Acoustic Letter of Support

Macarthur Gardens North R3
DA Modification

Prepared For:
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1. Introduction

1.1. Purpose and scope

BSE (Acoustics) have prepared this acoustic letter of support for Landcom as part of the State Significant Development Application (SSDA) for an affordable housing development within the Macarthur Gardens North precinct (MGN) in the Campbelltown Local Government Area (LGA). The MGN precinct is identified as Lot 1097 in DP1182558.

The purpose of this letter is to support a Section 4.55 Modification Application for the approved residential development, which was originally approved by the Minister for Planning and Public Spaces as detailed in the Development Consent dated 29 April 2026 (reference *SSD-80482713*).

BSE issued a noise impact assessment for the original application, dated 29 July 2025 (ref. *20250529 Macarthur Garden North Site R3 Acoustic DA Report V3*); this acoustic report is nominated in the Development Consent and recommended noise mitigation measures from this report must be implemented in the development as stated in Conditions B13 and E13.

This letter of support details the changes in the design, and minor updates to acoustic recommendations for the development.

2. Project Information

2.1. Proposal Amendments

The proposed development has been slightly amended since the previous approval was issued on 29 April 2026; this approval was based on drawings issued by DKO on 24 November 2025. The new architectural drawings on which this modification application is based are issued by DKO, revision '*For S.455 Submission*', dated 19 June 2026.

The general footprint and layout of the building, and the carpark access driveway location remain unchanged.

A summary of the changes since the previous approval (as modified) are detailed as follows:

- The number of storeys in the proposed building has reduced from 9 to 8.
- Some RLs have changed e.g. Basement level and ground level of Tower B.
- Setbacks have slightly increased.
- Apartment layouts have changed, although the total number of apartments remains the same at 130.
- Reduction of carparking spaces in the single basement level, from 64 down to 52. The basement carparking entry is at the same location.
- The outdoor communal open space areas on ground and Level 3 are generally of the same size and location and remain functionally the same.

3. Noise Criteria

All noise criteria stated in this letter remain consistent with the approved noise assessment by BSE 29 July 2025 (ref. *20250529 Macarthur Garden North Site R3 Acoustic DA Report V3*).

3.1. Sensitive Receivers

The sensitive receivers potentially most affected from noise from the source under consideration are listed in Table 1 and shown in the aerial image of the surrounding area in Figure 1. As the predominant noise sources from the proposed site will consist of outdoor communal gatherings and carpark activity, the proposed residential within the overall Macarthur Gardens masterplan will be most affected.

Table 1: Table of potential affected receivers

Receiver ID	Receiver Type	Address	Description
R01	Proposed Residential (Macarthur North site)	Goldsmith Avenue, Campbelltown Lot 1097 on DP1182558	Proposed residential building (up to 32m or approx. 10 storeys)
R02	Proposed Residential (Macarthur North site)	Goldsmith Avenue Lot 1097 on DP1182558	Proposed residential building (up to 32m or approx. 10 storeys)
R03	TAFE NSW - Education Facility	181 Narellan Road, Campbelltown Lot 2 on DP253700	TAFE Education site with many buildings
R04	Gilchrist Park – Public Recreation	Narellan Road, Campbelltown Lot 3 on DP253700	Baseball field and public recreation area
R05	Proposed R3 Onsite Apartments	Goldsmith Avenue Lot 1097 on DP1182558	Proposed residential building, R3 site

Figure 1: Site location, potentially affected receivers, and monitoring locations

3.2. Noise Monitoring Results

Rating Background Levels (RBL) measured by Renzo Tonin for day, evening, and night periods are shown in Table 2. Noise monitoring was conducted by Renzo Tonin between 31 October and 8 November 2019.

Table 2: Overall L_{eq} ambient levels and Rating Background Levels (RBL)

Location	NSW NPI Ambient Assessment – Measured RBL $L_{A90,T}$			NSW Road Traffic Assessment – Measured $L_{Aeq,T}$	
	Day (Mon-Sat 7am-6pm, Sun 8am-6pm)	Evening (6pm-10pm)	Night (Mon-Sat 10pm-7am, Sun 10pm-8am)	15-hour day (7am-10pm)	9-hour night (10pm-7am)
1 (SW of Site R3)	45	45	38	N/A	N/A
2 (West of Site R3)	51	51	41	63	60
3 (East of Site R3)	46	47	41	63	58

3.3. Project Specific Criteria

3.3.1. Intrusive/Amenity Noise Criteria

The selection of the project specific criterion is detailed in Table 3. Based on the future development of the site which will include high-density residential uses and mixed-use developments, as well as the existing nearby arterial roads, the urban residential amenity noise category has been selected for all residential receivers.

Table 3: NSW Noise Policy for Industry Project Criteria, dB(A).

Receivers	Time Period	Measured L_{90} RBL	Intrusiveness Criteria (RBL + 5dBA)	Nominated Noise Amenity Area	Designated Amenity Noise Level	Project Amenity Criteria (Amenity Level -5dBA + 3dBA)	Overall Criteria (Lower of Intrusiveness/ Amenity)
1 (Residential)	Day	46	51	Urban Residential	60	58	**51**
	Evening	47	52		50	48	**48**
	Night	41	46		45	43	**43**
2 (Residential)	Day	45	50	Urban Residential	60	58	**50**
	Evening	45	50		50	48	**48**
	Night	38	43		45	43	**43**
3 (TAFE)	When in Use	N/A	N/A	Education/Classroom	45*	43*	**43***
4 (Recreation)	When in Use	N/A	N/A	Active Recreation Area	55	53	**53**
*Noise limits for school classrooms are nominated as 35dB(A) internally in the Interim Construction Noise Guideline. A reduction of 10dB(A) from external levels to internal levels is applied, assuming open windows, according to the EPA. The levels listed in this table are the external levels (55dBA).							

3.3.2. Sleep Disturbance

Based on the measured background levels during the night-time period, noise criteria $L_{Aeq,15min}$ 51dB(A) for receiver 1 and 48 dB(A) for receiver 2, is applicable for the development. Note that these criteria are higher than the applied amenity noise criteria.

The L_{AFMax} criteria for the night-time period are 61dB(A) for Receiver 1 and 58dB(A) for Receiver 2 based on the measured background levels.

It should be noted that the sleep disturbance criteria does not apply to non-residential receivers.

3.3.3. Construction Noise

Following the determination of daytime RBL values, during Recommended Standard Hours, the following Noise Affected and Highly Noise Affected Construction Noise Management Levels are summarised below in Construction Noise Management Levels $Leq_{,15min}$ dBA – Recommended Standard Hours.

Table 4: Construction Noise Management Levels $L_{eq,15min}$ dBA – Recommended Standard Hours.

Time of Day	Receiver	Measured RBL (dBA)	Management Level, $L_{Aeq\ (15min)}$	Highly Affected Management Level, $L_{Aeq\ (15min)}$
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays	1 (Residential)	51	Noise affected (51+10) = 61	75
	2 (Residential)	50	Noise affected (50+10) = 60	75
Recommended standard hours and When properties are in use	3 (Classrooms at schools and other education institutions)	N/A	55*	N/A
	4 (Active recreation areas)	N/A	65	N/A
*Noise limits for classrooms are nominated as 45dB(A) internally in the Interim Construction Noise Guideline. A reduction of 10dB(A) from external levels to internal levels is applied, assuming open windows, according to the EPA. The levels listed in this table are the external levels (55dBA).				

Note that Receivers 1 & 2 are proposed residential buildings – noise limits for construction would only be applicable in these buildings if they are constructed and occupied before construction of the subject site (R3).

3.3.4. Construction Vibration

Construction vibration levels depend on several factors. These include the activity, the machine, the geology of the ground and the distance between the building and the source. In Australia there is no current specific standard for construction vibration.

The NSW EPA Assessing Vibration: a technical guideline (2006) provides some guidance in relation to human comfort but does not directly relate to damage levels to buildings. This methodology is equivalent to the guidelines issued in current international standards and described in *'AS2670 Vibration and shock - Guide to the evaluation of human exposure to whole body vibration'*, as shown below in Table *5*.

Table 5: Multiplying Factors to obtain limit vibration levels (mm/s) - human comfort criteria

Place	Multiplying Factors		
	Time	Continuous Vibration	Intermittent or Impulsive
Residential	Day 0700-2200	2	60
	Night 2200-0700	1.4	20
Office	Day 0700-2200	4	128
	Night 2200-0700	4	128
Workshops	Day 0700-2200	8	128
	Night 2200-0700	8	128

With regards to structural damage, the German DIN4150 and NSW EPA and British Standard BS6472 provide guidelines relevant to this assessment. These criteria are summarised below in Table 6.

Table 6: Typical Vibration Limit Criteria (mm/s) – structural damage criteria

Criterion	Typical Vibration Velocity (mm/s)	Standard
Disturbance to Persons (Day) 0700-2200	0.3 – 0.6 peak	BS6472
Disturbance to Persons (Night) 2200-0700	0.2 peak	BS6472
Damage to Dwellings	5 – 15 rms	DIN 4150
Damage to Heritage Buildings	**3 – 8 rms**	**DIN 4150**

Management of noise and vibration impacts during construction is best mitigated through the implementation of a site noise and vibration management plan by the prospective lead building contractor.

3.4. Australian/New Zealand Standards 2107-2016

Australian / New Zealand Standard AS/NZS 2107:2016 *'Acoustics – Recommended design sound levels and reverberation times for building interiors'* is a widely accepted guide to desirable interior background noise for residential buildings as summarised below in AS 2107 Recommended internal noise levels and midfrequency reverberation times (s).

It is used to determine the required noise limits within onsite apartments.

Table 7: AS 2107 Recommended internal noise levels and midfrequency reverberation times (s).

Type of Occupancy/Activity		**Design Sound Level $L_{eq,T}$**
Residential Buildings – Apartments in inner city areas or entertainment districts or near major roads	Common areas	45 to 50 dB(A)
	Living areas	35 to 45 dB(A)
	Sleeping areas	35 to 40 dB(A)
	Work areas	35 to 45 dB(A)

4. Noise Impact Assessment Methodology

4.1. Operational Noise Impacts

Based on the review of the changes between the approved and current plans for the development, the noise sources are expected to remain relatively unchanged. For reference, noise sources previously assessed are detailed in this section. The unchanged location of the communal areas and carpark driveway mean that the previous assessment as shown is still relevant.

Noise assessment from the communal areas, both the Ground Level central courtyard and the Level 3 areas, is based on the nominated activities as used by residents of the R3 site apartments.

BSE have modelled as the following a typical worst-case 15-min period based on the following information:

- Predicted noise levels from patron/resident voices are modelled on raised voice levels of 66dB(A) L_{eq} at 1m per person.
- Noise from communal area voices are modelled as follows in each area. Half of the people in each area are assumed to be speaking at any given time.
    - 100 residents in the Ground Level central courtyard dining – raised voices
    - Background amplified music in the Ground Level central courtyard
    - 20 residents in each of the Level 3 communal areas – raised voices
- Vehicle carparking is assessed at the following rates:
    - 15 vehicle passes in the worst-case daytime 15-minute period
    - 15 vehicle passes in the worst-case evening 15-minute period
    - 5 vehicle passes in the worst-case night-time 15-minute period
- Each car pass, including door closure and car start noise, is assessed as a sound power level of:
    - $L_{eq,15sec}$ 85dB(A)
    - L_{Max} 90dB(A)
- The carwash bay in the basement carpark is assumed to be a manual carwash location with typical commercial spray-hose and soap guns etc. It is likely to have a sound power of Lw 84dB(A) and due to its location would be emit generally insignificant noise at neighbouring receivers when compared to traffic passes and other noise sources. It is however, recommended to be used during the daytime and evening periods only (7am-10pm).
- Sound power level was approximated to 8dB(A) higher than the sound pressure level at 1m.

4.2. Construction Noise Impacts

Similarly, construction noise impacts are not expected to significantly change with the updated plans, given that excavation and structural works would still be of the same scope. Therefore the previous assessment, which is also shown below in Table 8 for reference, is still relevant.

Table 8: Typical construction plant and sound power levels L_W dB(A) (DEFRA)

Typical Plant	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	dBA
Excavation Works									
Bobcat (5t)	99	99	94	87	87	86	82	76	**93**
Truck Delivery	114	110	105	102	98	94	90	83	**104**
Screw Piler	104	101	90	94	90	86	82	77	**95**
Structural Works									
Truck Delivery	114	110	105	102	98	94	90	83	**104**
Concrete Pump	112	104	98	99	101	101	94	86	**106**
Saw	110	110	100	99	97	96	90	92	**103**
Mobile Crane (50t)	106	97	95	92	90	85	77	68	**95**
Angle Grinder	85	79	80	88	98	105	101	101	**110**
Hammer	94	94	96	96	91	85	83	79	**97**
Fit out Works									
Angle Grinder	85	79	80	88	98	105	101	101	**110**
Hammer	94	94	96	96	91	85	83	79	**97**

4.3. Road Traffic and Rail Noise Intrusion

Road traffic and rail noise impacts to the development on Site R3were assessed by BSE, utilising measurements and assessment from Renzo Tonin which they had implemented for the overall masterplan development.

As stated in Renzo Tonin's acoustic report (ref. *TL100-05F01 Masterplan acoustic and vibration assessment r1*, dated 3 December 2021), noise impacts from road traffic and rail were assessed through Cadna-A modelling and verified with the onsite noise monitors.

The assessment horizon year and the number of vehicles, heavy vehicle percentage, speed, etc. used in the assessment are not specified in the report by Renzo Tonin. This report by BSE has taken the nominated impacts from road traffic and rail which are shown in graphical form in the Renzo Tonin report, and below in Figure 2.

Noise impacts for each façade are determined by BSE based on the provided graphical results in the Renzo Tonin report, and are stated in The $LA_{eq,15hr}$ day results are corrected provided night-time impacts using the difference in the Renzo Tonin monitoring noise levels.

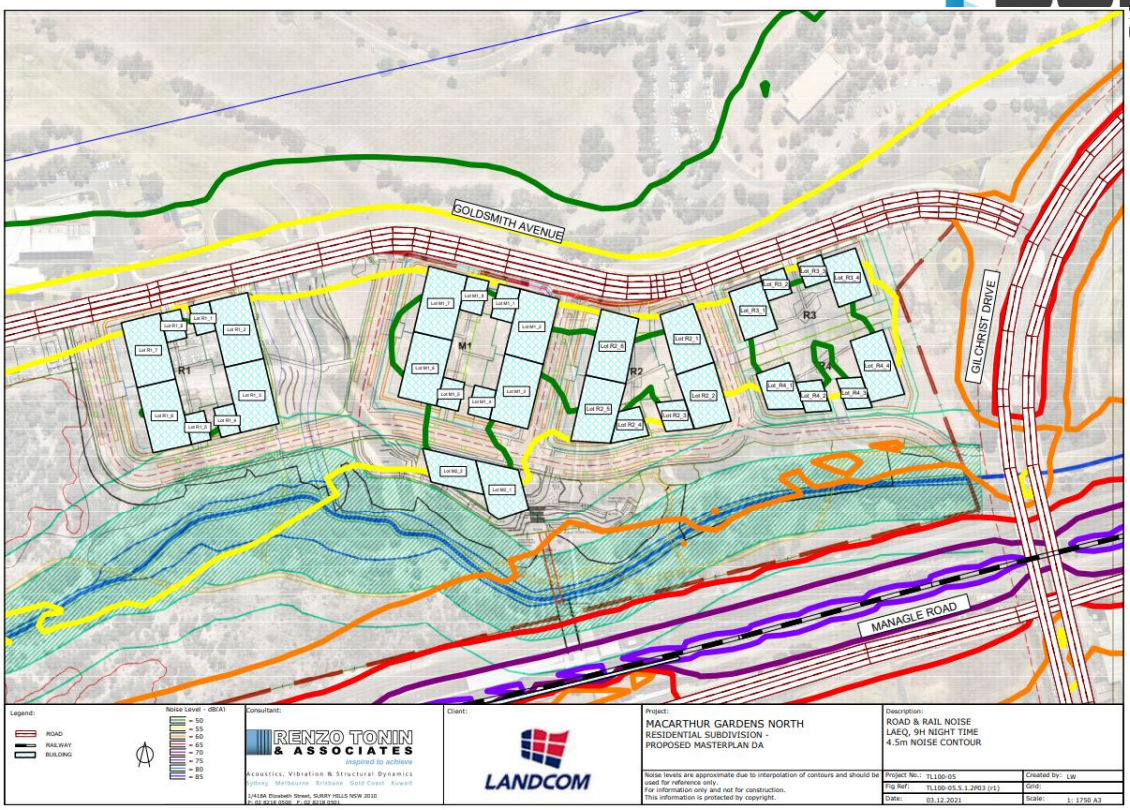

Figure 2: Renzo Tonin Graphical Noise Impacts - LAeq,9hr Night-time, Level 1

Renzo Tonin states that the graphical data should be used for reference only. This letter only provides more specific faced treatments for the proposed R3 building based on current drawings, and previous results stated in the Renzo Tonin report. Recommendations are shown for treatment of entire facades as they were in the approved report. Therefore, although the layout of apartments has been altered, these façade recommendations have not changed because they are independent of these layout changes.

5. Recommendations

As stated throughout Section 4, the methodology used in the approved acoustic report by BSE is still relevant to the proposal after minor changes to the development. However, the recommendations for mechanical ventilation has been slightly updated for this S4.55 Modification, based on wording within the NSW *Development Near Rail Corridors and Busy Roads – Interim Guideline* as stated below.

5.1. Façade Construction Recommendations

Based upon the specified traffic noise impacts from Renzo Tonin, recommended façade treatments are listed in Table 9 in order to minimise traffic and rail noise impacts in accordance with SEPP requirements. Noise impacts from proposed onsite sources (communal areas and carparking) are assessed in accordance with the maximum noise level nominated in AS2107:2016.

Where a room is nominated as affected by both traffic/rail and onsite noise impacts, the highest nominated treatment should be implemented. Mechanical ventilation is also necessary in nominated habitable areas, so that the façade doors and windows can remain closed. Mechanical ventilation is nominated in accordance with Section 3.6.1 of the '*Development Near Rail Corridors and Busy Roads – Interim Guideline*' issued by NSW Department of Planning in 2008; i.e., mechanical ventilation is required "*if internal noise levels with windows or doors open exceed the criteria by more than 10dBA*".

Table 9:Traffic Noise - minimum transmission loss requirements (Rw).

Level	Tower	Façade	Room	Recommended Façade Glazing Treatments		
				Minimum Rw		Mechanical Ventilation
				Glazing	Wall	
Ground Floor – Level 2	East	Northern Façade	Bedroom	28	35	Yes
			Other habitable rooms	28	35	Yes
		Eastern Façade	Bedroom	29	35	Yes
			Other habitable rooms	29	35	Yes
		Southern Façade	Bedroom	23	35	No
			Other habitable rooms	23	35	No
		Western Façade	Bedroom	26	35	No
			Other habitable rooms	26	35	No
	West	Northern Façade	Bedroom	28	35	Yes
			Other habitable rooms	28	35	Yes
		Eastern Façade	Bedroom	23	35	No
			Other habitable rooms	23	35	No
		Southern Façade	Bedroom	23	35	No
			Other habitable rooms	23	35	No
		Western Façade	Bedroom	26	35	No
			Other habitable rooms	26	35	No
Level 3 – Level 7	East	Northern Façade	Bedroom	27	35	Yes
			Other habitable rooms	27	35	Yes
		Eastern Façade	Bedroom	29	35	Yes
			Other habitable rooms	29	35	Yes
		Southern Façade	Bedroom	23	35	No
			Other habitable rooms	23	35	No
		Western Façade	Bedroom	26	35	No
			Other habitable rooms	26	35	No
	West	Northern Façade	Bedroom	27	35	Yes
			Other habitable rooms	27	35	Yes
		Eastern Façade	Bedroom	23	35	No

Level	Tower	Façade	Room	Recommended Façade Glazing Treatments		
				Minimum Rw		Mechanical Ventilation
				Glazing	Wall	
			Other habitable rooms	23	35	No
		Southern Façade	Bedroom	23	35	No
			Other habitable rooms	23	35	No
		Western Façade	Bedroom	26	35	No
			Other habitable rooms	26	35	No

Table 10: Onsite Noise–minimum transmission loss requirements (Rw).

Level	Apartments	Room	Recommended Façade Glazing Treatments		
			Minimum Rw		Mechanical Ventilation
			Glazing	Wall	
Ground Floor	Apartments adjacent to entrance driveway ramp leading to basement	Bedroom	24	35	Yes
		Other habitable rooms	24	35	Yes
Ground Floor – Level 2	All apartments overlooking the ground level communal area	Bedroom	29	35	Yes
		Other habitable rooms	27	35	Yes
Level 3 – Level 6	All apartments overlooking the Level 3 communal areas	Bedroom	24	35	Yes
		Other habitable rooms	22	35	Yes

Nominal façade wall constructions are listed below. Other systems may be implemented if they achieve the specified Rw rating.

- Wall Rw35:
  - Single 64mm steel studs, 50mm thick insulation (11kg/m^3) in cavity. 6mm thick fibre cement cladding externally and 10mm standard plasterboard (min. 8.5kg/m^2) internally.

Nominal glazing solutions are also stated below. Note that other systems may be implemented if they achieve the specified Rw rating. These systems are only typical recommendations; a laboratory (NATA or equivalent) test should be reviewed to determine the rating of the applied system, once the exact product has been selected. The nominated Rw rating is required for the entire system which includes glass, frames, and seals.

- Glazing Rw29:
  - 5mm thick single glazing, with full acoustic seals such as Q-Lon, or
  - 6mm/12mm air gap/4mm, with full acoustic seals such as Q-Lon
- Glazing Rw24-27:
  - 4mm thick single glazing, with full acoustic seals such as Q-Lon
- Glazing Rw22-23:
  - 4mm thick single glazing, with standard weather (mohair) seals

5.2. Other Construction and Management Controls

The following management controls should also be implemented to operation of the development.

- Amplified speakers should not be used in the Level 3 outdoor communal areas. Any amplified speakers used in the ground level outdoor communal area should be limited to the daytime and evening periods

only (Mon-Sat 7am-10pm, Sun & public holidays 8am-10pm), and not exceed a level of 75dBA at 1m from the speakers.

- Use of the outdoor ground-level communal area should be limited to the daytime and evening periods only (Mon-Sat 7am-10pm, Sun & public holidays 8am-10pm).
- Waste collection should be undertaken in accordance with the surrounding residential and commercial uses.
- The following recommendations are proposed for the carpark:
    - Secure metal grating/drains to prevent any rattling.
    - Avoid any floor finishes that produce squealing tyres, e.g. polished concrete.

5.3. Mechanical Plant

At this stage, the majority of mechanical plant equipment is nominated on the rooftop, however the selection and final locations of equipment has not been finalised and therefore a full assessment cannot be conducted at this stage.

All mechanical plant should be designed to comply with relevant noise criteria detailed in Section 3.3.1. Acoustic design should be undertaken throughout the design phases of the project once information regarding the location and equipment models have been selected.

5.4. Construction Noise

The approved report has included a preliminary assessment and recommendations for construction noise and vibration.

Construction noise levels are predicted in the worst case to exceed the Noise Affected Management Levels at receivers 1-3. Therefore, reasonable work controls may need to be implemented to minimise disruption to neighbouring residents and other sensitive receivers. In particular, work times should be organised to minimise the potential for disruption of neighbouring Macarthur Gardens residential (if relevant) and TAFE NSW.

To achieve acceptable construction noise levels, it is recommended that best practice measures outlined in AS2436-2010 ‘Guide to noise and vibration control on construction, demolition and maintenance sites’ and recommended best practice procedures in the NSW EPA Interim Guide are used. As stated, noise management measures such as scheduling, and community consultation are practical management measures to minimise the impacts to neighbouring residences.

In addition, engineering measures such as site boundary hoardings may also be used to minimise these impacts. AS2436-2010 provides a summary of measures and their effectiveness in reducing noise impacts. As specified by the EPA ICNG (2009) these mitigation measures must be feasible and reasonable options for use.

Further assessment as part of a noise and vibration management plan must be conducted after the equipment, and location/schedule of works is selected – this has been included within Consent Condition C1 of the Development Consent dated 29 April 2026 (reference *SSD-80482713*).

6. Conclusion

This acoustic letter of support has been issued in relation to the Section 4.55 Modification application for the proposed affordable housing development at Macarthur Gardens North Site R3. Minor changes to the design have been nominated to the development since the most recent approval by the Minister for Planning and Public Spaces as detailed in the Development Consent dated 29 April 2026 (reference *SSD-80482713*). The noise impacts of the updated design have been compared to the previous assessment and recommendations detailed in the approved acoustic report by BSE dated 29 July 2025 (ref. *20250529 Macarthur Garden North Site R3 Acoustic DA Report V3*).

Based on the updated plans, we believe that in general the previous noise and vibration assessment is relevant. A minor change to mechanical ventilation recommendations is nominated in this letter although all other recommendations have stayed the same as our previously approved report.

A. Appendix A – Acoustic Terminology

Absorption

The properties of a material composition to convert sound energy into heat, thereby reducing the amount of energy that can be reflected.

Airborne Noise

A condition when sound waves are being carried by the atmosphere.

Attenuation

The reduction of sound energy as a function of distance travelled.

A-Weighted Sound Level (Noise level)

A measure of sound pressure designed to reflect the response of the human ear, which does not respond equally to all frequencies. The ear is less efficient at low and high frequencies than at medium or speech-range frequencies. To describe sound in a manner representative of the human ear's response, it is necessary to reduce the effects of the low and high frequencies with respect to the medium frequencies. The resultant sound level is said to be A-weighted, and the units are dBA. The A-weighted sound level is also called the 'noise level'. Sound level meters have an A-weighting network for measuring A-weighted sound levels. Most levels of occupational, industrial, and environmental noise are measured using A-weighting.

Barrier

A material that when placed around a source of noise inhibits the transmission of that noise beyond the barrier. Also, an environment or any physical thing that interferes with communication or listening.

Decibel (dB)

Sound level in Bels as a logarithmic ratio. Relative quantity of sound intensity compared to a standard unit used as a reference. The decibel or dB cannot be used by itself. Both the quantity considered (sound power level or sound pressure level) and the standard unit used as a reference must be specified when the decibel is used.

Diffuse Sound Field

A diffuse sound field is one in which the sound field at any given point is made up of sound waves of all angles of incidence.

Direct Field

The sound in a region in which all or most of the sound arrives directly from the source without reflection.

Free Field

Sound waves from an outdoor source where there are no obstructions.

Frequency

The number of oscillations or cycles per unit of time. Acoustical frequency is usually expressed in units of Hertz (Hz) where one Hz is equal to one cycle per second.

Hertz (Hz)

Frequency of sound expressed by cycles per second.

Intensity Level (LI) (IL)

A measure of the acoustic power passing through a unit area expressed on a decibel scale referenced to some standard (usually 10^{-12}) watt per square meter.

Noise Reduction Coefficient (NRC)

The NRC of an acoustical material is the mathematical average, to the nearest multiple of 0.05, of its absorption coefficients at center frequencies of 250, 500,1000, 2000 Hertz Octaves.

Octave Bands

Sounds that contain energy over a wide range of frequencies are divided into sections called bands. A common standard division is in octave bands identified by their center frequencies 31.5, 63, 250, 500, 1000, 2000, 4000 and 8000Hz.

Reverberation

Sound after it is ended at the source will continue to reflect off surfaces until the sound wave loses energy by absorption to eventually die out.

Reverberation Time

The time taken for sound to decay 60 dB to 1/1,000,000 of its original sound level after the sound source has stopped. Sound after it has ended will continue to reflect off surfaces until the wave loses enough energy by absorption to eventually die out. Reverberation time is the basic acoustical property of a room, which depends only on its dimensions and the absorptive properties of its surfaces and contents. Reverberation has an important impact on speech intelligibility.

Sound Absorption

The property possessed by materials, objects, and air to convert sound energy into heat. Sound waves reflected by a surface create a loss of energy. That energy not reflected is referred to as the absorption coefficient.

Sound Absorption Coefficient

The fraction of energy striking a material or object that is not reflected. For instance, if a material reflects 70% of the sound energy incident upon its surface, then its Sound Absorption Coefficient would be 0.30. SAC=Absorption/Area in sabins per sq. m.

Sound Level

A subjective measure of sound expressed in decibels as a comparison corresponding to familiar sounds experienced in a variety of situations.

Sound Pressure Level (SPL)

An important measure of sound loudness, the level is calculated in decibels by 20 times the logarithm to the base 10 of the ratio of the measured sound pressure level and the reference point.

Sound Level Meter

A device that converts sound pressure variations in air into corresponding electronic signals. The signals are filtered to exclude sound waves outside the desired frequencies.

Sound Transmission Class (STC)

A single-number system used to rate the sound transmission performance of a wall, panel, ceiling, etc. The higher the ranking, the better the ability to obstruct sound transmission.

Speech Intelligibility

The ability of a listener to hear and correctly interpret verbal messages. In a classroom with high ceilings and hard parallel surfaces such as glass and tile, speech intelligibility is a particular problem. Sound bounces off walls, ceilings, and floors, distorting the teacher's instructions and interfering with students' ability to comprehend.

Structure-Borne Noise

A condition when the sound waves are being carried by a solid material. Sound waves in this state are inaudible to the human ear since they cannot carry energy to it. Airborne noise can be created from the radiation of structure-borne noise into the air. Structure-borne noise may be propagated by shear waves, tension-compression waves, bending waves, or complicated combinations of waves.

Transmission Loss (TL)

The reduction of airborne sound power that is caused by placing a wall or barrier between the reverberant sound field of a source and the receiver. Transmission loss is a property of the wall or barrier.