OCTAVE ACOUSTICS

Uniting c/- Midson Group Ltd

7 November 2024

Stage 3 Detailed Development Application - Seniors Housing Development

Noise Impact Assessment - First Residential Stage

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Client	Uniting c/- Midson Group Ltd
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0	30.11.2023	Issued to Client	NH	RB
1	06.12.2023	Project team comments incorporated	NH	RB
2	04.09.2024	Amended scheme	RB	LE
3	07.11.2024	Amended drawings	RB	AL

Disclaimer

Contents

1. Executive Summary

Octave Acoustics was engaged by Midson Group Ltd on behalf of Uniting to provide a Stage 1 Detailed Development Application noise impact assessment for the first residential stage of the senior's housing development at 171 Wattle Road, Shellharbour City Centre. The assessment responds to criteria set out within Shellharbour City Council DCP as follows:

- Road Noise Policy – Defines criteria for traffic noise impacts associated with new land use developments.
- Noise Policy for Industry – Assesses the potential impact of noise (mechanical and plant, on and surrounding Subject Site), and subsequently to determine achievable noise requirements for the first residential stage.
- Australian Standard AS2107 *Recommended Design Sound Levels and Reverberation Times for Building Interiors*, 2016 – Sets sound level range of specific interior spaces onsite, taking into account space function.
- Shellharbour LEP 2013 / Australian Standard AS2021 *Aircraft Noise Intrusion* – Setting criteria to inform building elements from aircraft noise intrusion.

Results of Octave Acoustics assessments indicate that noise impacting the first residential stage on the Subject Site will be adequately mitigated via the implementation of standard commercial grade glazing and plant attenuation methods. Furthermore, assessment indicates that potential noise impacts on the first stage resulting from both aircraft and the adjacent Stockland site will be immaterial. Noise associated with additional traffic generated by the first stage was determined to comply with the relevant requirements of the Road Noise Policy at the surrounding noise sensitive receptors, including the existing housing development to the immediate south of the subject site.

Overall, the assessments indicate that noise impacts associated with the first residential stage of the development at 171 Wattle Road, Shellharbour City Centre will comply with the applicable criteria at all surrounding sensitive receptors, including existing residential uses to the south and potential future residential uses to the west. The results also indicate that the first residential stage will comply with the relevant noise related requirements within the Shellharbour DCP.

2. Introduction

Octave Acoustics was engaged by Uniting c/Midson Group Ltd to provide a noise impact assessment for the Stage 1 Residential Detailed Development Application for the first residential stage of the senior's housing development at 171 Wattle Road, Shellharbour City Centre which is legally described as Lot 2 DP 1043053 and has an approximate area of 42,630m^2 (Subject Site).

The Stage 1 Residential Detailed Development Application for the first residential stage aligns with the modified concept as proposed in the concurrent section 4.55 modification application relating to the previously approved Concept Development Application. The concept application related to development across the entire site consisting of 352 Independent Living Units across 11 buildings. Octave Acoustics has provided a separate noise impact assessment for the section S4.55(2) modification.

3. Site Context

The first residential stage of the approved Seniors Housing development comprising of 4 buildings, between 4 and 6 storeys in height and containing 152 Independent Living Units (ILU), common area uses, 2 levels of basement parking and the construction of a full roadway serving the development.

This first stage of development is located at the south end of the greater Uniting site on land zoned R3 Medium Density Residential. The land is abutted to the (refer to Figure 1):

- North by the balance of the Uniting site, Lake Entrance Road (SP2) with Shellharbour Hospital and TAFE beyond (zoned SP2).
- East by Wattle Road, public reservation grassland land (zoned RE1) with low density residential development beyond (zoned R2).
- West by publicly accessible grassland (zoned DM), a potential future residential use, with Stockland's Shellharbour beyond (zoned E2 Commercial Centre).
- Southwest by Uniting Elanora Shellharbour Aged Care (zoned R3).
- South by NSW Land and Housing Corporation residential development (zoned R3) with Benson Avenue beyond.

Figure 1: Site Context – Uniting Shellharbour First Residential Stage

4. Noise Measurements

4.1. Unattended Noise Monitoring

Octave Acoustics attended site on Thursday the 5th of October 2023 to inspect existing conditions and install an unattended noise monitor. The monitor was located on the roof of the Uniting aged care facility at 23 Wallaroo Drive with the microphone 1.2m above roof level in free field conditions (refer to Figure 1 and Table 1). The unattended monitor was recovered on Thursday the 12th of October.

Table 1 – Unattended Noise Monitoring

Designation	Duration	Noise Environment Classification
Location L1	7 days	R3 – Medium Density Residential

Monitoring was conducted using an NTi XL2 sound level meter. The sound level meter was calibrated before and after the assessment using a Bruel and Kjaer 4320 calibrator. No drift in calibration was detected. The NTi XL2 complies with the requirements IEC 616272-1.2013 Sound Level Meters and is classified as a Class 1 Instrument. The NTi XL2 and calibrator carried current NATA certification.

The resulting data were analysed in conjunction with weather data obtained from the Bureau of Meteorology Automatic Weather Station located at Kiama. Noise data affected by adverse wind and rainfall events was identified and omitted from further assessment, in accordance with the requirements of the Noise Policy for Industry. A summary of noise monitoring results is presented in Table 2. Full results of unattended noise monitoring are presented in Appendix B.

Table 2 – Summary of Unattended Monitoring Results

Date	Assessment Background Level, dB LA90		
	Day	Evening	Night
Thursday, 5 October 2023	n/a	47	44
Friday, 6 October 2023	50	44	43
Saturday, 7 October 2023	48	45	44
Sunday, 8 October 2023	47	45	44
Monday, 9 October 2023	51	44	43
Tuesday, 10 October 2023	49	45	44
Wednesday, 11 October 2023	51	45	44
Thursday, 12 October 2023	51	n/a	n/a
Overall RBL	**49**	**45**	**44**

Notes: n/a = Invalid data due to weather / incomplete measurement period exclusions.

4.2. Attended Noise Measurements

Octave Acoustics attended site on Thursday the 5th of October 2023 to inspect existing conditions and conduct attended noise measurements at two separate locations (refer to Figure 1). Attended Noise Measurements were taken 1.2m above ground level in free field conditions. The noise measurements assessed the L_{Aeq} and L_{A90} over 15 minutes at each location.

The measurements were conducted using an NTi XL2 sound level meter. The sound level meter was calibrated before and after the assessment using a Bruel and Kjaer 4320 calibrator. No drift in calibration was detected. The NTi XL2 complies with the requirements IEC 616272-1.2013 Sound Level Meters and is classified as a Class 1 Instrument. The NTi XL2 and calibrator carried current NATA certification.

Data processing was carried out by reviewing the noise measurement results graphically whilst referring to time synchronised audio files, identifying and excluding extraneous noise from other (geotechnical) works being carried out in the area. A summary of attended measurement results is shown in Table 3.

Table 3 – Results of Attended Noise Measurements

Location	Average Ambient Noise L_{Aeq} (dB)	Ambient Background Level L_{A90} (dB)
Location A1	53	50
Location A2	52	50

The attended noise measurement results were used in conjunction with the results of the unattended monitoring to inform and validate traffic noise levels across the façade of the first residential stage of the development.

5. Criteria

5.1. Shellharbour Council DCP Requirements

The following clauses of the Shellharbour Council DCP set out the noise related requirements for the development application assessment for the first residential stage:

> ***Chapter 31*** *– Acoustic Protection for noise sensitive uses such as child care centres and residential development*
>
> …
>
> ***31.2*** *- Developments and subdivision fronting and within proximity to busy roads, rail corridors and other-noise generating land uses:*
>
> ***31.2.1 -*** *"A noise assessment survey and a program of appropriate noise attenuation measures to reduce traffic or other noise that potentially will affect sensitive noise receivers must be prepared by a suitably qualified acoustic consultant in accordance with the NSW Road Noise Policy and/or Industrial Noise Policy issued by the NSW Governments'. The assessment shall predict noise levels for a ten-year period and any noise attenuation measures shall address these noise levels."*
>
> …
>
> ***31.2.3 –*** *"The above reports are required for all the following types of development applications:*
>
> *a. subdivisions creating additional lot(s)*
>
> *b. dual occupancy and multi-unit developments fronting and within 100m of busy roads including Shellharbour Road, Lake Entrance Road, Princes Highway, Tongarra Road, Terry Street, Illawarra Highway.*
>
> *c. child care centres*
>
> *d. sensitive land uses (eg seniors housing, dwellings, child care centres) adjoining industrial and business zoned land*
>
> *e. sensitive land uses (eg seniors housing, dwellings, child care centres) within business zoned land.*
>
> …
>
> ***31.2.7 –*** *"Architectural Treatments are to be designed in accordance with AS3671 – Traffic Noise Intrusion Building Siting and Construction, the Indoor sound criteria of AS2107 - Recommended Design Sound Levels and Reverberation Times for Building Interiors."*
>
> …
>
> ***Chapter 32*** *– Airport and Environs Development*
>
> ***Aircraft Noise***
>
> ***32.1 –*** *"The LEP needs to be referred to in relation to provisions on preventing noise sensitive development from being located close to the airport and its flight paths, minimising aircraft noise impact via building noise attenuation in noise sensitive buildings and ensuring land use and development does not hinder airport operations."*

Table 4 sets out where each of the above DCP requirements are addressed within this document.

Table 4 – Criteria Reference Table

DCP Clause	Criteria	Addressed in Report Section
31.2.1	Road Noise Policy	4.2 & 5.1
31.2.1	Noise Policy for Industry	4.3 & 5.2
31.2.7	Australian Standard AS2107	4.4 & 5.1
31.2.3 b.	Lake Entrance Road – TISEPP	5.1.1
32.1	Shellharbour LEP 2013	4.5
32.1	Australian Standard AS2021 – Aircraft Noise Intrusion	4.5.1 & 5.3

5.2. Road Noise Policy

The NSW Department of Environment, Climate Change and Water *Road Noise Policy,* 2011 (RNP) defines criteria for traffic noise impacts associated with new land use developments as set out in Table 5. In the application of these criteria the RNP states:

> *"For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, an increase in the total traffic noise level should be limited to 2 dB above that of the 'no build option'."*

Table 5 - Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)	
		Day (7am – 10pm)	Night (10pm – 7am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq,\ 15\ hour}$ 60 (external)	$L_{Aeq,\ 9\ hour}$ 55 (external)

5.3. Noise Policy for Industry

The EPA's Noise Policy for Industry (NPfI) applies both intrusive and amenity assessments to quasi-steady state noise emissions from industrial activities. It is relevant to apply these assessments to the proposed use as described below.

5.3.1. Intrusive Noise Assessment

The intrusiveness of a noise source may generally be considered acceptable if the level of noise from the source (L_{Aeq}), does not exceed the background noise level by more than 5dB when beyond a minimum threshold. The intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment. The intrusiveness noise level is determined as follows:

$L_{Aeq,\ 15\ min}$ = Rating Background Noise Level +5dB

Where:

$L_{Aeq,\ 15\ min}$ represents the equivalent continuous (energy average) A-weighted sound pressure level of the source over 15 minutes.

And

Rating Background Noise Level (RBL) represents the background level to be used for assessment purposes, as determined by the methods outlined in the Noise Policy for Industry; typically being the median L_{A90} for each period, day, evening and night.

It should be noted that intrusiveness noise levels are not used directly as regulatory limits. They are used in combination with the amenity noise level to assess the potential impact of noise, assess reasonable and feasible mitigation options and subsequently determine achievable noise requirements. The applicable rating background noise levels and resulting Intrusiveness Noise Levels have been calculated from the results of noise monitoring (RBL per Table 2) are set out in Table 6 below.

Table 6 - Applicable Intrusiveness Noise Levels

Time of Day	RBL dB(A)	Intrusiveness Noise Levels ($L_{Aeq,\ 15\ min}$ dB(A))
Day	49	54
Evening	45	50
Night	44	49

Notes:
1. *Day is 7am – 6pm Monday to Saturday*
   8am – 6pm Sundays and public holidays
2. *Evening is 6pm – 10pm*
3. *Night is 10pm – 7am Monday to Saturday*
   10pm – 8am Sundays and public holidays.

5.3.2. Amenity Noise Assessment

To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should not exceed the recommended amenity noise levels specified in Table 7 where feasible and reasonable.

Table 7 – Amenity Noise Levels

Receiver	Noise Amenity Area	Time of Day	L_{Aeq}, dB(A)
Residential	Suburban	Day	55
		Evening	45
		Night	40
Commercial premises	All	When in use	65

Notes:

1. *Day is 7am – 6pm Monday to Saturday*
   8am – 6pm Sundays and public holidays
2. *Evening is 6pm – 10pm*
3. *Night is all remaining times.*
4. *'Suburban' – an area with an acoustical environment that:*
   - *has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry.*
   - *This area often has the following characteristics; evening ambient noise levels defined by the natural environment and human activity.*

The recommended amenity noise levels have been selected on the basis of studies that relate industrial noise to annoyance in communities (Miedema and Voss, 2004). They have been subjectively scaled to reflect the perceived differential expectations and ambient noise environments of rural, suburban and urban communities for residential receivers. They are based on protecting the majority of the community (90%) from being highly annoyed by industrial noise.

The recommended amenity noise levels represent the objective 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 for industrial developments = recommended amenity noise level minus 5dB(A) (refer to Table 8)**

Table 8 – Project Amenity Noise Levels (ANL)

Receiver	Noise Amenity Area	Time of Day	Project ANL[1]	
			$L_{Aeq\ period}$, dB(A)	$L_{Aeq\ 15\text{-}minute}$, dB(A)
Residential	Urban	Day	55	53
		Evening	45	43
		Night	40	38
Commercial premises	All	When in use	65	63

Notes:

1. *Project ANL is that for the 'noise amenity area' minus 5dB(A) plus 3dB(A) to convert from a period level to a 15-minute level in accordance with the methodology set out in Fact Sheet E of the NPfI.*

Amenity noise levels are not used directly as regulatory limits. They are used in combination with the project intrusiveness noise level to assess the potential impact of noise, and subsequently determine achievable noise requirements.

5.3.3. Project Trigger Levels

The project trigger level is computed as the lower of the intrusiveness and amenity levels. The project trigger levels for each receiver type are summarised in Table 9.

Table 9 – Project Noise Trigger Levels

Receiver	Project Intrusiveness Level ($L_{Aeq, 15min, night}$)	Project Amenity Level ($L_{Aeq, 15min, night}$)	Project Trigger Level ($L_{Aeq, 15min, night}$)[1]
Day	54	53	53
Evening	50	43	43
Night	49	38	38
All			
Commercial Premises	N/A	63	63

Note: Project Trigger Levels may be relaxed in accordance with the NPfI where receivers are affected by significant levels of road traffic noise.

5.4. Australian Standard AS2107

Appropriate criteria for the protection of building occupants from traffic noise are as set out in Australian Standard AS2107 *Recommended Design Sound Levels and Reverberation Times for Building Interiors*, 2016 as presented in Table 10 below. The recommended sound levels take into account the function of the area(s) and apply to the sound level measured within the space when unoccupied but ready for occupancy.

Table 10 – Ambient Noise Level Criteria Derived from AS2107:2016

Type of occupancy/activity[1]	Design sound level (L_{Aeq}) range[2]
Apartments - Living areas	35 – 45
Apartments - Sleeping areas (night time)	35 – 40
Corridors, Circulation & Lobbies	45 – 50

Notes:

1. *Houses and apartments in suburban areas or near intermittent traffic on roads.*
2. *Sound levels within the given ranges have been found to be acceptable by most people for the space under consideration. When the sound level is greater than the upper level of the range most people occupying the space will become dissatisfied with the level of the sound. When the sound level is below the lower level of the range, the inadequacy of background sound to provide masking sound can become problematic, for example, by allowing other intermittent noise sources to cause distraction, annoyance, or lack of privacy.*

5.5. Shellharbour LEP 2013

Shellharbour DCP requires reference to the Shellharbour Local Environmental Plan (LEP) 2013 regarding Aircraft Noise intrusion to sensitive receivers. Shellharbour LEP 2013, Part 6 Additional local provisions, subsection 6.8 Development in areas subject to aircraft noise, sets out the below:

1) The objectives of this clause are as follows -

(a) to prevent certain noise sensitive developments from being located near the Illawarra Regional Airport and its flight paths,
(b) to assist in minimising the impact of aircraft noise from that airport and its flight paths by requiring appropriate noise attenuation measures in noise sensitive buildings,
(c) to ensure that land use and development in the vicinity of that airport do not hinder or have any other adverse impacts on the ongoing, safe and efficient operation of that airport.

2) This clause applies to development that—
(a) is on land that -
(i) is near the Illawarra Regional Airport, and
(ii) is in an ANEF contour of 20 or greater, and
(b) the consent authority considers is likely to be adversely affected by aircraft noise.

3) Before determining a development application for development to which this clause applies, the consent authority -
(a) must consider whether the development will result in an increase in the number of dwellings or people affected by aircraft noise, and
(b) must consider the location of the development in relation to the criteria set out in Table 2.1 (Building Site Acceptability Based on ANEF Zones) in AS 2021—2000, and
(c) must be satisfied the development will meet the indoor design sound levels shown in Table 3.3 (Indoor Design Sound Levels for Determination of Aircraft Noise Reduction) in AS 2021—2000.

5.5.1. Australian Standard AS2021 – Aircraft Noise Intrusion

Shellharbour Council's DCP requires consideration of the Shellharbour LEP 2013 which cites assessment with respect to Australian Standard AS2021 to inform building siting and construction in response to potential aircraft noise impacts.

Australian Standard AS2021 Acoustics – Aircraft noise intrusion – Building siting and construction, together with the relevant Australian Noise Exposure Forecast (ANEF) chart or locality map for the aerodrome under consideration, provides guidelines for determining:

- whether the extent of aircraft noise intrusion makes building sites 'acceptable', 'unacceptable' or 'conditionally acceptable' for the types of activity to be, or being, undertaken; and
- for 'conditionally acceptable' sites, the extent of noise reduction required to provide acceptable noise levels indoors for the types of activity to be, or being, undertaken; and
- the type of building construction necessary to provide a given noise reduction, provided that external windows and doors are closed.

Building site acceptability is first determined based on the ANEF zone of the site. Criteria for each building type in the proposed development are summarised in Table 11.

If the site is "acceptable", no further consideration of the Standard is necessary.

Table 11 - Building Site Acceptability Based on ANEF Zones

Building type	ANEF zone of site		
	Acceptable	Conditionally acceptable	Unacceptable
Residential	Less than 20 ANEF[1]	20 to 25 ANEF[2]	Greater than 25 ANEF
Commercial	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF

Notes:
1. The actual location of the 20 ANEF contour is difficult to define accurately, mainly because of variation in aircraft flight paths. Because of this, the procedure of for 'conditionally acceptable' land may be followed for building sites outside but near to the 20 ANEF contour.
2. Within 20 ANEF to 25 ANEF, some people may find that the land is not compatible with residential or educational uses. Land use authorities may consider that the incorporation of noise control features in the construction of residences or schools is appropriate.

5.6. Construction – Noise Impacts

5.6.1. Residential Receivers

The recommended work hours set out in Table 12 below have been adapted from the Department of Environment and Climate Change Interim Construction Noise Guideline, 2009 (ICNG) incorporating DA approved hours for works.

Table 12 - Road Traffic Noise Assessment Criteria for Residential Land Uses

Heading	Heading	Heading
Recommended standard hours: Monday to Friday 7am to 6pm. Saturday 7:30am to 3:30pm. No work on Sundays or Public Holidays.	Noise affected RBL + 10dB	This noise 'affected' level represents the point above which there may be some community reaction to noise. – Where the predicted or measured LAeq (15 min) is greater than the affected noise 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 the works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75dB(A)	The highly noise affected level represented 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 by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise (such as mid-morning or mid-afternoon for works near residences. 2. 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	A strong justification would typically be required for works outside the recommended standard hours. 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 5dB(A) above the noise affected level, the proponent should negotiate with the community.

The applicable noise management levels for residential receivers adjacent the subject site have been calculated based on measured background noise levels obtained during noise and are presented in Table 13 below.

Table 13 - Noise Management Levels for Residential Receivers

Time	RBL	Noise Affected $L_{eq\ 15\ min}$	Highly Noise Affected $L_{eq\ 15\ min}$
Monday to Friday 7am to 6pm Saturday 7:30am to 3:30pm	49 dB(A)	59 dB(A)	75 dB(A)
Out of hours 'evening'	45 dB(A)	50 dB(A)	-
Out of hours 'night'	44 dB(A)	49 dB(A)	-

5.6.2. Other Sensitive Land Uses

Other sensitive land uses, such as schools, typically consider noise from construction to be disruptive when the properties are being used (such as during school times). Table 14 presents management levels for noise at other sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed. The proponent should consult with noise sensitive land use occupants likely to be affected by noise from the works to schedule the project's work hours to achieve a reasonable noise outcome.

Internal noise levels are to be assessed at the centre of the occupied room. External noise levels are to be assessed at the most affected point within 50 m of the area boundary. Where internal noise levels cannot be measured, external noise levels may be used.

Table 14 - Noise Management Levels for other Sensitive Land Uses

Land Use	Management Level, Leq 15 min (applies when properties are being used)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion).	External noise level 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation).	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS2107 for specific uses.

5.6.3. Commercial & Industrial Premises

Due to the broad range of sensitivities that commercial or industrial land can have to noise from construction, the process of defining management levels is separated into three categories. The external noise levels should be assessed at the most-affected occupied point of the premises:

- Industrial premises: external $L_{Aeq\ (15\ min)}$ 75 dB(A)
- Offices, retail outlets: external $L_{Aeq\ (15\ min)}$ 70 dB(A)
- Other businesses that may be very sensitive to noise, where the noise level is project specific as discussed below.

Examples of other noise-sensitive businesses are theatres and childcare centres. The proponent should undertake a special investigation to determine suitable noise levels on a project-by-project basis; the recommended 'maximum' internal noise levels in AS 2107 Acoustics – *Recommended Design Sound Levels and Reverberation Times for Building Interiors* may assist in determining relevant noise levels.

5.7. Construction Impacts - Vibration

5.7.1. Human Comfort

The ICNG states that vibration associated with construction works, including continuous, intermittent or impulsive vibration, but excluding blasting, is to be assessed in accordance with section 2.5 'Short-term works' in *Assessing Vibration – A Technical Guideline* (DEC 2006), which states:

When short-term works such as piling, demolition and construction give rise to impulsive vibrations, undue restriction on vibration values may significantly prolong these operations and result in greater annoyance. Short-term works are works that occur for a duration of approximately one week.

In circumstances where work is short term, feasible and reasonable mitigation measures have been applied, and the project has a demonstrated high level of social worth and broad community benefits, then higher vibration values (above the maximum) may apply. In such cases, best management practices should be used to reduce values as far as practicable, and a comprehensive community consultation program should be instituted. An example of a possible management strategy would be to restrict the times during which high vibration values occur to the least sensitive times of the day. Typical issues covered in a consultation program include a public contact point for handling complaints, and early notification of proposed operations and any significant change to operations.

Assessing Vibration – A Technical Guideline provides criteria for exposure to continuous and impulsive vibration as set out in Table 15 below. Acceptable values for intermittent vibration as presented in Table 16 below.

Table 15 – Criteria for Exposure to Continuous and Impulsive Vibration

Place	Time	Assessment Criteria					
		[2]rms acceleration (m/s)^2		[3]rms velocity (mm/s)		[3]Peak velocity (mm/s)	
		Preferred	Max	Preferred	Max	Preferred	Max
Continuous Vibration							
Critical working areas[1]	Day or night-time	0.0050	0.010	0.10	0.20	0.14	0.28
Residences	Daytime[4]	0.010	0.020	0.2	0.4	0.28	0.56
	Night-time	0.0070	0.014	0.14	0.28	0.20	0.40
Offices	Day or night-time	0.020	0.040	0.40	0.80	0.56	1.1
Workshops	Day or night-time	0.040	0.080	0.80	1.6	1.1	2.2
Impulsive Vibration							
Critical working areas[1]	Day or night-time	0.0050	0.010	0.10	0.20	0.14	0.28
Residences	Daytime[4]	0.30	0.60	6.0	12.0	8.6	17.0
	Night-time	0.10	0.20	2.0	4.0	2.8	5.6
Offices	Day or night-time	0.64	1.28	13.0	26.0	18.0	36.0
Workshops	Day or night-time	0.64	1.28	13.0	26.0	18.0	36.0

Notes:

1. *e.g. hospital operating theatres, precision laboratories.*
2. *Values derived from z-axis critical frequency range 4–8 Hz. Where required, a more detailed analysis can be conducted as per BS 6472–1992.*
3. *Values given for the most critical frequency range >8 Hz assuming sinusoidal motion. Where required, a more detailed analysis can be conducted as per AS 2670.2–1990. Sufficient justification should accompany the use of a peak velocity approach if used in an assessment.*
4. *Specific values depend on social and cultural factors, psychological attitudes and expected degree of intrusion.*

Table 16 – Acceptable Vibration Dose Values for Intermittent Vibration (m/s$^{1.75}$)

Location	Daytime		Night-time	
	Preferred	Maximum	Preferred	Maximum
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions & places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes:

1. *Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.*
2. *Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas.*

Source: BS 6472–1992

5.7.2. Building Damage

Assessing Vibration – A Technical Guideline does not address vibration induced damage to buildings and structures. Applicable criteria for vibration inducted building damage are typically taken from German Standard DIN 4150: Part 3 *Structural Vibration in Buildings – Effects on Structures* (German Institute for Standardisation, 1999). Trigger levels from the DIN4150 are given below in Table 17.

Table 17 – DIN 4150 Structural Damage Criteria

Line	Time	Peak Component Particle Velocity, mm/s			
		At Building Foundations			Plane of the Uppermost Floor
		4Hz to 15Hz	15Hz to 40Hz	40Hz and above	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 – 40	40 – 50	40
2	Dwellings and buildings of similar design and/or use	5	5 – 15	15 – 20	15
3	Structures that, because of the particular sensitivity of vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g., Listed buildings under preservation order)	3	3 – 8	8 – 10	8

Table 17 gives guideline values for peak particle velocity at the foundation and in the plane of the highest floor of various types of buildings. Experience has shown that if these values are complied with, damage that reduces the serviceability of a building will not occur. If damage nonetheless occurs, it is assumed that other causes are responsible. Exceeding the values in Table 17 does not necessarily lead to damage, should they be significantly exceeded, however, further investigations are necessary.

These values relate to transient vibrations only. Continuous vibration can give rise to dynamic magnifications due to resonances and triggers may need to be reduced by up to 50%. It should be noted that DIN4150 does not provide criteria relating to vibration induced subsidence.

6. Assessment

6.1. Road Noise Policy

Traffix Group has provided the following indicative calculation for AADT on Wattle Road resulting from the introduction of the first residential stage.

- AADT on Wattle Road = 2.1 vehicles x 152 Units = 319 vehicles per day

The 2dB increase road traffic noise threshold set by the Road Noise Policy would require an increase in traffic volume of 59%. The existing AADT for Wattle Road is 17,000 vehicles. The additional 319 vehicles generated by the first stage of development represents a 1.9% in traffic volume. This is far below the 59% required for a 2dB increase in traffic noise levels. It is concluded that additional road traffic noise impacts associated the first stage comply with the requirements of the Road Noise Policy and no further assessment is required.

6.2. Australian Standard AS2107

Performance requirements for the glazing system specification were developed to satisfy the relevant traffic noise intrusion requirements of Australian Standard AS2107. To this end a 3-D computer model of the Subject Site was established in CadnaA software implementing the ISO9613 environmental noise prediction algorithms. The noise model was then validated using results of on-site noise monitoring and measurements. The model was then run to calculate L_{Aeq} sound pressure levels across the façades of the first stage of residential development.

This process indicated that worst-case Day period (7am to 6pm) traffic noise level results in a noise level of 61 dB L_{Aeq} at the most affected facades adjacent Wattle Road. Results of unattended noise monitoring indicated that night period traffic noise levels are typically 5dB below that of the day period (56 dB L_{Aeq}).

Traffic noise intrusion to the proposed apartments was then calculated using standard transmission loss algorithms. Performance requirements for the glazing specification were developed as required for design compliance with AS2107. As presented in the Table 12 below.

Table 18 - Minimum Performance Required for Façade Glazing Systems, R_w

Façade / Apartment	Performance Requirement for Glazing Assembly including Frame and Seals	Indicative Glazing[1,2]
Refer to markup in Appendix C for the extents / application of these requirements.	$R_w \geq 35$	Glazing system incorporating one pane of 10.38mm thick laminated glass. OR Double glazed system incorporating one pane of 6.38mm thick laminated glass, 12mm air-gap and one pane of 6mm thick float glass in a Capral 419 system. Doors and operable windows to include EPDM seals.
	$R_w \geq 31$	Double Glazing system incorporating two panes of standard 6mm thick float glass separated by a 12mm airgap. Operable windows to include full perimeter EPDM seals. Sliding doors to include full perimeter wool pile seals.

6.2.1. Proximity to Major Roads - Lake Entrance Road

The first residential stage of the development is greater than 100m away from Lake Entrance Road, or any other major road listed within the Shellharbour Council's DCP. As such, a traffic noise assessment is not required to address Clause 31.2.3 b of the DCP.

6.3. Noise Policy for Industry

6.3.1. First Residential Stage

A detailed plant noise emission assessment is not possible at this early stage of the project as the mechanical scheme and selections are not yet available. However, it is expected that the primary noise sources associated with the mechanical design will be:

- Air-conditioning condensers – Located in common areas.
- Basement ventilation fans – Located on Ground Level
- Carpark exhaust fans - Located at roof Level

It is noted that such plant can be satisfactorily attenuated through appropriate selection, placement and if necessary, acoustic treatments. Where necessary, this may include the implementation of and fitment of attenuators to supply and exhaust fans. A comprehensive assessment of the proposed plant will be carried during design development stage. This will result in finalised schedule of acoustic treatments required for compliance with the established NPfI criteria.

6.3.2. Stockland

Potential plant noise impacts associated with the adjacent Stockland site was assessed and evaluated through reference to results of both the unattended and attended noise measurements. The data collected was primarily influenced by road and vehicle noise, with no distinctive features that could be directly attributed to the noise from the Stockland site. Results indicate that noise emissions from Stockland Shellharbour satisfy the NPfI night period criteria (10pm – 7am).

6.4. Shellharbour Council LEP / Australian Standard AS2021

Figure 2 shows that the Subject Site at 171 Wattle Road is substantially outside ANEF 20 contour of Wollongong Regional Airport. The land is therefore categorised as "Acceptable" with respect to potential aircraft noise impacts and no further consideration is required.

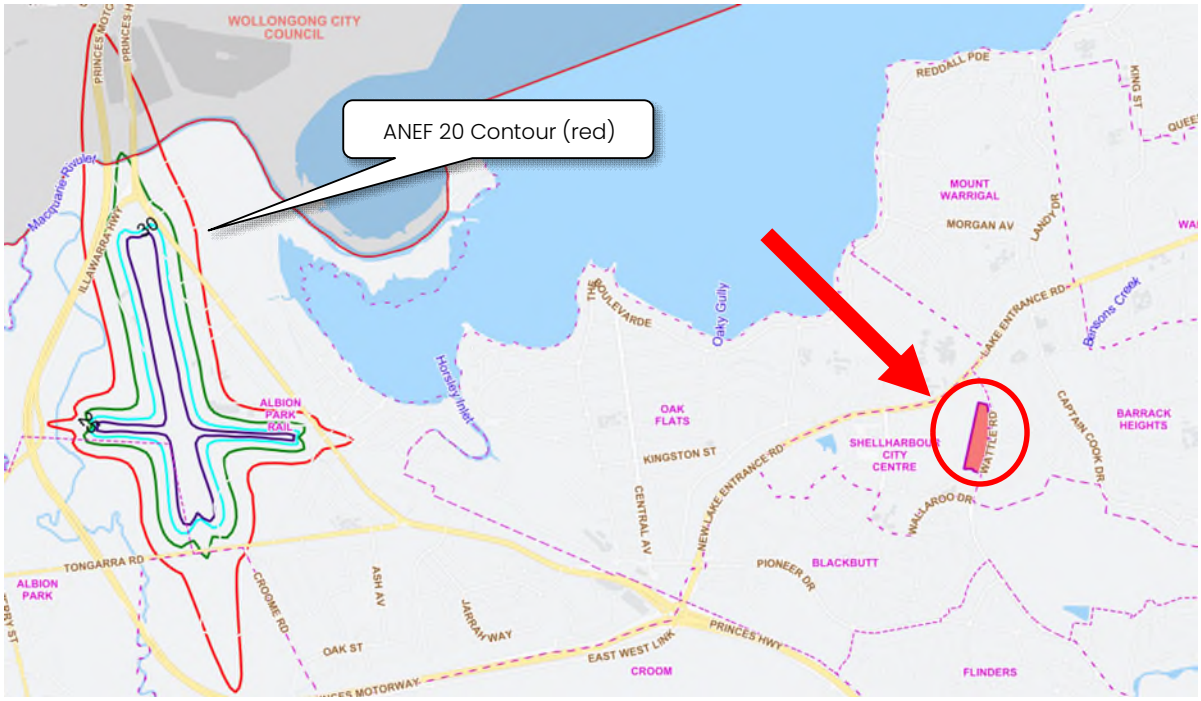


Figure 2 – Wollongong Regional Airport ANEF zone Map showing the location of the Subject Site

6.5. Construction Noise & Vibration

The sensitive receivers potentially most affected by construction noise and vibration impacts associated with the development are those within the housing development on the southern boundary of the subject site (indicated in Figure 1). Based on the set back of the development and the bulk of the associated works from the southern boundary it is expected that vibration will be unlikely to materially affect the amenity or structural integrity at the housing development. However, it is expected that construction noise impacts may occasionally exceed applicable trigger levels devised in accordance with the ICNG.

A formal assessment of potential construction noise and vibration impacts will be provided in a separate Construction Noise and Vibration Management Plan (CNVMP) document for the works. The CNVMP will provide a comparison of predicted noise and vibration impacts with appliable trigger/assessment levels. Where exceedances are identified, guidance and recommendations will be provided to best achieve compliance where reasonable and feasible. The CNVMP will also set out protocols for communications and management of community expectations and complaints.

7. Conclusion

Octave Acoustics was engaged by Midson Group Ltd on behalf of Uniting to provide a Stage 1 Detailed Development Application noise impact assessment for the first residential stage of the senior's housing development at 171 Wattle Road, Shellharbour City Centre. This report responds to criteria set out within Shellharbour City Council DCP; the key items addressed include:

- Road Noise Policy – Defines criteria for traffic noise impacts associated with new land use developments.
- Noise Policy for Industry – Assesses the potential impact of noise (mechanical and plant, on and surrounding Subject Site), and subsequently to determine achievable noise requirements for the first residential stage.
- Australian Standard AS2107 *Recommended Design Sound Levels and Reverberation Times for Building Interiors*, 2016 – Sets sound level range of specific interior spaces onsite, taking into account space function.
- Shellharbour LEP 2013 / Australian Standard AS2021 *Aircraft Noise Intrusion* – Setting criteria to inform building elements from aircraft noise intrusion.

The results of Octave Acoustics' assessments indicate that noise impacting the first residential stage on the Subject Site will be adequately mitigated via the implementation of standard commercial grade glazing and plant attenuation methods. Furthermore, assessment indicates that potential noise impacts on the first stage resulting from both aircraft and the adjacent Stockland site are immaterial. Noise associated with additional traffic generated by the first stage has been determined to comply with the relevant requirements of the Road Noise Policy at the surrounding noise sensitive receptors.

The assessments described in this document indicate that noise impacts associated with the first residential stage of the development at 171 Wattle Road, Shellharbour City Centre will comply with the applicable criteria at all surrounding sensitive receptors. The results of Octave Acoustics assessments also indicate that the first residential stage will comply with the relevant noise related requirements within the Shellharbour DCP.

Appendix A: Glossary of Terms

'A' Frequency Weighting

The 'A' frequency weighting roughly approximates to the Fletcher-Munson 40 phon equal loudness contour. The human loudness perception at various frequencies and sound pressure levels is equated to the level of 40 dB at 1 kHz. The human ear is less sensitive to low frequency sound and very high frequency sound than midrange frequency sound (i.e. 500 Hz to 6 kHz). Humans are most sensitive to midrange frequency sounds, such as a child's scream. Sound level meters have inbuilt frequency weighting networks that very roughly approximates the human loudness response at low sound levels. It should be noted that the human loudness response is not the same as the human annoyance response to sound. Here low frequency sounds can be more annoying than midrange frequency sounds even at very low loudness levels. The 'A' weighting is the most commonly used frequency weighting for occupational and environmental noise assessments. However, for environmental noise assessments, adjustments for the character of the sound will often be required.

AMBIENT NOISE

The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far, including all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc. Usually assessed as an energy average over a set time period 'T' (LAeq,T).

AUDIBLE

Audible refers to a sound that can be heard. There are a range of audibility grades, varying from "barely audible", "just audible" to "clearly audible" and "prominent".

BACKGROUND NOISE LEVEL

Total silence does not exist in the natural or built-environments, only varying degrees of noise. The Background Noise Level is the minimum repeatable level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc. It is quantified by the noise level that is exceeded for 90 % of the measurement period 'T' (LA90,T). Background Noise Levels are often determined for the day, evening and night time periods where relevant. This is done by statistically analysing the range of time period (typically 15 minute) measurements over multiple days (often 7 days). For a 15-minute measurement period the Background Noise Level is set at the quietest level that occurs at 1.5 minutes.

'C' FREQUENCY WEIGHTING

The 'C' frequency weighting approximates the 100 phon equal loudness contour. The human ear frequency response is more linear at high sound levels and the 100 phon equal loudness contour attempts to represent this at various frequencies at sound levels of approximately 100 dB.

DECIBEL

The decibel (dB) is a logarithmic scale that allows a wide range of values to be compressed into a more comprehensible range, typically 0 dB to 120 dB. The decibel is ten times the logarithm of the ratio of any two quantities that relate to the flow of energy (i.e. power). When used in acoustics it is the ratio of the square of the sound pressure level to a reference sound pressure level, the ratio of the sound power level to a reference sound power level, or the ratio of the sound intensity level to a reference sound intensity level. See also Sound Pressure Level and Sound Power Level. Noise levels in decibels cannot be added arithmetically since they are logarithmic numbers. If one machine is generating a noise level of 50 dB, and another similar machine is placed beside it, the level will increase to 53 dB (from 10 $\log_{10}(10^{(50/10)} + 10^{(50/10)})$ and not 100 dB. In theory, ten similar machines placed side by side will increase the sound level by 10 dB, and one hundred machines increase the sound level by 20 dB. The human ear has a vast sound-sensitivity range of over a thousand billion to one, so the logarithmic decibel scale is useful for acoustical assessments.

dBA – See 'A' frequency weighting

dBC – See 'C' frequency weighting

EQUIVALENT CONTINUOUS SOUND LEVEL, LAeq

Many sounds, such as road traffic noise or construction noise, vary repeatedly in level over a period of time. More sophisticated sound level meters have an integrating/averaging electronic device inbuilt, which will display the energy time-average (equivalent continuous sound level - LAeq) of the 'A' frequency weighted sound pressure level. Because the decibel scale is a logarithmic ratio, the higher noise levels have far more sound energy, and therefore the LAeq level tends to indicate an average which is strongly influenced by short-term, high level noise events. Many studies show that

human reaction to level-varying sounds tends to relate closer to the LAeq noise level than any other descriptor.

'F'(FAST) TIME WEIGHTING

Sound level meter design-goal time constant which is 0.125 seconds.

FREE FIELD

In acoustics a free field is a measurement area not subject to significant reflection of acoustical energy. A free field measurement is typically not closer than 3.5 metres to any large flat object (other than the ground) such as a fence or wall or inside an anechoic chamber.

FREQUENCY

The number of oscillations or cycles of a wave motion per unit time, the SI unit is the hertz (Hz). 1 Hz is equivalent to one cycle per second. 1000 Hz is 1 kHz.

LOUDNESS

The volume to which a sound is audible to a listener is a subjective term referred to as loudness. Humans generally perceive an approximate doubling of loudness when the sound level increases by about 10 dB and an approximate halving of loudness when the sound level decreases by about 10 dB.

MAXIMUM NOISE LEVEL, LAFmax

The root-mean-square (rms) maximum sound pressure level measured with sound level meter using the 'A' frequency weighting and the 'F' (Fast) time weighting. Often used for noise assessments other than aircraft.

MAXIMUM NOISE LEVEL, LASmax

The root-mean-square (rms) maximum sound pressure level measured with sound level meter using the 'A' frequency weighting and the 'S' (Slow) time weighting. Often used for aircraft noise assessments.

NOISE

Noise is unwanted, harmful or inharmonious (discordant) sound. Sound is wave motion within matter, be it gaseous, liquid or solid. Noise usually includes vibration as well as sound.

OFFENSIVE NOISE

Reference: Dictionary of the NSW Protection of the Environment Operations Act 1997).

"Offensive Noise means noise:

(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:

(i) is harmful to (or likely to be harmful to) a person who is outside the premise from which it is emitted, or

(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or

(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulations."

'S' (SLOW) TIME WEIGHTING

Sound level meter design-goal time constant which is 1 second.

SOUND ATTENUATION

A reduction of sound due to distance, enclosure or some other devise. If an enclosure is placed around a machine, or an attenuator (muffler or silencer) is fitted to a duct, the noise emission is reduced or attenuated. An enclosure that attenuates the noise level by 20 dB reduces the sound energy by one hundred times.

SOUND EXPOSURE LEVEL (LAE)

Integration (summation) rather than an average of the sound energy over a set time period. Use to assess single noise events such as truck or train pass by or aircraft flyovers. The sound exposure level is related to the energy average (LAeq,T) by the formula $LAeq,T = LAE - 10 \log_{10} T$. The abbreviation (SEL) is sometimes inconsistently used in place of the symbol (LAE).

SOUND PRESSURE

The rms sound pressure measured in pascals (Pa). A pascal is a unit equivalent to a newton per square metre (N/m^2).

SOUND PRESSURE LEVEL, Lp

The level of sound measured on a sound level meter and expressed in decibels (dB). Where $LP = 10 \log_{10}(Pa/Po)^2$ dB (or $20 \log_{10}$ (Pa/ Po) dB) where Pa is the rms sound pressure in Pascal and Po is a reference sound pressure conventionally chosen is 20 µPa (20×10^{-6} Pa) for airborne sound. Lp varies with distance from a noise source.

SOUND POWER

The rms sound power measured in watts (W). The watt is a unit defined as one joule per second. A

measures the rate of energy flow, conversion or transfer.

SOUND POWER LEVEL, Lw

The sound power level of a noise source is the inherent noise of the device. Therefore, sound power level does not vary with distance from the noise source or with a different acoustic environment. $Lw = Lp + 10 \log_{10}$ 'a' dB,

re: 1pW, (10^{-12} watts) where 'a' is the measurement noise-emission area (m2) in a free field.

SOUND TRANSMISSION LOSS

The amount in decibels by which a random sound is reduced as it passes through a sound barrier. A method for the measurement of airborne Sound Transmission Loss of a building partition is given in Australian Standard AS1191 - 2002.

STATISTICAL NOISE LEVELS, Ln

Noise which varies in level over a specific period of time 'T' (standard measurement times are often 15-minute periods) may be quantified in terms of various statistical descriptors with some common examples:

The noise level, in decibels, exceeded for 1% of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as LAF1,T. This may be used for describing short-term noise levels such as could cause sleep arousal during the night.

The noise level, in decibels, exceeded for 10% of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as LAF10,T. In most countries the LAF10,T is measured over periods of 15 minutes, and is used to describe the average maximum noise level.

The noise level, in decibels, exceeded for 90% of the measurement time period, when 'A' frequency weighted and 'F' time weighted is reference to as LAF90,T. In most countries the LAF90,T is measured over periods of 15 minutes, and is used to describe the average minimum or background noise level.

WEIGHTED SOUND REDUCTION INDEX, Rw

This is a single number rating of the airborne sound insulation of a wall, partition or ceiling. The sound reduction is normally measured over a frequency range of 100 Hz to 3.150 kHz and averaged in accordance with ISO standard weighting curves (Refer AS/NZS 1276.1:1999). Internal partition wall Rw+C ratings are frequency weighted to simulate insulation from human voice noise. The Rw+C is similar in value to the STC rating value. External walls, doors and windows may be Rw+Ctr rated to simulate insulation from road traffic noise. The spectrum adaptation term Ctr adjustment factor takes account of low frequency noise. The weighted sound reduction index is normally similar or slightly lower number than the STC rating value.

'Z' FREQUENCY WEIGHTING

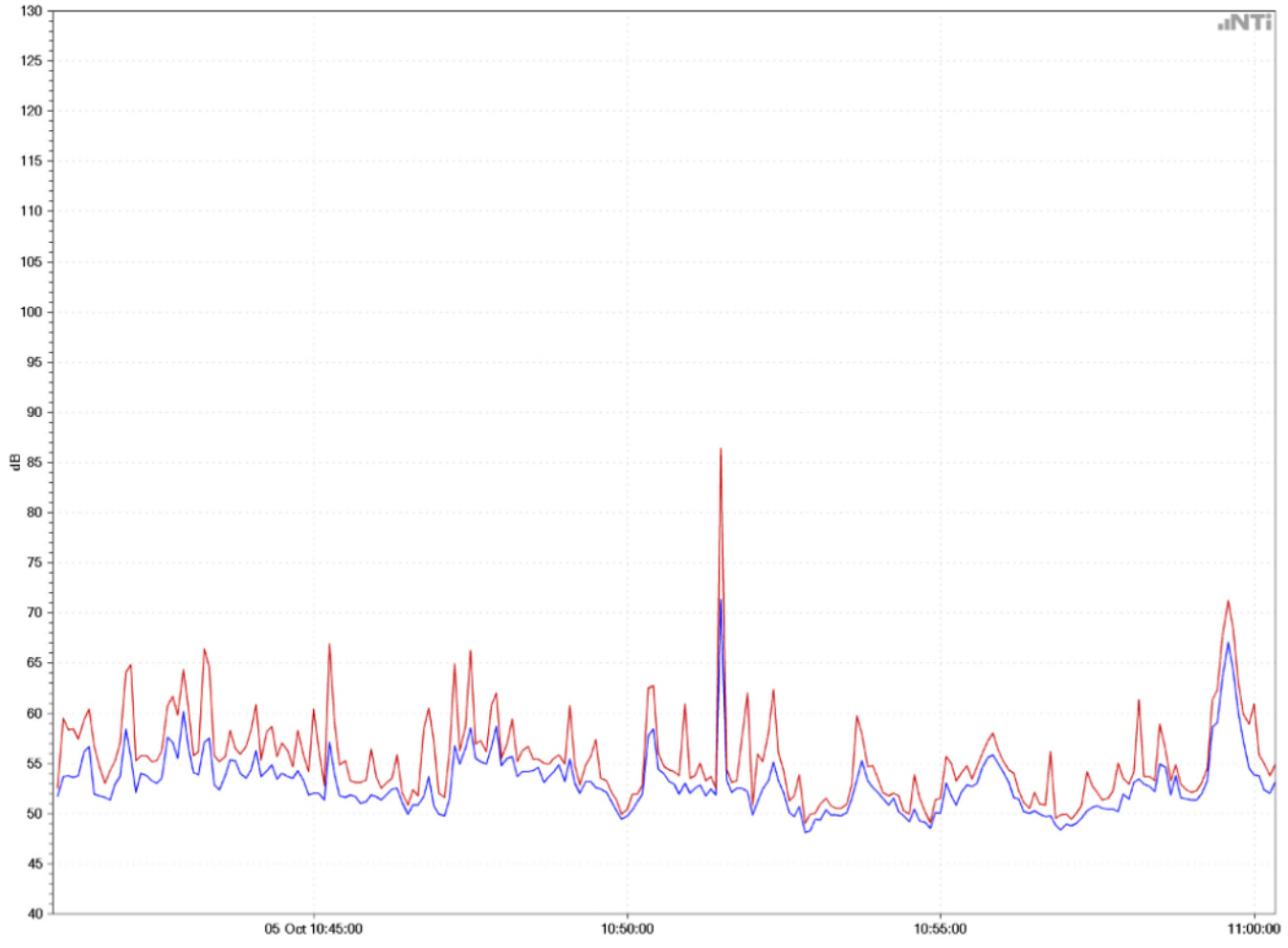
The 'Z' (Zero) frequency weighting is 0 dB within the nominal 1/3 octave band frequency range centred on 10 Hz to 20 kHz. This is within the tolerance limits given in AS IEC 61672.1-2004: 'Electroacoustics - Sound level meters – Specifications'.

Appendix B: Results of Noise Monitoring

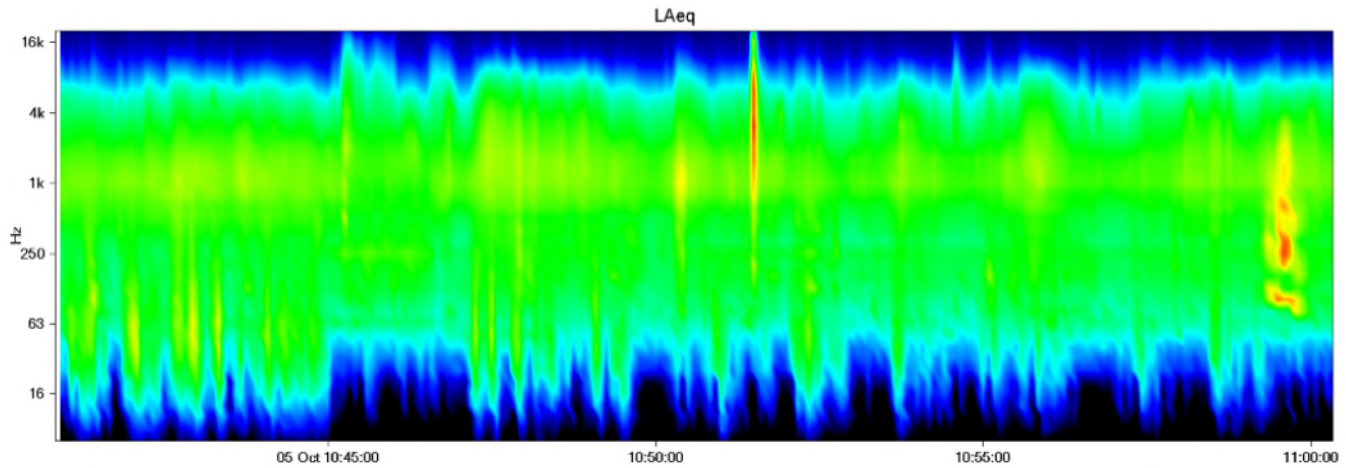
Attended Measurement 1

Start: 2023-10-05 10:40:50

End: 2023-10-05 11:00:17



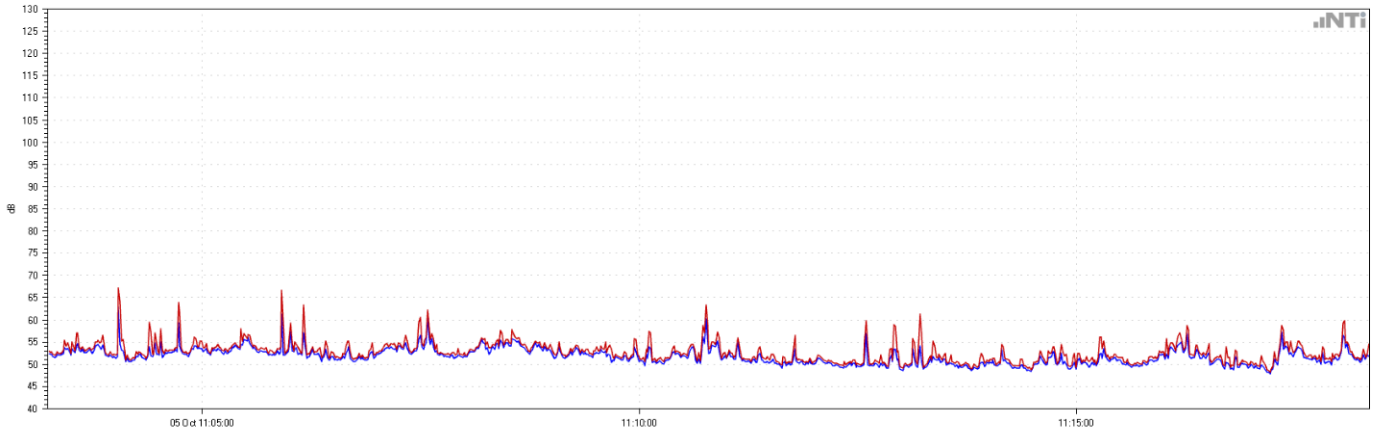
LAFmax_dt LAeq_dt



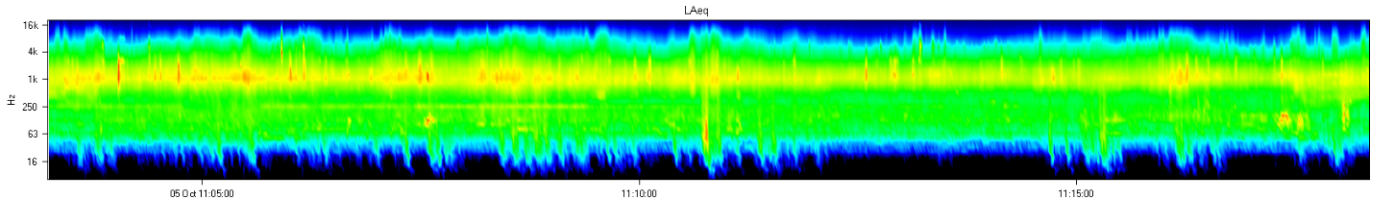
Attended Measurement 2

Start: 2023-10-05 11:03:14

End: 2023-10-05 11:18:21



LAFmax_dt LAeq_dt



Unattended Measurements

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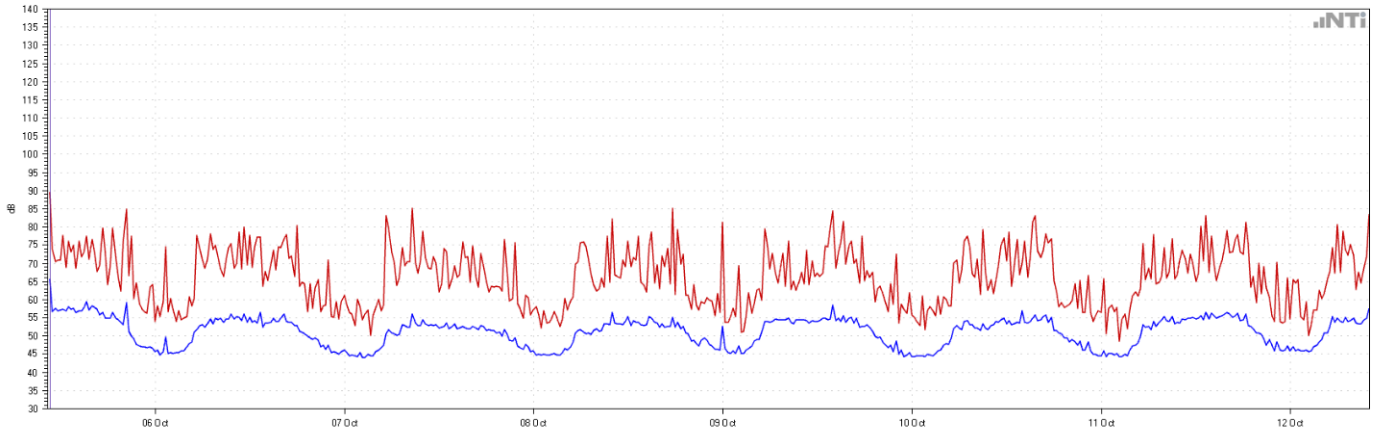
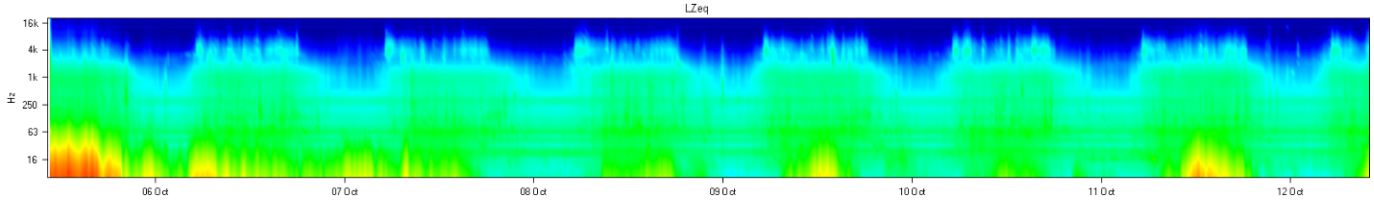
End: 2023-10-12 09:57:56





Appendix C: Glazing Treatments

Acoustic Performance Requirements for Glazing (Rw)

(magenta line)	Rw >= 35
Untagged glazing	Rw >= 31

LEGEND

Boundary	
S4.55 Building Envelope	
Building Line Over	
Residential Entry	
Carpark Entry	
Demolished Tree	
Ex Retained Tree	
New Tree	

NOTES

1. Refer to Landscape documentation for public domain and landscape areas for further information regarding materials and finishes selection.
2. Refer to Architectural Design Report for further information
3. Refer to Cover Sheet for BASIX commitments and BASIX report for further information

CLIENT
UNITING
222 Pitt Street
Sydney 2000 NSW

Building Separation Notes:
* Screening added to provide visual privacy to balconies
** Habitable to non-habitable condition (9m min)

Rev	Date	Approved by	Revision Notes
C	02.02.24		For Information
D	30.07.24	CM	For Consultant Coordination
E	23.08.24		For Consultant Coordination
F	30.08.24		For Final Review
G	9/9/2024	CM	For Consultant Coordination
H	01.11.24	CM	For DA Submission

Project Title
Shellharbour Uniting
171 Wattle Road Shellharbour NSW 2529 Australia

Drawing Title
GA Plans
Ground Level

Scale: 1:250 @A1, 50%@A3
Status: For DA Submission
Project No.: 21067
Dwg No.: DA-110-009
Drawn by: JS,VT,LF,CR,BE
Rev: H
North

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LEGEND

ACU	Air Conditioning Condenser
ACC	Accessible
ADP	Adaptable
AHD	Australian Height Datum
AL	Aluminium
AMB	Ambulant
AWN	Awning
B	Bathroom
B1,2...	Bedroom 1, Bedroom 2, etc.
BAL	Balustrade
BL	Bollard
BOH	Back of House
BWK	Brickwork
BY	Balcony
CFC	Compressed Fibre Cement
CL	Centre Line
CLD	Cladding
CLF	Chainlink Fence
CLNR	Cleaner Store
COF	Concrete Off-Form Finish
COL	Column
COMS	Communications Services
CP	Carparking Space
CPD	Cupboard
CPE	Car Park Exhaust
CR	Card Reader
CWY	Covered Walkway
CWB	Car Wash Bay
D	Dining
DB	Distribution Board
DP	Down Pipe
DWF	Decorative Wall Finish
E	Entry
ELEC	Electrical Services
EN	Ensuite
(EX)	Existing
EXH	Exhaust
F	Fire Services
FEP_01,02.	Fire Egress Passage No.01, 02, et
FEX	Fire Extinguisher
FFL	Finished Floor Level
FG	Fixed Glass
FGL	Finished Ground Level
FH	Fire Hydrant
FHR	Fire Hose Reel
FIP	Fire Indicator Panel
FMP	Fire Mimic Panel
FOH	Front of House
FS_01,	Fire Stair No.1, 2, etc.
FW	Floor Waste
GBC	Garbage Chute
GBR	Garbage Room
GC	Glass Clear
GDR	Grated Drain
GHR	Garbage Holding Room
GL	Ground Line
GLS	Glass
GPT	Gross Pollutant Trap
GR	Grab Rail
GT	Glass, Translucent
GVL	Gravel
H	Hydraulic Services
HR	Handrail
HRV	Heavy Rigid Vehicle
HWU	Hot Water Unit
K	Kitchen
KB	Kerb
L_01,	Lift No.1, 2, etc.
L	Living
LG	Lower Ground
LV	Louvre
LY	Laundry
M	Mechanical Services
MBX	Mail Box Assembly
MH	Manhole
MSB	Main Switch Board
MTR	Meter
MV	Mechanical Vent
NGL	Natural Ground Level
NOM	Nominal
(O)	Operable
OSD	On Site Detention Tank
P	Pantry
PB	Plasterboard
PCF	Powder Coat Finish
PD	Pivot Door
PER	Pergola
PF	Paint Finish
PLD	Panel Lift Door
PV	Paving
R	Robe
RA	Return Air
RES	Residential
RL	Relative Level to AHD
RWO	Rainwater Outlet
S	Storage
SA	Supply Air
SB	Splash Back
SCN	Screen
SCOL	Steel Column
SD	Sliding Door
SFF	Stone Floor Finish
SGN	Signage
SHR	Shower
SHRS	Shower Seat
SIM	Similar
SKL	Skylight
SL	Static Line
SMD	Smoke Door
SNK	Sink
SOP	Set Out Point
SPD	Spoon Drain
(SR)	Semi Recessed
SS	Stainless Steel
SSCN	Shower Screen
SSD	Sub-Surface Drainage System
SSL	Structural Slab Level
STY	Study
SWD	Stormwater Drain
SWF	Stone Wall Finish
SWP	Stormwater Pit
TCE	Terrace
TD	Timber Deck
TFF	Timber Floor Finish
TGSi	Tactile Ground Surface Indicator
TH	Threshold
TOW	Top of Wall
TV	Television
TYP	Typical
U/G	Underground
U/S	Underside
UG	Upper Ground
UNO	Unless Noted Otherwise
UT	Utility Space
UR	Urinal
V	Void
VIS	Visitor
VP	Vent Pipe
WC	WC
WC_A	WC - Accessible
WC_F	WC - Female
WC_M	WC - Male
WC_P	WC - Parents
WC_U	WC - Unisex
WF	Wall Finish
WIR	Walk in Robe
WM	Washing Machine
WS	Wheel Stop

Boundary
S4.55 Building Envelope
Building Line Over
Residential Entry
Carpark Entry
Demolished Tree
Ex Retained Tree
New Tree

NOTES

1. Refer to Landscape documentation for public domain and landscape areas for further information regarding materials and finishes selection.
2. Refer to Architectural Design Report for further information
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NOTES

DLCS Quality Endorsed Company ISO 9001:2015, Registration Number 20476
Nominated Architect: Nicholas Turner 6695, ABN 86 064 084 911

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Building Separation Notes:
* Screening added to provide visual privacy to balconies
** Habitable to non-habitable condition (9m min)

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Acoustic Performance Requirements for Glazing (Rw)

(magenta line)	Rw >= 35
Untagged glazing	Rw >= 31

LEGEND

ACU	Air Conditioning Condenser	CFC	Compressed Fibre Cement	D	Dining	FGL	Finished Ground Level	GLS	Glass
ACC	Accessible	CL	Centre Line	DB	Distribution Board	FH	Fire Hydrant	GPT	Gross Pollutant Trap
ADP	Adaptable	CLD	Cladding	DP	Down Pipe	FHR	Fire Hose Reel	GR	Grab Rail
AHD	Australian Height Datum	CLF	Chainlink Fence	DWF	Decorative Wall Finish	FIP	Fire Indicator Panel	GT	Glass, Translucent
AL	Aluminium	CLNR	Cleaner Store	E	Entry	FMP	Fire Mimic Panel	GVL	Gravel
AMB	Ambulant	COF	Concrete Off-Form Finish	ELEC	Electrical Services	FOH	Front of House	H	Hydraulic Services
AWN	Awning	COL	Column	EN	Ensuite	FS_01,	Fire Stair No.1, 2, etc.	HR	Handrail
B	Bathroom	COMS	Communications Services	(EX)	Existing	FW	Floor Waste	HRV	Heavy Rigid Vehicle
B1,2...	Bedroom 1, Bedroom 2, etc.	CP	Carparking Space	EXH	Exhaust	GBC	Garbage Chute	HWU	Hot Water Unit
BAL	Balustrade	CPD	Cupboard	F	Fire Services	GBR	Garbage Room	K	Kitchen
BL	Bollard	CPE	Car Park Exhaust	FEP_01,02.	Fire Egress Passage No.01, 02, et	GC	Glass Clear	KB	Kerb
BOH	Back of House	CR	Card Reader	FEX	Fire Extinguisher	GDR	Grated Drain	L_01,	Lift No.1, 2, etc.
BWK	Brickwork	CWY	Covered Walkway	FFL	Finished Floor Level	GHR	Garbage Holding Room	L	Living
BY	Balcony	CWB	Car Wash Bay	FG	Fixed Glass	GL	Ground Line	LG	Lower Ground

LV	Louvre	PCF	Powder Coat Finish	SCN	Screen	(SR)	Semi Recessed	TOW	Top of Wall	WC_F	WC - Female
LY	Laundry	PD	Pivot Door	SCOL	Steel Column	SS	Stainless Steel	TV	Television	WC_M	WC - Male
M	Mechanical Services	PER	Pergola	SD	Sliding Door	SSCN	Shower Screen	TYP	Typical	WC_P	WC - Parents
MBX	Mail Box Assembly	PF	Paint Finish	SFF	Stone Floor Finish	SSD	Sub-Surface Drainage System	U/G	Underground	WC_U	WC - Unisex
MH	Manhole	PLD	Panel Lift Door	SGN	Signage	SSL	Structural Slab Level	U/S	Underside	WF	Wall Finish
MSB	Main Switch Board	PV	Paving	SHR	Shower	STY	Study	UG	Upper Ground	WIR	Walk in Robe
MTR	Meter	R	Robe	SHRS	Shower Seat	SWD	Stormwater Drain	UNO	Unless Noted Otherwise	WM	Washing Machine
MV	Mechanical Vent	RA	Return Air	SIM	Similar	SWF	Stone Wall Finish	UT	Utility Space	WS	Wheel Stop
NGL	Natural Ground Level	RES	Residential	SKL	Skylight	SWP	Stormwater Pit	UR	Urinal		
NOM	Nominal	RL	Relative Level to AHD	SL	Static Line	TCE	Terrace	V	Void		
(O)	Operable	RWO	Rainwater Outlet	SMD	Smoke Door	TD	Timber Deck	VIS	Visitor		
OSD	On Site Detention Tank	S	Storage	SNK	Sink	TFF	Timber Floor Finish	VP	Vent Pipe		
P	Pantry	SA	Supply Air	SOP	Set Out Point	TGSI	Tactile Ground Surface Indicator	WC	WC		
PB	Plasterboard	SB	Splash Back	SPD	Spoon Drain	TH	Threshold	WC_A	WC - Accessible		

- Boundary
- S4.55 Building Envelope
- Building Line Over
- Residential Entry
- Carpark Entry
- Demolished Tree
- Ex Retained Tree
- New Tree

NOTES

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2. Refer to Architectural Design Report for further information
3. Refer to Cover Sheet for BASIX commitments and BASIX report for further information

DLCS Quality Endorsed Company ISO 9001:2015, Registration Number 20476
Nominated Architect: Nicholas Turner 6695, ABN 86 064 084 911

CLIENT
UNITING
222 Pitt Street
Sydney 2000 NSW

Building Separation Notes:
* Screening added to provide visual privacy to balconies
** Habitable to non-habitable condition (9m min)

Rev	Date	Approved by	Revision Notes
C	02.02.24		For Information
D	30.07.24	CM	For Consultant Coordination
E	23.08.24		For Consultant Coordination
F	30.08.24		For Final Review
G	9/9/2024	CM	For Consultant Coordination
H	01.11.24	CM	For DA Submission

Project Title
Shellharbour Uniting
171 Wattle Road Shellharbour NSW 2529 Australia

Drawing Title
GA Plans
Level 02

Scale: 1:250 @A1, 50%@A3
Project No. 21067
Drawn by: JS,VT,LF,CR,BE
North
Status: For DA Submission
Dwg No. DA-110-020
Rev: H

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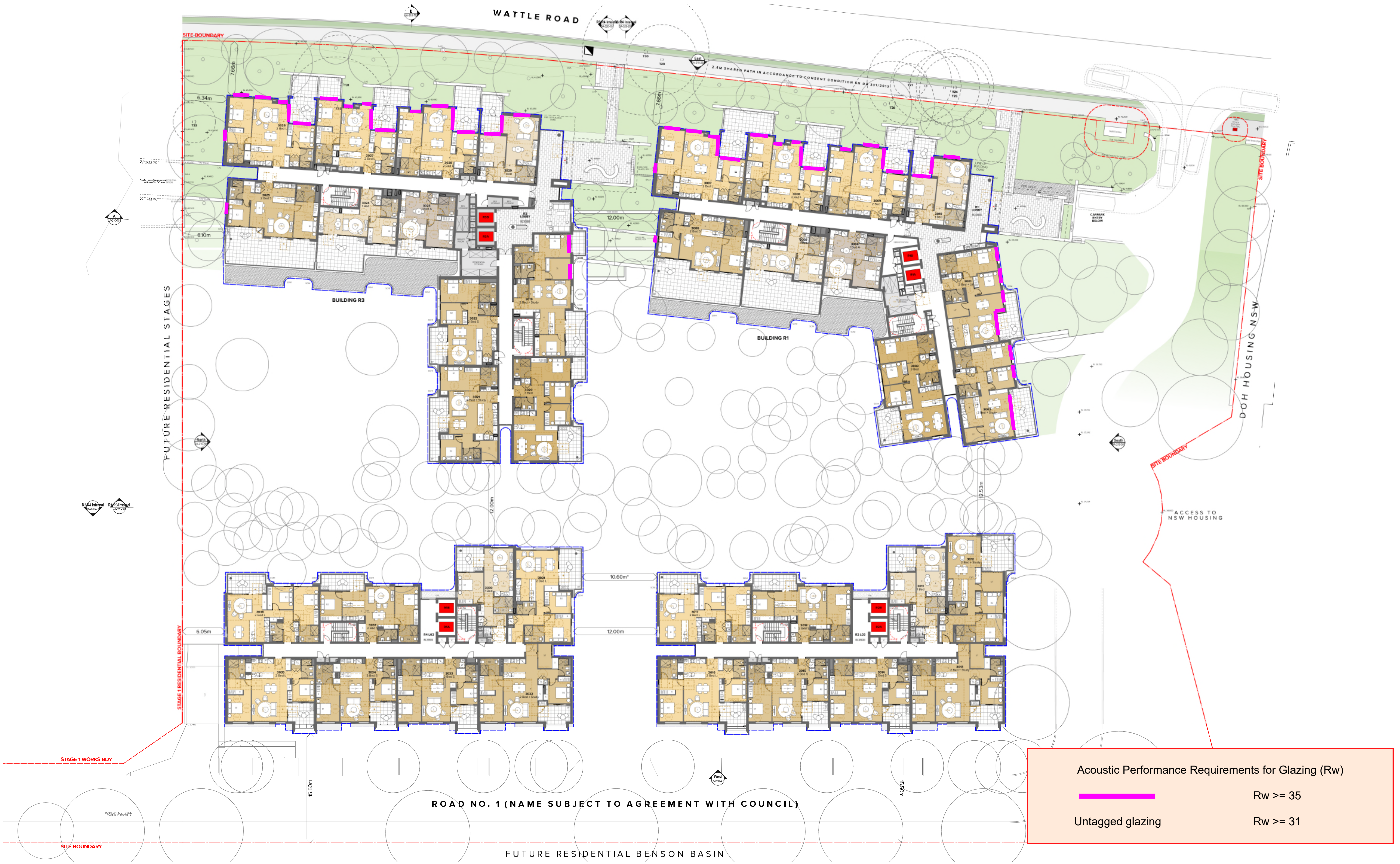

LEGEND

ACU	Air Conditioning Condenser	CFC	Compressed Fibre Cement	D	Dining	FGL	Finished Ground Level	GLS	Glass	LV	Louvre	PCF	Powder Coat Finish	SCN	Screen	(SR)	Semi Recessed	TOW	Top of Wall	WC_F	WC - Female		
ACC	Accessible	CL	Centre Line	DB	Distribution Board	FH	Fire Hydrant	GPT	Gross Pollutant Trap	LY	Laundry	PD	Pivot Door	SCOL	Steel Column	SS	Stainless Steel	TV	Television	WC_M	WC - Male		
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AHD	Australian Height Datum	CLF	Chainlink Fence	DWF	Decorative Wall Finish	FIP	Fire Indicator Panel	GT	Glass, Translucent	MBX	Mail Box Assembly	PF	Paint Finish	SFF	Stone Floor Finish	SSD	Sub-Surface Drainage System	U/G	Underground	WC_U	WC - Unisex		
AL	Aluminium	CLNR	Cleaner Store	E	Entry	FMP	Fire Mimic Panel	GVL	Gravel	MH	Manhole	PLD	Panel Lift Door	SGN	Signage	SSL	Structural Slab Level	U/S	Underside	WF	Wall Finish		
AMB	Ambulant	COF	Concrete Off-Form Finish	ELEC	Electrical Services	FOH	Front of House	H	Hydraulic Services	MSB	Main Switch Board	PV	Paving	SHR	Shower	STY	Study	UG	Upper Ground	WIR	Walk in Robe		
AWN	Awning	COL	Column	EN	Ensuite	FS_01,	Fire Stair No.1, 2, etc.	HR	Handrail	MTR	Meter	R	Robe	SHRS	Shower Seat	SWD	Stormwater Drain	UNO	Unless Noted Otherwise	WM	Washing Machine		
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B1,2...	Bedroom 1, Bedroom 2, etc.	CP	Carparking Space	EXH	Exhaust	GBC	Garbage Chute	HWU	Hot Water Unit	NGL	Natural Ground Level	RES	Residential	SKL	Skylight	SWP	Stormwater Pit	UR	Urinal				
BAL	Balustrade	CPD	Cupboard	F	Fire Services	GBR	Garbage Room	K	Kitchen	NOM	Nominal	RL	Relative Level to AHD	SL	Static Line	TCE	Terrace	V	Void				
BL	Bollard	CPE	Car Park Exhaust	FEP_01,02.	Fire Egress Passage No.01, 02, et	GC	Glass Clear	KB	Kerb	(O)	Operable	RWO	Rainwater Outlet	SMD	Smoke Door	TD	Timber Deck	VIS	Visitor				
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BWK	Brickwork	CWY	Covered Walkway	FFL	Finished Floor Level	GHR	Garbage Holding Room	L	Living	P	Pantry	SA	Supply Air	SOP	Set Out Point	TGSI	Tactile Ground Surface Indicator	WC	WC				
BY	Balcony	CWB	Car Wash Bay	FG	Fixed Glass	GL	Ground Line	LG	Lower Ground	PB	Plasterboard	SB	Splash Back	SPD	Spoon Drain	TH	Threshold	WC_A	WC - Accessible				

Boundary
S4.55 Building Envelope
Building Line Over
Residential Entry
Carpark Entry
Demolished Tree
Ex Retained Tree
New Tree

NOTES

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3. Refer to Cover Sheet for BASIX commitments and BASIX report for further information

CLIENT
UNITING
222 Pitt Street
Sydney 2000 NSW

Building Separation Notes:
* Screening added to provide visual privacy to balconies
** Habitable to non-habitable condition (9m min)

Rev	Date	Approved by	Revision Notes
C	02.02.24		For Information
D	30.07.24	CM	For Consultant Coordination
E	23.08.24		For Consultant Coordination
F	30.08.24		For Final Review
G	9/9/2024	CM	For Consultant Coordination
H	01.11.24	CM	For DA Submission

Project Title
Shellharbour Uniting
171 Wattle Road Shellharbour NSW 2529 Australia

Drawing Title
GA Plans
Level 03

Scale: 1:250 @A1, 50%@A3
Project No.: 21067
Drawn by: JS,VT,LF,CR,BE
North
Status: For DA Submission
Dwg No.: DA-110-030
Rev: H

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Acoustic Performance Requirements for Glazing (Rw)	
(magenta line)	Rw >= 35
Untagged glazing	Rw >= 31

LEGEND

- Boundary
- S4.55 Building Envelope
- Building Line Over
- Residential Entry
- Carpark Entry
- Demolished Tree
- Ex Retained Tree
- New Tree

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CLIENT
UNITING
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Sydney 2000 NSW

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Rev	Date	Approved by	Revision Notes
B	12.12.23		For Information
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D	30.07.24	CM	For Consultant Coordination
E	23.08.24		For Consultant Coordination
F	30.08.24		For Final Review
G	01.11.24	CM	For DA Submission

Project Title
Shellharbour Uniting
171 Wattle Road Shellharbour NSW 2529 Australia

Drawing Title
GA Plans
Level 04

Scale: 1:250 @A1, 50%@A3
Status: For DA Submission
Project No. 21067
Dwg No. DA-110-040
Drawn by: JS,VT,LF,CR,BE
Rev: G
North

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Acoustic Performance Requirements for Glazing (Rw)

Glazing	Requirement
Magenta line	Rw >= 35
Untagged glazing	Rw >= 31

LEGEND

Abbr.	Meaning
ACU	Air Conditioning Condenser
ACC	Accessible
ADP	Adaptable
AHD	Australian Height Datum
AL	Aluminium
AMB	Ambulant
AWN	Awning
B	Bathroom
B1,2...	Bedroom 1, Bedroom 2, etc.
BAL	Balustrade
BL	Bollard
BOH	Back of House
BWK	Brickwork
BY	Balcony
CFC	Compressed Fibre Cement
CL	Centre Line
CLD	Cladding
CLF	Chainlink Fence
CLNR	Cleaner Store
COF	Concrete Off-Form Finish
COL	Column
COMS	Communications Services
CP	Carparking Space
CPD	Cupboard
CPE	Car Park Exhaust
CR	Card Reader
CWY	Covered Walkway
CWB	Car Wash Bay
D	Dining
DB	Distribution Board
DP	Down Pipe
DWF	Decorative Wall Finish
E	Entry
ELEC	Electrical Services
EN	Ensuite
(EX)	Existing
EXH	Exhaust
F	Fire Services
FEP_01,02.	Fire Egress Passage No.01, 02, et
FEX	Fire Extinguisher
FFL	Finished Floor Level
FG	Fixed Glass
FGL	Finished Ground Level
FH	Fire Hydrant
FHR	Fire Hose Reel
FIP	Fire Indicator Panel
FMP	Fire Mimic Panel
FOH	Front of House
FS_01,	Fire Stair No.1, 2, etc.
FW	Floor Waste
GBC	Garbage Chute
GBR	Garbage Room
GC	Glass Clear
GDR	Grated Drain
GHR	Garbage Holding Room
GL	Ground Line
GLS	Glass
GPT	Gross Pollutant Trap
GR	Grab Rail
GT	Glass, Translucent
GVL	Gravel
H	Hydraulic Services
HR	Handrail
HRV	Heavy Rigid Vehicle
HWU	Hot Water Unit
K	Kitchen
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L_01,	Lift No.1, 2, etc.
L	Living
LG	Lower Ground
LV	Louvre
LY	Laundry
M	Mechanical Services
MBX	Mail Box Assembly
MH	Manhole
MSB	Main Switch Board
MTR	Meter
MV	Mechanical Vent
NGL	Natural Ground Level
NOM	Nominal
(O)	Operable
OSD	On Site Detention Tank
P	Pantry
PB	Plasterboard
PCF	Powder Coat Finish
PD	Pivot Door
PER	Pergola
PF	Paint Finish
PLD	Panel Lift Door
PV	Paving
R	Robe
RA	Return Air
RES	Residential
RL	Relative Level to AHD
RWO	Rainwater Outlet
S	Storage
SA	Supply Air
SB	Splash Back
SCN	Screen
SCOL	Steel Column
SD	Sliding Door
SFF	Stone Floor Finish
SGN	Signage
SHR	Shower
SHRS	Shower Seat
SIM	Similar
SKL	Skylight
SL	Static Line
SMD	Smoke Door
SNK	Sink
SOP	Set Out Point
SPD	Spoon Drain
(SR)	Semi Recessed
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SSCN	Shower Screen
SSD	Sub-Surface Drainage System
SSL	Structural Slab Level
STY	Study
SWD	Stormwater Drain
SWF	Stone Wall Finish
SWP	Stormwater Pit
TCE	Terrace
TD	Timber Deck
TFF	Timber Floor Finish
TGSI	Tactile Ground Surface Indicator
TH	Threshold
TOW	Top of Wall
TV	Television
TYP	Typical
U/G	Underground
U/S	Underside
UG	Upper Ground
UNO	Unless Noted Otherwise
UT	Utility Space
UR	Urinal
V	Void
VIS	Visitor
VP	Vent Pipe
WC	WC
WC_A	WC - Accessible
WC_F	WC - Female
WC_M	WC - Male
WC_P	WC - Parents
WC_U	WC - Unisex
WF	Wall Finish
WIR	Walk in Robe
WM	Washing Machine
WS	Wheel Stop

- Boundary
- S4.55 Building Envelope
- Building Line Over
- Residential Entry
- Carpark Entry
- Demolished Tree
- Ex Retained Tree
- New Tree

NOTES

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CLIENT
UNITING
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Sydney 2000 NSW

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Rev	Date	Approved by	Revision Notes
B	12.12.23		For Information
C	02.02.24		For Information
D	30.07.24	CM	For Consultant Coordination
E	23.08.24		For Consultant Coordination
F	30.08.24		For Final Review
G	01.11.24	CM	For DA Submission

Project Title
Shellharbour Uniting
171 Wattle Road Shellharbour NSW 2529 Australia

Drawing Title
GA Plans
Level 05

Scale: 1:250 @A1, 50%@A3
Project No. 21067
Drawn by: JS,VT,LF,CR,BE
North
Status: For DA Submission
Dwg No. DA-110-050
Rev G

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Acoustic Performance Requirements for Glazing (Rw)

(magenta line)	Rw >= 35
Untagged glazing	Rw >= 31

LEGEND

ACU	Air Conditioning Condenser	CFC	Compressed Fibre Cement	D	Dining	FGL	Finished Ground Level	GLS	Glass	LV	Louvre	PCF	Powder Coat Finish	SCN	Screen	(SR)	Semi Recessed	TOW	Top of Wall	WC_F	WC - Female
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Boundary
S4.55 Building Envelope
Building Line Over
Residential Entry
Carpark Entry
Demolished Tree
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NOTES

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NOTES

DLCS Quality Endorsed Company ISO 9001:2015, Registration Number 20476
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F	30.08.24		For Final Review
G	01.11.24	CM	For DA Submission

Project Title
Shellharbour Uniting
171 Wattle Road Shellharbour NSW 2529 Australia

Drawing Title
GA Plans
Level 06

Scale: 1:250 @A1, 50%@A3
Project No.: 21067
Drawn by: JS,VT,LF,CR,BE
North
Status: For DA Submission
Dwg No.: DA-110-060
Rev: G

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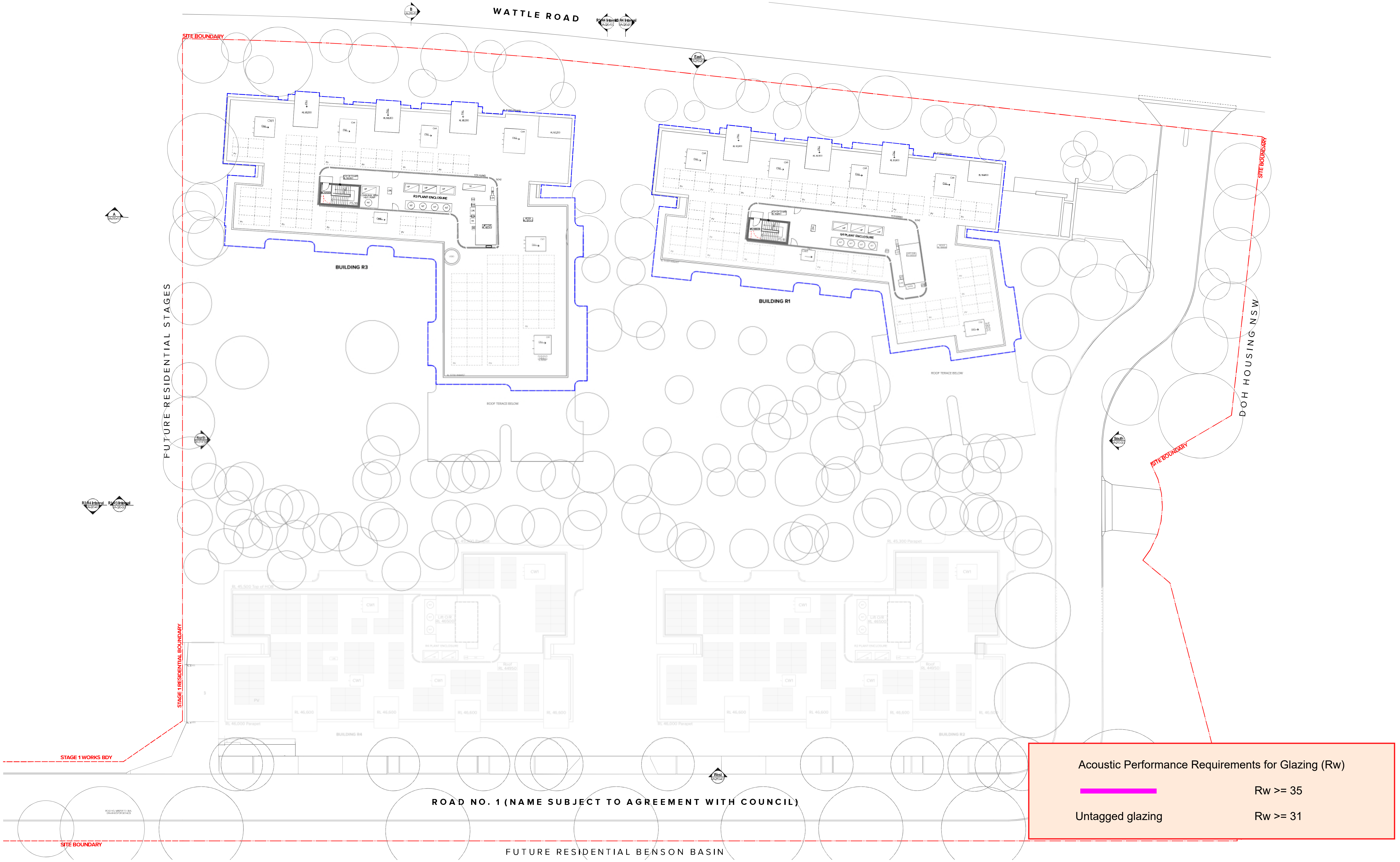

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UT	Utility Space
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V	Void
VIS	Visitor
VP	Vent Pipe
WC	WC
WC_A	WC - Accessible
WC_F	WC - Female
WC_M	WC - Male
WC_P	WC - Parents
WC_U	WC - Unisex
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Building Separation Notes:
* Screening added to provide visual privacy to balconies
** Habitable to non-habitable condition (9m min)

Rev	Date	Approved by	Revision Notes
B	12.12.23		For Information
C	02.02.24		For Information
D	30.07.24	CM	For Consultant Coordination
E	23.08.24		For Consultant Coordination
F	30.08.24		For Final Review
G	01.11.24	CM	For DA Submission

Project Title
Shellharbour Uniting
171 Wattle Road Shellharbour NSW 2529 Australia

Drawing Title
GA Plans
Level 7 Roof Level

Scale: 1:250 @A1, 50%@A3
Project No.: 21067
Drawn by: JS,VT,LF,CR,BE
North
Status: For DA Submission
Dwg No.: DA-110-070
Rev: G

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