Norman Disney & Young
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Report

Roberts Co

Wentworth Point New High School
Construction Noise and Vibration Management Plan

Revision: 1.5 – Main Works Assessment **Issued**: 21 October 2022

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1 INTRODUCTION

1.1 Purpose

The purpose of this report is to assist the contractor with suitable noise and vibration control measures to enable the works associated with the main works and construction of the Wentworth Point new high school located at Wentworth Point, NSW.

The proposed development is for the construction of a school whereby the project is known as Wentworth Point new high school. The project is located within the peninsula of Wentworth Point at 3 Burroway Road, Wentworth Park, and comprises a gymnasium, performing arts learning spaces, science and engineering workshops, typical learning spaces, library and staff areas. A playing field located on the adjacent site to the north will be subject to a Joint Use Agreement with Parramatta City Council.

As per the 2022/2023 budget papers, this project is now referred to as "Wentworth Point new high school". Future documentation relating to this project, including this document, will be labelled accordingly.

Due to the SSD-11802230 application being submitted as "Sydney Olympic Park new high school", the project name will remain the same on the Planning Portal and future documentation may reference this.

Please also note 'Wentworth Point new high school' is the placeholder name for the school. The school naming will occur closer to opening, following a community consultation process.

1.2 Objective of study

- Identify the local Council requirements relating to Construction Noise.
- A quantitative assessment to identify the expected noise levels from expected equipment used in the proposed construction.
- Provide advice on any mitigation measures needed to comply with the relevant requirements.
- Set out a noise complaints management procedure.
- Address the consent condition requirements relating to Noise and Vibration Management Sub Plan

1.3 Authority

Authority to undertake this report was provided by Adam Greentree of Roberts Co.

1.4 Information Sources

- NSW EPA – Interim Construction Noise Guideline
- BS 5228-1:2009 - Code of practice for noise and vibration control on construction and open sites, Part 1 Noise.
- Briefing email 'Roberts Co – Noise and Vibration Plan for Mainworks' dated 07 February 2022.

1.5 SSDA Conditions

Table 1 below details the SSDA conditions and the area of the report where they are addressed.

Table 1: SSDA Conditions

Condition		Report Location
B16. The Construction Noise and Vibration Management Sub-Plan must address, but not be limited to, the following:		
(a)	be prepared by a suitably qualified and experienced noise expert;	See Appendix for CV
(b)	describe procedures for achieving the noise management levels in EPA's Interim Construction Noise Guideline (DECC, 2009);	Section 3.3.1 Section 5
(c)	describe the measures to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers;	Section 5
(d)	include strategies that have been developed with the community for managing high noise generating works;	Section 8
(e)	describe the community consultation undertaken to develop the strategies in condition B15(d)	Section 8
(f)	include a complaints management system that would be implemented for the duration of the construction; and	Section 9
(g)	include a program to monitor and report on the impacts and environmental performance of the development and the effectiveness of the implemented management measures in accordance with the requirements of condition B12.	Section 6

1.6 Revision History

Table 2: Revision History

Revision	Date of Issue	Comments
1.0	18 February 2022	Main Works Assessment
1.1	06 April 2022	Minor Amendments
1.2	19 September 2022	Minor Amendments
1.3	20 September 2022	Minor Amendments
1.4	27 September 2022	Minor Amendments
1.5	21 October 2022	Minor Amendments

2 TERMINOLOGY

2.1 Noise

Noise levels are quantified in decibels, zero decibels being the threshold of audibility for a normally hearing young person and 140 decibels being a very loud sound that will cause discomfort or pain.

Decibel, dB: The decibel scale is logarithmic. A doubling in loudness would subjectively be represented by an increase in noise levels of 10 decibels (dB). A small change of 3dB would be just noticeable to most listeners. Decibels are not actually a unit of sound pressure but are simply an expression of a ratio from a standardised sound pressure level representing zero decibels.

A-weighted Decibel, dBA: In most instances the district and regional councils, New Zealand Standards and International Standards require assessments to adopt "A" weighted decibels. The "A" weighting is applied in an attempt to match the response of the human ear. "A" weighted decibels can be measured with a sound level meter which has been electronically adjusted to an international standard.

The spread of noise over a time period can be expressed in a number of ways. Three of the most commonly used for environmental applications are:

L_{10}: The sound level exceeded for ten per cent of the time. This identifies loud, non-continuous sounds or the louder parts of continuous sounds.

L_{eq}: The average sound pressure level over the measurement period.

L_{MAX}: The loudest single event over the measurement period.

3 NOISE AND VIBRATION CRITERIA

3.1 Site Location and Overview

The main works involve the excavation, piling, concrete pouring, façade and fit-out works on the development site located at 7 Burroway Road. The project site is as depicted in Figure 1 below. A dirt bund exists at the western boundary of the site indicated in Figure 1.

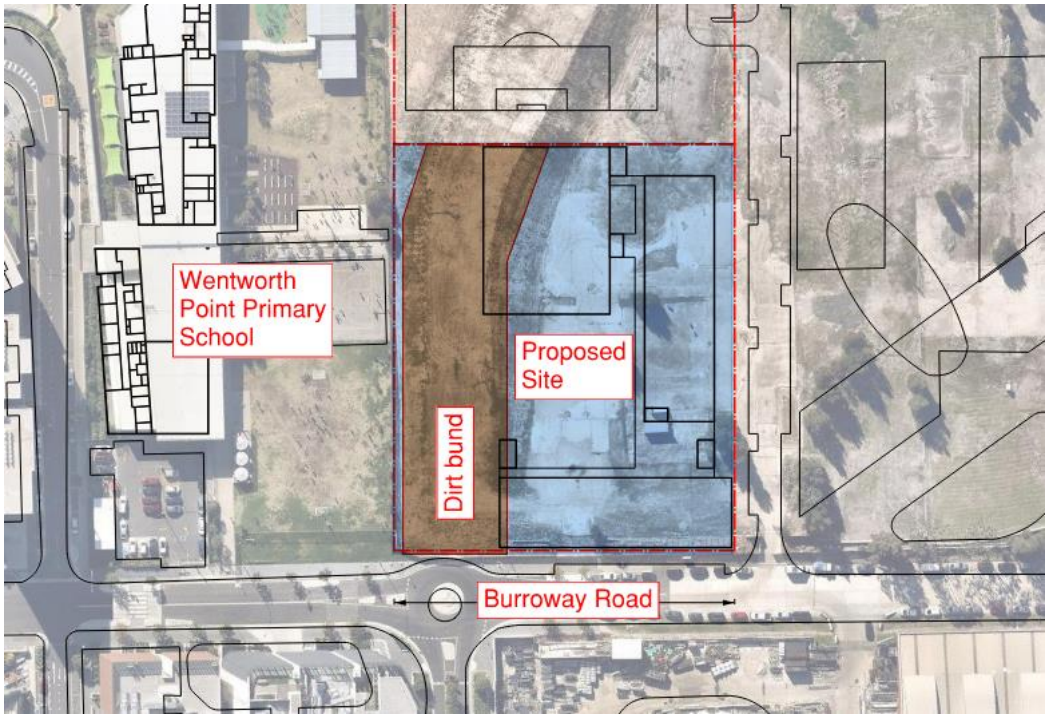


Figure 1. Project Location

3.2 Nearest Noise Sensitive Receivers

The proposed development is located adjacent to, and has been assessed to, the following:

1. Wentworth Point Primary School (to the west)
2. 17 Wentworth Place, an existing residential apartment complex (to the south)
3. Block H, a proposed residential development (to the south)
4. A proposed mixed-use development (to the east).
5. Future peninsula park (to the north)

However, for the purposes of this main works assessment, construction noise will be only assessed to existing receivers (**Wentworth Point Primary School** and the residential tower at **17 Wentworth Place**) as the other receiver locations are currently empty sites. These noise sensitive receivers are depicted in Figure 2 below.

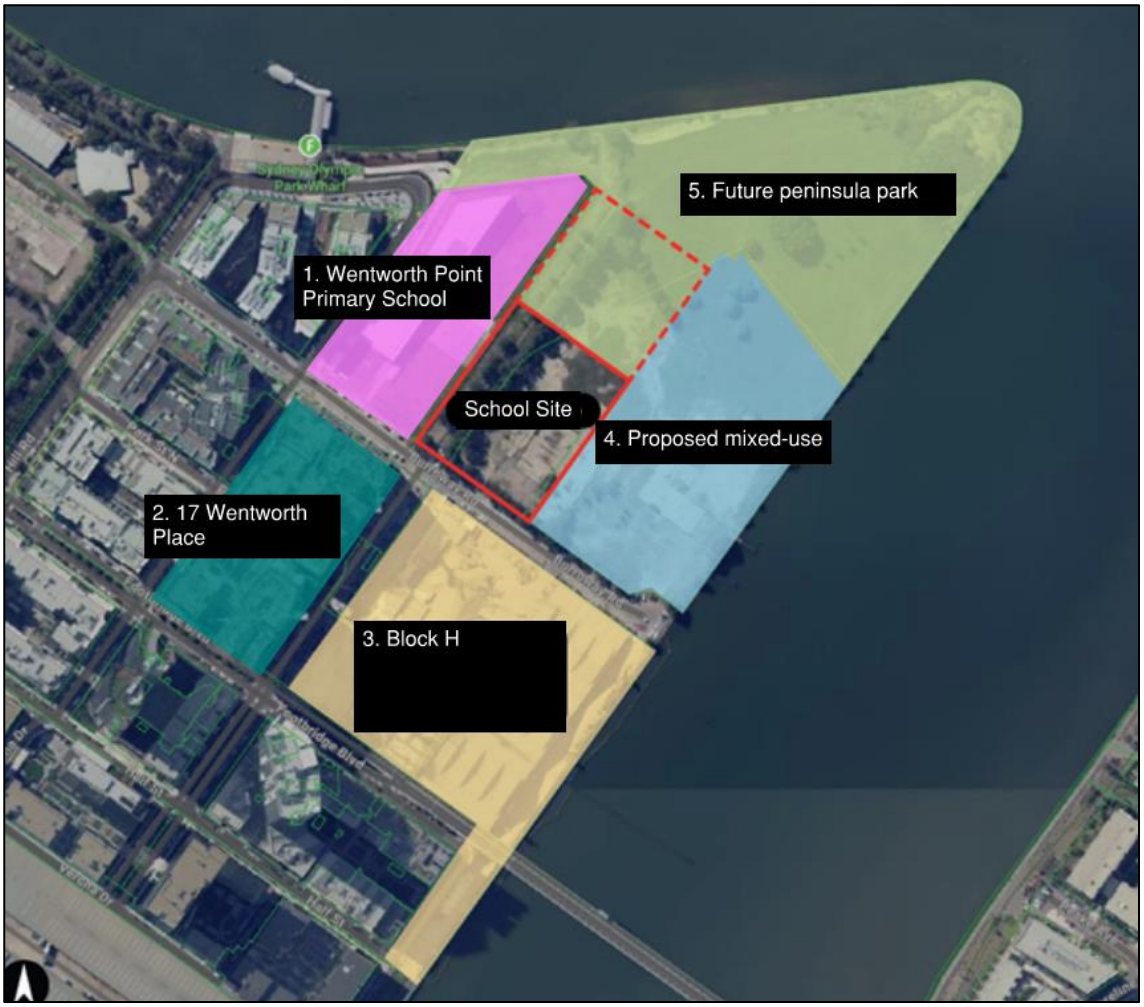


Figure 2. Noise Sensitive Receivers

3.3 Construction Noise Criteria

3.3.1 Interim Construction Noise Guideline

The NSW Interim Construction Noise Guideline was developed by the NSW-Department of Environment & Climate Change DECC, NSW which incorporates the EPA. The Guideline contains detailed procedures for the assessment and management of construction noise impacts.

The guideline presents two ways of assessing construction noise impacts – the quantitative method, which is generally suited to longer term construction works and the qualitative method, which is generally suited to short term works (usually not more than 3 weeks) such as infrastructure maintenance.

It is expected that the length of the construction works associated with the development would be more than 3 weeks and therefore a quantitative method has been used for this assessment.

Table 3 sets out the management levels for noise at residence and other sensitive land uses, respectively. Restrictions to the hours of construction may apply to activities that generate noise at residences above the 'highly noise affected management level' which is >75dBA. Affected properties above 75 dBA will require community consultation and a Construction Noise & Vibration Management Plan (CNVMP).

Table 3. Noise at Residences and Other Sensitive Land Uses using Quantitative Assessment

Receiver Type	Recommended Hours	Time of Day	Management Level $L_{eq,15min}$ [dBA]
Residential	Recommended Standard Hours	Monday – Friday 7am to 6pm. Saturday 8am to 1pm. No work on Sundays or Public Holidays.	**Noise Affected** RBL + 10 (Assessed externally)
			Highly noise affected 75 (Assessed externally)
Classrooms at schools and other education institutions		When properties are being used (i.e., Classroom operational hours)	45* (Internal noise level)

Note: Noise Levels apply at the boundary that is most exposed to construction noise and at a height of 1.5m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most affected point within 30m of the residence.

***Where internal noise levels cannot be measured, external noise levels may be used. A conservative estimate of the difference between internal and external noise levels is 10 dB for buildings other than residences. Some buildings may achieve greater performance, such as where windows are fixed (that is, cannot be opened).

3.3.2 Application of Noise Affected Levels

As per the NSW Interim Construction Noise Guideline:

"The **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 noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.
- The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

The **highly noise affected** level represents the point above which there may be strong community reaction to noise.

- Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account:
  - Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences)
  - If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times."

3.3.3 Noise Management Levels

Noise Management Levels (NML) associated with the construction works on the project site are presented in Table 4 below.

Table 4. Construction Noise Management Levels, Leq 15min

Receivers	Recommended Hours	Period	RBL $L_{A90,15mins}$ [dBA]	Management Level [dBA]
Surrounding Residences	All Hours (Standard Construction Hours)	When in use	46 dB(A)*	**Noise Affected** (46 + 10) = **56 dB(A)** (Assessed externally) **Highly noise affected** **75 dB(A)** (Assessed externally)
Classrooms at Wentworth Point Primary School				**45 dB(A)** (Internal noise level)
* Unattended noise measurements were carried out on the site between Tuesday 20th April and Monday 3rd May 2021 to establish existing background noise levels.				

3.4 Construction Vibration Criteria

The effects of construction vibration upon buildings can be separated into three main categories:

- Perceptibility of the occupants to the vibration and the possibility of them being disturbed or annoyed.
- Vulnerability of the building structures to vibration induced damaged.
- Vulnerability of the contents of the building that includes types of equipment, activities and processes.

3.4.1 Human Response to Vibration

Humans are very sensitive to vibration, and they can be disturbed, annoyed and have their work activities interfered with if the levels are too high. The Interim Construction Noise Guideline references *"Assessing Vibration: a technical guideline"* (Vibration Guideline) issued by the Department of Environment and Conservation NSW for measurement and assessment of vibration. The Vibration Guideline provides vibration criteria for continuous, impulsive and intermittent vibration

Continuous vibration	Impulsive vibration	Intermittent vibration
Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading. Blasting is assessed using ANZECC (1990).	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer this would be assessed against impulsive vibration criteria.

The criteria are discussed in more detail in the following sections.

3.4.2 Continuous and impulsive vibration (1-80 Hz)

According to the Vibration Guideline for continuous and impulsive vibration, assessment of impact should be considered on the basis of weighted root-mean-square acceleration values and results are to be compared against the following preferred and maximum values given for each orthogonal axis. The frequency weightings as per BS6841:1987 (reproduced in Appendix B3 of the guideline) are to be applied to the RMS measurement values (1-80Hz). The criteria in the Vibration Guideline are derived from the limiting values of the assessment curves and multiplying factors from BS 6472:1992 (the curves are no longer referenced in the superseded version of the standard BS 6472:2008). We have assumed hotels will be assessed as per the criteria for residences.

Table 2.2 Preferred and maximum weighted rms values for continuous and impulsive vibration acceleration (m/s^2) 1–80 Hz

Location	Assessment period[1]	Preferred values		Maximum values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous vibration					
Critical areas[2]	Day- or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028
Workshops	Day- or night-time	0.04	0.029	0.080	0.058
Impulsive vibration					
Critical areas[2]	Day- or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92
Workshops	Day- or night-time	0.64	0.46	1.28	0.92

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. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of this policy, and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472–1992

The Vibration Guideline notes *"Activities should be designed to meet the preferred values where an area is not already exposed to vibration. Where all feasible and reasonable measures have been applied, values up to the maximum value may be used if they can be justified. For values beyond the maximum value, the operator should negotiate directly with the affected community. Situations exist where vibration above the preferred values can be acceptable, particularly for temporary disturbances and infrequent events of short-term duration. An example is a construction or excavation project."*

3.4.3 Intermittent vibration (1-80 Hz)

According to the Vibration Guideline for intermittent vibration, assessment of impact should be considered on the basis of vibration dose values (VDV). Acceptable values of vibration dose are given as follows. We have assumed hotels will be assessed as per the criteria for residences.

Table 2.4 Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas[2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

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

3.4.4 Structural Response to Vibration - German Standard DIN 4150-3:1999

The German Standard DIN 4150-3 Structural Vibration Part 3: Effects on building and structures is commonly used in Australia to evaluate the effects of vibration on structures primarily used for static loading.

The response of a building to vibration is affected by several factors that include its type of foundation, the underlying ground conditions, its construction and the state of the building. Please note the construction vibration limits are designed to ensure the structural integrity of nearby buildings and are not for human comfort, noting that the limits are above perceptibility.

According to DIN 4150 short term vibration refers to vibration which does not occur often enough to cause structural fatigue and which does not produce resonance in the structure being evaluated (e.g. transient thumps and one off shock-type events). Long-term vibration refers to all types of vibration not covered by the definition of 'short-term vibration'. The criteria for short-term and long-term vibration are listed in the following sections.

3.4.5 Guideline Values for evaluation of short-term vibration - DIN 4150-3:1999

The vibration limits of table 1 in DIN 4150-3:1999 (replicated in Table 5 below) refer to the evaluation of the effects of short-term vibration on structures. The criteria are the peak particle velocities (ppv) measured on any foundation or uppermost full storey of any building not related to the site.

It should however be noted that compliance with the vibration limits to avoid structural damage of buildings, cannot provide certainty. If damage occurs despite compliance with the standard, it is to be assumed that other causes are responsible, however, further investigations are necessary. And conversely, exceeding the limits does not necessarily lead to damage.

Table 5. DIN 4150-3 Construction Vibration Limits – Short Term

Type of Structures	Guideline values for vibration velocity (mm/s)			
	Vibration at the foundation at a frequency of			Vibration at horizontal plane of highest floor at all frequencies
	1Hz to 10Hz	10 to 50 Hz	50 to 100Hz (and above)	
Buildings for commercial purposes, **Industrial building** and building of similar design	20	20 to 40	40 to 50	40
Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15
Structures that because of their particular sensitivity to vibration, cannot be classified as above and are of great intrinsic value (e.g. listed buildings under preservation order)	3	3 to 8	8 to 10	8

3.4.6 Guideline Values for evaluation of long-term vibration - DIN 4150-3:1999

The vibration limits of table 3 in DIN 4150-3:1999 refer to the evaluation of the effects of long-term vibration on structures. The criteria are the peak particle velocities measured on the uppermost full storey of any building not related to the site and are listed in Table 6.

According to the standard, *exceeding the values listed below does not necessarily lead to damage*.

If a building is subject to harmonic vibration, then maximum values can occur in floors other than the top floor, or in the foundation. The values given also apply in these cases.

Table 6. DIN 4150-3 Construction Vibration Limits – Long Term

Type of Structures	Guideline values for velocity, vi, in mm/s of vibration in horizontal plane of highest floor, at all frequencies
Buildings for commercial purposes, Industrial building and building of similar design	10
Dwellings and buildings of similar design and/or occupancy	5
Structures that because of their particular sensitivity to vibration, cannot be classified as above and are of great intrinsic value (e.g. listed buildings under preservation order)	2.5

4 CONSTRUCTION NOISE ASSESSMENT

4.1 Expected Construction Programme and Methodology

According to the information provided by the construction team and the client for this project, we expect the main works of construction to be split into the following major tasks:

- **Piling** – 4 months
- **Excavation** – 3 months
- **Concrete pouring -** 7 months
- **Material transport/handling –** Life cycle of the project
- **Fitout works –** 6 months

4.2 Expected Construction Activities

According to the information provided by the construction team and the client for this project, we expect the critical construction equipment to consist of the following:

Table 7. Expected Construction Activities/Equipment per Task

Piling	Excavation	Concrete Pouring	Material Transport	Façade / Fitout works
Large rotary bored piling rig	Articulated truck (up to 20 daily trips)	Concrete trucks (up to 30 trucks on pour dates)	Articulated truck (Rigid vehicles with an occasional semi-truck)	Articulated truck (Rigid vehicles with an occasional semi-truck)
Tracked excavator	Tracked excavator	Mobile concrete pumps with boom arm (up 2 pumps on pour dates)	Tracked mobile crane	Tracked mobile crane
				Hand tools (Hand saws, drills and concrete saws)

4.3 Expected Construction Equipment Noise Levels

The current list of proposed equipment respective reference acoustic data is outlined in Table 8 below. Any additional equipment proposed will need to be assessed acoustically, with the report updated and mitigations included where required.

Table 8. Proposed Construction Equipment List

Equipment	L_{eq} Sound Pressure Level at 10m (dBA)	Source and Reference
Articulated dump truck, 25t	81	BS5228-2009/ Table C5 Ref 16
Tracked excavator 40t	79	BS5228-2009/ Table C2 Ref 14
Large rotary bored piling rig, 110t	84	BS5228-2009/ Table C3 Ref 14
Concrete mixer truck	79	BS5228-2009/ Table C4 Ref 27
Mobile concrete pumps with boom arm, 26t	80	BS5228-2009/ Table C4 Ref 29
Tracked mobile crane, 105t	75	BS5228-2009/ Table C4 Ref 52

4.4 Noise Propagation to Noise Sensitive Receivers

Predicted noise levels at the external receivers from all construction activities are as follows.

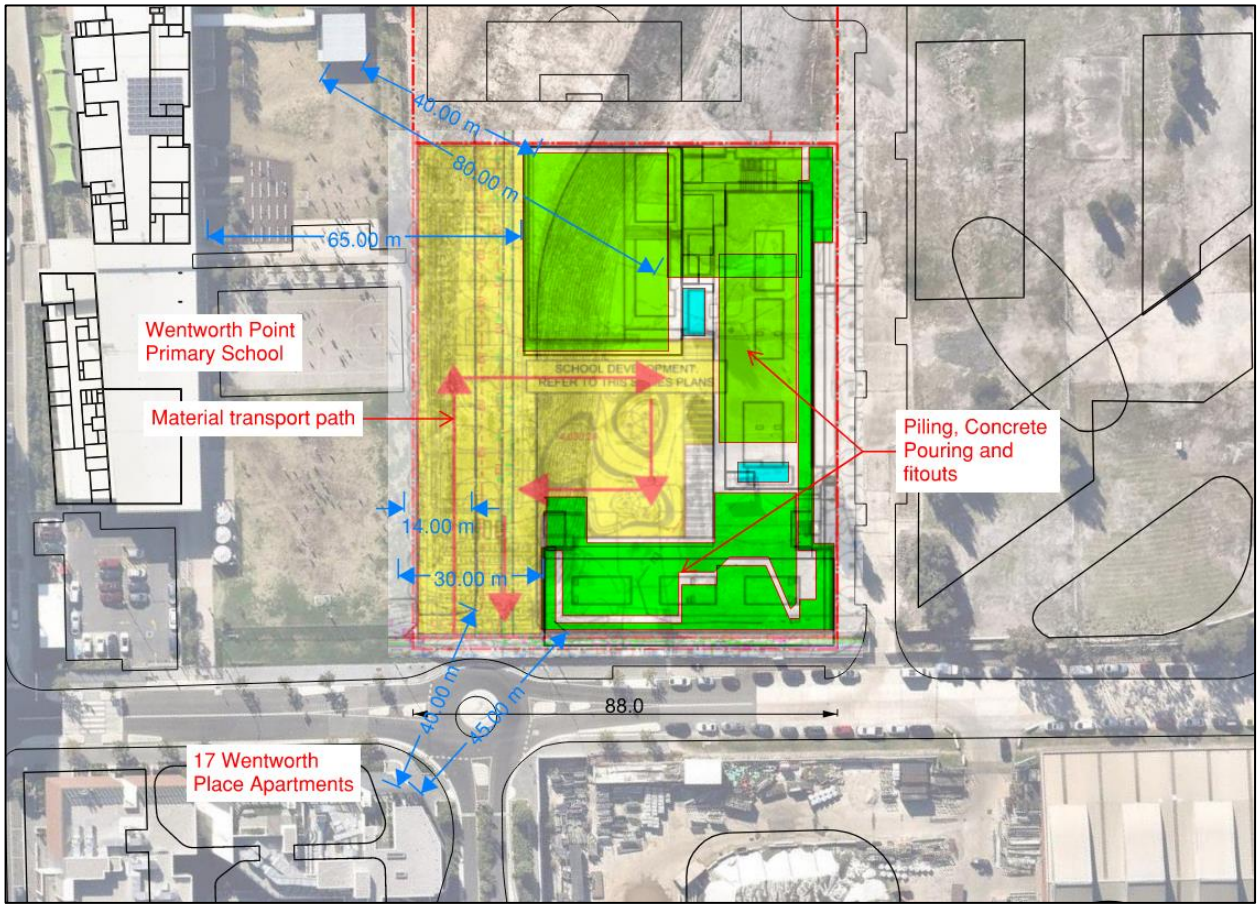


Figure 3. Noise Sensitive Receiver Locations and Distances

Please note that these values represent a 'worst case' scenario where the source is at the closest possible distance to the receiver and not incorporating any mitigation measures, except where stated. It is likely that noise levels are lower than these 'worst case' predictions.

Table 9. Predicted Construction External Noise Levels to Noise Sensitive Receivers

Activity	L_{eq} Sound Pressure Level at Receivers		
	Wentworth Primary School: Playground (Distance: ~30m)	**Wentworth Primary School: Classrooms (Distance: ~40m)**	**17 Wentworth Place Apartments (Distance: ~40m)**
Piling (Piling rig and tracked excavator running simultaneously)	**< 75 dBA**	**< 75 dBA** (Avg. 67 dBA @ 80m)	**< 75 dBA** (Avg. 70 dBA @ 70m)
Excavation (Tracked excavator and dump truck running simultaneously)	**77 dBA**	**< 77 dBA** (Avg. 71 dBA @ 80m)	**< 77 dBA** (Avg. 72 dBA @ 70m)
Concrete Pouring (4 trucks running simultaneously)	**76 dBA**	**< 76 dBA** (Avg. 67 dBA @ 80m)	**< 76 dBA** (Avg. 68 dBA @ 70m)
Material Transport (Truck pass-by)	**86 dBA (Pass-by Max)**	**< 77 dBA (Pass-by Max)** (Avg. 71 dBA @ 80m)	**< 77 dBA (Pass-by Max)** (Avg. 72 dBA @ 75m)
Façade / Fitout works (Noise primarily from mobile crane as fitout works enclosed by façade)	**64 dBA**	**61 dBA** (Avg. 56 dBA @ 70m)	**61 dBA** (Avg. 55 dBA @ 80m)

There is a 3~4-metre-tall dirt bund along the site boundary, between the area of works and the playground, which is expected to act as a natural noise barrier (should it remain intact). It is predicted that this will reduce construction noise levels by between **4-9 dB** where there is no line-of-sight between the receivers and machinery (i.e. effectiveness will depend on the location of the receiver and source in relation to the dirt bund). However, it is understood that the bund will be removed during the early stages of works and has not been accounted for in this assessment.

It is noted that due to the receiver height of the residential tower at 17 Wentworth Place, noise barriers will be ineffective at this location unless direct line-of-sight from noisy activities is removed.

5 NOISE MITIGATION MEASURES

5.1 Site Specific Noise Mitigation

From the predicted noise levels shown in Section 4.4 above, it is recommended that noise mitigation measures are put in place to minimize the effects of construction noise to neighbouring properties.

5.1.1 Piling

As the dirt bund will not be intact during piling activities, we recommend localized barriers/hoarding (where practical) to minimise noise emissions to the Wentworth Point Primary School playground and classrooms. A minimum barrier height of **2m** is recommended to replace the bund during piling.

5.1.2 Excavation

We recommend localized barriers/hoarding to minimise noise emissions to Wentworth Point Primary School when the dirt bund is being excavated. A minimum barrier height of **2m** is recommended to replace the bund during excavation. It is understood that these works will entail the removal of the dirt bund.

5.1.3 Concrete Pouring

For this assessment, a worst-case scenario of 4 concrete trucks running simultaneously has been allowed for. To minimise noise emissions, it is recommended that the number of concrete trucks and pumps running simultaneously is minimised where possible. It is understood that these works will be completed after removal of the dirt bund.

5.1.4 Material Transport

Due to the ability of trucks to move around site, a noise barrier/bund is not expected to provide much noise mitigation when equipment is located far away from the barrier. It is recommended that vehicle acceleration and engine idling is minimised as far as practical along the material transport path.

Should barriers near the noise sources be impractical, an alternative option would be to erect noise barriers near the ground level receivers (such as the nearest classrooms). This mitigation method is recommended upon confirmation of noise levels obtained by site measurement.

5.1.5 Façade / Fitout Works

Where internal works are to occur, it is recommended that noisy work (such as concrete cutting and grinding) is to be done on floors where the building envelope is enclosed to minimise noise emissions. Solid/plywood hoarding is recommended for noisy works in areas not enclosed by the building façade.

5.1.6 Predicted Construction Noise Levels after Noise Mitigation Methods

With the above noise mitigation methods in place, Table 10 predicts the expected noise levels at the noise sensitive receivers.

Table 10. Predicted Construction Noise Levels to Noise Sensitive Receivers with Noise Mitigation

Activity	L_{eq} Sound Pressure Level at Receivers		
	Wentworth Primary School: Playground (Distance: ~30m)	**Wentworth Primary School: Classrooms (Distance: ~40m)**	**17 Wentworth Place Apartments (Distance: ~40m)**
Piling (Piling rig and tracked excavator running simultaneously)	**69 dBA**	**< 69 dBA** (Avg. 65 dBA* @ 80m)	**< 75 dBA** (Avg. 70 dBA @ 70m)
Excavation (Tracked excavator and dump truck running simultaneously)	**73 dBA***	**< 74dBA*** (Avg. 69 dBA @ 80m)	**< 74dBA*** (Avg. 70 dBA @ 70m)
Concrete Pouring (2 trucks running simultaneously)	**73 dBA**	**< 73 dBA** (Avg. 67 dBA @ 80m)	**< 73 dBA** (Avg. 68 dBA @ 70m)
Material Transport (Truck pass-by)	**86 dBA (Pass-by Max)**	**< 77 dBA (Pass-by Max)** (Avg. 71 dBA @ 80m)	**< 77 dBA (Pass-by Max)** (Avg. 72 dBA @ 75m)
Façade / Fitout works (Noise primarily from mobile crane as fitout works enclosed by façade)	**64 dBA**	**61 dBA** (Avg. 56 dBA @ 70m)	**61 dBA** (Avg. 55 dBA @ 80m)
***Predicted noise level should a noise barrier be used effectively where practical, either at the source or receiver locations.			

Due to the ability of the dump truck and tracked excavator to move around site, a noise barrier/bund is not expected to provide much noise mitigation when equipment is located far away from the barrier. We also note that these noise levels will also reduce as the distance between the equipment and receiver increases.

5.2 General Noise Mitigation Measures

In addition to measures for mitigating noise exceedances outlined in Section 5.1, general guidelines should be followed to minimise overall noise.

Measures will be put in place where necessary to mitigate construction noise to affected neighbouring properties. The mitigation measures which are likely to be put in place include:

- Selection of quiet / muffled equipment
- Trucks and other vehicles should use non-tonal reversing alarms
- Vehicle warning devices such as horns will not be used as signalling devices
- Dropping equipment/materials from a height or into trucks is to be avoided

Affected neighbours should also be given the contact details of the nominated person who will be responsible for the implementation of the Construction Noise Management Plan. The nominated person/s is listed in Section 5.2.4.

The complaints procedure set out in Section 9 shall be adhered to and in line with the Community Communication Strategy.

5.2.1 Time Management of Activities

Limiting the amount of time each equipment is able run will further reduce noise emissions. For example, halving the running time, such as allowing the piling rig to run 7 minutes for every 15 minutes will provide a further **3 dB** reduction.

5.2.2 General Site Activity

When noisy equipment (for example but not limited to angle grinders, jack hammers, hammering) is to be used on site near the occupied buildings, this may potentially breach noise limits. If site conditions are proved to be more difficult and construction becomes noisier as a result, a further method of mitigating noise effects is to reduce the percentage of running time for key equipment.

5.2.3 Material Handling

Care should be taken when loading and unloading materials such that no excessive noise is produced.

5.2.4 Methods of Noise Management

This section sets out written procedures that will, if properly implemented by the identified responsible persons, ensure that noise emissions are controlled to appropriate levels.

1. The relevant authority/Roberts Co. shall be provided with the name(s) and contact telephone number(s) of the Site Manager or other identified person(s) who will be responsible for the implementation of the Construction Noise Management Plan (the nominated Roberts Co. personnel to be confirmed at a later date).

Name of person responsible for implementing CNVMP	TBC
Cellular phone number:	0447 237 186
Email address:	adam.greentree@au.roberts.co
Name of person responsible for implementing CNMP	Adam Greentree

2. The implementation of the Noise Management Plan shall be included in the written job description of the identified responsible person(s). At least one responsible person shall be present on site at all times.

3. The identified responsible person(s) shall ensure that:

- Noise from the construction works is measured and assessed in accordance with:
  - NSW EPA – Interim Construction Noise Guideline
  - All identified noise measures are in place and effective at all times
  - Any noise complaints are responded to in a prompt and reasonable manner, following the methodology set out below.

4. Measured or available reference noise levels for additional equipment not covered in this report shall be used to predict the levels of noise that will be generated at identified sensitive receivers.
5. Where the predicted noise levels exceed the recommendations of NZS 6803:1999, options for safe, practicable and cost-effective additional noise control measures shall be identified by a suitably qualified person.
6. In the event that any complaint is received due to the construction noise, this shall be monitored by a suitable trained person under the direction of an identified responsible. Additional measurements shall be taken to reduce the noise impact. Please refer to Section 6 for details.
7. Suitable noise monitoring locations shall be identified that are representative of the most equipment surrounding residential premises. The location of monitoring will be determined on a case-by-case basis, taking into consideration the receiver, location of activity deemed noisy and the recommendations contained within this Construction Noise and Vibration Sub Plan.
8. In the event that the measured noise levels are found to exceed the construction noise limits the Site Manager or other responsible person shall be advised. Options for further noise control measures shall be investigated and implemented where and as soon as possible. The relevant authority/Schools Infrastructure NSW will be informed of the exceedances and any noise control measures and recommendations provided by a suitably qualified person shall be implemented.
9. The Site Manager shall require all contractors to maintain road-going vehicles in a roadworthy condition at all times and ensure that all relevant noise control equipment is fitted and operating effectively.
10. A complaint record log shall be kept at the site office and in the event of a complaint being received relating to noise, the identified responsible person should be the site Foreman, and in line with the Community Communication Strategy.
11. If activities are identified that are considered to be generating excessive noise, the identified person shall take appropriate all practicable action to reduce noise to a reasonable level and contact the complainant and advise them of the outcome of the investigation and make a written note of the event and the outcome in accordance with the Community Communication Strategy and log the complaint on the complaint register.
12. In situations where engineering controls are rendered ineffective or not feasible, Administrative Noise Control Measure will be utilised. These may include:
    - Job rotation
    - Job redesign, and rosters
    - Redesign of plant and methodology of work
    - Sound barriers/materials
13. It is advisable to carry on a training and education procedures for all construction personnel on good noise management practices.

5.3 Noise Barrier Construction

5.3.1 Required Barrier Height 2m or Less

Where required barrier height is 2m or less, noise barriers should be of minimum 2.5kg/m^2 surface mass, 25mm thickness, and height of 2m. Echo Barriers are a viable option for installation should the barrier height required (from mitigations) be 2m or lower. These should be located between the activity and nearest receiver as depicted below. The activity should occur at a distance 5m or less from the noise barrier in order to maximise effectiveness of the barriers.

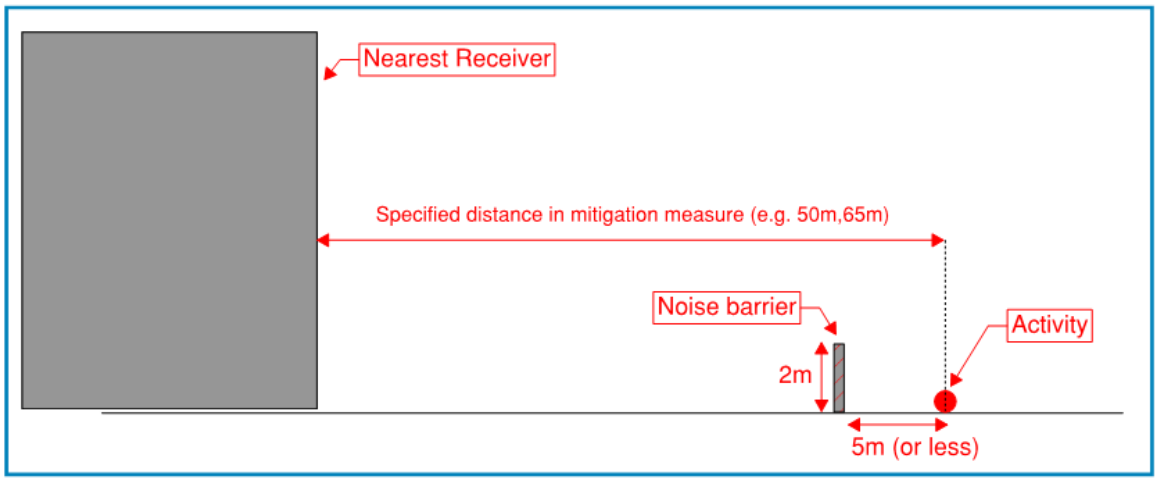


Figure 4. General Noise Barrier Installation

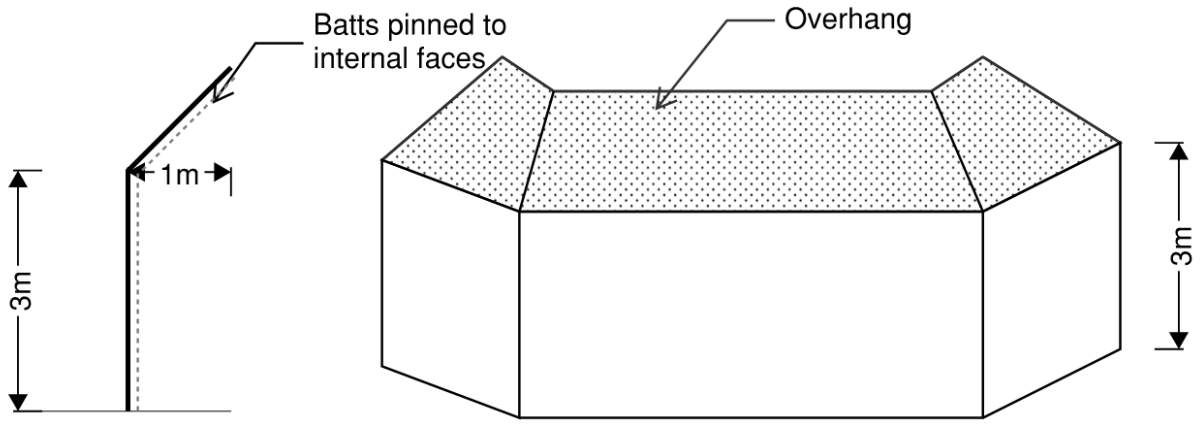
5.3.2 Required Barrier Height Greater than 2m

Where required noise barrier heights exceed readily available products, a larger custom screen will need to be erected. This should be 17mm plywood or 9mm minimum thickness cement sheet (minimum 12 Kg/m2), with no gaps between the panels (or approved equivalent). There should also be absorption in the form of 75mm thick, minimum 32 kg/m^2, fibreglass or polyester batts pinned to the internal faces of the screen. The absorption will prevent 'bouncing' of the noise and prevent it reflecting behind the equipment.

The screen should also have an overhang placed at no more than 1m from the noisiest part of the equipment.

The overhang is a way of increasing the effective height of the barrier, particularly for areas where a nearby receiver located at a higher floor may overlook the plant. The diagram below should illustrate the effect we are looking to achieve. The noise source should be located such that the overhang breaks direct line-of-sight between the noise source and nearby receiver.

Figure 5. Depiction of Localised Noise Barrier



Alternatively, a full enclosure can be considered to absorb noise in all directions.

6 CONSTRUCTION NOISE MONITORING

Monitoring of noise is an important part of managing noise emissions from construction sites. We recommend noise monitoring to be undertaken in the event of any complaints received (the results of which shall be submitted to Schools Infrastructure NSW/Roberts Co within one week of receiving the complaint) and aligning with the Community Communication Strategy.

6.1 Location

Noise monitoring may occur at the facade of any neighbouring building, such as outside the classrooms of Wentworth Point Primary School or at 17 Wentworth Place apartments. Should noise monitoring outside classrooms be impractical, the noise logger may be placed within the site boundary as close as possible to the classrooms.

Noise trigger levels will then be determined by the location of the logger and be set subsequent to a site assessment during deployment.

6.2 Extent of Monitoring

We would suggest that the best means of conducting measurements is to utilise qualified acoustic engineers with Type 1/Class 1 hand-held sound level meter. When reporting results, the engineer should exclude traffic noise from construction noise to establish the actual level of noise being produced by the site. Furthermore, they can identify what types of equipment are creating the most noise and if needed, advise the Site Manager on additional mitigation measures and whether the complaint management procedures are required (Refer to Section 9).

In the event that complaints are received, the degree and duration of monitoring should reflect the extent of complaints and compliance. Permanent logging stations are available but are an expensive and often ineffective method of policing compliance. While they have the ability to continuously record noise levels 24-7, and even issue alerts if certain levels are exceeded, they are not able to easily identify whether the noise source in question was due to a construction activity or some other localised event unrelated to construction. This makes the data gathered copious but generally unusable for enforcement.

The following procedure is proposed for noise monitoring:

- Noise monitoring is to be undertaken if a complaint is received
- Monitoring to be conducted as per the NSW EPA – Interim Construction Noise Guideline
- Results of routine monitoring shall be submitted to Schools Infrastructure NSW. Results of monitoring in the event of any complaints shall be submitted to the Project Manager, Project Director and Senior Project Director within 1 week of receiving the complaint

7 CONSTRUCTION VIBRATION

Due to the construction types proposed and average distances between the works and receivers, we do not anticipate any significant vibration effects with regards to DIN 4150-3 compliance for the protection of building structures. The most intensive activity is expected to be the piling works.

We do not anticipate that there will be issues with regard to compliance with the vibration limits presented in the criteria above.

If problems and/or complaints arise on site, these should be dealt with as per the requirements for noise, i.e. any vibration complaints should be followed up by monitoring to establish the cause and levels of vibration, with any necessary mitigation measures taken following this.

If it is not practical to measure within adjacent dwellings, we propose that the vibration assessment be made at ground level either outside or inside the dwellings (whichever is possible), with prediction methodologies used to establish whether vibration levels are either near, or clearly well below, compliance limits.

7.1 Preliminary Vibration Assessment

It is important to note that 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. Surface works are expected to have a lower vibration impact than ground compacting/piling works.

Compliance with vibration limits is expected based on ensuring ground compacting equipment is selected to adherer to minimum safe working distances. While these magnitudes do not predict cosmetic/structural damage, it is anticipated that human response/comfort would be impacted at these distances. The current RMS Construction Noise and Vibration Guideline sets safe working distances for vibrating plant and equipment. These are summarised below in Table 11.

Table 11. RMS Plant Vibration Safe Operating Distances - Construction Noise and Vibration Guideline 2016

Plant Item	Rating / Description	Minimum working distance	
		Cosmetic damage (BS 7385)	Human response (OH&E Vibration Guideline)
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	4 m	7 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	44 m	73 m
Jackhammer	Handheld	2 m (nominal)	2 m
Pile Boring	< 800 mm	2 m (nominal)	4 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Vibratory Roller	< 200 kN (Typically 4-6 tonnes)	12 m	40 m

Based on the required construction activities to be undertaken as part of the project, as well as the proximity of the surrounding receivers to the site, the resulting construction vibration is unlikely to negatively impact on any of the surrounding receivers. NDY's SSDA response is attached in the appendix at the end of this report.

8 COMMUNITY LIAISON

An important part of managing construction noise is to manage community expectations.

It is important for all personnel on construction sites to maintain good relations with their neighbours and to respect the rights of these neighbours to live or work nearby without being subjected to unreasonable or excessive noise.

Consultation and co-operation between Schools Infrastructure NSW (SINSW)/Roberts Co, the contractor and the neighbours before commencement of work, and the removal of uncertainty, helps reduce adverse reactions to noise. It is understood that, at the time of writing, this process is underway and will align with the Community Communication Strategy that has been prepared.

It is recommended that this is completed as per SINSW standard processes, such as but not limited to:

- Information sessions
- Information booths
- Notifications
- Online resources and contacts
- Contact cards

It is recommended that a public relations person/team is identified for the project who will be responsible for overseeing the community liaison process, in line with the Community Communication Strategy.

9 COMPLAINTS MANAGEMENT SYSTEM

For this project, it is noted that School Infrastructure NSW manages all enquires and complaints for the project.

As outlined in the Community Communication Strategy, should complaints be raised during construction, they will need to be logged, managed, closed out and resolved by SINSW within the timeframes outlined in the Community Communication Strategy.

The contractor and School are to refer all complaints through SINSW so they can be recorded and managed appropriately.

Please refer to the following SINSW community contact card details for further information.

10 CONCLUSION

Main works construction noise for the Wentworth Point new high school development has been reviewed to form a CNVMP for the purposes of meeting the NSW Interim Construction Noise Guideline. On review, the following conclusions were made:

- Construction activities, when assessed at the shortest possible distances (worst-case scenario) to both noise sensitive receivers, is predicted to exceed the 'Highly Noise Affected' noise levels. However, when assessed based on average distances, noise levels from all assessed activities are predicted to comply.
- As the dirt bund is removed, excavation and material transport activities without noise mitigation are expected to produce ~77 dBA at the external façade of the Wentworth Point Primary School classrooms (when activities are happening at the closest distance to the school). When assessed based on an average distance from the construction site to the face, this predicted noise level reduces to ~71 dBA.
- Localised barriers/hoarding to the western site perimeter is recommended during the excavation of the bund.
- Localised barriers at the closest affected classroom façades are recommended to be explored upon confirmation of noise levels by site measurement.
- Incorporation of noise mitigation strategies outlined in this document is expected to allow construction works to be undertaken whilst comply with the NSW Interim Construction Noise Guideline.

APPENDIX - VIBRATION PRE-CONSTRUCTION SURVEY RESPONSE

19 September 2022

Roberts Co
Level 9, 60 Castlereagh Street
Sydney NSW 2000
Australia

Attention: Adam Greentree

WENTWORTH POINT NEW HIGH SCHOOL – VIBRATION PRE-CONSTRUCTION SURVEY

Due to the construction types proposed and average distances between the works and receivers, we do not anticipate any significant vibration effects with regards to DIN 4150-3 compliance for the protection of building structures. The most vibration intensive activity is expected to be the piling works.

We do not anticipate that there will be issues with regard to compliance with the vibration limits and construction methodology presented in the NDY Construction Noise and Vibration Management Plan (rp211028s0013b[1.2]_Construction Noise and Vibration Management Plan.pdf).

Given the above, it is proposed that the desktop pre-construction assessment in the NDY Construction Noise and Vibration Management Plan will satisfy the SSDA requirements and that a vibration pre-construction survey is not strictly necessary. However, should complaints arise, the noise and vibration monitoring strategy described in the Construction Noise and Vibration Management Plan will be adhered to.

We trust this information is of assistance, please do not hesitate to contact us if you have any questions or require anything further.

NORMAN DISNEY & YOUNG

Kanvin Chen | Senior Project Engineer - Acoustics
K.Chen@ndy.com

APPENDIX - ACOUSTIC CONSULTANT CV

KANVIN CHEN | SENIOR PROJECT ENGINEER

After completing his mechanical engineering degree at The University of Auckland, Kanvin joined NDY to pursue his career as an Acoustic Engineer.

With his attention to detail and self-motivation, Kanvin has added value to the Acoustic Team by providing well thought-out and quality solutions to ensure client needs are always satisfied.

Kanvin's interest in Acoustics stems from his passion for improving the quality of living and efficient use of the spaces which surround us, aligning with NDY's core value of "making spaces work".

YEARS EXPERIENCE

5 +

EXPERTISE

Acoustics

QUALIFICATIONS

Bachelor of Engineering (Hons)

PROFESSIONAL AFFILIATIONS

ASNZ Affiliate

Member of the Australian Acoustical Society

OFFICE LOCATION

Melbourne

CAREER HISTORY

Acoustic Project Consultant – Norman Disney & Young, Melbourne, VIC

October 2019 – Present

Roles & responsibilities:

- Project leadership of medium to large projects
- Research and development projects from inception to completion
- Field measurements of noise and vibration
- Advanced acoustic analyses of building services equipment
- 3D modelling of noise and reverberation environments
- Advanced building acoustics assessments
- Reporting of acoustic advice for presentation to external stakeholders

Acoustic Consultant – Norman Disney & Young, Auckland, NZ

June 2017 – September 2019

Roles & responsibilities:

- Field measurements of noise and vibration
- Acoustic analyses of building services equipment
- Building acoustics assessments
- Reporting of acoustic advice for presentation to external stakeholders
- Project leadership of small projects

CORRECTIONS & JUSTICE

Chisholm Road Prison, Lara, VIC (2020)

New maximum-security prison with approximately 1200 beds. The state-of-the-art facility will feature the highest and most stringent level of security. Key features include new health, education, and recreation facilities | Acoustic Engineer

Hopkins Correctional Centre, Lara, VIC (2021)

New maximum-security prison with approximately 1200 beds | Acoustic Engineer

311 Spencer Street – Victoria Police, Melbourne, VIC (2021)

65,000 m^2 NLA office and integrated fitout for Victoria Police | Acoustic Engineer

EDUCATION

Unitec Building 110 Fitout, Auckland, NZ (2018)

Refurbishment of a former library to create new office and learning spaces | Lead Acoustic Engineer

Australian National University, College of Arts & Social Sciences (RSHA), Canberra, Australian Capital Territory, Australia (2019-2020 | $70 m)

The 10,000m² facility includes 3,000m² of specialist laboratory spaces and 7,000m² of staff/student areas. It will provide will become a permanent home for the operational functions of the School of Archaeology and Anthropology (SAA), School of Literature, Languages and Linguistics (SLLL) and Humanities Research Centre (HRC).

Design of two new academic buildings (RSHA and CBE Buildings), with one involving CLT construction.

Kanvin was the lead acoustic engineer on this project and his responsibilities included providing design input around the sound insulation performance of the building fabric and acoustic reverberation treatment of internal learning spaces. Specialist advice was provided around the lecture theatre and laboratory design to ensure that the sound and vibration insulation requirements were met.

Murdoch University - New Academic Building (NAB), 90 South Street, Murdoch Western Australia, Australia (2019 to Current | $135 m)

Norman Disney & Young were been engaged to undertake the design of the Mechanical, Electrical, Communications, Security, Fire Protection, Fire Engineering, Hydraulic, Acoustics, Environmental Sustainability, Audio Visual briefing and Vertical Transportation Services. This building forms an integral part of transitioning Discovery Way as the primary arrival gateway for the University. A linear four storey academic building is proposed as a concrete structure for the lower-level stories, with an innovative engineered timber frame for the upper three stories. The 'New Academic Building' (NAB) will provide Murdoch University with over 15,000m² of contemporary collaborative learning space, informal peer-to-peer learning, academic workplace and campus landscape.

Kanvin was the lead acoustic consultant on this project, providing substantial design input around the sound insulation performance of the lightweight cross laminated timber structure and acoustic reverberation treatment of internal learning spaces.

Sydney Olympic Park New High School, Sydney, New South Wales, Australia (2020 to current | $100 m)

The new high school is being developed to cater for the growing population in the Sydney Olympic Park, Wentworth Point and Concord West communities.

The project consists of a new 9-stream high school for 1520 students designed and built over two stages located on Burroway Rd, Wentworth Point. Currently, the following areas are proposed:

- Outdoor spaces including landscaped recreation areas, playing field and games courts
- Multi-purpose hall for sports and performance
- Library and canteen facilities
- New performing arts spaces.
- Science and laboratory spaces
- Wood & metal workshop areas

Kanvin is the lead acoustic engineer on this project, providing design input around the acoustic separation between the various spaces and spatial acoustic treatment to critical areas, ensuring that the design is fit for purpose.

DEFENCE

HMAS Harman JIWF, Canberra, ACT (2020)

Joint Information Warfare Facility | Acoustics Engineer

OFFICES NEW

Emporium Melbourne Co-working Hub, VIC (2019 | $30M)

KANVIN CHEN | SENIOR PROJECT ENGINEER

The growing diversity in Emporium Melbourne's offering sees the conversion of the existing Level 4 Myer tenancy repurposed into a space suitable for co-working office tenants, with an additional 3 levels of space constructed (utilising new CLT floor slabs) behind the Myer heritage façade on Lonsdale Street. The conversion of 10,000 sq m of office NLA over 4 levels included design considerations that remained sensitive to the heritage façade, navigation of sustainability requirements and assisting with the Melbourne Fire Brigade (MFB) approvals process | Lead Acoustic Engineer

Geelong Civic Accommodation Precinct, Geelong, Victoria, Australia (2019 - 2022 | $90 m)

Currently under construction, the Geelong Civic Accommodation Precinct will be a purpose-built commercial hub. The premium building comprises a Lower Ground secure carpark, Ground floor customer service area and end-of-trip facilities, and 5 office levels with a total NLA of approximately 9,400 m^2.

Kanvin is the lead acoustic engineer on this project to ensure that the acoustic project performance requirements were met and provided validation of value management options.

60-80 Moorabool Street, Geelong, Victoria, Australia (2021 | $45 m)

10,000m^2 NLA 8 storey office development including integrated fitout for GMHBA. The building comprises two basement levels including end-of-trip facilities, a ground floor lobby and retail areas targeting 5 Star Green Star and 5 Star NABERS Energy ratings.

Kanvin was the lead acoustic engineer on this project, providing the necessary acoustic practices and treatment to ensure that the project achieved the targeted performance and sustainability requirements.

311 Spencer Street, Melbourne, Victoria, Australia (2021 | $650 m)

40-storey commercial office building accommodating Victoria Police. 65,500 m^2 NLA, 110,000 m^2 GFA with secure basement level car parking for 600 cars and end-of-trip facilities. A helipad is included at rooftop level, whilst a public forecourt acts as a continuation of the external spaces and public realm with the adjacent 313 Spencer Street. PCA A Grade, 5 Star Green Star As-built and 4.5 Star NABERS energy and water.

Kanvin was an acoustic engineer on this project providing acoustic detailing/construction reviews on-site assistance.

EXISTING ASSETS

181 William Street, Melbourne, VIC

Lobby Refurbishment | Acoustic Engineer

INTERIORS

120 Spencer Street, Melbourne, VIC (2019)

Mechanical services review and noise investigation for the WeWork fitout | Acoustics Engineer

HOTELS

1 Queen Street Intercontinental Hotel, Auckland, NZ (2022)

Conversion of the existing HSBC 20 story office building located in a prominent position on the Auckland CBD waterfront into a 21-story building with seven office levels, 14 level of 5-star hotel (243 rooms), and a rooftop bar. The building will be fully integrated into the larger Commercial Bay development currently being built adjacent (also an NDY project), which is made up of a 39-story office tower and a three-level retail mall providing pedestrian connection to surrounding buildings (including 1 Queen Street) | Lead Acoustic Engineer. Kanvin, was responsible for interior acoustics and mechanical services for a premium hotel experience and integration of commercial

Wirra Wirra Vineyard Resort, SA (2020)

KANVIN CHEN | SENIOR PROJECT ENGINEER

The Wirra Wirra Winery Hotel is a project to build the first five-star accommodation of scale in the McLaren Vale wine region and the first integrated winery resort of its type in South Australia. The hotel concept was built around a theme of health and wellness, targeting international and domestic travelers. The hotel GLA will be in the order of 5,000 m^2 | Lead Acoustic Engineer. Kanvin took the role as Acoustic design Lead of the boutique guestrooms and common spaces to ensure comfortable acoustic environments for guests

Cordis Hotel, Auckland, NZ (2019)

The Cordis Hotel (by Langham) is a 5-star upscale hotel that is located in the heart of Auckland, offering contemporary accommodations with modern amenities, dining venues and event spaces. NDY acoustics have teamed up with Cordis in the upgrade of the existing building facade to improve the overall acoustic comfort of the guestrooms from the bustling city streets of Auckland. Kanvin assisted in redevelopment of the building façade to minimize noise ingress to hotel guestrooms | Acoustics Engineer

RESIDENTIAL

Kainga Ora (Formerly Housing New Zealand) Developments, Auckland, NZ (2017-2019)

Development of efficient State Housing projects – Cost effective building design to maintain the acoustic privacy and amenity of residents

- 3184-3188 Great North Road, Auckland, NZ
- 2 Cracroft Street, Auckland, NZ
- 2 Wilson Road, Auckland, NZ
- 12-14 Hillcrest Road, Auckland, NZ
- 20-22 Lynton Road, Auckland, NZ
- 4 Jordan Avenue, Auckland, NZ
- 432 Onehunga Mall, Auckland, NZ
- 139 Greys Avenue, Auckland, NZ

AGED CARE & SENIORS LIVING

Kew Gardens Aged Care, Kew, VIC (2020)

Acoustic advice for the refurbishment of an Aged Care facilty | Acoustic Engineer

HOSPITALS

Centenary Hospital for Women and Children, Canberra, ACT (2019)

Acoustic advice for the expansion of new health facilities | Acoustic Engineer

St Vincents Private Hospital, Melbourne, Victoria, Australia (2020)

Redevelopment of the St Vincent's Private Hospital involving the expansion of existing facilities and a new hospital wing. The building will house a range of facilities including 106 new acute medical/ surgical and maternity beds, 7 extra operating theatres (inc. 1 hybrid), medical imaging, CSSD, retail, pharmacy, expanded Day Procedure, staff & conference areas.

It also features a 3-level expansion to the multi-level car park to the north of the current Private Hospital. Approximately 150 extra car spaces are envisaged.

Kanvin was as acoustic engineer on this project aiding in the design of the sound insulation performance of the building fabric, reverberation control and mechanical services noise treatment.

PRIMARY CARE CENTRES

WDHB Collingwood Clinic, Hamilton, NZ (2020)

Involvement in the acoustic design to ensure the privacy of large clinical and office spaces | Lead Acoustic Engineer

KANVIN CHEN | SENIOR PROJECT ENGINEER

DISTRIBUTION CENTRES

Foodstuff Distribution Centre, Auckland Airport, NZ (2021)

Development of the base build acoustics of the new distribution centre and head office for Foodstuffs New Zealand| Acoustic Engineer

MANUFACTURING

Monkeytoe, New Plymouth, NZ (2019)

Research and Development of the HushMonkey acoustic screening system | Acoustic Engineer

CRITICAL FACILITIES

Equinix, 32 Walsh Street, West Melbourne, VIC (2021)

Investigation of potential noise arising from proposed chiller upgrades and the effects on the surrounding environment | Acoustic Engineer

NORMAN DISNEY & YOUNG CONSULTING ENGINEERS

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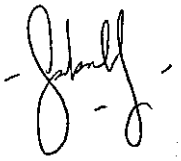
NDY QA SYSTEM

Revision No:	1.5
Revision Date:	21 October 2022
Reason Description:	Main Works Assessment

Authorisation By: Kanvin Chen

Client Name:	Roberts Co
Client Contact:	Adam Greentree
Project Leader:	Kanvin Chen
Editor:	Kanvin Chen

Verification By: Gabriel Lu



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