

Alexandria Park Community School
Construction Noise Vibration Management Plan (CNVMP)_

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1 EXECUTIVE SUMMARY

This Construction Noise and Vibration Management Plan (CNVMP) presents the results of an assessment of potential noise and vibration impacts associated with the demolition, excavation and construction of the proposed redevelopment of Alexandria Park Public School.

This assessment has been conducted in accordance with the NSW EPA *Interim Construction Noise Guideline (ICNG) 2009* and having regard to Australian Standard AS 2436 "*Guide to Noise Control on Construction, Maintenance and Demolition Sites*".

Noise control strategies have been formulated within this report to ensure that construction noise impacts from the site are minimised. In particular, a detailed outline of the community consultation procedures proposed for the site which has been included which will form the basis of the noise control strategy.

The Plan should also be updated during the construction period in response to information gathered during this period.

2 INTRODUCTION

This report presents the recommended approach for managing noise and vibration arising from the redevelopment of Alexandria Park Public School project.

The principal objective of this study is to undertake an evaluation of work to be performed during the demolition, excavation and construction of the project and forecast the potential impact of noise and vibration emissions. The evaluation will be used to formulate and streamline effective regulation and mitigation measures. The objective is to minimise noise emissions from the construction process or to schedule works, which may have a significant acoustic impact on adjoining receivers.

The principal issues, which will be addressed in this report, are:

- Identification of the noise and vibration guidelines which will be applicable to this project.
- Identification of potentially impacted receivers.
- Prediction of likely noise levels impacting surrounding receiver locations.
- Formulation of a strategy for construction to comply with the guidelines identified.
- Establishment of direct communication networks between affected groups, namely the Richard Crookes Construction, Department of Education, Department of Planning, surrounding land owners and Acoustic Logic Consultancy Pty Ltd.

A critical component of this report is the formulation of noise control strategies for the different construction processes. These strategies include the formulation of site management procedures, whether they be operational, or time based. A detailed noise and vibration management plan forms part of this report.

In the report construction noise management levels are formulated based on the following:

- Condition B23 of the Development Consent from the Minister for Planning (SSD 8373).
- NSW EPA Interim Construction Noise Guideline (ICNG).
- A consideration of the procedures and requirements set out Australian Standard 2436-2010 *"Guide to Noise Control on Construction, Maintenance and Demolition Sites"*.
- The requirements to control noise emissions from the construction site to levels which does not cause undue disturbance to the identified receiver locations.
- The noise mitigation measures available.

Provided all measures outlined in this report are fully implemented, noise associated with the construction of the development will be strictly controlled, and the impact on the surrounding environments will be minimised.

3 CONDITION B23 OF THE DEVELOPMENT CONSENT FROM THE MINISTER FOR PLANNING – SSD 8373

Condition B23 of SSD 8373 Development Consent states the following

- B23.** *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;*
 - (b) Describe procedures for achieving the noise management levels in the EPA’s Interim Construction Noise Guideline (DECC, 2009);*
 - (c) Describe the measures to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers;*
 - (d) Include strategies that have been developed with the community for managing high noise generating works;*
 - (e) Describe the community consultation undertaken to develop the strategies in condition B23(d); and*
 - (f) Include a complaints management system that would be implemented for the duration of the construction.*

Other relevant conditions are as follows:

- C17** *The Applicant must implement, where practicable and without compromising the safety of construction staff or members of the public, the use audible movement alarms of a type that would minimise noise impacts on surrounding noise sensitive receivers.*
- C20** *Vibratory compactors must not be used closer than 30 meters from residential buildings unless vibration monitoring confirms compliance with the vibration criteria specified in condition C19.*

4 HOURS OF WORK

Hours of work which are applicable to construction works at Alexandria Park Public School are as follows:

4.1 CONDITION C6 AND C8 OF THE DEVELOPMENT CONSENT FROM THE MINISTER FOR PLANNING – SSD 8373

Condition C6 of SSD 8373 Development Consent states the following

Construction Hours

C6. *Construction, including the delivery of materials to and from the site, may only be carried out between the following hours:*

- (a) between 7 am and 6 pm, Mondays to Fridays inclusive; and*
- (b) between 7:30 am and 3:30 pm, Saturdays.*

No work may be carried out on Sundays or public holidays.

C8 *Rock breaking, rock hammering, sheet piling, pile driving, and similar activities may only be carried out between the following hours:*

- a) 9am to 12pm, Monday to Friday;*
- b) 2pm to 5pm Monday to Friday; and*
- c) 9am to 12pm, Saturday.*

5 SITE DESCRIPTION AND POTENTIALLY AFFECTED LOCATIONS

The site of the subject development is located within the existing Alexandria Park Public School grounds, construction of the new school will be carried out over multiple stages allowing for the school to still partly operate during the redevelopment. The following occupancies have been identified as the most sensitive receivers with regard to potential noise or vibration impacts due to their proximity to the project site.

5.1 RECEIVER LOCATIONS

The potentially most impacted sensitive receiver locations as presented in Figure 1 and also detailed below. These locations will be used as a basis for this assessment.

- Receiver 1.** Residential dwellings along Buckland Street.
- Receiver 2.** Residential apartments along Belmont Street (North).
- Receiver 3.** Residential apartments along Belmont Street (South).
- Receiver 4.** Residential apartments along Fountain Street
- Receiver 5.** Residential apartments along McEvoy Street.
- Receiver 6.** Commercial properties along McEvoy Street.
- Receiver 7.** Commercial properties along Power Avenue.



 Wilkson Murray Noise Monitor Locations

**Figure 1 – Site Map and Receiver Locations
Sourced from SixMaps NSW**

 **Project Site**
 **Residential**
 **Commercial**

6 PROPOSED CONSTRUCTION WORKS

The construction period has been divided into a number of main work phases, along with the main noise producing equipment (and equipment numbers) and activities likely to occur in each phase.

Table 1 – Construction Activities

Construction Activity	Equipment / Process (Number of Items)	Sound Power Level* dB(A)_{AvMax}
Demolition and Excavation	Concrete Sawing (up to 2)	115
	Concrete Pulveriser (up to 2)	110
	Excavator Mounted Hydraulic Hammer (up to 2)	120
	Excavator with Bucket, Bobcat (up to 2)	105
	Hand Held Scrambling Drills ⁽²⁾	105
	Trucks ⁽¹⁾	105
Structure and Fit-out	Trucks ⁽¹⁾	105
	Concrete Pumps ⁽¹⁾	110
	Crane (Diesel) ⁽¹⁾ (up to 3)	105
	Concreting - Vibrator and Helicopter Float (up to 2)	105
	Mobile Crane ⁽²⁾	107
	Powered Hand Tools (up to 4)	100

*These levels are inclusive of noise penalties as per the Interim Construction Noise Guidelines, where applicable..

The noise levels presented in the above table are derived from the following sources:

1. Table D2 of Australian Standard 2436-1981
2. Data held by this office from other similar studies.

7 CONSTRUCTION NOISE CODES AND GUIDELINES

The NSW EPA *Interim Construction Noise Guideline (ICNG) 2009* details specific construction noise and vibration management levels applicable to construction sites within NSW.

Where feasible and practical measures may be applied to the construction site is to endeavour to comply with the noise management levels outlined in the guideline. A summary of the code is detailed below.

7.1 NSW EPA INTERIM CONSTRUCTION NOISE GUIDELINE (ICNG) 2009

NSW EPA INCG adopts different management levels depending on the applicable receiver type, each is discussed below.

7.1.1 Residential Receivers

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- *“Noise affected” level.* Where construction noise is predicted to exceed the “noise effected” level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the “noise effected level”. For residential properties, the “noise effected” level occurs when construction noise exceeds ambient levels by more than:
 - 10dB(A) $L_{eq(15min)}$ for work during standard construction hours (7am-6pm Monday to Friday and 8am to 1pm on Saturdays); and
 - 5dB(A) $L_{eq(15min)}$ for work outside standard construction hours (7:30am to 8am and 1pm to 3:30pm on Saturdays); and
- *“Highly noise affected level”.* Where noise emissions are such that nearby properties are “highly noise effected”, noise controls such as respite periods should be considered. For residential properties, the “highly noise effected” level occurs when construction noise exceeds 75dB(A) $L_{eq(15min)}$ at nearby residences. Highly noise affected level only applies during standard construction hours.

A summary of noise emission management levels for standard hours of construction are presented below:

Table 2 – Construction Noise Emission Management Level (Residents)

Receiver Type	“Noise Affected” Level - dB(A) $L_{eq(15min)}$	“Highly Noise Affected” Level - dB(A) $L_{eq(15min)}$
Residential Receiver	Background + 10dB(A) (Standard Construction Hours)	75
	Background + 5dB(A) (Outside Standard Construction Hours)	N/A

7.1.2 Commercial Receivers

EPA guidelines recommend a construction noise management level for commercial receivers of 70dB(A) $L_{eq(15-minute)}$.

7.2 AUSTRALIAN STANDARD AS 2436:2010 “GUIDE TO NOISE CONTROL ON CONSTRUCTION, MAINTENANCE AND DEMOLITION SITES”

Australian Standard AS 2436 provides guidance on noise and vibration control in respect to construction and demolition sites, the preparation of noise and vibration management plans, work method statements and impact studies.

The Standard states that:

- “Some construction and demolition activities are by their very nature noisy. The authorities responsible for setting noise level criteria for essential works will take note of the constraints imposed by such activities, especially when they are of short duration.”
- Construction, demolition and maintenance works pose different problems of noise and vibration control when compared with most other types of industrial activity, since (a) they are mainly carried on in the open; (b) they are often temporary in nature although they may cause considerable disturbance whilst they last; (c) the noise and vibration arise from many different activities and kinds of plant, and their intensity and character may vary greatly during different phases of the work; and (d) the sites cannot be separated by planning controls, from areas that are sensitive to noise and vibration.

The standard provides advice and guidelines for the prediction of impacts and the methods available to manage impacts. It guideline promulgates feasible and reasonable mitigation strategies and controls, and stakeholder liaison, in the effort to reach a realistic compromise between site activities and impacts on neighbouring properties.

7.3 BACKGROUND NOISE LEVELS

Existing rating background noise levels (RBL) which have been used for the basis of this assessment have been adopted from the previous acoustic reports prepared for the site which were conducted by either Wilkson Murray *Alexandria Park Community School Development Application Acoustic Assessment (Revision B, dated April 2018, reference: AC-REP-16283R1)* for the development application of this project.

7.3.1 Measured Background Noise Levels

The background noise levels established from the unattended noise monitoring (location 4 from the AECOM report) are detailed in the Table below.

Table 3 – Measured Background Noise Level

Location	Time of Day	Rating Background Level dB(A)L ₉₀ (Period)
Location 1 (refer to Figure 1)	Daytime (7am to 6pm)	49
Location 1 (refer to Figure 1)	Daytime (7am to 6pm)	46

7.4 CONSTRUCTION NOISE MANAGEMENT LEVELS

7.4.1 Residential Receivers

Construction noise management levels applicable to the development have been determined based on the minimum background noise level recorded and the construction noise guidelines detailed in 7 of this report. Construction noise management levels of the site are detailed in Table 4 below.

Table 4 – External Construction Noise Management Levels

Receiver	Category	Time of Day	Background Noise Level dB(A)$L_{90}(\text{Period})$	Construction Noise Management Levels dB(A)$L_{eq}(15\text{-minute})$
Residential Receivers	Monday to Friday	7am to 5pm (BG+10 Period)	46	56
	Saturday	8am to 1pm (BG+10 Period)	(Adoption of the lowest background noise level as per Condition E5 of the development consent)	56
		7:30am to 8am and 1pm to 3:30pm (BG+5 Period)		51

7.4.2 Commercial Receivers

EPA guidelines recommend a construction noise management level for commercial receivers of 70dB(A) $L_{eq}(15\text{-minute})$.

8 VIBRATION CRITERIA

8.1 CONSTRUCTION VIBRATION

Vibration caused by construction at any residence or structure outside the subject site must be limited to:

- For structural damage vibration, German Standard DIN 4150-3 Structural Vibration: Effects of Vibration on Structures; and
- For human exposure to vibration, British Standard BS 6472 – 'Guide to Evaluate Human Exposure to Vibration Buildings (1Hz to 80Hz.

The criteria and the application of this standard are discussed in separate sections below.

8.2 DAMAGE CRITERIA

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in Table 2.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 5 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

Type of Structure		Peak Particle Velocity (mms ⁻¹)			
		At Foundation at a Frequency of			Plane of Floor of Uppermost Storey
		< 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

8.3 HUMAN COMFORT AND AMENITY

The British Standard BS 6472 – 'Guide to Evaluate Human Exposure to Vibration Buildings (1Hz to 80Hz)' will be used to assess construction vibration for human comfort.

This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings. The recommendations of this guideline should be adopted to assess and manage vibration from the site. Where vibration exceeds, or is likely to exceed, the recommended levels then an assessment of reasonable and feasible methods for the management of vibration should be undertaken.

Table 6 – BS 6472 Vibration Criteria

		RMS acceleration (m/s ²)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Offices		0.02	0.04	0.4	0.8	0.56	1.1
Workshops		0.04	0.08	0.8	1.6	1.1	2.2
Impulsive Vibration							
Residences	Daytime	0.3	0.6	6.0	12.0	8.6	17.0
Offices		0.64	1.28	13.0	26.0	18.0	36.0
Workshops		0.64	1.28	13.0	26.0	18.0	36.0

Note 1: Continuous vibration relates to vibration that continues uninterrupted for a defined period (usually throughout the daytime or night-time), e.g. continuous construction or maintenance activity. (DECC, 2006)

Note 2: Impulsive vibration relate to vibration that builds up rapidly to a peak followed by a damped decay and that may or may not involve several cycles of vibration (depending on frequency and damping), with up to three occurrences in an assessment period, e.g. occasional loading and unloading, or dropping of heavy equipment (DECC, 2006).

9 PREDICTED CONSTRUCTION NOISE LEVELS

Noise from the worst-case construction works for each phase of the development have been predicted to the nearest most affected sensitive receivers. The predicted noise levels are presented in this section.

The following presents the predicted noise levels for each item of typically louder plant. Noise has been predicted to surrounding sensitive uses. The loudest typical appliances for each phase has been included and presented as a cumulative assessment.

Table 7 – Predicted Cumulative Construction Noise Levels – Standard Construction Hours – Demolition and Excavation Works

Cumulative Demolition and Excavation Phase						
Receiver Number	Equipment	Predicted Noise Level dB(A) _{Leq(15-minute)}		Management Level dB(A) _{Leq(15-minutes)}	Exceedance	Comments
Receiver 1 – Residential dwellings along Buckland Street.	Concrete Sawing (up to 2)	66	82	56 (Noise Affected Level - NAL) 75 (Highly Noise Affected Level – HNAL)	+26 above NAL +7 above HNAL	Exceedances will occur when works are undertaken within close proximity to adjoining receiver.
Receiver 2 – Residential apartments along Belmont Street (North).	Concrete Pulveriser (up to 2)	62	85		+29 above NAL +10 above HNAL	
Receiver 3 – Residential apartments along Belmont Street (South).	Excavator Mounted Hydraulic Hammer (up to 2)	67	87		+31 above NAL +12 above HNAL	
Receiver 4 – Residential apartments along Fountain Street.	Excavator with Bucket, Bobcat (up to 2)	64	87		+31 above NAL +12 above HNAL	
Receiver 5 – Residential apartments along McEvoy Street.		61	87		+31 above NAL +12 above HNAL	
Receiver 6 – Commercial properties along McEvoy Street.	Hand Held Scrambling Drills	56	84	70	+14	
Receiver 7 – Commercial properties along Power Avenue.	Trucks	54	80		+10	

Table 8 – Predicted Cumulative Construction Noise Levels – Standard Construction Hours – Structure and Fit-out Works

Cumulative Structure and Fit-out Phase						
Receiver Number	Equipment	Predicted Noise Level dB(A) _{L_{eq}(15-minute)}		Management Level dB(A) _{L_{eq}(15-minutes)}	Exceedance	Comments
Receiver 1 – Residential dwellings along Buckland Street.	Trucks ⁽¹⁾ Concrete Pumps ⁽¹⁾ Crane (Diesel) ⁽¹⁾ (up to 3) Concreting - Vibrator and Helicopter Float (up to 2) Mobile Crane ⁽²⁾ Powered Hand Tools (up to 4)	58	74	56 <i>(Noise Affected Level - NAL)</i> 75 <i>(Highly Noise Affected Level – HNAL)</i>	+18 above NAL Below HNAL	Exceedances will occur when works are undertaken within close proximity to adjoining receiver.
Receiver 2 – Residential apartments along Belmont Street (North).		54	73		+17 above NAL Below HNAL	
Receiver 3 – Residential apartments along Belmont Street (South).		59	78		+22 above NAL +3 above HNAL	
Receiver 4 – Residential apartments along Fountain Street.		56	78		+22 above NAL +3 above HNAL	
Receiver 5 – Residential apartments along McEvoy Street.		53	78	+22 above NAL +3 above HNAL		
Receiver 6 – Commercial properties along McEvoy Street.		48	75	70	+5	
Receiver 7 – Commercial properties along Power Avenue.		46	73		+3	

Table 9 – Predicted Cumulative Construction Noise Levels – Outside Standard Construction Hours – Demolition and Excavation Works

Cumulative Demolition and Excavation Phase						
Receiver Number	Equipment	Predicted Noise Level dB(A) _{L_{eq}(15-minute)}		Management Level dB(A) _{L_{eq}(15-minutes)}	Exceedance	Comments
Receiver 1 – Residential dwellings along Buckland Street.	Concrete Sawing (up to 2)	66	82	51 (Noise Affected Level - NAL)	+31 above NAL	Exceedances will occur when works are undertaken within close proximity to adjoining receiver.
Receiver 2 – Residential apartments along Belmont Street (North).	Concrete Pulveriser (up to 2)	62	85		+34 above NAL	
Receiver 3 – Residential apartments along Belmont Street (South).	Excavator Mounted Hydraulic Hammer (up to 2)	67	87		+36 above NAL	
Receiver 4 – Residential apartments along Fountain Street.		64	87		+36 above NAL	
Receiver 5 – Residential apartments along McEvoy Street.	Excavator with Bucket, Bobcat (up to 2)	61	87		+36 above NAL	
Receiver 6 – Commercial properties along McEvoy Street.	Hand Held Scrambling Drills	56	84	70	+14	
Receiver 7 – Commercial properties along Power Avenue.	Trucks	54	80		+10	

Table 10 – Predicted Cumulative Construction Noise Levels – Outside Standard Construction Hours – Structure and Fit-out Works

Cumulative Structure and Fit-out Phase						
Receiver Number	Equipment	Predicted Noise Level dB(A) _{Leq(15-minute)}		Management Level dB(A) _{Leq(15-minutes)}	Exceedance	Comments
Receiver 1 – Residential dwellings along Buckland Street.	Trucks ⁽¹⁾ Concrete Pumps ⁽¹⁾ Crane (Diesel) ⁽¹⁾ (up to 3) Concreting - Vibrator and Helicopter Float (up to 2) Mobile Crane ⁽²⁾	58	74	56 <i>(Noise Affected Level - NAL)</i>	+23 above NAL	Exceedances will occur when works are undertaken within close proximity to adjoining receiver.
Receiver 2 – Residential apartments along Belmont Street (North).		54	73		+22 above NAL	
Receiver 3 – Residential apartments along Belmont Street (South).		59	78		+27 above NAL	
Receiver 4 – Residential apartments along Fountain Street.		56	78		+27 above NAL	
Receiver 5 – Residential apartments along McEvoy Street.		53	78		+27 above NAL	
Receiver 6 – Commercial properties along McEvoy Street.	Powered Hand Tools (up to 4)	48	75	70	+5	
Receiver 7 – Commercial properties along Power Avenue.		46	73		+3	

10 AMELIORATIVE MEASURES

On review of the tables above and the predicted areas of compliance and exceedance with noise emission goals, the following noise management recommendations have been developed.

10.1 RESPITE PERIODS

Exceedances above the *Highly Noise Affected Level (HNAL)* of 75dB(A) has been predicted, in particular when works are undertaken along the adjoining boundaries for the residential receivers. Therefore to provide some amenity to the surrounding receivers the following respite periods are to be adopted:

- 7:30am to 8:00am – Monday to Friday.
- 12:00pm to 1:00pm – Monday to Friday.
- 7:30am to 8:30am – Saturday.
- 12:00pm to 1:00pm – Saturday.

Additional respite periods are required in accordance with CoC C8 for Rock breaking, rock hammering, sheet piling, pile driving and similar activities.

These works can not commence until 9am, respite from 12-2pm and must not continue after 5pm on Monday-Friday.

These works can not commence until 9am, and must not continue after 12pm on Saturday.

10.2 PNEUMATIC HAMMERING

Hammering will typically produce the loudest noise levels emanating from the site and have the highest potential for noise impacts on surrounding receivers. On this basis, it is recommended that surrounding receivers are consulted on the processes of the demolition phase. Management processes will include:

- Substituting rock breaking during demolition for alternative measures such as sawing and lifting the slab pieces entailing:
 - Making saw cuts to break up the slab;
 - Using a muncher or pulveriser to break up the slab pieces, where practically feasible.

Pneumatic hammering should not be operated during the nominated respite periods above.

10.3 GENERAL OPERATION OF EXCAVATORS

Excavators are expected to be used for the majority of the time during the demolition and excavation periods.

Where prolonged excavator use is necessary, excavators could be moved to another part of the site to offer the receiver closest to the excavator some respite. Where practical and feasible, by moving the excavator from working on one part of the site to the opposite side of the site can provide up to a 13dB(A) reduction in noise levels impacting residential receiver locations.

Excavators should not be operated during the nominated respite periods above.

10.4 CONCRETE PUMPS

In the event concrete pumps are located along adjoining boundaries extended periods of exceedances will occur. It is recommended that concrete pumps are located as far away from residential boundaries where practical and feasible.

10.5 CONCRETE VIBRATOR/HELICOPTER

Concrete vibrators and helicopters will exceed the NML's when work is undertaken within close proximity to adjoining receivers. It therefore is recommended that these machines are not operated outside the standard construction hours (7:00am-6:00pm).

Scheduling of work shall be investigated to minimise the use of these machines being operated along the adjoining boundaries during the early morning time (i.e. 7:00am to 8:00am).

10.6 VEHICLE NOISE

Trucks, trailers and concrete trucks must turn off their engines when on site to reduce impacts on adjacent land use (unless required to remain running during concrete pumping for example).

As required by condition C17 - where practicable the use non-tonal movement alarms should be adopted ("whooshers"/"quackers").

10.7 EQUIPMENT MAINTENANCE

Richard Crookes Construction (and their subcontractors) should ensure that all equipment are operating within the manufacturers recommendations.

10.8 TOWER CRANES

Tower cranes which are diesel are to have an acoustic enclosure around the engine bay and an industrial silencer fitted to exhausts. A detailed review of crane selection should be undertaken prior to installation.

10.9 NOISE AND VIBRATION MONITORING

Attended noise measurements should be undertaken at the start of key stages i.e; demolition, bulk excavation, first major concrete pour.

Attended noise measurements should be conducted in accordance with Australian Standard AS1055: 2018 '*Acoustics- Description and measurement of environmental noise*', and should include the following:

- Type 1 or 2 sound meter (calibrated)
- Use of appropriate noise descriptor (in the case being $L_{eq}(15min)$).
- Detail of measurement position and proximity to reflecting surface if any (building or similar). Measurement positions will typically be at residential property boundaries.
- Comment regarding influence of meteorological conditions.

Vibration monitoring is typically required during demolition, excavation, vibrated piling and compaction works. Initial vibration monitoring locations are indicated in Appendix 1. All monitors are Texcel or equal and have SMS warning capability to notify contractor in the event of excessive vibration generation.

10.10 VIBRATORY COMPACTORS

Vibratory compactors must not be used closer than 30 meters from residential buildings unless vibration monitoring confirms compliance with the vibration criteria specified in condition C19.

10.11 OTHER ACTIVITIES

- In the event of a complaint, the procedures outlined in Section 11 and 12 should be adopted.
- Compliant handling as per Section 13 is to be adopted.

11 CONTROL OF CONSTRUCTION NOISE AND VIBRATION

The execution of this work will facilitate the formulation of noise control strategies for this project.

The flow chart presented in Figure 2 illustrates the process that will be followed in assessing construction activities.

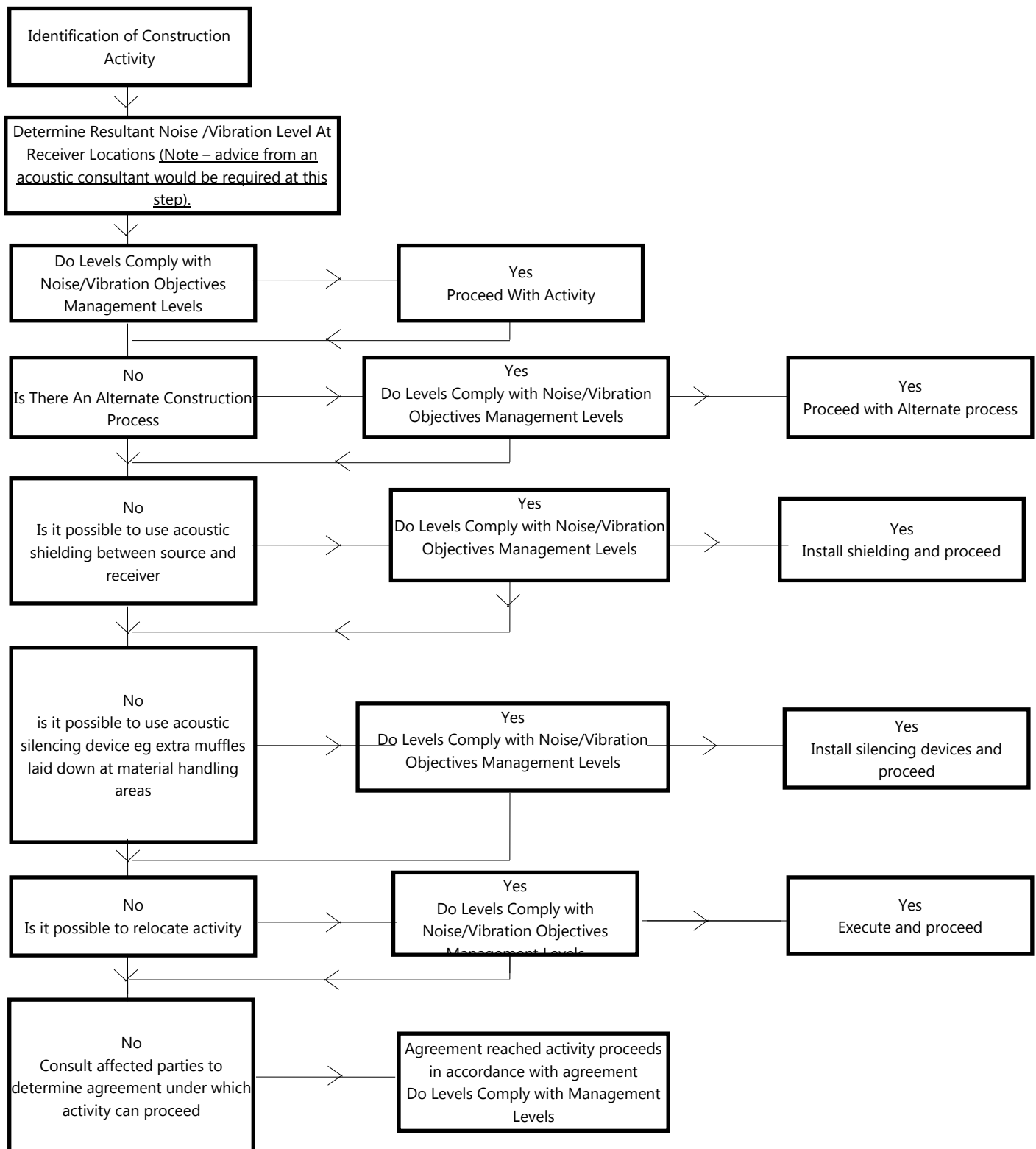


Figure 2 – Process Flowchart

12 NOISE AND VIBRATION CONTROL METHODS

The determination of appropriate noise control measures will be dependent on the particular activities and construction appliances. This section provides an outline of available methods.

12.1 SELECTION OF ALTERNATE APPLIANCE OR PROCESS

Where a particular activity or construction appliance is found to generate excessive noise levels, it may be possible to select an alternative approach or appliance. For example; the use of a hydraulic hammers on certain areas of the site may potentially generate high levels of noise. By carrying this activity by use of pneumatic hammers, bulldozers ripping and/or milling machines may result in a lower levels of noise.

12.2 ACOUSTIC BARRIER

Barriers or screens can be an effective means of reducing noise. Barriers can be located either at the source or receiver.

- The placement of barriers at the source is generally only effective for static plant (tower cranes). Equipment which is on the move or working in rough or undulating terrain cannot be effectively attenuated by placing barriers at the source.
- Barriers can also be placed between the source and the receiver however this will not be beneficial in this instance due to receivers overlooking the site.

The degree of noise reduction provided by barriers is dependent on the amount by which line of sight can be blocked by the barrier. If the receiver is totally shielded from the noise source reductions of up to 15dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8dB(A) may be achieved. Where no line of sight is obstructed by the barrier, generally no noise reduction will occur.

As barriers are used to provide shielding and do not act as an enclosure, the material they are constructed from should have a noise reduction performance that is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10mm or 15mm thick plywood (radiata plywood) would be acceptable for the barriers.

As mentioned previously, throughout the demolition stage it is recommended to install a loaded vinyl screen for any noisy works being undertaken. It is also recommended to install the loaded vinyl screen to the adjoining level above and below.

12.3 SILENCING DEVICES

Where construction process or appliances are noisy, the use of silencing devices may be possible. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

12.4 MATERIAL HANDLING

The installation of rubber matting over material handling areas can reduce the sound of impacts due to material being dropped by up to 20dB(A).

12.5 TREATMENT OF SPECIFIC EQUIPMENT

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.

12.6 ESTABLISHMENT OF SITE PRACTICES

This involves the formulation of work practices to reduce noise generation. It is recommended that all available and reasonable treatments and mitigation strategies presented in this report be adopted to minimise noise emissions from the excavation and construction activities on site.

12.7 NOISE MONITORING

Noise monitoring can be undertaken to determine the effectiveness of measures which are been implemented. The results of monitoring can be used to devise further control measures.

12.8 COMBINATION OF METHODS

In some cases it may be necessary that two or more control measures be implemented to minimise noise.

13 COMMUNITY INTERACTION AND COMPLAINTS HANDLING

13.1 COMMUNITY CONSULTATION

In order for any construction noise management programme to work effectively, continuous communication is required between all parties, which may be potentially impacted upon, the builder and the regulatory authority. This establishes a dynamic response process which allows for the adjustment of control methods and management levels for the benefit of all parties.

Community consultation has been undertaken prior to works through Richard Crookes Constructions and NSW Department of Education. This includes meetings and correspondence with the following affected parties:

- Receiver 1.** Residential dwellings along Buckland Street.
- Receiver 2.** Residential apartments along Belmont Street (North).
- Receiver 3.** Residential apartments along Belmont Street (South).
- Receiver 4.** Residential apartments along Fountain Street
- Receiver 5.** Residential apartments along McEvoy Street.
- Receiver 6.** Commercial properties along McEvoy Street.
- Receiver 7.** Commercial properties along Power Avenue.

It is intended that direct lines of communication continue between Richard Crookes Constructions, NSW Department of Education and potentially impacted receivers in the vicinity of the site be maintained.

The following is a list of community consultation documents and procedures:

- NSW Education Community Communication Strategy, April 2019.
- It is recommended that the developer prepares a neighbourhood letter as a brief introduction to the project and to notify stakeholders of upcoming construction activities.
- It is recommended that the developer prepares news gazette which will be issued to stakeholders monthly.

13.2 DEALING WITH COMPLAINTS – BY BUILDER

Should ongoing complaints of excessive noise or vibration management levels occur immediate measures shall be undertaken to investigate the complaint, the cause of the exceedances and identify the required changes to work practices. In the case of exceedances of the vibration limits all work potentially producing vibration shall cease until the exceedance is investigated.

The effectiveness of any changes shall be verified before continuing. Documentation and training of site staff shall occur to ensure the practices that produced the exceedances are not repeated.

If a noise complaint is received the complaint should be recorded on a Noise Complaint Form. The complaint form should list:

- The name and address of the complainant (if provided);
- The time and date the complaint was received;

- The nature of the complaint and the time and date the noise was heard;
- The name of the employee who received the complaint;
- Actions taken to investigate the complaint, and a summary of the results of the investigation;
- Required remedial action, if required;
- Validation of the remedial action; and
- Summary of feedback to the complainant.

A permanent register of complaints should be held. All complaints received should be fully investigated and reported to management. The complainant should also be notified of the results and actions arising from the investigation.

It is recommended that a noise complaint form which will be filled out in the event of a complaint and entered into a complaints register.

The investigation of a complaint shall involve where applicable;

- Noise measurements at the affected receiver;
- An investigation of the activities occurring at the time of the incident;
- Inspection of the activity to determine whether any undue noise is being emitted by equipment; and
- Whether work practices were being carried out either within established guidelines or outside these guidelines.

Where an item of plant is found to be emitting excessive noise, the cause is to be rectified as soon as possible. Where work practices within established guidelines are found to result in excessive noise being generated then the guidelines should be modified so as to reduce noise emissions to acceptable levels. Where guidelines are not being followed, the additional training and counselling of employees should be carried out.

Measurement or other methods shall validate the results of any corrective actions arising from a complaint where applicable.

13.3 RESPONSE TIMEFRAME

In accordance with the SINSW Community Communication Strategy action times are as follows:

Complaint:

Phone Call/Email Within Business Hours:	Agree time frame for response. Resolve within 2 days possible. If not possible, escalate as required, resolve within 7 business days.
Phone Call/Email Outside of Business Hours:	Acknowledge receipt upon returning to office. Resolve within 2 days possible. If not possible, escalate as required, resolve within 7 business days.

Interaction/letter:

Phone Call/Email Within Business Hours:	Agree time frame for response. Log interaction, close out in 7 business days.
Phone Call/Email Outside of Business Hours:	Agree time frame for response. Log interaction, close out in 7 business days.
Letter:	Log interaction, close out in 10 business days.

13.4 REPORTING REQUIREMENTS

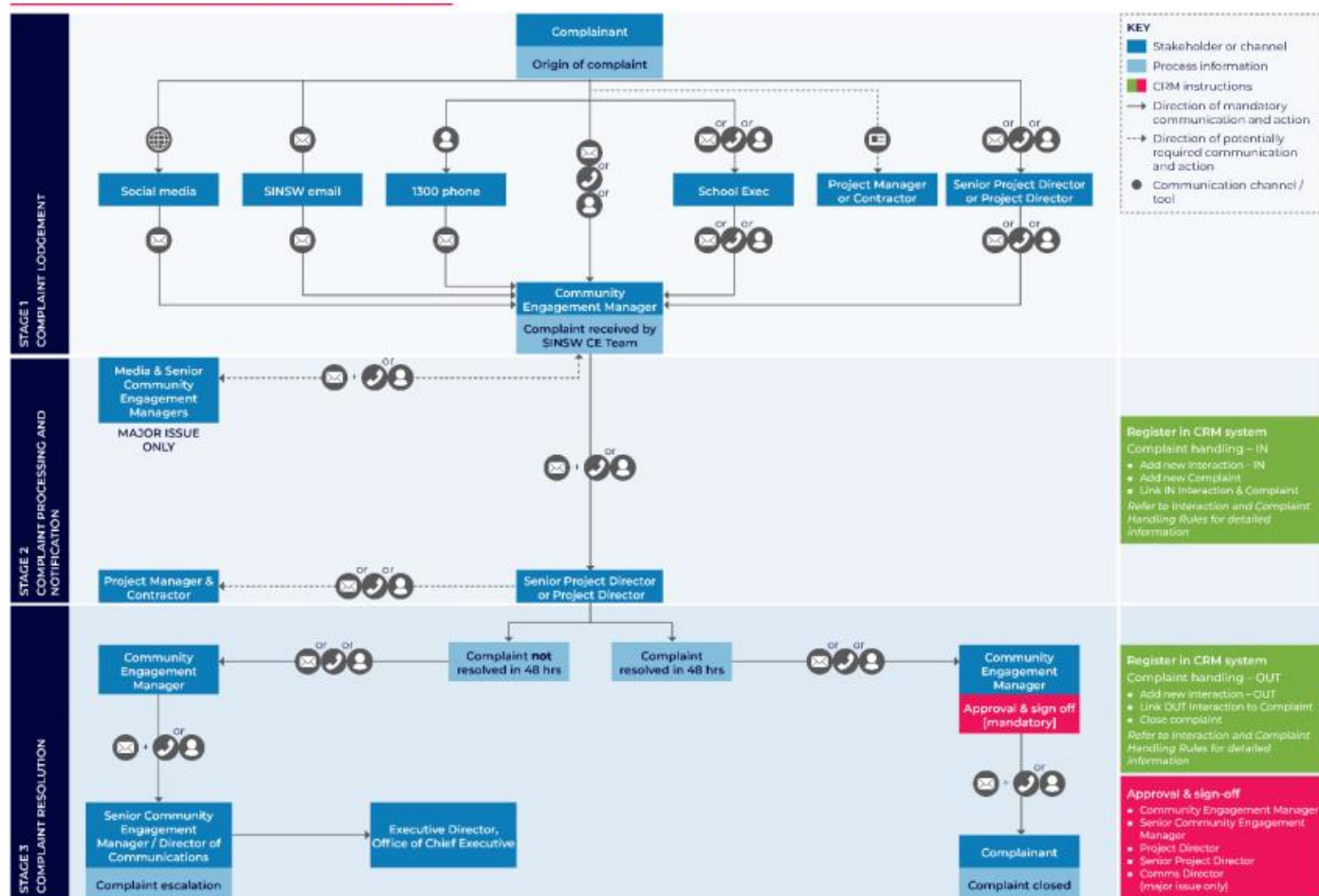
The following shall be kept on site:

1. A register of complaints received/communication with the local community shall be maintained and kept on site with information as detailed in section 10, 11 and 12.
2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring shall be retained on site at all times.
3. Any noise exceedances occurring including, the actions taken and results of follow up monitoring.
4. A report detailing complaints received and actions taken shall be presented to the construction liaison committee.

13.5 COMPLAINTS HANDLING – SINSW

Intern complaints handling within SINSW are detailed in the Community Communication Strategy, as are extracted below:

COMPLAINTS MANAGEMENT PROCESS FLOW CHART



14 CONCLUSION

A noise and vibration management plan has been undertaken of the proposed demolition, excavation and construction activities at Alexandria Park Public School to satisfy the requirements of condition B23 of the development consent from the minister for planning – SSD 8373

The assessment of construction noise and vibration indicates that management and engineering measures will be needed to limit noise impacts to the buildings adjacent to the site.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

A handwritten signature in black ink, appearing to read 'Gh' followed by a long horizontal stroke.

Acoustic Logic Consultancy Pty Ltd
Matthew Furlong

Appendix 1 – Vibration Monitoring Locations

