green
55 - 60	Light Green
60 - 65	Yellow
65 - 70	Orange
70 - 75	Red
75 - 80	Dark Red
80 - 85	Red
> 85	Dark Red

NOTES

PROJECT
57-61 ARCHER STREET CHATSWOOD

PROJECT NO.
P01003

ARCHITECT

CLIENT
CHATSWOOD PROPERTY PTY LTD

SCALE
NTS

STATUS
FOR INFORMATION

DRAWING
CONSTRUCTION NOISE CONTOUR MAP -
STRUCTURAL WORKS & FACADE AND
FINISHES

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-200-01-03

REVISION
001

