



North Sydney Public School

Operational Noise Compliance Testing

Taylor Construction

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1 INTRODUCTION

Pulse White Noise Acoustics has been engaged to undertake the acoustic noise testing of the operational noise resulting from the completed North Sydney Public School project.

Noise level measurement were conducted in conjunction with the projects *Conditions of Consent* including Item E8 and E9 of the SSD-11869481 which includes reference to the Marshall Day *North Sydney Public School Upgrade – SSDA Noise and Vibration Assessment* dated 13 August 2021 and reference: Rp 001 20210481 as referenced in the consent conditions.

Acoustic testing of the operational school has been undertaken for the completed project including a period when all building services were operational.

A glossary of terminology used in this report is provided in Appendix A.

2 PROJECT DESCRIPTION

The development includes the construction of the new buildings on the North Sydney Public School site which is located to the west of the Pacific Highway and include McHatton Street to the north and Bay Road to the south.

The surrounding receivers to the site include residential receivers within proximity to the site. The site location, in relation to surrounding buildings, is shown in Figure 1 below, which include locations within proximity of the building services associated with the project including external condenser equipment, supply and exhaust fans.

Figure 1 Site Map, Measurement Locations and Surrounding Receivers



3 PROJECT NOISE LEVEL CRITERIA

Noise levels testing conducted as part of the assessment includes the required levels detailed in Item E8 and E9 of the SSD-9250948 including the SSD-11869481-Mod-2 which includes reference to the Marshall Day *north Sydney Public School Upgrade – SSDA Noise and Vibration Assessment* dated 13 August 2021 and reference: Rp 001 20210481 as referenced in the consent conditions, which include the following:

Operational Noise Limits

- E8. The Applicant must ensure that noise generated by operation of the development does not exceed the noise limits in Noise and Vibration Assessment dated 13 August 2021 and prepared by Marshall Day Acoustics **and complies with the acoustic performance requirements in Memorandum 220015-NSPS-S4.55 Acoustic Review-R3 dated 2 November 2022 and prepared by Pulse White Noise Acoustics.**
- E9. The Applicant must undertake short term noise monitoring in accordance with the *Noise Policy for Industry* where valid data is collected following the commencement of use of each stage of the development. The monitoring program must be carried out by an appropriately qualified person and a monitoring report must be submitted to the Planning Secretary within two months of commencement use of each stage of the development or other timeframe agreed to by the Planning Secretary to verify that operational noise levels do not exceed the recommended noise levels for mechanical plant identified dated 13 August 2021 and prepared by Marshall Day Acoustics. Should the noise monitoring program identify any exceedance of the recommended noise levels referred to above, the Applicant is required to implement appropriate noise attenuation measures so that operational noise levels do not exceed the recommended noise levels or provide attenuation measures at the affected noise sensitive receivers.

Section 6.1.1 (*'Noise Policy for Industry'*) of the Marshall Day assessment includes the project required noise emissions criteria as project noise trigger levels for the operation of building services, including the following:

6.1.1 'Noise Policy for Industry'

Airborne noise criteria applicable to the site derived in accordance with the NPfi are summarised in Table 13. These criteria apply (in accordance with the SEARs) to airborne noise emission related to the PA system, school bell and mechanical services.

Table 13: NPfi Project Noise Trigger Levels

Receiver	Period	Project Noise Trigger Level, $L_{Aeq,15min}$, dB		
		Receiver A3, A4, A5, A6, A7	Receiver A2	Receiver A1, A8
Residential	Day	50	55	58
	Evening	45	48	48
	Night	40	43	43

Figure 1 of the Marshall Day report detail the receiver locations, which is included below:

Figure 1: Existing site and surrounds



4 OPERATIONAL NOISE LEVEL MEASUREMENTS

Attended noise level measurements of the operation of the school has been conducted at the boundary of the residential properties within proximity of the school and detailed in Figure 1 above.

Testing was conducted on the 23rd October 2023 during a period when all building services were operational including the external condenser equipment.

Testing undertaken as part of the completed school which was operational at the time of testing.

The noise level survey was performed using a Brüel & Kjær Hand-held Analyser Type 2236C type meter. Calibration of the sound level meter was checked with a Brüel & Kjær Type 4231 acoustical calibrator (serial number 3009148) prior to and following the measurements. Drift in calibration did not exceed ± 0.5 dBA. All equipment carried current NATA calibration certificates.

Attended measurements took place between 10.00am and 11.30am on the 23rd October 2023.

Prior to all the noise measurements being undertaken all ventilation and air conditioning systems were checked to be operational and were confirmed by the mechanical contractor as to being in operation.

The noise level testing undertaken as part of the compliance testing was undertaken in accordance with the requirements of the EPA's *Noise Policy for Industry* and the relevant Australian Standards including AS1055:2018 'Acoustics – Description and Measurement of Environmental Noise.

The attended and unattended noise locations were selected to obtain suitable noise levels for the normal operation of the mechanical services equipment and the projects noise level criteria as detailed in the SSD and the projects *SSDA Noise and Vibration Assessment* which are detailed in the section above.

Noise levels at the school was undertaken in accordance with the requirements of the EPA and the testing methodologies of AS1055. Details of the testing are included in this Section of the report.

The project noise level criteria is based on the *Conditions of Consent* including Item E8 and E9 of the SSD-11869481 which includes reference to the Marshall Day *north Sydney Public School Upgrade – SSSA Noise and Vibration Assessment* dated 13 August 2021 and reference: Rp 001 20210481 as referenced in the consent conditions and detailed above.

The period of the testing undertaken as part of the Operational Noise Compliance Testing included 15 min period.

The period of testing was undertaken as this was identified as a representative period when the school was operational at a normal maximum capacity, including the building services equipment and the like.

The noise level test location includes that which are representable of the potentially worst affected receivers, including the locations detailed in Figure 1 above and presented in the table below.

The testing was undertaken during the period when the equipment was operational at maximum capacity. Details of the operation of the plant provided to this office has indicated that the major plant is not operational at maximum capacities during night time hours.

The results of measured external noise levels during a period when the building services operating under normal conditions are detailed in the table below.

Table 1 Measured External Noise Levels

Measurement Location	Time of Measurement	Measured Noise Contribution $L_{Aeq} (15 \text{ min})$ dB(A)	Project Noise Level Trigger $L_{Aeq} (15 \text{ min})$ dB(A)	Comments
Location 1	October 2023- Period when the building services were operational including condenser equipment	44 dB(A)	Day – 50 Evening – 45 Night - 40	Noise from plant not audible, see note 1 below.
Location 2		45 dB(A)	Day – 50 Evening – 45 Night - 40	Noise from plant just audible, see note 1 below.
Location 3		51 dB(A)	Day – 58 Evening – 48 Night - 43	Noise from plant not audible, see note 1 below. Noise resulting from other noise sources such as traffic noise.
Location 4		53 dB(A)	Day – 58 Evening – 48 Night - 43	Noise from plant not audible, see note 1 below. Noise resulting from other noise sources such as traffic noise
Location 5		44 dB(A)	Day – 50 Evening – 45 Night - 40	Noise from plant just audible, see note 1 below.
Location 6		46 dB(A)	Day – 50 Evening – 45 Night - 40	Noise from plant not audible, see note 1 below.

Note1: Noise level generated from the operation of the building services compliant with relevant day and evening criteria.

Based on the results of the noise testing at the site the noise contribution from the operation of the plant and equipment is compliant with the project requirements, measured noise levels

were resulting from other noise sources which were not associated with the project including traffic movements on surrounding roadways, natural noise sources and the like.

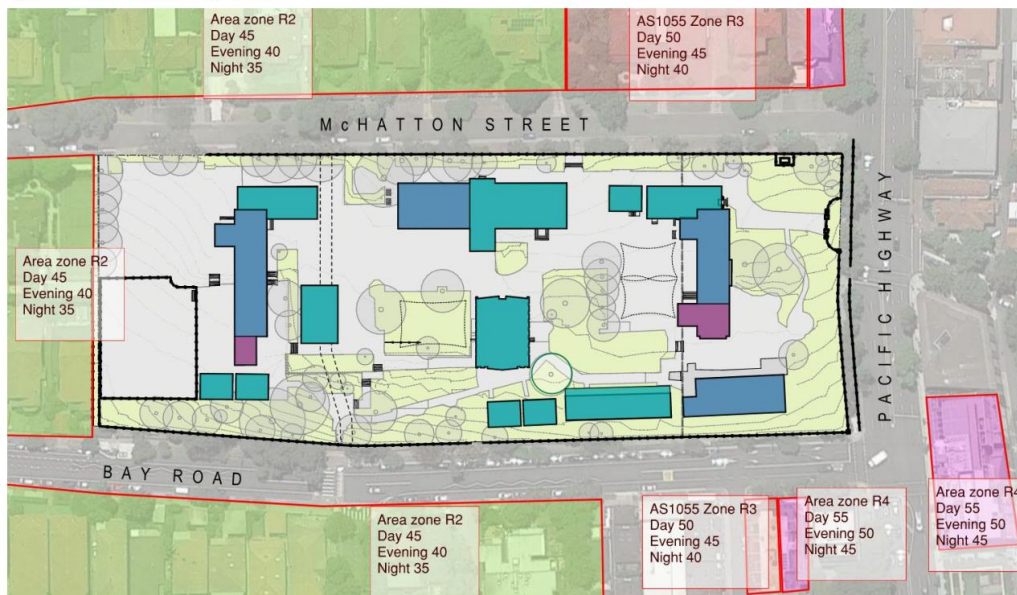
The building services will not be required to run at maximum capacities during night time periods including the external condenser equipment. Based on the operation of the equipment noise levels will comply with the project requirements based on the operational conditions of the building services including those included in items 8 and E9 of the project SSD requirements and detailed in the table above.

During testing the recorded noise level at all locations completed in this assessment and detailed above, included environmental noise sources which were not associated with the operation of school and included noise from traffic noise from surrounding roadways (including movements on the Pacific Highway) and other environmental noise contributions.

Based on the results of testing the contribution of the environmental noise sources has been corrected from the obtained site measurement such that the noise contributions from the operation of the school can be assessed as detailed in Table 1 above.

Details of the estimated ambient noise levels at the site area included in the Marshall Day North Sydney Public School Upgrade – SSDA Noise and Vibration Assessment dated 13 August 2021 and reference: Rp 001 20210481. Figure 6 of the Marchall Day report includes the following;

Figure 6: Estimated Rating Background Levels



Based on the results of acoustic testing noise levels resulting from the operation of the mechanical equipment on the site are compliant with the projects *Conditions of Consent* including Item E8 and E9 of the SSD.

As exceedances have not been identified no additional noise mitigations are required.

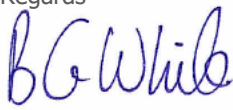
5 CONCLUSION

This report details the results of noise level testing conducted on the operational noise levels resulting from the North Sydney Public School project, including the completed project.

Based on the results of acoustic testing noise levels resulting from the operation of the mechanical equipment on the site are compliant with the projects *Conditions of Consent* including Item E8 and E9 of the SSD-11869481 which includes reference to the Marshall Day *North Sydney Public School Upgrade – SSDA Noise and Vibration Assessment* dated 13 August 2021 and reference: Rp 001 20210481 as referenced in the consent conditions.

In the event you require any additional information or clarification regarding this report please contact the author below.

Regards

A handwritten signature in blue ink that reads 'Ben White'.

Ben White
Director

Pulse White Noise Acoustics

6 APPENDIX A – GLOSSARY OF TERMS

<i>Ambient Sound</i>	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.																				
<i>Audible Range</i>	The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound having frequencies in the region 20 Hz to 20 kHz, although it is possible for some people to detect frequencies outside these limits.																				
<i>Character, acoustic</i>	The total of the qualities making up the individuality of the noise. The pitch or shape of a sound's frequency content (spectrum) dictate a sound's character.																				
<i>Decibel [dB]</i>	The level of noise is measured objectively using a Sound Level Meter. The following are examples of the decibel readings of every day sounds; <table border="0" style="margin-left: 40px;"> <tr><td>0dB</td><td>the faintest sound we can hear</td></tr> <tr><td>30dB</td><td>a quiet library or in a quiet location in the country</td></tr> <tr><td>45dB</td><td>typical office space. Ambience in the city at night</td></tr> <tr><td>60dB</td><td>Martin Place at lunch time</td></tr> <tr><td>70dB</td><td>the sound of a car passing on the street</td></tr> <tr><td>80dB</td><td>loud music played at home</td></tr> <tr><td>90dB</td><td>the sound of a truck passing on the street</td></tr> <tr><td>100dB</td><td>the sound of a rock band</td></tr> <tr><td>115dB</td><td>limit of sound permitted in industry</td></tr> <tr><td>120dB</td><td>deafening</td></tr> </table>	0dB	the faintest sound we can hear	30dB	a quiet library or in a quiet location in the country	45dB	typical office space. Ambience in the city at night	60dB	Martin Place at lunch time	70dB	the sound of a car passing on the street	80dB	loud music played at home	90dB	the sound of a truck passing on the street	100dB	the sound of a rock band	115dB	limit of sound permitted in industry	120dB	deafening
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<i>dB(A)</i>	<i>A-weighted decibels</i> The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.																				
<i>Frequency</i>	Frequency is synonymous to <i>pitch</i> . Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.																				
<i>Loudness</i>	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on																				
<i>L_{Max}</i>	The maximum sound pressure level measured over a given period.																				
<i>L_{Min}</i>	The minimum sound pressure level measured over a given period.																				
<i>L₁</i>	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.																				
<i>L₁₀</i>	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.																				
<i>L₉₀</i>	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L ₉₀ noise level expressed in units of dB(A).																				
<i>L_{eq}</i>	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.																				
<i>Background Sound Low</i>	The average of the lowest levels of the sound levels measured in an affected area in the absence of noise from occupants and from unwanted, external ambient noise sources. Usually taken to mean the L _{A90} value																				



<i>Ctr</i>	A frequency adaptation term applied in accordance with the procedures described in ISO 717.
<i>dB (A)</i>	'A' Weighted overall sound pressure level
<i>Noise Reduction</i>	The difference in sound pressure level between any two areas. The term "noise reduction" does not specify any grade or performance quality unless accompanied by a specification of the units and conditions under which the units shall apply
<i>NR Noise Rating</i>	Single number evaluation of the background noise level. The NR level is normally around 5 to 6 dB below the "A" weighted noise level. The NR curve describes a spectrum of noise levels and is categorised by the level at 1000 Hz ie the NR 50 curve has a value of 50 dB at 1000 Hz. The NR rating is a tangential system where a noise spectrum is classified by the NR curve that just encompasses the entire noise spectrum consideration.
<i>R_w</i>	Weighted Sound Reduction Index - Laboratory test measurement procedure that provides a single number indication of the acoustic performance of a partition or single element. Calculation procedures for <i>R_w</i> are defined in ISO 140-2:1991 "Measurement of Sound Insulation in Buildings and of Building Elements Part 2: Determination, verification and application of precision data".
<i>R'_w</i>	Field obtained Weighted Sound Reduction Index - this figure is generally up to 3-5 lower than the laboratory test determined level data due to flanked sound transmission and imperfect site construction.
<i>Sound Isolation</i>	A reference to the degree of acoustical separation between any two areas. Sound isolation may refer to sound transmission loss of a partition or to noise reduction from any unwanted noise source. The term "sound isolation" does not specify any grade or performance quality and requires the units to be specified for any contractual condition
<i>Sound Pressure Level, L_p dB</i>	A measurement obtained directly using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the rms sound pressure to the reference sound pressure of 20 micro Pascals.
<i>Sound Power Level, L_w dB</i>	Sound power level is a measure of the sound energy emitted by a source, does not change with distance, and cannot be directly measured. Sound power level of a machine may vary depending on the actual operating load and is calculated from sound pressure level measurements with appropriate corrections for distance and/or environmental conditions. Sound power levels is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 picoWatt
<i>Speech Privacy</i>	A non-technical term but one of common usage. Speech privacy and speech intelligibility are opposites and a high level of speech privacy means a low level of speech intelligibility. It should be recognised that acceptable levels of speech privacy do not require that speech from an adjacent room is inaudible.
<i>Transmission Loss</i>	Equivalent to Sound Transmission Loss and to Sound Reduction Index in terminology used in countries other than Australia. A formal test rating of sound transmission properties of any construction, by usually a wall, floor, roof etc. The transmission loss of all materials varies with frequency and may be determined by either laboratory or field tests. Australian Standards apply to test methods for both situations.

7 APPENDIX B - BEN WHITE CREDENTIALS

**AUSTRALIAN
ACOUSTICAL
SOCIETY**



This is to certify that

BENJAMIN WHITE

was admitted to the grade of

MEMBER

of the Australian Acoustical Society

on 27th October 2020

and is entitled to use the letters

M.A.A.S.

issued on 26th November 2020

S. Moore

President



General Secretary



This certificate remains the property of the Australian Acoustical Society

Curriculum Vitae – Benjamin White



Employment Experience:

Director – Pulse White Noise Acoustics – Present	November 2020
Director - White Noise Acoustics: Present	March 2019 –
Director/Engineer - Acoustic Logic Consultancy: 2001 – July 2018	March

Ben is a Member of the Australian Acoustic Society (AAS)

Experience:

Ben White the Director of White Noise has over 17 years of experience in acoustic.

Ben has significant experience in providing acoustic services and expert advice in the following areas:

- Residential acoustic reports including aircraft noise (AS2021) assessments, traffic noise, train noise and vibration assessments.
- Noise emission assessments for various projects including assessments with planning requirements using EPA, Department of Planning, Council DCP's and similar regulatory requirements.
- Planning approvals including Development Applications for multi dwelling residential developments, commercial developments, hotels and boarding houses, places of entertainment, carparks, mixed use developments, shopping centres and the like.
- Expert court witness including Land and Environment Court and other expert witness work.
- Project planning and specifications for types of projects including residential, commercial, retail, hotel accommodation, warehouses and industrial developments and mixed-use projects.
- Project delivery for all types of projects including, design advice and project delivery requirements at all stages of projects during design and construction.
- Certification works including on site testing for the provision of certification of all types of projects including items required to comply with Part F5 of the BCA as well as project specific acoustic requirements.
- Mechanical design and advice for the treatments of mechanical services with project requirements.
- External façade design and specification.
- Specialised acoustic design advice including areas of projects.
- Issues with existing building include site surveys and audits as well as advice regarding rectification if required.