601 Pacific Highway, St Leonards (SSD-85848713)

Noise and Vibration Impact Assessment

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E-LAB Consulting

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Document QA and Revisions

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1 EXECUTIVE SUMMARY

This Noise and Vibration Impact Assessment has been prepared by E-LAB Consulting and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of a State Significant Development Application (SSDA) (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site).

Furthermore, this Noise and Vibration Impact Assessment has been prepared to address the following relevant Secretary's Environmental Assessment Requirements (SEARs), issued on 4 July 2025. Table 1 below summarises the SEARs requirements and outlines the appropriate mitigation measures and the corresponding section within this report where the mitigation has been considered.

Table 1: SEARs requirements and report section reference

ITEM	DESCRIPTION OF REQUIREMENT	SECTION REFERENCE (THIS REPORT)
10	**Noise and Vibration**	
	▪ Provide a noise and vibration impact 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 Impacts: The provisions of Section 2.120 (Impact of road noise or vibration on non-road development) of the State Environmental Planning Policy (Transport and Infrastructure) 2021 apply to the SSDA as the annual average daily traffic volume along this section of the Pacific Highway is more than 20,000 vehicles. Demonstrate the development will comply with the provisions contained in Section 2.120 of State Environmental Planning Policy (Transport and Infrastructure) 2021, particularly Subclause 3.	Refer to Section 7 for operational assessment and Section 8 for operational mitigation measures, including compliance against State Environmental Planning Policy (Transport and Infrastructure) 2021. Refer to Section 9 and 10 for construction assessment and Section 11 for construction mitigation measures.

This report concludes that the proposed mixed-use development is acceptable and warrants approval subject to the implementation of the mitigation measures outlined in Section 8 and 11.

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

2 INTRODUCTION

This Noise and Vibration Impact Assessment has been prepared by E-LAB Consulting and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of a State Significant Development Application (SSDA) (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site).

The proposal seeks consent for the following:

- An amendment to the North Sydney Local Environmental Plan 2013 (NLEP 2013) to rezone the site from E2 Commercial Centre to MU1 Mixed Use and to amend the minimum non-residential floor space ratio development standard under Clause 4.4A from 20:1 to 1:1
- Demolition of the existing 14 storey commercial office building that is currently on the site
- Site excavation, remediation and other preparatory works
- Construction and operation of a new 52 storey (RL264.50) mixed use shop top housing development, with a FSR of 20:1 (maximum GFA of 56,880m^2), comprising:
    - 538 dwellings including 508 Build-to-Sell apartments and 30 Affordable Housing apartments across a mix of apartment typologies.
    - A contribution of 5% of the residential GFA toward Affordable Housing.
    - Retail and commercial land uses at the ground and podium levels.
    - Internal and external residential amenities provided throughout the building.
    - Six levels of basement carparking, comprising a total of 300 car spaces, bicycle parking, loading bays, waste areas, plant, and back of house.
    - Vehicular access to the basement via Atchison Street.
    - Landscaping and Public Domain works.
    - Reticulation of site services and infrastructure (electricity, telecommunication, water, and sewer connections).

3 SITE DESCRIPTION

The site is located on Cammeraygal country at 601 Pacific Highway, St Leonards within North Sydney (LGA). The site is legally described as Lot 71 in DP749690 and has a total area of 2,844m^2. The site is 4.5 km north of the Sydney CBD, 3 km from the North Sydney CBD, and within proximity to the centres of St Leonards, Chatswood, and Macquarie Park. The site is located 350 metres (walking distance) from St Leonards train station and approximately 400m (walking distance) from the Crows Nest Metro station.

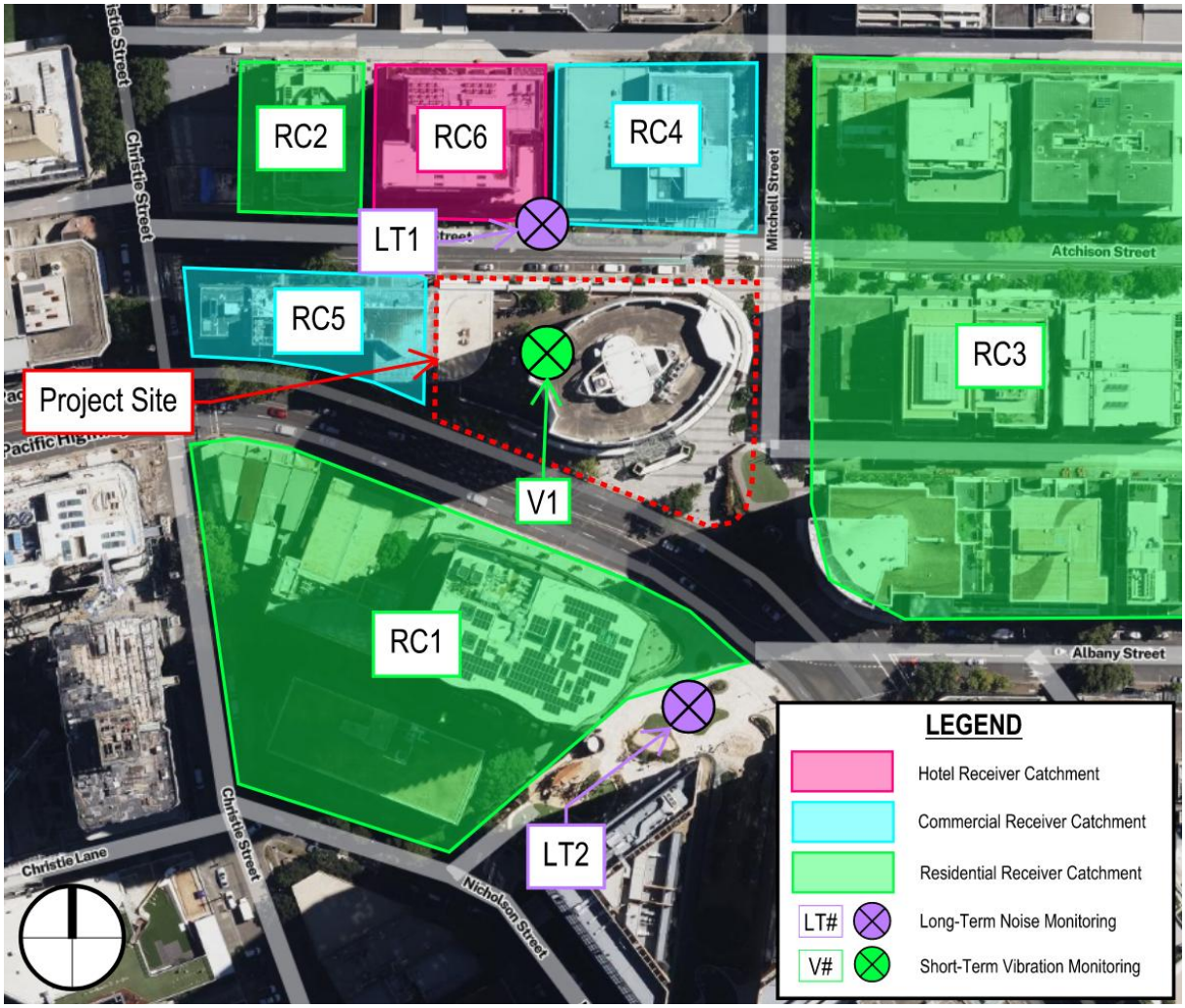
A site aerial and location plan is provided in Figure 1 below.

Figure 1: Aerial view of the site (Source: Urbis)

The location of the proposed development, noise/vibration monitoring and measurement locations, and surrounding noise-sensitive receivers are presented in Figure 2. Noise and vibration sensitive receivers have been delineated into receiver catchments (RCs) as shown in Figure 2.

- RC1 – Existing residential receiver to the south, across Pacific Highway
- RC2 – Existing residential receivers to the north-west, across Atchison St
- RC3 – Existing residential receivers to the east, across Mitchell St
- RC4 – Existing commercial receivers to the north, across Atchison St
- RC5 – Existing hotel receivers to the north, across Atchison St
- RC6 – Existing commercial receivers to the west, adjoining the site

Figure 2: Acoustic site plan identifying the surrounding noise-sensitive receivers and noise monitoring locations



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 the requirements listed in the SEARs
- 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
- 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:

- Airborne noise intrusion to the development's habitable areas from surrounding roads
- Vibration impact to the development's habitable areas from the below Metro corridor
- Noise emissions associated with carparking and service vehicle activities
- Noise emissions associated with retail and commercial tenancies
- Noise emission from mechanical plant and equipment serving the development
- Noise emissions associated with residential communal spaces
- Noise emission from the residential cinema room
- Noise emission from the residential gym

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 development and associated impacts on the surrounding noise sensitive receivers
- Vibration generated during the construction of the 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:

- NSW EPA's Noise Policy for Industry 2017, dated October 2017 (NPI)
- NSW EPA's Road Noise Policy, dated March 2011 (RNP)
- NSW's State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP 2021)
- NSW EPA's Development Near Rail Corridors and Busy Roads – Interim Guideline, dated December 2008 (Interim Guideline)
- NSW EPA's Interim Construction Noise Guideline, dated July 2009 (ICNG)
- Assessing vibration: A Technical Guideline 2006 (AVTG)
- 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”
- AS 1055:2018 - “Acoustics – Description and measurement of environmental noise”
- Sydney Metro Underground Corridor Protection Technical Guidelines, dated July 2025

5 SITE NOISE INVESTIGATIONS

5.1 NOISE MEASUREMENT EQUIPMENT

The following instrumentation was used for noise measurement and analysis:

- Bruel and Kjaer Sound Calibrator Type 4231 (S/N: 3029638)
- NSRT mk3 Sentry Noise Loggers
- Svantek 958A Class 1 four-channel vibration analyser (S/N: 97750)

All instrument systems are laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement system was also field calibrated prior to and after noise surveys. Calibration drift was found to be less than 0.2dB during measurements. No adjustments for instrument drift during the measurement period were warranted.

5.2 LONG-TERM NOISE MONITORING

5.2.1 Background Noise

Based on our site survey, the long-term monitoring locations shown in Figure 2 were chosen. Background noise levels and subsequent Rating Background Noise Level (RBL) have been established for nearby residential receivers in accordance with the NPI using the results of the noise monitoring at LT1 and LT2. Noise monitoring was conducted between 13 and 24 October 2025.

The description of time of day presented in Table 2 is outlined within the NPI and described as follows:

- Day – the period from 7:00am to 6:00pm Monday to Saturday, 8am to 6pm on Sundays and public holidays
- Evening – the period from 6:00pm to 10:00pm
- Night – the period from 10:00pm to 7:00am, or 10:00pm to 8:00am on Sundays and public holidays.
- The noise monitoring results are presented in Table 2.

Table 2: Unattended noise monitoring results

LOCATION	RATING BACKGROUND NOISE LEVELS - dB(A)		
	DAY	EVENING	NIGHT
LT1	56	50	45
LT2	60	55	49

The local ambient noise environment is expected to be typical of an Urban residential environment (as classified by the NPI). Please note that any adverse weather affected data (in accordance with the NPI) or extraneous noise sources during the period of logging has been excluded from the calculations.

5.2.2 Traffic Noise

Based on our site survey, the long-term monitoring locations shown in Figure 2 were chosen, which will be used to establish the traffic noise levels at the project site.

The description of time of day presented in Table 3 is described as follows:

- Day – the period from 7:00am to 10:00pm
- Night – the period from 10:00pm to 7:00am

Table 3: Unattended traffic noise monitoring results

LOCATION	MEASURED TRAFFIC NOISE LEVELS	
	DAY $L_{Aeq,15hour}$ dB(A)	NIGHT $L_{Aeq,9hour}$ dB(A)
LT1	60	55
LT2	67	62

6 PROJECT NOISE AND VIBRATION CRITERIA

6.1 RELEVANT NOISE AND VIBRATION ASSESSMENT DOCUMENTS

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

- NSW EPA's Noise Policy for Industry 2017, dated October 2017 (NPI)
- NSW EPA's Road Noise Policy, dated March 2011 (RNP)
- NSW's State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP 2021)
- NSW EPA's Development Near Rail Corridors and Busy Roads – Interim Guideline, dated December 2008 (Interim Guideline)
- NSW EPA's Interim Construction Noise Guideline, dated July 2009 (ICNG)
- Assessing vibration: A Technical Guideline 2006 (AVTG)
- 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"
- AS 1055:2018 - "Acoustics – Description and measurement of environmental noise"
- Sydney Metro At-grade and Elevated Sections Corridor Protection Technical Guideline, dated 1 August 2025

6.2 INTERNAL NOISE LEVELS

6.2.1 SEPP (Transport and Infrastructure) 2021

For developments with residential accommodation which are adjacent to a transitway and that the consent authority considers is likely to be adversely affected by road noise or vibration, SEPP 2021 provides the following acoustic criteria.

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 child care 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.

It is noted that based on Transport for NSW's Traffic Volume Map (Map 12D), Pacific Hwy is classified as a road which triggers a mandatory noise assessment under clause 2.120 of SEPP (Transport and Infrastructure) 2021.

6.2.2 Development Near Rail Corridors and Busy Roads – Interim Guideline

The Interim Guideline provides guidance on designing residential developments which are adjacent to transitways by governing maximum internal noise levels averaged over certain periods within bedrooms and living areas.

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

Table 4: 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)$L_{Aeq(9hour)}$	45 dB(A)$L_{Aeq(9hour)}$
Living rooms	At any time	40 dB(A)$L_{Aeq(15hour)}$	50 dB(A)$L_{Aeq(15hour)}$

6.3 GROUNDBORNE VIBRATION

Internal ground/structure borne vibration levels to the proposal should be controlled to within the requirements of the AVTG. Recommended Vibration Dose Values (VDVs) for intermittent vibration as scheduled in the AVTG are summarised in Table 5.

Table 5: Acceptable vibration dose values for intermittent vibration

LOCATION	PREFERRED VALUES		MAXIMUM VALUE	
	DAY	NIGHT	DAY	NIGHT
Residential areas	0.20 $m/s^{1.75}$	0.13 $m/s^{1.75}$	0.40 $m/s^{1.75}$	0.26 $m/s^{1.75}$

6.4 GROUNDBORNE NOISE

As per Section 3.6.2 of the Interim Guideline, residential buildings should be designed so that the 95th percentile of train pass-bys complies with a ground-borne $L_{Amax,slow}$ noise limit of 40dBA (daytime) or 35dBA (night-time).

6.5 NOISE EMISSIONS

6.5.1 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:

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

Where the RBLs established in accordance with Fact Sheet A are lower than the values presented in Table 6 for each assessment period, the values presented in Table 6 shall be used for that particular assessment period. These result in the minimum intrusiveness noise levels provided in Table 6.

Table 6: 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 7 provides the project intrusiveness noise levels applicable to each of the surrounding residential noise-sensitive receivers.

Table 7: Project intrusiveness noise level criteria for each residential receiver catchment

RECEIVER CATCHMENT	TIME OF DAY	MEASURED RBL - dB(A)	PROJECT INTRUSIVENESS NOISE LEVELS - $L_{Aeq,15min}$ dB(A)
RC1[1]	Day	60	65
	Evening	55	60
	Night	49	54
RC2 and RC3[2]	Day	56	61
	Evening	50	55
	Night	45	50

Note 1: Based on monitored background noise levels at LT2

Note 2: Based on monitored background noise levels at LT1

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:

- Project Amenity Noise Level = Recommended Amenity Noise Level (see Table 8) – 5 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 8.

Table 8: 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)
RC1 to RC3	Residential (Urban)[1]	Day	60	55	58
		Evening	50	45	48
		Night	45	40	43
RC4 and RC5	Commercial	When in use	65	60	63
RC6	Hotel	Day	65	60	63
		Evening	55	50	53
		Night	50	45	48

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

Under Section 2.4.1 of the NPI, where the existing traffic noise is ≥ 10 dB(A) above the recommended amenity level and road traffic is the dominant source unlikely to decrease, a high-traffic project amenity noise level may be applied, defined as $L_{Aeq,period(traffic)}$ –15 dB(A).

These criteria are considered to be satisfied at the site:

- Surveys and monitoring undertaken have identified road traffic as the persistent and continuous noise source in the area
- Measured L_{Aeq} values for the LT2 monitor are over 10 dB(A) above the NPI's urban residential amenity level in the evening (65 dBA) and night (62 dBA) periods
- Given the site's location on arterial corridors with established public transport and future developments, traffic noise levels are not expected to decline in future years

Accordingly, it is appropriate and consistent with Section 2.4.1 of the NPI to adopt high-traffic amenity noise levels for the evening and night-time periods for RC1, derived as 15 dB(A) below the measured $L_{Aeq,period}$ traffic levels.

The resultant project amenity noise levels have been presented in Table 9 below.

Table 9: Project amenity noise level criteria for each receiver catchment (with high traffic amenity noise levels applied)

RECEIVER CATCHMENT	RECEIVER TYPE	TIME OF DAY	PROJECT AMENITY NOISE LEVEL - $L_{Aeq,15min}$ dB(A)
RC1	Residential (Urban)	Day	58
		Evening	53[1]
		Night	50[1]
RC2 and RC3		Day	58
		Evening	48
		Night	43
RC4 and RC5	Commercial	When in use	63
RC6	Hotel	Day	63
		Evening	53
		Night	48

Note 1: High traffic project amenity noise level for RC1 is based on monitored traffic noise levels at LT2

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 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 10 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 10: Project noise trigger levels (PNTL) to be applied to each surrounding receiver catchment

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)	PNTL - $L_{Aeq,15min}$ dB(A)
RC1	Residential (Urban)	Day	65	58	-	**58**
		Evening	60	53	-	**53**
		Night	54	50	54 $L_{Aeq,15min}$ 64 L_{AFmax}	**50**
RC2 and RC3		Day	56	58	-	**58**
		Evening	50	48	-	**48**
		Night	45	43	45 $L_{Aeq,15min}$ 55 L_{AFmax}	**43**
RC4 and RC5	Commercial	When in use	-	63	-	**63**
RC6	Hotel	Day	-	63	-	**63**
		Evening	-	53	-	**53**
		Night	-	48	-	**48**

6.6 CONSTRUCTION NOISE CRITERIA

6.6.1 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

TIME OF DAY	MANAGEMENT LEVEL $L_{Aeq,15min}$[1]	HOW TO APPLY
Recommended Standard Hours within NSW ICNG: Monday – Friday 7am – 6pm Saturday 8am – 1pm No work on Sundays or public holidays	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.
	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. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Airborne Noise – Commercial Receiver Catchments

The airborne noise criteria for surrounding commercial 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 commercial receiver catchments

LAND USE	MANAGEMENT LEVEL (APPLIES WHEN PROPERTIES ARE BEING USED) $L_{Aeq,15min}$
Offices, Retail Outlets	70 dB(A)

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.

6.7 OPERATIONAL & 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.

6.7.1 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/s^2) 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					
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

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
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

6.7.2 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)

6.7.3 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, vi, 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					

6.7.4 Sydney Metro Underground Corridor Protection Technical Guidelines

Section 5.4.1 of the Sydney Metro Underground Corridor Protection Technical Guidelines, dated July 2025, provides the following considerations during construction of a development:

5.4.1 Considerations during construction of Development

During construction of Development, and in accordance with TS 01717 Development Near Rail Tunnels, vibration impacts on Sydney Metro structures must be minimised. The maximum peak particle velocity (PPV) at 4 Hz and above at the tunnel lining is:

- *20 mm/s measured at the tunnel lining for segment lined tunnels*
- *15 mm/s measured at the tunnel lining for mass concrete lined tunnels (e.g. Epping to Chatswood, mined station caverns, crossover caverns etc.).*

Sources of vibration that are to be considered include: demolition, piling, ground treatments (e.g. compaction), construction equipment, tunnelling and industrial machinery.

Continuous rock breaking/hammering and sheet piling, vibratory rollers, excavators and the like can give rise to dynamic magnification due to resonance.

Sydney Metro may request construction vibration monitoring. In these instances, the Applicant or public authority should nominate an Alert level for monitoring and management purposes to advise when vibration levels are approaching these limits to ensure that the limits are not exceeded.

Atypical construction methods are to be assessed on a case-by-case basis with reference to relevant standards.

To assess the likelihood of cosmetic damage due to vibration, Australian Standard AS 2187: Part 2-2006 Explosives – Storage and Use – Part 2: Use of Explosives specifies that the highest of the orthogonal vibration components (transverse, longitudinal and vertical directions) are to be compared with the guidance vibration velocity limits.

7 OPERATIONAL NOISE AND VIBRATION ASSESSMENT

7.1 TRAFFIC AND RAIL AIRBORNE NOISE INTRUSION

7.1.1 Noise Modelling and Assumptions

In order to provide acoustic amenity to occupants of the proposed development and comply with the project specific internal noise limits, the noise impact of surrounding roads were assessed at the façade of the proposed development.

3D acoustic modelling for noise emissions from the surrounding roads was conducted using the software SoundPlan (Version 9.0). Noise emissions and impacts from surrounding roads were modelled in accordance with the CoRTN prediction techniques and calibrated to the measurements conducted for this assessment.

This model is recognised by regulatory authorities around Australia and is endorsed by the NSW DP&E for use in projects of this scale. The acoustic modelling was undertaken considering specific meteorological characteristics such as wind speeds, prevailing wind directions and temperature in accordance with the hourly weather data for a full calendar year described in the Test Reference Year for Mascot 1987 (94767 Mascot (Syd AMO) 1978-87 1987).

Attenuation due to distances, building shielding and environmental absorption, together with additional noise incident on the façade due to façade reflections are taken into account within the 3D model.

7.1.2 "Windows Closed" Assessment

The results of the 3D modelling are provided in Appendix A (in the form of façade noise contours), showing the incident noise levels on the façade (daytime and night-time) as a result of external noise sources (traffic and rail). The incident noise levels are presented as $L_{Aeq,9h}$ and $L_{Aeq,15h}$ statistical metrics for the purpose of demonstrating compliance with the State Environmental Planning Policy (Transport and Infrastructure) 2021 and Interim Guideline, and mitigation measures are presented in Section 8.1.

7.1.3 "Windows Open" Assessment

A preliminary "windows open" assessment has been conducted to assess whether the habitable spaces can meet the project internal noise limits established in Section 6.2.2 with windows open for natural ventilation (open in accordance with the natural ventilation requirements of the NCC).

If the project internal noise limits for windows/doors open is exceeded, the habitable area is considered noise-affected, and an alternative means of ventilation is required in accordance with the requirements of the NCC (i.e. an alternative ventilation system complying with AS 1668.2 and AS/NZS 3666.1).

The assessment has been conducted under the assumption the occupant has opened their windows to achieve natural ventilation (and as recommended in the DoP Interim Guideline), that is, when the windows are open to 5% of the floor area of the room being ventilated, with a reduction of incident noise level to internal noise level of 10dB(A). Room loss has also been considered as part of this assessment.

In order to achieve the project internal noise limits established in Section 6.2.2 whilst simultaneously achieving the ventilation requirements, mitigation measures have been proposed in Appendix C for the proposed development.

The results of the acoustic façade analysis indicate that highlighted residential habitable areas will require an alternative means of ventilation (e.g. mechanical ventilation). It should be noted that these areas are indicative and may change as the design develops due to a change in the building form, form of the façade, internal finishes within each of the habitable spaces and location of openings.

7.2 METRO VIBRATION IMPACT

Operator attended measurements of vibration levels from the below Metro corridor have been undertaken at the project site (locations V1 as indicated in Figure 2).

Table 17 provides the worst-case overall VDV based on the undertaken measurements of Metro movements and checks for compliance against the AVTG criteria.

Table 17: Metro vibration compliance

LOCATION	TIME OF DAY	VIBRATION DOSE VALUE VDV ($M/S^{1.75}$)			COMPLIANCE (YES / NO)
		MEASURED	PREFERRED	MAXIMUM	
V1	Day	0.001	0.20	0.40	Yes
	Night	0.0007	0.13	0.26	

7.3 METRO GROUNDBORNE NOISE IMPACT

Based on the undertaken vibration measurements on site, it is predicted that groundborne noise at the closest residential habitable spaces within the development, being Level 02, will be less than 20dB(A) $L_{Amax,slow}$ in both the day and night. Subsequently, the development will be capable of satisfying the Interim Guideline groundborne noise requirements without further acoustic mitigation measures.

7.4 CARPARKING AND SERVICE VEHICLE NOISE EMISSION

All carparking, loading dock and waste collection areas for the development will be located within structural enclosed basement levels. In consideration of this, it is expected that noise generated by activities of these areas will not have an adverse noise impact on the surrounding noise-sensitive receivers and the project specific noise emission criteria are capable of being met without additional acoustic mitigation measures. Nonetheless, general loading dock management recommendations have been provided in Section 8.2.

7.5 RETAIL AND COMMERCIAL NOISE EMISSION

At the time of writing, the tenants for the retail and commercial spaces have not been determined and therefore the operational details and internal layouts for these spaces are unknown.

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

7.6 MECHANICAL SERVICES NOISE EMISSION

Primary external mechanical plant and equipment serving the development are expected to be located on rooftop and Level 5 plant room, and are generally limited to ventilation fans, VRF units, hot water heat pumps, cooling towers and a building maintenance unit located on the roof. At this stage the mechanical design is preliminary, and detailed equipment selections are yet to be made.

During the detailed design of the project, the mitigation measures outlined in Section 8.3 shall be considered when developing the mechanical services design. With provision of the mitigation measures, it is expected that the development will be capable of complying with the project specific noise emission criteria outlined in Section 6.5.1.

7.7 COMMUNAL AREAS NOISE EMISSION

It is proposed that the development will consist of residential communal areas throughout, such as outdoor gardens and lap pool. The intended design and usage of these areas are for passive recreational use by residents and are not intended for noise intensive events (e.g. commercial events/parties with amplified music). The anticipated noise emissions from typical residential use, primarily casual conversation, is consistent with normal residential environments which are also expected to generally be masked by the urban and traffic noise in the environment. Additional acoustic treatment is not warranted; however operational recommendations are provided in Section 8.4 to minimise noise impact at surrounding receivers.

7.8 RESIDENTIAL GYM NOISE EMISSION

It is proposed that there will be a gym on Level 5 for residents to use. Due to the potential for high sources of noise from this space, an indicative assessment of noise emission from the operation has been conducted to determine suitable noise mitigation measures where required.

7.8.1 Details and Assumptions

The operational noise assessment of the gym has been conducted based on the following assumptions:

- The average sound pressure level within the gym is 80dB(A), which is representative of an active environment with moderately loud background music being played and is considered conservative for the space
- The gym façade is fixed or closed whilst in use and consists of typical glazing systems (such as 6.38mm laminated glass)

7.8.2 Predicted Noise Levels

The noise generated by the gym has been predicted to the facades of the surrounding noise-sensitive receivers during the nighttime period (being the most noise-sensitive period for residential receivers) and are summarised below in Table 18. Attenuation factors from distance, barriers, etc. have been applied where applicable.

Table 18: Cumulative predicted noise level from residential gym

RECEIVER	PREDICTED NOISE LEVEL dB(A)$L_{Aeq15min}$	PROJECT TRIGGER NOISE LEVEL dB(A)$L_{Aeq15min}$	COMPLIANCE (YES/NO)
RC1	< 30	50	Yes
RC2	< 30	43	Yes
RC3	< 30	43	Yes
RC4	< 30	63	Yes
RC5	< 30	63	Yes
RC6	< 30	48	Yes

Based on the predicted noise levels, the residential gym will be capable of complying with the NPI project noise trigger levels.

8 OPERATIONAL MITIGATION MEASURES

8.1 EXTERNAL SOUND ISOLATION – BUILDING ENVELOPE

8.1.1 Glazed Façade Elements

To simplify the acoustic façade requirements across the development, an acoustic facade type (AFT) has been assigned to typical glazing arrangements in Table 19. A markup of the AFT's on architectural general arrangement plans are provided in Appendix B. The acoustic ratings provided in Table 19 are indicative of the glazing assembly in its entirety (glass and frame).

Table 19: Acoustic façade types & glazing arrangements

ACOUSTIC FAÇADE TYPE	REQUIRED ACOUSTIC RATING ($R_w + C_{tr}$)	TYPICAL EQUIVALENT GLASS
1	29	Single-glazed: 6.38mm laminated glass Double-glazed: 6.38mm / 12mm airgap / 6mm
2	33	Single-glazed: 10.38mm laminated glass Double-glazed: 10.38mm / 12mm airgap / 6mm

The façade recommendations in Table 19 will be refined once the architectural design is progressed into detailed design.

8.1.2 Non-Glazed Façade Elements

In addition to the required glazing systems outlined in Appendix B, the solid/non-glazed elements of the façade for residential accommodation spaces shall be constructed to ensure the resulting internal noise levels within each space in the proposed development do not exceed the project internal noise limits outlined in Section 6.2.

Masonry constructions such as concrete or core-filled blockwork will be satisfactory with no additional acoustic treatment required.

Lightweight constructions are to have an indicative acoustic performance of no less than $R_w + C_{tr}$ 45 to ensure the resulting internal noise levels within each space in the proposed development do not exceed the project internal noise limits outlined in Section 6.2.

8.2 LOADING DOCK

The following general noise mitigation and management procedures are recommended to be integrated into the overall Operational Management Plan for the development:

- Vehicles travel at no faster than 10km/h whilst on the premises
- All service vehicle engines are to be switched off when parked or when unloading goods
- Releasing of airbrakes are to only occur once inside the development's basement levels

8.3 MECHANICAL SERVICES

Mitigation measures for the mechanical plant that are to be considered during the design development stage to ensure compliance with project noise emission criteria are as follows:

- Positioning mechanical plant away from nearby receivers
- Acoustic attenuators fitted to duct work
- Screening around mechanical plant
- Acoustic insulation within duct work
- Absorptive finishes to plant rooms
- Programming reduced capacities during sensitive times (e.g. night time)

In relation to building management units, noise is primarily generated during short hydraulic operations (e.g., launching/parking), occurring infrequently for less than ~10 minutes twice per day. During detailed design, acoustic performance will be managed by specifying maximum allowable noise levels and incorporating mitigation measures such as larger hydraulic pumps, insulated power packs, and acoustic isolation pads to reduce both hydraulic noise and vibration from tracked movement.

It should be noted that the noise reduction requirements will be confirmed and refined once the mechanical plant and equipment selections and design have been progressed further during the detailed design of the proposed development. The mitigation measures proposed at this stage of the development are conservative in nature.

8.4 COMMUNAL AREAS

It is recommended that the following mitigation measures are considered for the outdoor communal spaces (e.g. gardens and lap pool) and may also be incorporated as part of the operational management plan for the development:

- Communal outdoor spaces are restricted to only be accessible between 7am and 10pm to ensure there is no risk of offensive noise to surrounding receivers during the night (10pm to 7am)
- Signage displayed reminding residents to be considerate and minimise noise while the space is in use (i.e. no shouting, restriction on any amplified music, and that the outdoor communal space is not to be used for parties)

9 CONSTRUCTION NOISE ASSESSMENT

It is noted that a detailed construction plan/methodology is not available at this stage and a contractor has not been appointed. As such, the below assessments are indicative and should be further developed as part of a Construction Noise and Vibration Management Sub-Plan.

9.1 PROPOSED CONSTRUCTION ACTIVITIES

At the time of writing, a contractor has not been engaged and a detailed description of work / construction methodology has not been determined. As such, the construction staging has been assumed as follows:

- Bulk excavation and piling
- Civil works after piling (detailed excavation, retention and foundation)
- Structural works (construction, façade, finishes and services).

Similarly, hours of work are also yet to be confirmed. For the purpose of this assessment, we understand that the potential construction hours are as follows:

- Monday to Friday: 7:00am to 6:00pm
- Saturday: 8:00am to 1:00pm
- Sunday and public holidays: no work unless approved via specific applications that are approved for outside of hours work

9.2 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 20. The equipment noise levels have been extracted from AS2436:2010 “Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites”.

Table 20: Cumulative impact – construction equipment noise levels

STAGES	ESTIMATED DURATION	EQUIPMENT	QUANTITY	SOUND POWER LEVEL – dB(A)	ACOUSTICAL USAGE FACTOR (%)	USAGE IN 15-MINUTE PERIOD (MINUTES)	TIME CORRECTED SOUND POWER LEVEL– dB(A) $L_{Aeq,15min}$
Demolition	3 months	Excavator 30 tonne	1	107	40	6	103
		Excavator breaker	1	118	40	6	114
		Bobcat	1	107	40	6	103
		General Truck	1	107	30	4.5	102
Excavation and Civil Works	6 months	Excavator 30 tonne	1	107	40	6	103
		Bobcat	2	107	40	6	103
		General Truck	2	107	30	4.5	102
Structural Works	18 months	Powered hand tool	6	102	50	7.5	99
		Concrete pump truck	1	108	50	7.5	105
		General truck	2	107	30	4.5	102
		Mobile crane	1	104	20	3	97

It is noted that a detailed construction plan/methodology is not available at this stage and a contractor has not been appointed. As such, the above equipment and noise levels are indicative and should be further developed as part of a Construction Noise and Vibration Management Sub-Plan.

9.3 NOISE MODELLING AND ASSUMPTIONS

In order to assess the noise impact from the site during the various construction stages, a desktop noise calculation was prepared and has been conducted generally in accordance with the ICNG calculation procedure. The calculation represents a 'reasonable' worst case noise level as this does not account for shielding attenuation such as from buildings and elevated grounds, and ground absorption.

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

- All construction equipment for each stage are operating simultaneously in an assessed 15-minte period, representing a reasonably worst-case scenario
- All construction equipment for each stage are concentrated near the project boundary closest to the respective receiver, representing a reasonably worst-case scenario
- The predicted noise levels at the receivers have been assessed at a height of 1.5m above ground level in accordance with the assessment procedures of the ICNG
- The noise levels have been assessed using neutral weather conditions

9.4 PREDICTED NOISE LEVELS

The predicted noise levels at surrounding noise-sensitive receivers have been presented in Table 21 to Table 23 and have been assessed to the ICNG construction noise management levels established in Section 6.6, during the ICNG recommended hours of work.

Table 21: Predicted 'worst-case' noise levels at surrounding noise-sensitive receivers (demolition works)

RECEIVER CATCHMENT	PREDICTED NOISE LEVEL RANGE (dBA $L_{Aeq,15min}$)	NOISE MANAGEMENT LEVEL (dBA $L_{Aeq,15min}$)	NOISE MANAGEMENT LEVEL EXCEEDANCE (dBA)	EXCEEDS HIGHLY NOISE AFFECTED LEVEL (YES/NO)
RC1	68-73	65	Up to 8	No
RC2	66-71	60	Up to 11	No
RC3	67-72	60	Up to 12	No
RC4	70-75	70	Up to 5	N/A
RC5	70-75	70	Up to 5	N/A
RC6	70-75	60[1]	Up to 15	N/A

Note 1: The noise management level for residential receiver RC2 and RC3 have been adopted as the ICNG does not specify levels for hotel receivers

Table 22: Predicted 'worst-case' noise levels at surrounding noise-sensitive receivers (excavation and piling works)

RECEIVER CATCHMENT	PREDICTED NOISE LEVEL RANGE (dBA $L_{Aeq,15min}$)	NOISE MANAGEMENT LEVEL (dBA $L_{Aeq,15min}$)	NOISE MANAGEMENT LEVEL EXCEEDANCE (dBA)	EXCEEDS HIGHLY NOISE AFFECTED LEVEL (YES/NO)
RC1	63-68	65	Up to 3	No
RC2	60-65	60	Up to 5	No
RC3	61-66	60	Up to 6	No
RC4	65-70	70	0	N/A
RC5	65-70	70	0	N/A
RC6	64-69	60[1]	Up to 9	N/A

Note 1: The noise management level for residential receiver RC2 and RC3 have been adopted as the ICNG does not specify levels for hotel receivers

Table 23: Predicted 'worst-case' noise levels at surrounding noise-sensitive receivers (structural works)

RECEIVER CATCHMENT	PREDICTED NOISE LEVEL RANGE (dBA $L_{Aeq,15min}$)	NOISE MANAGEMENT LEVEL (dBA $L_{Aeq,15min}$)	NOISE MANAGEMENT LEVEL EXCEEDANCE (dBA)	EXCEEDS HIGHLY NOISE AFFECTED LEVEL (YES/NO)
RC1	64-69	65	Up to 4	No
RC2	61-66	60	Up to 6	No
RC3	62-67	60	Up to 7	No
RC4	67-72	70	Up to 2	N/A
RC5	65-70	70	0	N/A
RC6	65-70	60[1]	Up to 10	N/A

Note 1: The noise management level for residential receiver RC2 and RC3 have been adopted as the ICNG does not specify levels for hotel receivers

10 CONSTRUCTION VIBRATION ASSESSMENT

Vibration intensive activities are typically limited to demolition of structures and excavation works with hydraulic hammers, rock breaking, and percussive methods of piling installation.

The proposed construction activities include bulk excavation using tracked excavators and trucks, and piling works, which are expected to use non-impact methods such as bored piling. While these activities can generate ground vibration, the magnitude and extent of propagation are highly dependent on equipment type, ground conditions, and separation distance.

Safe working distances for vibration intensive plant and are quoted for both "cosmetic" damage (in accordance with BS 7385) and human comfort (in accordance with Assessing Vibration – a technical guideline), have been provided, based on Transport for NSW's "Construction Noise and Vibration Guideline". The recommended safe working distances for each of the plant listed above are provided in Table 24.

Table 24: Recommended safe working distances for vibration intensive plant

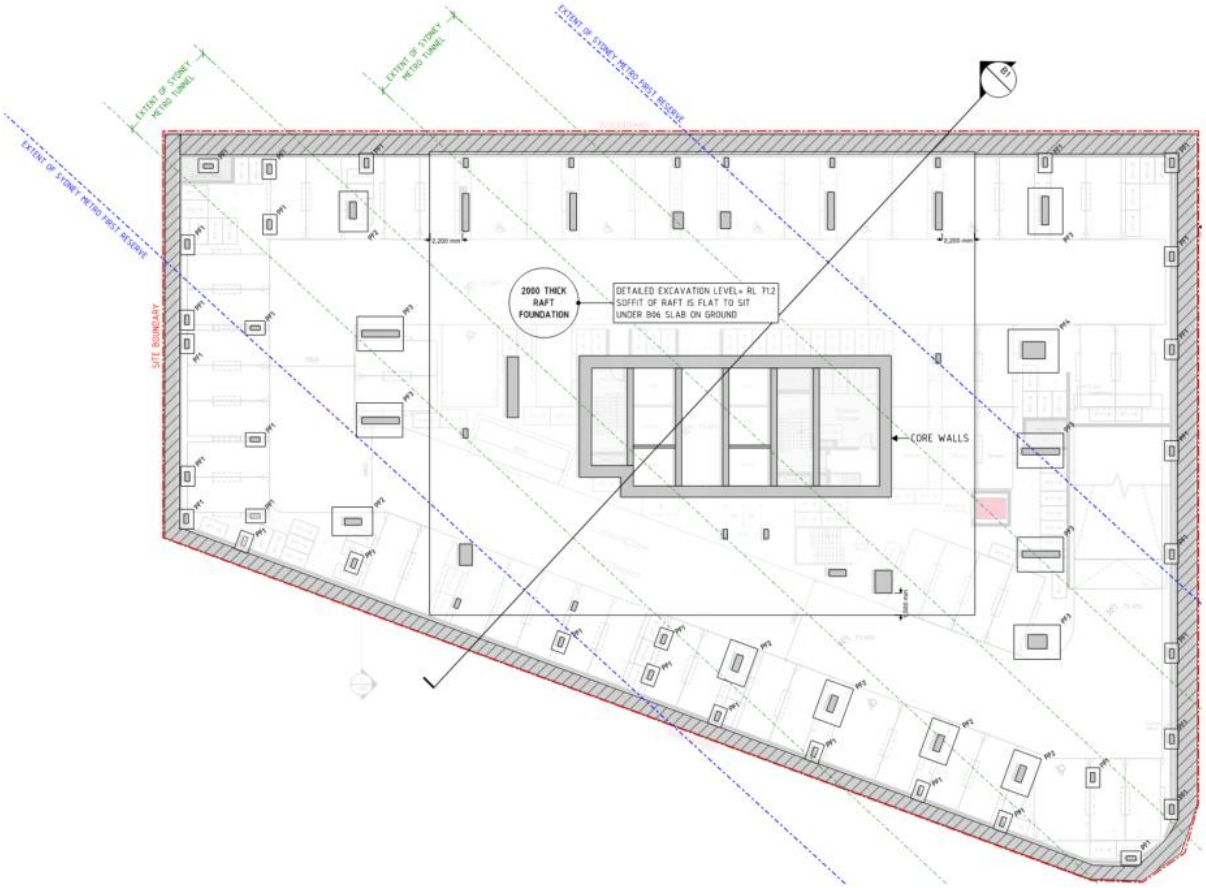
EQUIPMENT	APPROX. SIZE/ WEIGHT/ MODEL	MINIMUM DISTANCE – COSMETIC DAMAGE (BS 7385)	MINIMUM DISTANCE – HUMAN RESPONSE (OH&E VIBRATION GUIDELINE)
Vibratory roller	1-2 tonne	5m	15m to 20m
	2-4 tonne	6m	20m
	4-6 tonne	12m	40m
	7-13 tonne	15m	100m
	13-18 tonne	20m	100m
	> 18 tonne	25m	100m
Small hydraulic hammer	300 kg (5 to 12t excavator)	2m	7m
Medium hydraulic hammer	900 kg (12 – 18t excavator)	7m	23m
Large hydraulic hammer	1600 kg (18 to 34t excavator)	22m	73m
Pile driver – vibratory	Sheet piles	2m to 20m	20m
Piling rig – bored	≤ 800mm	2m (nominal)	N/A
Piling rig – hammer	12t down force	15m	50m
Jackhammer	Handheld	1m (nominal)	Avoid contact with structure

The closest vibration sensitive receivers are considered to be the adjacent existing commercial properties (RC5). Once a construction method is determined at time of head contractor appointment, it is recommended that the contractor engage a specialist to undertake attended vibration measurements at the commencement of work in order to verify the safe working distances.

If the levels are compliant with the vibration limits as listed in Section 6.7, then work may proceed based on the implementation of the measures detailed in this report. If there are exceedances, reasonable and feasible mitigation measures and additional vibration monitoring should be conducted.

Further to above, it is understood that Sydney Metro tunnels exist below the project site which will require special consideration (see Figure 3 for Metro tunnel locations). As per the Sydney Metro Underground Corridor Protection Technical Guideline, vibration monitoring shall be undertaken where the development is considered to be a 'Medium' or 'High' risk level (refer to Table 6.1 of the Sydney Metro Underground Corridor Protection Technical Guideline). Measures to prevent cosmetic damage to surrounding structures are provided in Section 11 and a vibration monitoring strategy has been provided in Section 11.3.

Figure 3: Indicative location of Sydney Metro tunnels (green and blue dotted lines) as extracted from the Structural Drawings for Sydney Metro prepared by BG&E



11 CONSTRUCTION NOISE AND VIBRATION MANAGEMENT

It is noted that a detailed construction plan/methodology is not available at this stage and a contractor has not been appointed. As such, the below recommendations and mitigation measures are indicative and should be further developed as part of a Construction Noise and Vibration Management Sub-Plan.

11.1 PROJECT SPECIFIC RECOMMENDATIONS

11.1.1 Noise

It is predicted that noise levels are expected to be exceeding the "noise affected" management levels at surrounding receivers throughout the stages of construction, namely due to the proximity of receivers and their line of sight to the project site. Having said this, the "highly noise affected" level is not expected to be exceeded.

These predicted noise levels (and exceedances) are considered to be a worst-case scenario without any corrections for shielding or directivity and with all equipment operation simultaneously in a 15-minute period. Noise levels at surrounding sensitive receivers can be expected to be less than those presented in Section 9.4, when works are not occurring simultaneously, when works are further away from the project site boundary, if a solid hoarding is implemented around the boundary, and if works occur internally within the building shell.

Furthermore, it is noted that this is an indicative assessment for a worst-case scenario and shall be refined as part of a Construction Noise and Vibration Management Sub-Plan once detailed construction plan/methodologies are available.

Notwithstanding the above, the following noise mitigation strategies are recommended to protect the amenity of surrounding noise-sensitive receivers during highly concentrated and loud activities:

- At least a one-hour respite period, for example between 12:00pm – 1:00pm (or other period to coincide with construction workers lunch time(s)), should be offered per day during the most intensive periods of noisy activities. Limiting these activities outside of sensitive hours (e.g. no noisy works, such as piling, between 7:00am – 8:00am on weekdays) should also be considered
- Frequent and proactive communication with surrounding residents and neighbours is also encouraged and a Community Consultation Strategy should be developed by the contractor. This will allow occupants of surrounding residents to arrange their schedules to accommodate possible noise sensitive activities (like online meetings and conferencing). More details regarding communication with the community can be found in Section 11.2.3
- For exceedances of less than 3dB(A), careful selection and maintenance of plant equipment will ensure that disruptions to adjacent receivers are minimised.

11.1.2 Vibration

It is expected that the main vibration inducing activities could be from bored piling or rock/slab breaking and other activities are generally considered to not be highly vibration intensive activities. It is recommended that the contractor engage a specialist to undertake attended vibration measurements at the commencement of work in order to verify the safe working distances.

If the levels are compliant with the vibration limits as listed in Section 6.7, then work may proceed based on the implementation of the measures detailed in this report. If there are exceedances, reasonable and feasible mitigation measures and additional vibration monitoring should be conducted. Measures to prevent cosmetic damage to surrounding structures are provided in Section 11 and a vibration monitoring strategy has been provided in Section 11.3.4.

Upon any complaints from surrounding residents, the following shall be undertaken:

- Vibration monitoring is recommended to be conducted at surrounding sensitive receivers (or at the location of complaint) in accordance with the monitoring program strategy proposed in Section 11.3
- Reasonable and feasible measures should be considered to lessen the impact, such as alternative methods or equipment for activities which are causing complaints to achieve the vibration levels required

To further diminish the vibration impact, the one-hour respite period, for example between 12:00pm – 1:00pm (or other period to coincide with construction workers lunch time(s)), recommended for noise mitigation shall also apply for vibration mitigation.

We recommend that dilapidation reports be prepared on surrounding sensitive receivers and buildings which will be in close proximity to heavy machinery. Guidance for this may be provided by the geotechnical engineer and controlled by ground composition.

11.2 GENERAL ACOUSTIC RECOMMENDATIONS

According to AS 2436 the following techniques could be applied to minimize the spread of noise and vibrations to the potential receivers.

11.2.1 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. 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 site office transportables can be effective barriers).
- Constructing barriers that are part of the project design early in the project to introduce the mitigation of site noise.
- Installing purpose-built noise barriers, acoustic sheds and enclosures.

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. A few of these methods have been introduced below.

Screening

Hoarding: Another way of implementing screening is to build hoarding that includes a site office on an elevated structure. This option offers superior noise reduction when compared with a standard, simple hoarding. The acoustic performance is further enhanced when the hoarding is a continuous barrier.

General remarks: In many cases, it is not practical to screen earthmoving operations effectively, but it may be possible to partially shield a construction plant at the early stages of the project with protective features required to screen traffic noise.

The usefulness of a noise barrier will depend upon its length, its height, its position relative to the source and the receiver, and the material of which it is made. A barrier designed to reduce noise from a moving source should extend beyond the last property to be protected by at least ten times the shortest distance from the said property to the barrier. A barrier designed to reduce noise from a stationary source should, where possible, extend beyond the direct line of sight between the noise source and the receiver by 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 already predominantly located within nominally closed structures, careful consideration should be given to reducing noise breakout at any openings.

Cranes

For the early works construction phases, any cranage will be limited to mobile cranes where the engines are typically enclosed in an acoustically treated housing.

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 (and combined where 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.
- 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.
- Spotters or observers.

Selection of Alternate Equipment

As part of the Contractor's Construction Methodology and Construction Management Plan, the noise and vibration impact of each equipment / machinery should be considered. Where feasible and practical, quieter equipment (lower Sound Power Level) shall be selected for the task. The Contractor can review the manufacturer's equipment sound data or utilise AS2436 and the TfNSW CNS as guides in understanding what the typical Sound Power Levels are for alternative types of machinery.

Attended short-term noise measurements can also be conducted to either compare the noise levels of machinery, or to understand what the noise level at surrounding noise sensitive receivers are.

The same consideration shall be taken for vibration intensive machinery, which are expected to be only rock hammering and piling. Where feasible and practical, less vibration intensive equipment shall be selected for the task such as favouring pulverising and sawing methods rather than hydraulic hammering for rock breaking.

As with noise, attended short-term vibration measurements can be conducted at start of vibration intensive works to ensure vibration criteria (see Section 6.7) at surrounding receivers are not exceeded.

As a guide, the Contractor can also refer to AS2436 and the TfNSW CNS to use as a guide in understanding vibration intensive activities and their alternate methods, based on minimum working distances.

Machinery shall be selected based on the noise criteria and vibration criteria as presented in Section 6.6 and 6.7.

11.2.2 Vibration

Vibration can be more difficult to control than noise, and there are few generalizations that can be made about its control. It should be kept in mind that vibration may cause disturbance by causing structures to vibrate and radiate noise in addition to perceptible movement.

Impulsive vibration can, in some cases, provide a trigger mechanism that could result in the failure of building components that had previously been in a stable state. Vibrations can also trigger annoyance, which might get elevated into action by occupants of exposed buildings and should therefore be included in the planning of communication with impacted communities.

It should be remembered that failures, sometimes catastrophic, can occur as a result of conditions not directly connected with the transmission of vibrations, e.g. the removal of supports from retaining structures to facilitate site access. BS 7385-2 provides more information on managing ground-borne vibration and its potential effects on buildings. Where site activities may affect existing structures, a thorough engineering appraisal should be made at the planning stage.

General principles of seeking minimal vibration at receiving structures should be followed in the first instance. Predictions of vibration levels likely to occur at sensitive receivers are recommended when they are relatively

close, depending on the magnitude of the source of the vibration or the distance associated. Relatively simple prediction methods are available in textbooks, codes of practice and standards, however, it is preferable to assess site transmission and propagation characteristics between source and receiver locations through measurements.

Guidance for measures available for the mitigation of vibration transmitted can be sought in more detailed standards, such as BS 5228-2 or policy documents, such as the NSW DEC *Assessing Vibration: A technical guideline*. Identifying the strategy best suited to the control of vibration follows a similar approach to that of noise: avoidance, control at the source, control along the propagation path, control at the receiver, or a combination of these. It is noted that vibration sources can include stationary plants (pumps and compressors), portable plants (jackhammers and pavement vibrators), mobile plants, pile-drivers, tunnelling machines and activities, and blasting, amongst others. Unusual ground conditions, such as a high water-table, can also cause a difference to expected or predicted results, especially when considering the noise propagated from piling.

11.2.3 Community Consultation to be Undertaken

The builder shall directly contact adjacent noise sensitive receivers and provide them with the following information:

- The contact details for a nominated representative in order to make noise / vibration complaints
- Explain the timeframe for the construction works and the proposed activities, i.e. the proposed start / stop dates of work and a description of the noise producing equipment that will be used
- Notify the noise sensitive receivers and relevant local / state authority in a timely manner should there be any need for an extension to the proposed arrangements
- Provide them with a copy of this report as approved by the relevant local / state authority
- Where noise is demonstrated as being compliant with criteria, this should not limit the proponent in undertaking further additional reasonable and feasible steps to reduce noise emissions.

11.2.4 Complaint Handling Procedures and Community Liaison

To assist in the management of noise and vibration complaints various procedures are to be followed. These include:

- Clearly visible signage identifying any key personnel along with their contact details to be erected along the perimeter of the building site including:
    - A 24-hour contact name, phone number and email address provided for the resident to address any complaint. The signage will declare; “For any enquiry, complaint or emergency relating to this site at any time please contact…”
- Give complaints a fair hearing
- Relevant local / state authority should be notified of the nature and details of complaints received (time, complainant etc.) and what remedial action has taken place, if any
- Have a documented complaints process, including an escalation procedure so that if a complaint is not satisfied there is a clear path to follow
- Call back as soon as possible to keep people informed of action to be taken to address noise problems. Call back at night time only if requested by the complainant to avoid further disturbance
- Implement all feasible and reasonable measures to address the source of the complaint
- A register is to be kept by the contractor to keep a record of complaints and detail any information associated with them. The contents of the register will include:
    - The name and the address of the complainant
    - Time and date of the complaint
    - The nature of the complaint (Noise/Vibration)
    - Subsequent details

- Remedial action undertaken

The contents of the register will be maintained and updated on a monthly basis with any new complaint without delay. The complaints will be reported to both the relevant local / state authority and the Contractor. The investigation of the complaint and any remedial actions will be performed by the builder and/or client representative on a monthly basis. In the event of noisy works scheduled, the builder will notify residents 5 business days in advance.

11.3 NOISE & VIBRATION MONITORING STRATEGY

11.3.1 General Methodology

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
- Long-term monitoring

Both of these approaches are elaborated below.

11.3.2 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, telling them when the noise and vibration criteria are exceeded. Thus, the selection of alternative method on construction or equipment selection is allowed in order to minimise noise and vibration impacts.

Short-term monitoring may also be undertaken prior to start of works to ensure noise levels emitted from machinery and equipment are within the manufacturer's tested data / tolerance. This check can be implemented periodically throughout the construction program as a maintenance routine to ensure machinery and equipment stay within the manufacturer's data / tolerance and are not faulty.

11.3.3 Long-term Monitoring

Similarly, to short-term monitoring, long-term monitoring provides real-time alerts to the builder / site manager when the noise and vibration criteria are exceeded. Instead of someone being on site measuring, noise and vibration loggers are used.

Typically, the noise and vibration loggers stay on site for a period of several months for the critical construction stages of the project, such as the demolition and excavation phases.

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.

Long-term noise monitoring reports shall be prepared and presented in accordance with the recommendations of the NSW ICNG (Section 8.2 of the ICNG).

11.3.4 Proposed Monitoring Programme

A monitoring programme is recommended to be carried out as part of a Construction Noise and Vibration Management Sub-Plan, once construction plans/methodologies are available and a contractor is appointed.

The monitoring programme is to be carried out during the most noise/vibration inducing periods during each construction phase as agreed with the Acoustic Engineer, the Contractor, other relevant consultants and in accordance with any conditions of consent. Locations shall be agreed prior to start of works and shall be reviewed regularly as construction works progress.

Noise/vibration loggers are to be capable of programming trigger levels and sending automatic alerts via emails/SMS once levels are exceeded.

The following vibration monitoring procedures will be followed by personnel suitably qualified and experienced in undertaking vibration measurements. Vibration measurements shall be carried out in accordance with Section 5 – Methods of Noise and Vibration Measurement of AS 2436-2010.

Vibration monitors will include tri-axial vibration sensors measuring over a frequency range from 1 to 500 Hz, in accordance with DIN 4150. The sensors will be mounted in general accordance with Australian Standard AS 2775-2004 Mechanical vibration and shock – Mechanical mounting of accelerometers.

Monitoring locations can be undertaken as a staged approach depending on the location of construction activities respective to receiver locations. Exact locations for all monitors will be agreed upon with the Acoustic Engineer, other relevant Consultants, the Contractor and property owners/tenants.

11.3.5 Metro Infrastructure Specific Monitoring

For construction works with potential noise and vibration impacts to Metro infrastructure, detailed pre-construction phase monitoring plans will be developed once construction level plans and methodologies are available and a contractor is appointed. These plans will be coordinated by all relevant consultants and approved by Sydney Metro. They may be staged to suit different stages of construction including demolition, bulk excavation and main construction works.

Noise and vibration monitoring methodologies, monitoring levels, alert trigger levels and escalation procedures have been established and proposed in the project specific Sydney Metro Tunnel Geotechnical Monitoring Plan prepared by Douglas Partners.

12 CONCLUSION

This Noise and Vibration Impact Assessment has been prepared by E-LAB Consulting and is submitted to the Department of Planning, Housing and Infrastructure (DPHI) in support of a State Significant Development Application (SSDA) (SSD-85848713) and concurrent rezoning proposal for a new mixed-use development at 601 Pacific Highway, St Leonards (the site).

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

- Airborne noise intrusion to the development's habitable areas from surrounding roads
- Vibration impact to the development's habitable areas from the below Metro corridor
- Noise emissions associated with carparking and service vehicle activities
- Noise emissions associated with retail and commercial tenancies
- Noise emission from mechanical plant and equipment serving the development
- Noise emissions associated with residential communal spaces
- Noise emission from the residential cinema room
- Noise emission from the residential gym

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

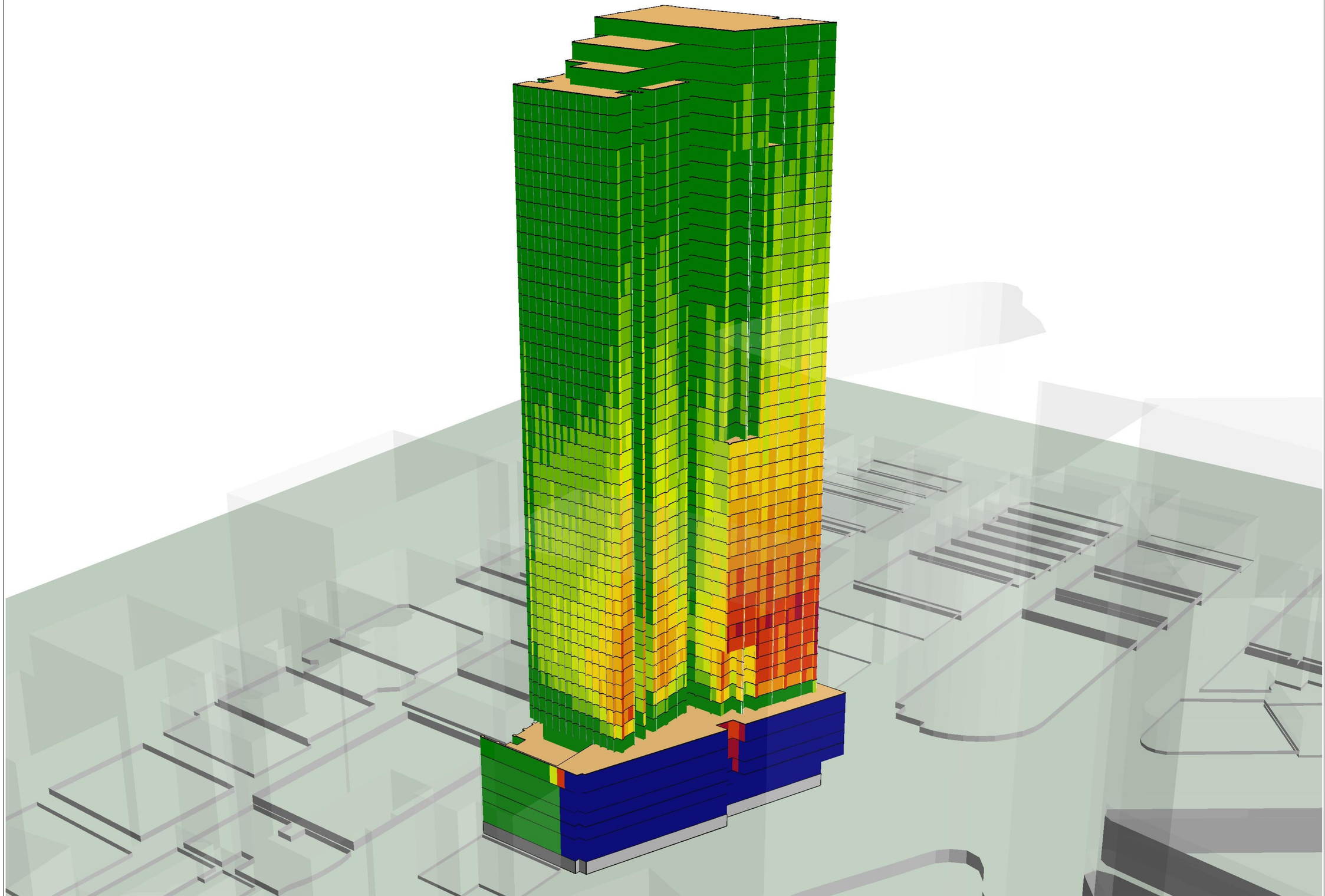
To assess each of the acoustic considerations for the proposed redevelopment, noise and vibration criteria has been established in Section 6 in accordance with the following documents:

- NSW EPA's Noise Policy for Industry 2017, dated October 2017 (NPI)
- NSW EPA's Road Noise Policy, dated March 2011 (RNP)
- NSW's State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP 2021)
- NSW EPA's Development Near Rail Corridors and Busy Roads – Interim Guideline, dated December 2008 (Interim Guideline)
- NSW EPA's Interim Construction Noise Guideline, dated July 2009 (ICNG)
- Assessing vibration: A Technical Guideline 2006 (AVTG)
- 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"
- AS 1055:2018 - "Acoustics – Description and measurement of environmental noise"
- Sydney Metro Underground Corridor Protection Technical Guidelines, dated July 2025

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 approved on the basis of noise and vibration, under the implementation of the mitigation measures outlined within the report.

Appendix A **Façade Noise Levels**



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	21/10/2025	FOR INFORMATION
2	31/10/2025	FOR INFORMATION
3	06/11/2025	FOR INFORMATION
4	09/03/2026	FOR SSDA

LEGEND

Daytime Facade Noise Level, $L_{Aeq,15hour}$ dB(A)

- ≤ 60
- 60-61
- 61-62
- 62-63
- 63-64
- 64-65
- 65-66
- 66-67
- 67-68
- ≥ 68

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATES SMART ARCHITECTS

CLIENT
STOCKLAND

SCALE
NTS

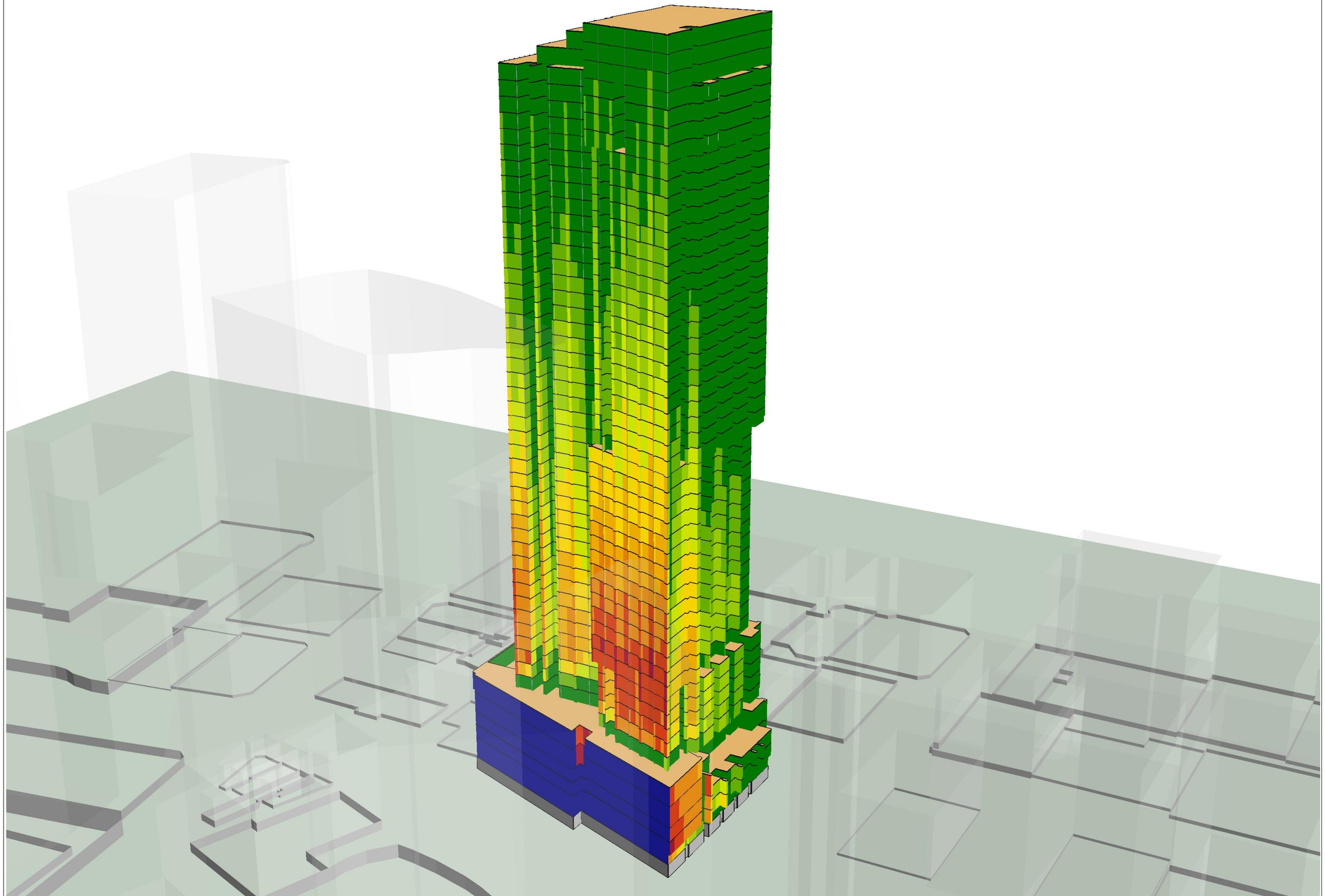
STATUS
FOR SSDA

DRAWING
FACADE NOISE LEVELS - DAYTIME
VIEW 1

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
AC-DWG-100-01-01

REVISION
004



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4	09/03/2026	FOR SSDA

LEGEND

Daytime Facade Noise Level, $L_{Aeq,15hour}$ dB(A)

- ≤ 60
- 60-61
- 61-62
- 62-63
- 63-64
- 64-65
- 65-66
- 66-67
- 67-68
- ≥ 68

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PROJECT NO.
P02572

ARCHITECT
BATES SMART ARCHITECTS

CLIENT
STOCKLAND

SCALE
NTS

STATUS
FOR SSDA

DRAWING
FACADE NOISE LEVELS - DAYTIME
VIEW 2

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
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REVISION
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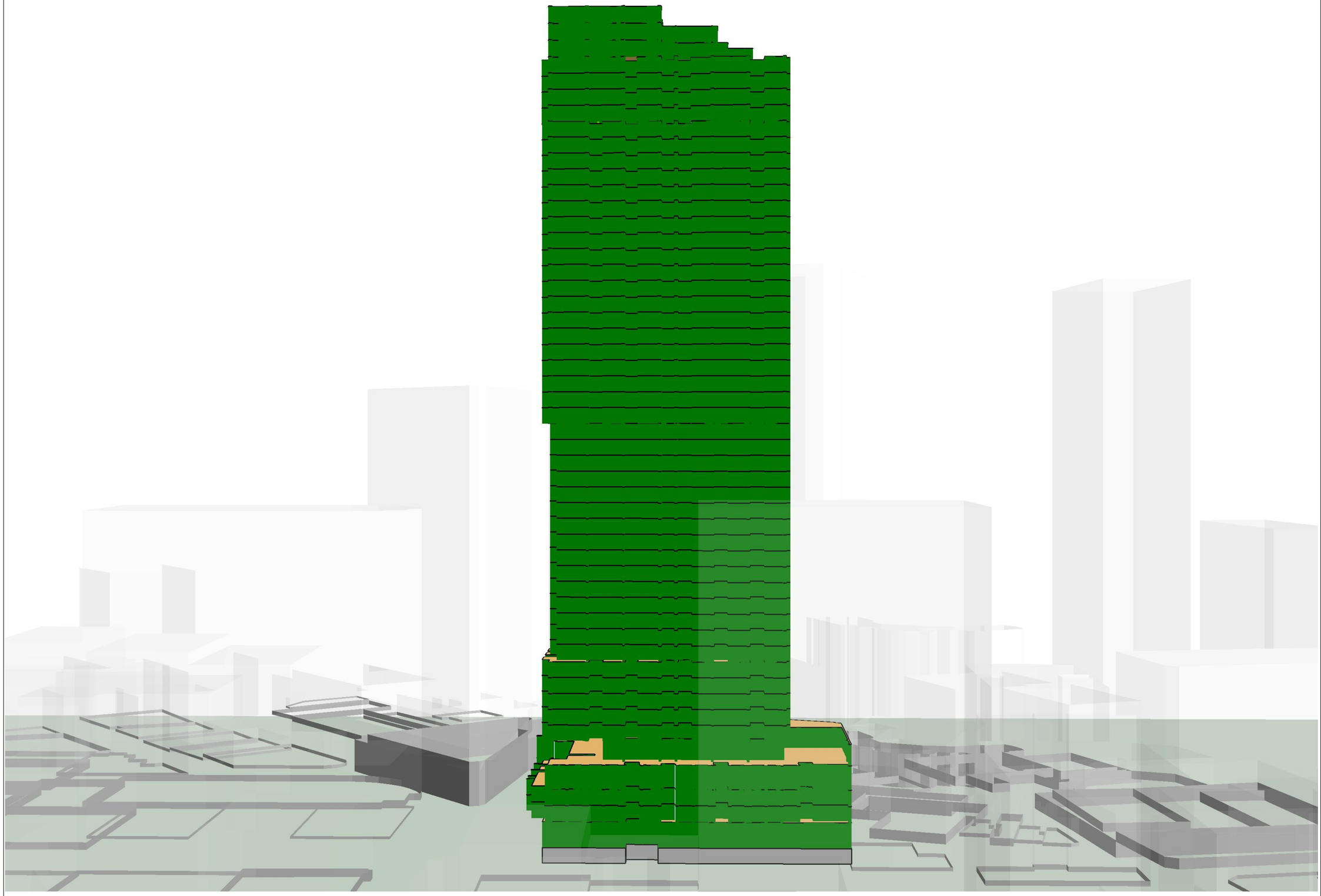

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3	06/11/2025	FOR INFORMATION
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LEGEND

Daytime Facade Noise Level, $L_{Aeq,15hour}$ dB(A)

- ≤ 60
- 60-61
- 61-62
- 62-63
- 63-64
- 64-65
- 65-66
- 66-67
- 67-68
- ≥ 68

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATES SMART ARCHITECTS

CLIENT
STOCKLAND

SCALE
NTS

STATUS
FOR SSDA

DRAWING
FACADE NOISE LEVELS - DAYTIME
VIEW 3

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
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REVISION
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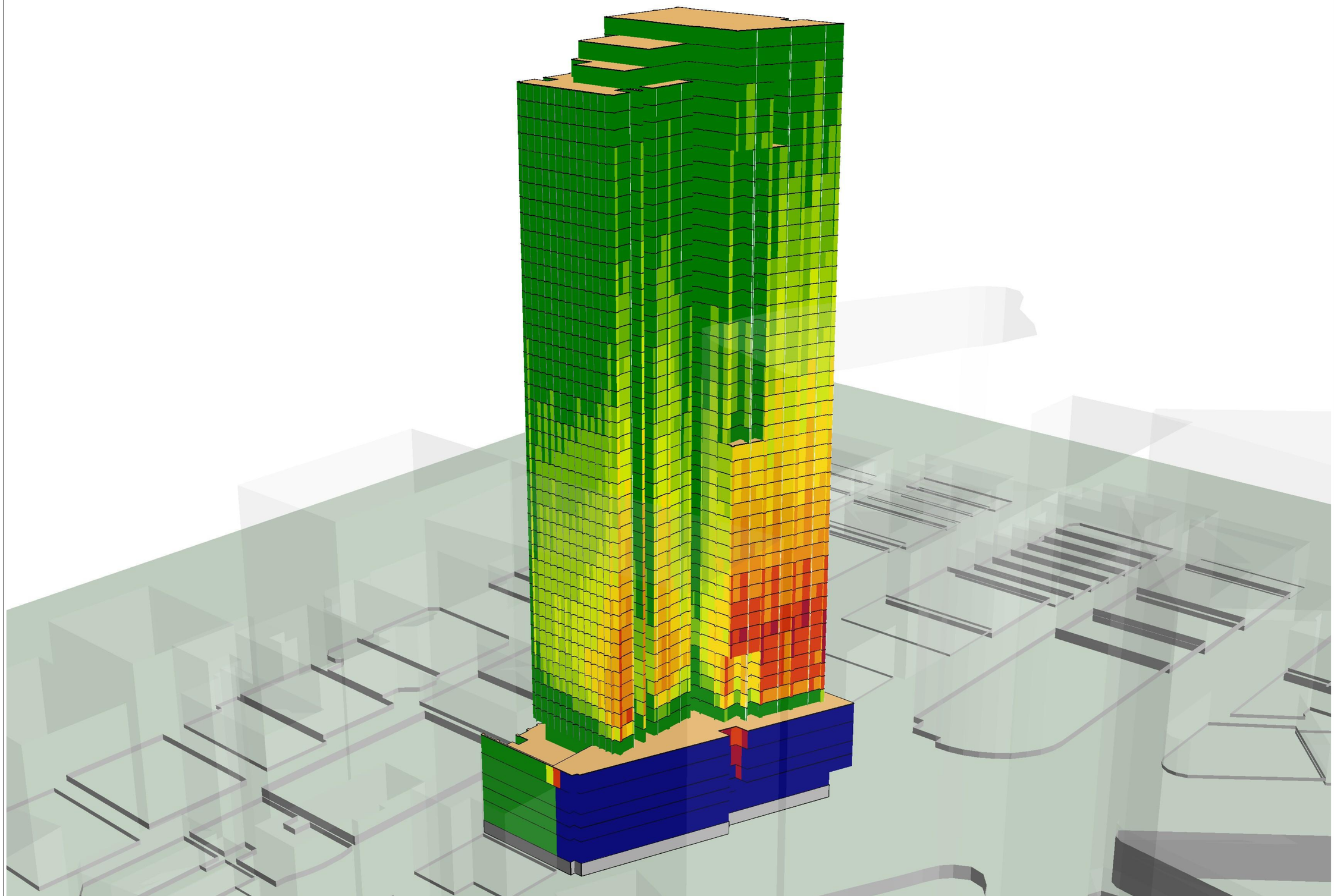

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1	21/10/2025	FOR INFORMATION
2	31/10/2025	FOR INFORMATION
3	06/11/2025	FOR INFORMATION
4	09/03/2026	FOR SSDA

LEGEND

Night Time Facade Noise Level, $L_{Aeq,9hour}$ dB(A)

- ≤ 55
- 55-56
- 56-57
- 57-58
- 58-59
- 59-60
- 60-61
- 61-62
- 62-63
- ≥ 63

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATES SMART ARCHITECTS

CLIENT
STOCKLAND

SCALE
NTS

STATUS
FOR SSDA

DRAWING
FACADE NOISE LEVELS - NIGHT TIME
VIEW 1

DISCIPLINE
ACOUSTICS AND VIBRATION

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REVISION
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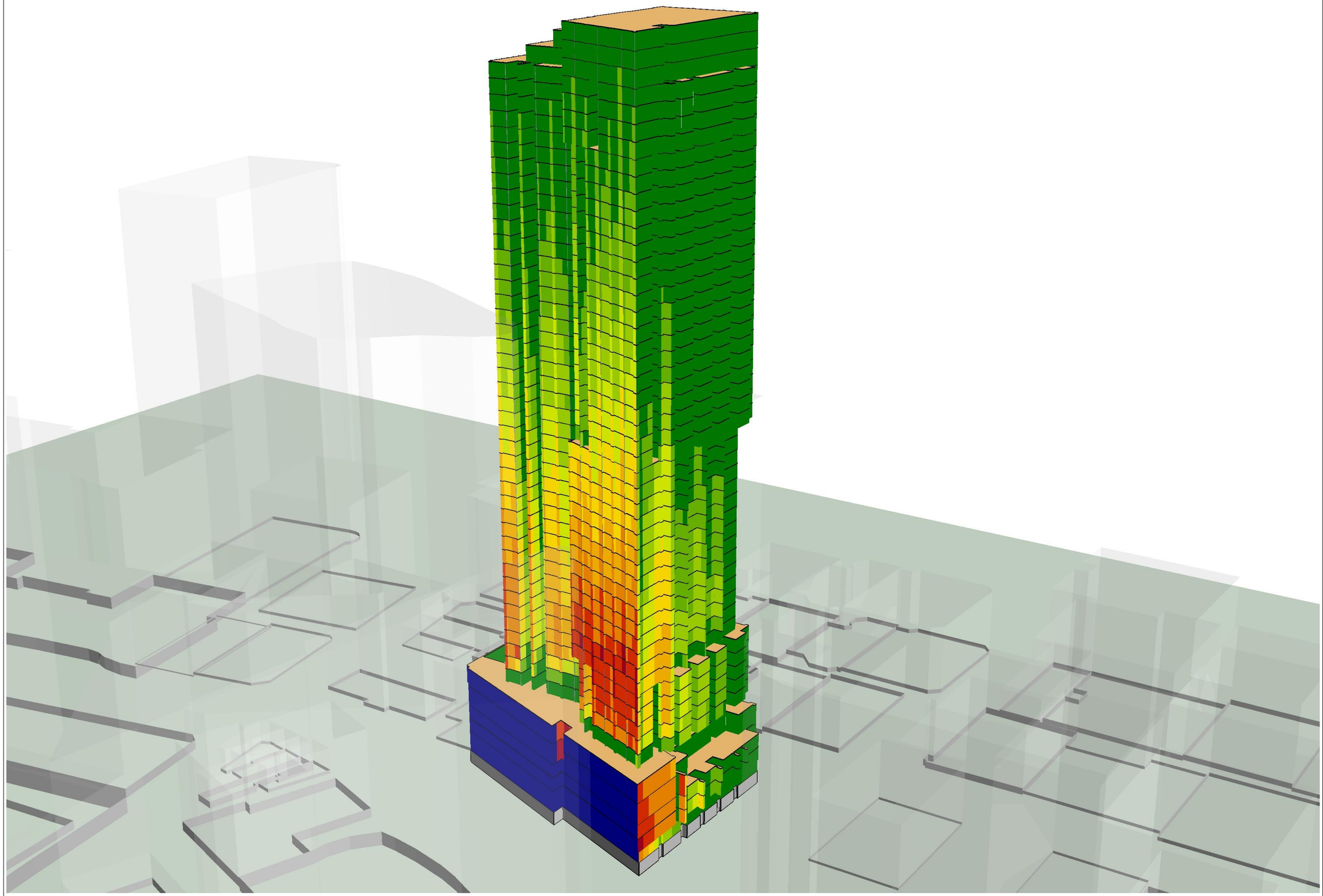

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3	06/11/2025	FOR INFORMATION
4	09/03/2026	FOR SSDA

LEGEND

Night Time Facade Noise Level, $L_{Aeq,9hour}$ dB(A)

- ≤ 55
- 55-56
- 56-57
- 57-58
- 58-59
- 59-60
- 60-61
- 61-62
- 62-63
- ≥ 63

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATES SMART ARCHITECTS

CLIENT
STOCKLAND

SCALE
NTS

STATUS
FOR SSDA

DRAWING
FACADE NOISE LEVELS - NIGHT TIME
VIEW 2

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
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REVISION
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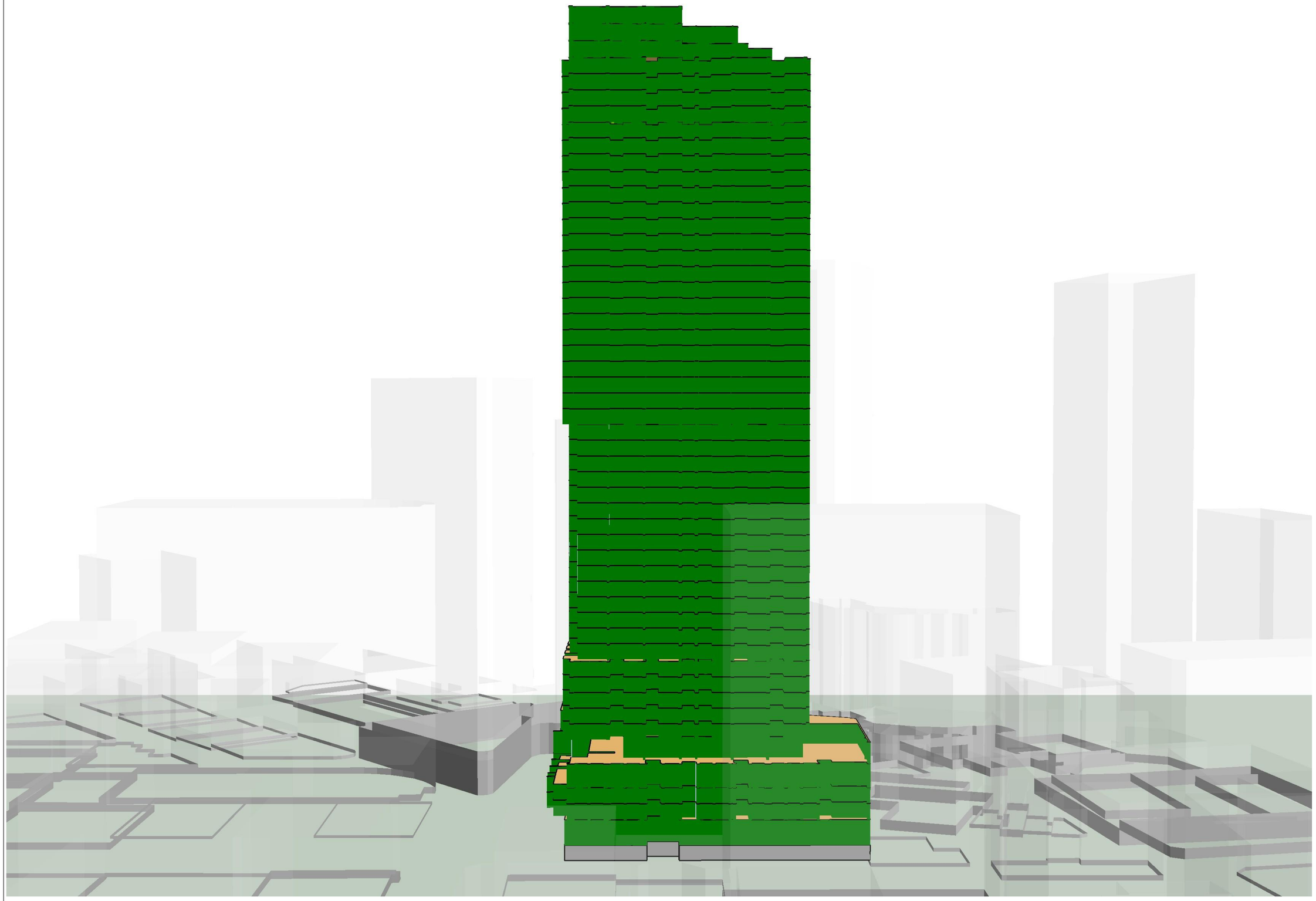

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3	06/11/2025	FOR INFORMATION
4	09/03/2026	FOR SSDA

LEGEND

Night Time Facade Noise Level, $L_{Aeq,9hour}$ dB(A)

- ≤ 55
- 55-56
- 56-57
- 57-58
- 58-59
- 59-60
- 60-61
- 61-62
- 62-63
- ≥ 63

NOTES

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601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATES SMART ARCHITECTS

CLIENT
STOCKLAND

SCALE
NTS

STATUS
FOR SSDA

DRAWING
FACADE NOISE LEVELS - NIGHT TIME
VIEW 3

DISCIPLINE
ACOUSTICS AND VIBRATION

DRAWING NUMBER
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REVISION
004

Appendix B **Acoustic Façade Types**

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 2

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-02

REVISION
001

E-LAB CONSULTING

ISSUE	DATE	STATUS
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LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 3

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
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REVISION
001

E-LAB CONSULTING

ISSUE	DATE	STATUS
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LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 4

DISCIPLINE
ACOUSTICS

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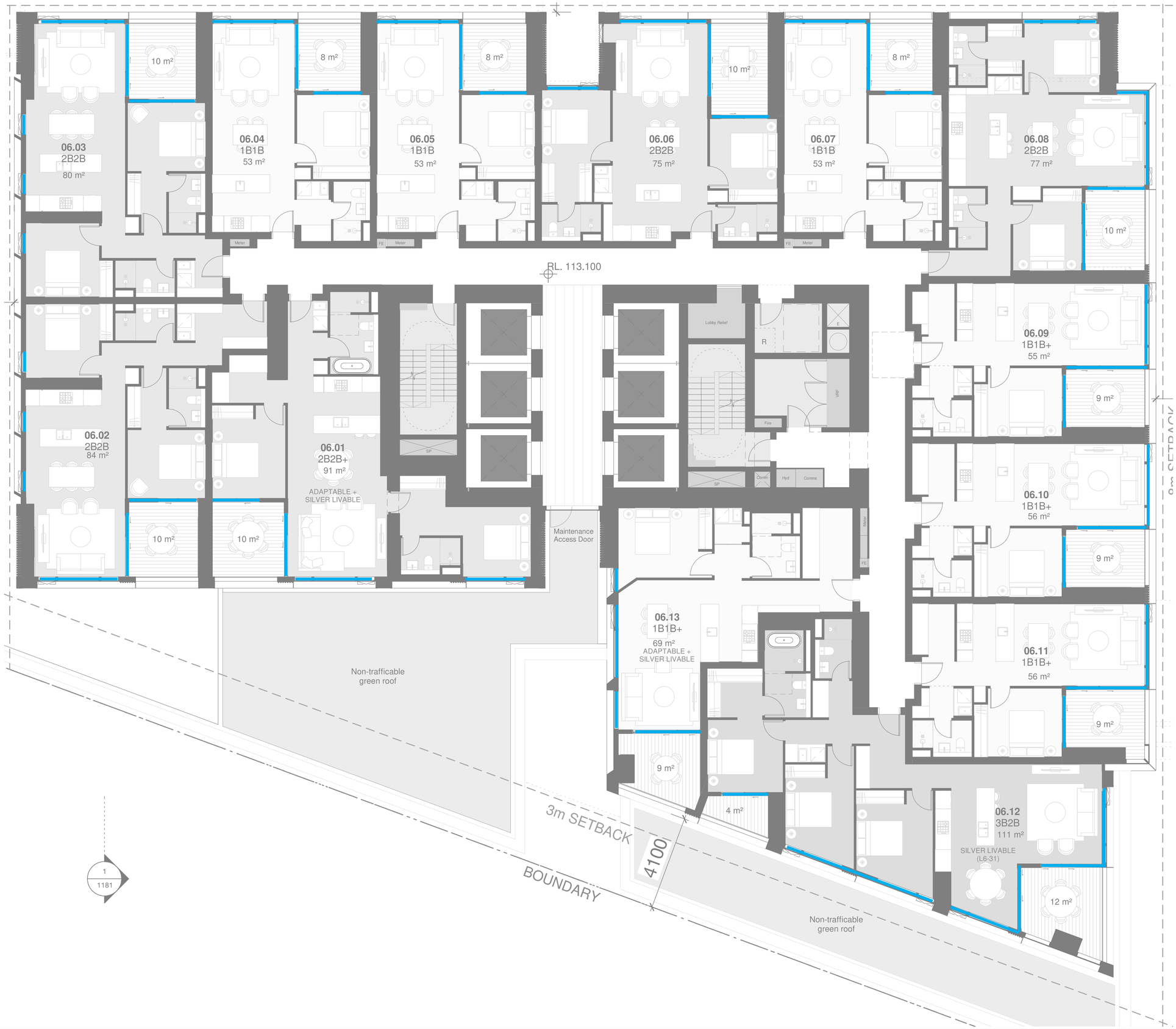

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 6

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-06

REVISION
001

E-LAB CONSULTING

ISSUE	DATE	STATUS
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LEGEND

- Acoustic Facade Type 1
- Acoustic Facade Type 2

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVELS 7 - 24

DISCIPLINE
ACOUSTICS

DRAWING NUMBER	REVISION
ELAB-AC-DWG-300-01-07	001

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

- Acoustic Facade Type 1
- Acoustic Facade Type 2

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 25

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
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REVISION
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E-LAB CONSULTING

ISSUE	DATE	STATUS
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LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVELS 26 - 32

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-26

REVISION
001

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 33

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-33

REVISION
001

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

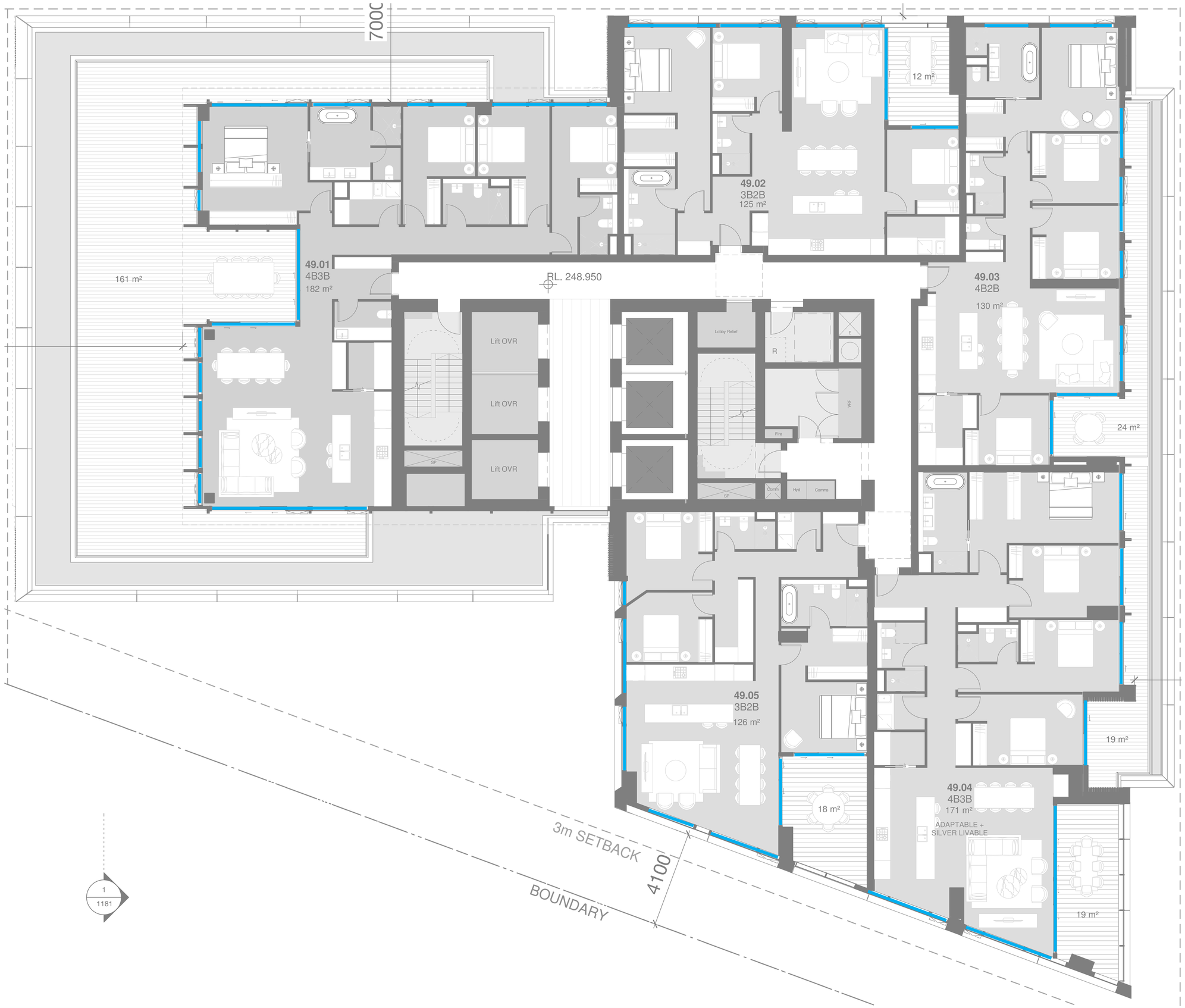
STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVELS 34 - 48

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-34

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

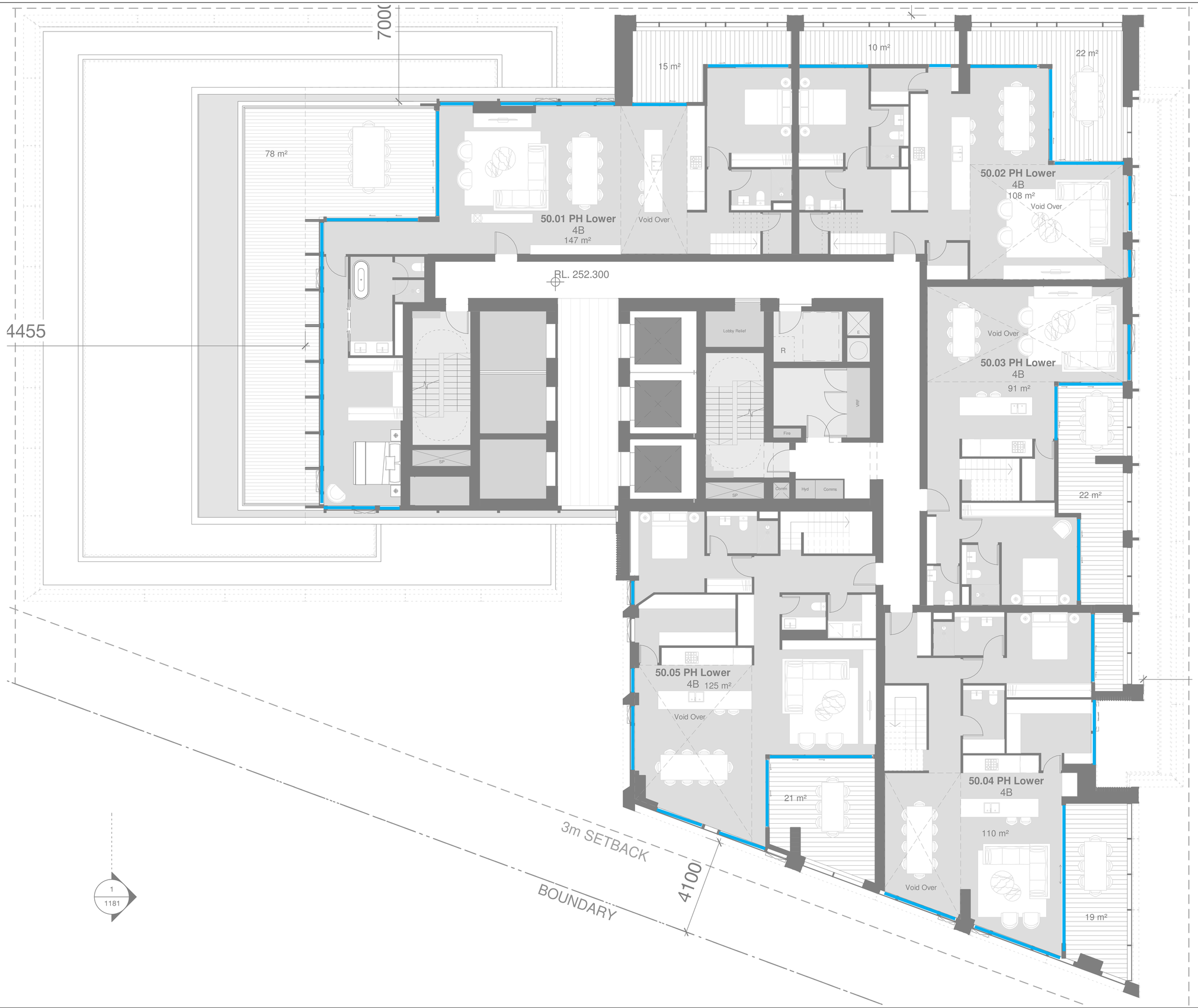
STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 49

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-49

REVISION
001



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 50

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-50

REVISION
001

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA

LEGEND

Acoustic Facade Type 1

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ACOUSTIC FACADE TYPES
LEVEL 51

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-300-01-51

REVISION
001

Appendix C **Alternate Means of Ventilation Areas**

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION LEVEL 7

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-07

REVISION
002

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 8

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-08

REVISION
002

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVELS 9 - 17

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-09

REVISION
002

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 18

DISCIPLINE
ACOUSTICS

DRAWING NUMBER	REVISION
ELAB-AC-DWG-200-01-18	002

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 19

DISCIPLINE
ACOUSTICS

DRAWING NUMBER	REVISION
ELAB-AC-DWG-200-01-19	002

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 20

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-20

REVISION
002

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVELS 21 - 23

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-21

REVISION
002

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVELS 24 - 27

DISCIPLINE
ACOUSTICS

DRAWING NUMBER	REVISION
ELAB-AC-DWG-200-01-24	002

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 28

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-28

REVISION
002

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 29

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-29

REVISION
002

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 30

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-30

REVISION
002

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVELS 31 - 32

DISCIPLINE
ACOUSTICS

DRAWING NUMBER	REVISION
ELAB-AC-DWG-200-01-31	002

E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

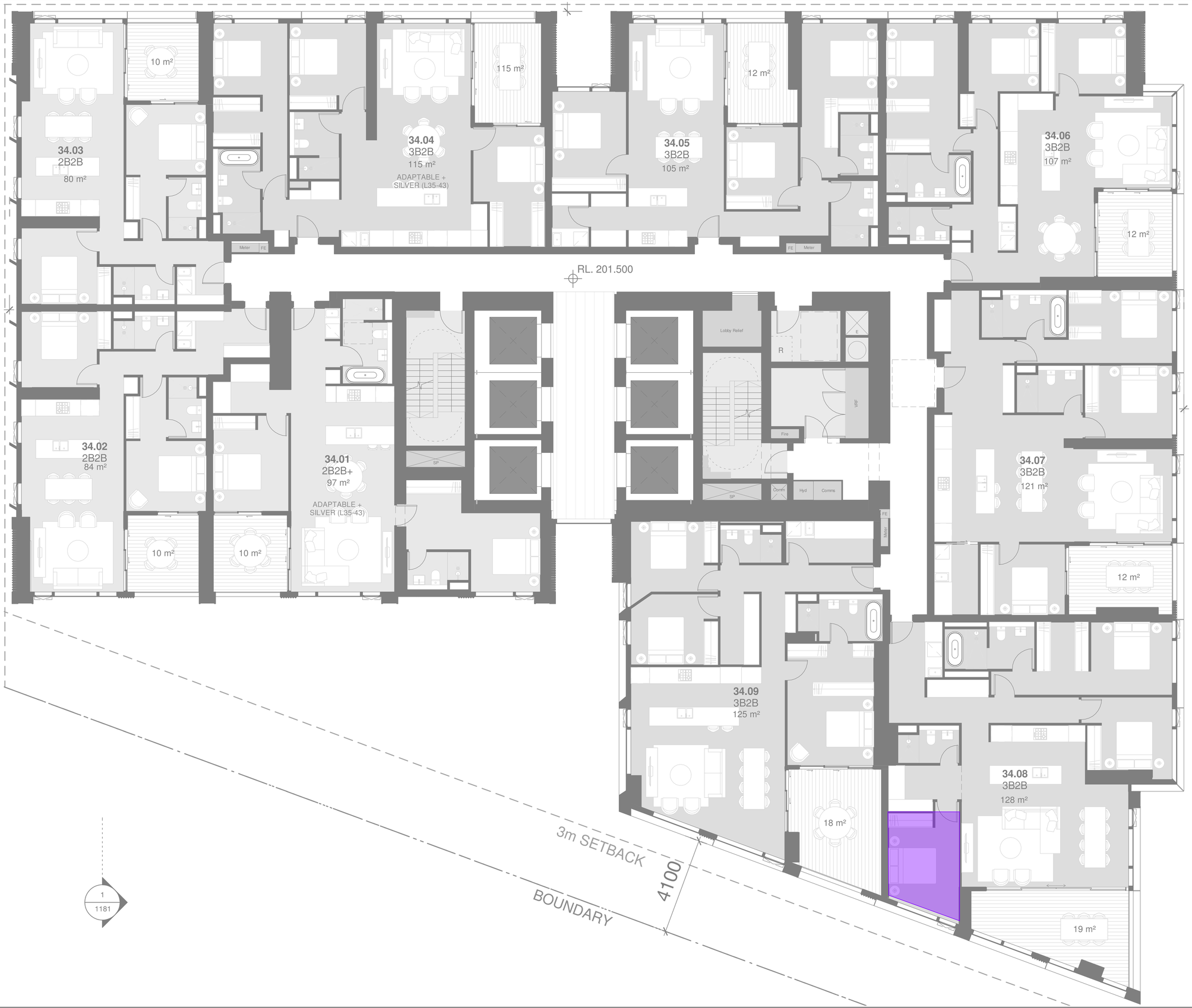
STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVEL 33

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-33

REVISION
002



E-LAB CONSULTING

ISSUE	DATE	STATUS
1	09/03/2026	FOR SSDA
2	18/03/2026	FOR SSDA

LEGEND

Designates residential rooms that require an alternate means of ventilation (e.g. mechanical ventilation)

NOTES

PROJECT
601 PACIFIC HIGHWAY, ST LEONARDS

PROJECT NO.
P02572

ARCHITECT
BATESSMART

CLIENT
STOCKLAND DEVELOPMENT

SCALE
NTS

STATUS
FOR SSDA

DRAWING
ALTERNATE MEANS OF VENTILATION
LEVELS 34 - 48

DISCIPLINE
ACOUSTICS

DRAWING NUMBER
ELAB-AC-DWG-200-01-34

REVISION
002

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