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Construction Noise & Vibration Management Plan

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1 INTRODUCTION

This report presents the recommended approach for managing noise and vibration emanating from the demolition, excavation and construction works at the approved Sandstone Precinct re-development, located at 23-33 & 35-39 Bridge Street, Sydney.

This assessment has been compiled to address condition C8 of the Minister for Planning conditions of development consent for the Sandstones Precinct (ref: SSD 7484).

The principal objective of this study is to undertake an evaluation of the work to be performed during the demolition, excavation and construction phases of the project and assess the potential impact of noise and vibration at the surrounding residential and commercial developments. The evaluation will be used to formulate and streamline effective regulation and mitigation measures.

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.
- Prediction of likely noise levels impacting surrounding receiver locations.
- Formulation of a work strategy to meet the noise and vibration guidelines identified in the above point.
- Establishment of direct communication networks between affected groups, namely Sydney City Council, the building Contractor, Acoustic Logic Consultancy Pty Ltd and the affected receivers

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

The objective of this study in all cases is to minimise noise and vibration emissions from the construction process or to schedule works which may have a significant acoustic impact on adjoining receivers.

All noise and vibration emission criteria detailed in this report have been based on the requirements detailed in conditions D8, D9, D10 and D11 of the development consent referenced above.

Provided all measures outlined in this report are fully implemented, noise and vibration associated with the demolition, excavation and construction works at the project will be strictly controlled, and the impact on the surrounding receivers minimised.

2 SITE AND PROJECT DESCRIPTION

The Sandstones Precinct re-development is located at the location of the existing Lands and Education buildings located at 23-33 Bridge Street, and 35-39 Bridge Street, Sydney respectively.

The Sandstones Precinct is bound by Bridge Street, lining the northern boundary of the site, Young Street lining the eastern boundary, Bent Street to the south and Gresham Street lining the western boundary. Loftus Street splits the development running in a north-south direction between the two buildings.

The project involves the re-development of the existing Sandstones Precinct to include additional visitor accommodation including an extension of 4 levels to the existing Education building, a function centre and provisions for additional retail tenancies. In addition to the above, a subterranean tunnel is to be constructed under Loftus Street linking the Education Building and the Lands Building, for back of house use.

The re-development does not include any alterations to the existing heritage façades of the Lands and Education buildings. As such, the shell of the existing buildings will remain throughout the entire project.

Regarding noise emissions from the site, the works most likely to impact the amenity of the surrounding areas includes the demolition works associated with the renovation and extension of the Education Building and to a lesser extent the noise associated with the renovation of the Lands Building. Additionally, the excavation of the ground to create a new 3 level basement area and a subterranean linkage between the two buildings beneath the project site have the potential for noise and particularly vibration emissions emanating to the surrounding buildings.

The nearest noise and vibration sensitive structures in the vicinity of the site are listed below:

- Receiver 1 – Residential Apartments – 38 Bridge Street
- Receiver 2 – Commercial Building – 41 Bridge Street (First Government House)
- Receiver 3 – Commercial Complex – 1 Farrer Place (Governor Phillip Tower)
- Receiver 4 – Commercial Complex – 1 Bligh Street
- Receiver 5 – Commercial Complex – 1 Bent Street
- Receiver 6 – Commercial Complex – 1 Gresham Street (Royal Exchange Building)
- Receiver 7 – Commercial Building – 50 Pitt Street
- Receiver 8 – Residential Apartments – 29 Macquarie Place

See figure 2.1 for site overview and relative location of noise and vibration sensitive receivers.

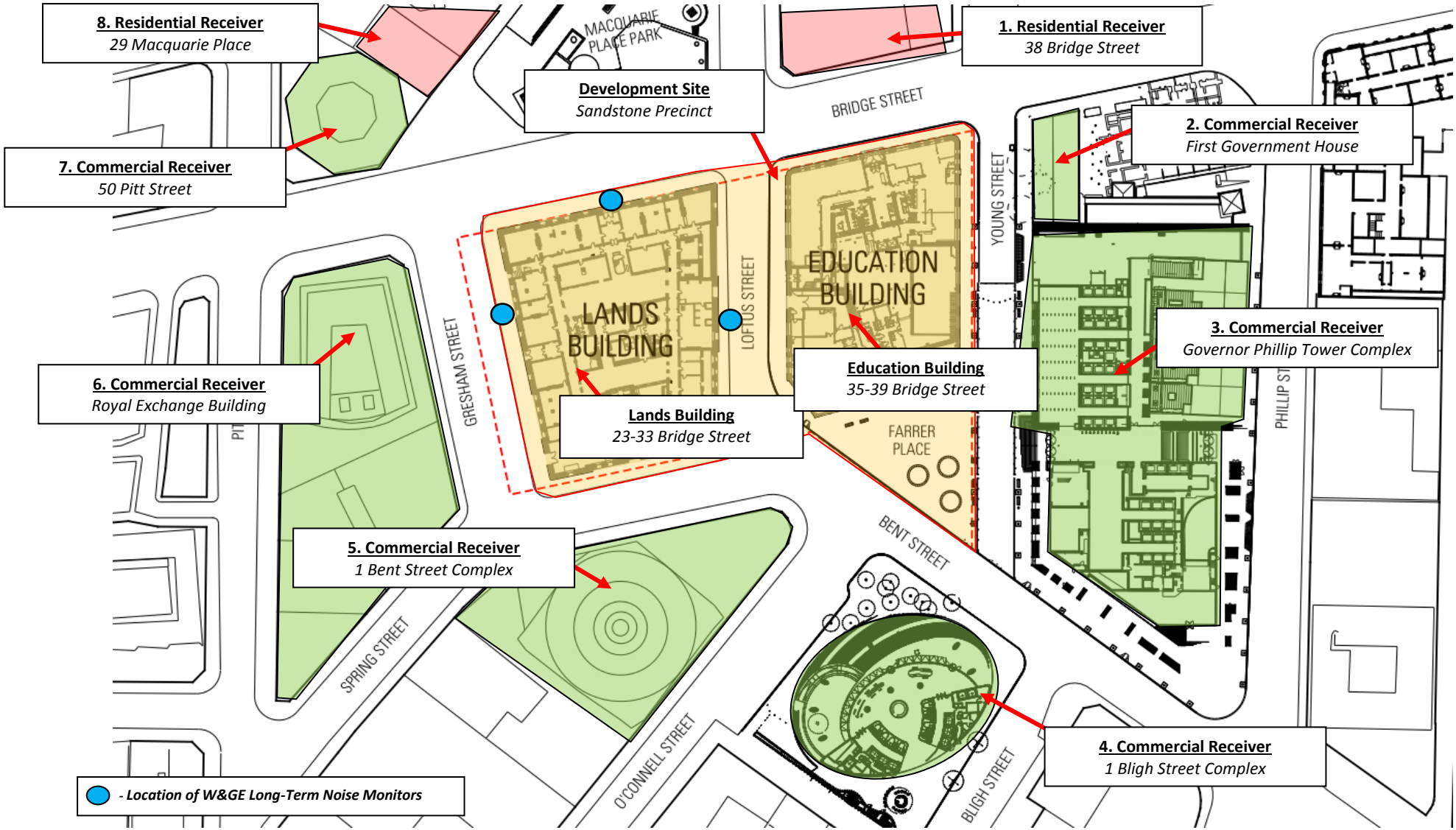

Figure 2.1 – *Sandstones Precinct Re-Development* - 23-33 & 35-39 Bridge Street

3 CONSTRUCTION NOISE AND VIBRATION GUIDELINES

The noise and vibration guidelines applicable at the site are discussed in the following sections.

3.1 HOURS OF WORK

Work at the site is to be conducted in the approved hours of work detailed in condition D1 of the Minister for Planning condition of development consent.

Hours of Work:

D1. *All work, including demolition, excavation and building work, and activities in the vicinity of the site generating noise associated with preparation for the commencement of work (e.g. loading and unloading of goods, transferring of tools etc.) in connection with the proposed development must only be carried out:*

a) Between 7:00am and 7:00pm on Mondays to Fridays inclusive
b) Between 7:00am and 5:00pm on Saturdays
c) No works must be undertaken on Sundays and Public Holidays.

Note: works may be undertaken outside of these hours with prior written approval from the Secretary, where:

i) It is required by a works authorisation deed executed with the RMS, or
ii) The delivery of materials is required outside these hours by the Police or occasional works are required outside these hours by other authorities, or
iii) It is required in an emergency to avoid the loss of life, damage to property and/or to prevent environmental harm.

D2. *The Applicant shall schedule rock breaking, rock hammering, sheet piling, pile driving and similar activity only between the following hours unless otherwise approved by the Secretary:*

a) 9:00am to 12:00pm, Monday to Friday
b) 2:00pm to 5:00pm, Monday to Friday
c) 9:00am to 12:00pm, Saturday.

3.2 BACKGROUND NOISE MONITORING

The background noise levels surrounding the site were determined in the development proposal phase of the project and nominated in the noise impact assessments titled *"The Sandstone Precinct, Sydney – Acoustic Report, Design Development Report (Lands)"* dated 27th June 2017 (Ref: 29212-SYD-N), and *"The Sandstone Precinct, Sydney – Acoustic Report, Design Development Report (Education)"* dated 27th June 2017 (Ref: 29212-SYD-N).

The background noise levels recorded at the Sandstones Precinct are presented below:

Table 3.2 – Measured Background Noise Level

Location	Time of Day	Rating Background Level dB(A) L_{90}
Bridge Street	Daytime	59
Gresham Street		59
Young Street		62

3.3 NOISE EMISSION GUIDELINES

3.3.1 Minister for Planning Conditions of Consent

Conditions D8, D9 and D10 state the following with regard to noise emissions from the site:

D8. *The development must comply with the construction noise management levels detailed in the Interim Construction Noise Guideline (Department of Environment and Climate Change, 2009). All feasible and reasonable noise mitigation measures shall be implemented and any activities that could exceed the construction noise management levels shall be identified and managed in accordance with the CNVMP, approved as part of the CEMP.*

D9. *Any noise generated during the construction of the development must not be offensive noise within the meaning of the Protection of the Environment Operations Act 1997 or exceed approved noise limits for the Subject Site.*

D10. *Where all control measures within the CNVMP have been implemented and the resultant noise and/or vibration levels at any sensitive receiver continue to exceed applicable criteria in the Construction Hours/Noise Code 1992 or Interim Construction Noise Guidelines and giving rise to sustained complaints then the contractor must provide regular, appropriate and sustained periods of respite in consultation with Council's Health and Building unit. Approval to vary the authorised noise and vibration levels must be received in writing by the proponent from Council prior to activities being undertaken that exceed sanctioned emission levels. Such periods must be set and agreed to by Council's Health and Building Unit.*

We note the *Department of Environmental and Climate Change* (DECC) is now known as the "*Environmental Protection Authority*" (EPA). The conditions of consent for the project directly reference the EPA's Interim Construction Noise Guideline. The guideline, and its application are discussed in the following section.

3.3.2 Environmental Protection Authority – Interim Construction Noise Guideline

This guideline nominates acceptable external and internal management levels for noise emissions from construction activities, based on the existing background noise level in the area and type of receiver. For projects within the recommended standard hours, the guideline recommends a noise level of 10dB(A) above the background – this level is referred to as the "noise affected level", for residential receivers. The noise emission goals for the nearby affected receivers are presented below:

Table 5.2 – Noise Emission Goals

Location	Time of Day	Measured Background Levels – dB(A)L_{90}	Noise Affected Level Background + 10dB(A)$L_{eq(15min)}$
Bridge Street	Approved Hours: Monday to Friday 7am to 7pm Saturday 8am to 1pm No work on Sundays or public holidays	59	69
Gresham Street		59	69
Young Street		62	72

Where noise from the construction works is above the "noise affected level", the proponent should apply any feasible and reasonable work practices to minimise noise.

If noise emissions are likely to exceed 75dB(A)$L_{eq(15min)}$, the receiver is deemed to be "*highly noise affected*". Introduction of management controls such as scheduling of noisy periods, or respite periods is recommended as detailed below.

3.3.3 Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site".

Where compliance with EPA cannot be achieved, noise emissions are to be managed in accordance with principles in AS2436:

- That reasonable suitable noise criterion is established (i.e. – adopt Council guidelines).
- That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes on parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours.
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

3.4 VIBRATION EMISSION GUIDELINES

Vibration generated by demolition, excavation and construction activity should be limited to the guidelines presented in the following documents when assessed at any surrounding sensitive structure:

- Minister for Planning Conditions of Consent (Condition D11.)
- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*
- For human exposure to vibration, the evaluation criteria presented in the EPA's "*Assessing Vibration: A Technical Guideline*" (Feb 2006).

3.4.1 Minister for Planning Conditions of Consent

Condition D11 states the following with regard to vibration emissions from the site:

D11. *Vibration caused by construction at any residence or structure outside the subject site must be limited to:*

a) For structural damage vibration to heritage buildings, German Standard DIN4150 Part 3 Structural Vibration in Buildings Effects on Structure
b) For human exposure to vibration, the evaluation criteria presented in British Standard BS 6472- Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz) for low probability of adverse comment
c) These limits apply unless otherwise outlined in the CEMP.

We note the vibration criteria contained in the EPA's "*Assessing Vibration: A Technical Guideline*" (Feb 2006) is taken directly from the British Standard *BS 6472- Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz).* The criteria contained in the documents referenced in the development consent are discussed below.

3.4.2 German Standard DIN 4150-3 (1999-02)

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 5.1.

It is noted that if measured vibration levels are below the guidelines listed below, damage that will reduce the serviceability of the building will not occur and if damage to the building does occur, it is assumed that the damage is related to other activities or sources. Furthermore, the DIN4150-3 guideline states the following regarding the limits presented in Table 5.1:

> *"Exceeding the values in table 1 (table 3.4 below) does not necessarily lead to damage; should they be significantly exceeded; however, further investigations are necessary."*

Table 3.4 – 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

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.

3.4.3 Environmental Protection Authority (EPA) – *Assessing Vibration: A Technical Guideline*

The EPA (formally DECC) *"Assessing Vibration: A Technical Guideline"* (Feb 2006) will be used to assess human discomfort caused by vibration generated by demolition, excavation and construction activities associated with the Sandstones Precinct project. We note this standard for assessing vibration is based on the guidelines contained in British Standard BS6472-1992.

Table 3.5 – EPA Recommended Vibration Criteria

		RMS acceleration (m/s^2)		**RMS velocity (mm/s)**		**Peak velocity (mm/s)**	
Receiver	*Time*	*Preferred*	*Maximum*	*Preferred*	*Maximum*	*Preferred*	*Maximum*
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Commercial		0.02	0.04	0.4	0.8	0.56	1.1
Industrial		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
Commercial		0.64	1.28	13	26	18	36
Industrial		0.64	1.28	13	26	18	36

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)

4 PROPOSED CONSTRUCTION WORKS

Education Building:

The works at the Education building include the demolition of the majority of the existing structure, leaving only the existing façade and minor existing slab sections around the perimeter of the building. There is also to be excavation works occurring below ground level, once the internal areas have been demolished.

After demolition and excavation works have been completed, the construction of the ten story (four levels above existing façade) building is to commence.

A subterranean tunnel is to be constructed under Loftus Street linking the Education Building and the Lands Building.

Lands Building:

Works at the lands building is to include the demolition, removal and replacement of the existing roof and the renovation of the existing internal areas of the building. Other than renovation works, no significant structural changes have been proposed.

Construction Activities & Equipment:

The typically loudest piece of equipment used will be excavator mounted hammers during the demolition and excavation phases of the project. A list of activities projected at the site are presented below.

Table 4.1 – Demolition, Excavation and Construction Activities

Construction Activity	Equipment / Process	Sound Power Level dB(A)
Demolition & Excavation	Concrete Sawing	115
	Angle grinders	114
	Bobcat	105
	Excavator/ Bulldozer	114
	Hydraulic Hammering	120
	Trucks	108
Renovation & Construction	Trucks	108
	Concrete Pumps	110
	Concrete Sawing	115
	Drilling	94
	Angle grinders	114
	Electric Saw	111
	Impact drill	105

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

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

5 NOISE EMISSION EVALUATION

5.1 NOISE RECEIVER LOCATIONS

Noise predictions will be conducted at the following noise sensitive receivers surrounding the site:

- Receiver 1 – Residential Apartments – 38 Bridge Street
- Receiver 2 – Commercial Building – 41 Bridge Street (First Government House)
- Receiver 3 – Commercial Complex – 1 Farrer Place (Governor Phillip Tower)
- Receiver 4 – Commercial Complex – 1 Bligh Street
- Receiver 5 – Commercial Complex – 1 Bent Street
- Receiver 6 – Commercial Complex – 1 Gresham Street (Royal Exchange Building)
- Receiver 7 – Commercial Building – 50 Pitt Street
- Receiver 8 – Residential Apartments – 29 Macquarie Place

5.2 PREDICTED NOISE LEVELS

Noise from the worst-case demolition/construction activities and associated equipment items (see table 4.1) for each phase of the development have been predicted to the nearest most affected sensitive receivers as listed above. The predicted noise levels are presented in the following sections for both works occurring at the Education Building and Lands Building.

5.2.1 Predicted Noise Emission Levels – Education Building

Noise emissions from the internal demolition, excavation and construction phases at the Education Building will be assessed at the noise sensitive receivers surrounding the eastern end of the site as follows:

- Table 5.1 – Demolition Noise – Receivers 1, 2, 3 & 4;
- Table 5.2 – Excavation Noise – Receivers 1, 2, 3 & 4;
- Table 5.3 – Construction Noise – Receivers 1, 2, 3 & 4.

We note the façade of the existing structure is to remain in place during the entire demolition, excavation and construction phase of the project and as such will provide significant screening of noise to the surrounding noise receivers, particularly when working at lower levels. The noise emission calculations have considered the screening effect at several stages as demolition works move down the building from rooftop level to excavation level below ground.

Table 5.1 – Predicted Noise Level – Education Building – Demolition Phase

Plant / Activity	Plant / Activity Noise Level (See Table 4.1)	Receiver (See Figure 2.1)	Predicted Noise Level at Receiver Façade [dB(A)]	Noise Emission Objective [dB(A)] (See Table 3.3)	Exceedance	Management Conditions
Hydraulic Hammering	120 dB(A)	1	68-72	69	Up to 3 dB(A)	See section below
		2	65-72	72	-	
		3	70-78	72	Up to 6 dB(A)	
		4	65-75	72	Up to 3 dB(A)	
Concrete Sawing	115 dB(A)	1	63-67	69	-	
		2	60-73	72	Up to 1dB(A)	
		3	65-73	72	Up to 1dB(A)	
		4	60-70	72	-	
Excavator / Bulldozer	114 dB(A)	1	62-66	69	-	
		2	59-72	72	-	
		3	64-72	72	-	
		4	59-69	72	-	

Table 5.2 – Predicted Noise Level – Education Building – Excavation Phase

Plant / Activity	Plant / Activity Noise Level (See Table 4.1)	Receiver (See Figure 2.1)	Predicted Noise Level at Receiver Façade [dB(A)]	Noise Emission Objective [dB(A)] (See Table 3.3)	Exceedance	Management Conditions
Hydraulic Hammering	120 dB(A)	1	63-65	69	-	See section below
		2	65-67	72	-	
		3	68-70	72	-	
		4	62-72	72	-	
Excavator / Bulldozer	114 dB(A)	1	57-59	69	-	
		2	59-61	72	-	
		3	62-64	72	-	
		4	56-66	72	-	
Trucks	108 dB(A)	1	51-53	69	-	
		2	53-55	72	-	
		3	56-58	72	-	
		4	50-60	72	-	

Table 5.3 – Predicted Noise Level – Education Building – Construction Phase

Plant / Activity	Plant / Activity Noise Level (See Table 4.1)	Receiver (See Figure 2.1)	Predicted Noise Level at Receiver Façade [dB(A)]	Noise Emission Objective [dB(A)] (See Table 3.3)	Exceedance	Management Conditions
Concrete Sawing	115 dB(A)	1	61-65	69	-	See section below
		2	63-65	72	-	
		3	64-69	72	-	
		4	58-62	72	-	
Concrete Pumps	110 dB(A)	1	56-60	69	-	
		2	58-60	72	-	
		3	59-64	72	-	
		4	53-57	72	-	
Trucks	108 dB(A)	1	54-58	69	-	
		2	56-58	72	-	
		3	57-62	72	-	
		4	51-55	72	-	

5.2.2 Predicted Noise Emission Levels – Lands Building

Noise emissions from the internal renovation works at the Lands Building will be assessed at the noise sensitive receivers surrounding the western end of the Sandstones Precinct site as follows:

- Table 5.4 – Renovation Works – Receivers 5, 6, 7 & 8;

We note that no renovation or demolition works are to be conducted on the façade of the existing building. Works are limited to the removal and reconstruction of the roof and the renovation of the internal areas of the building. The façade of the existing structure is to remain in place during the entire renovation phase of the project. The façade will provide significant screening of noise to the surrounding noise receivers. The noise emission calculations have considered the screening effect of the existing façade.

Table 5.4 – Predicted Noise Level – Lands Building – Renovation Phase

Plant / Activity	Plant / Activity Noise Level (See Table 4.1)	Receiver (See Figure 2.1)	Predicted Noise Level at Receiver Façade [dB(A)]	Noise Emission Objective [dB(A)] (See Table 3.3)	Exceedance	Management Conditions
Concrete Sawing	115 dB(A)	5	57-61	69	-	See section below
		6	56-60	69	-	
		7	53-56	69	-	
		8	51-54	69	-	
Angle Grinders	114 dB(A)	5	56-60	69	-	
		6	55-59	69	-	
		7	52-55	69	-	
		8	50-53	69	-	
Trucks	108 dB(A)	5	50-54	69	-	
		6	49-53	69	-	
		7	46-49	69	-	
		8	44-47	69	-	

6 MITIGATION MEASURES

In order to manage any potential noise impacts on nearby receivers, Built (NSW) Pty. Ltd. is committed to continual community consultation and engagement. Where noisy works become a problem, the protocols for community consultation and complaints handling as presented in Section 9 of the CNVMP will be implemented. Consultation with sensitive receivers and stakeholders will also take place throughout demolition, excavation and renovation works and stakeholders will regularly be updated about site works and have the opportunity to provide feedback. Where noise emissions continue to be a problem, the Contractor will liaise with the affected party to determine the appropriate action.

This will be conducted in accordance with the Noise Management Methodology presented in Section 9.4 of the CNVMP.

Sections 9.2 and 9.3 of the CNVMP provide a comprehensive methodology on how responses to complaints will be reported and managed. This procedure has been established in accordance with the Code of Practice 1992 and AS2436.

6.1 SITE SPECIFIC RECOMMENDATIONS

Site specific recommendations are listed below in the following sections.

6.1.1 Potential Vibration and Structure Borne Noise Impacts

Structure born vibration impacting on surrounding receivers will be mitigated as both the Education Building and Lands Building are free standing, with no direct mechanical connection with the surrounding receivers.

6.1.2 Concrete Demolition and Excavation

Hammering will typically produce the loudest noise levels emanating from the Education Building site and have the highest potential for noise impacts on surrounding receivers at the eastern end of the Sandstones Precinct. On this basis, it is recommended that surrounding receivers are consulted on the processes of the demolition and excavation works (particularly concrete/rock breaking).

Management processes will include:

- Loud activities (such as hammering into concrete) should be typically undertaken as detailed below;
    - Substituting concrete hammering during demolition for alternative measures such as concrete munching, milling or ripping where possible.
    - Sawing and then lifting (where practical). It should be noted that sawing will also produce high noise levels, but will typically be shorter in duration.

Any significant acoustic treatment of concrete demolition works, sawing and detailed excavation works is not feasible – surrounding developments are multi-storey buildings overlooking the site, negating any benefit that could be provided by additional noise screens. However, the existing external façade of the Education Building will have a significant effect on reducing noise levels. Where possible, the existing façade is to be sealed to aid in reducing noise levels emanating from the site. It is expected that exceedance of the noise goals will still be experienced at the surrounding receivers, particularly at higher levels. Accordingly, all activities should be managed to be consistent with AS2436 when strict compliance with noise emission goals is not achievable.

6.1.3 Excavator Noise

Excavators will be typically used for long periods of time during the demolition and detailed excavation periods. For the most part, excavators will only be in a slight exceedance of the criteria, particularly for receivers overlooking the site.

Where prolonged excavator use is necessary, where practical 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 8-10dB(A) reduction in noise levels impacting receiver locations.

6.1.4 Vehicle Noise

Vehicle noise will be generally be low impact in this instance, given the location of the receivers and the relatively high ambient noise conditions surrounding the site. Typically noise from cars and busses within the CBD will mask noise from truck movements entering/exiting the site. Notwithstanding, best practice techniques which will minimise noise including having burden trucks and concrete trucks turn off their engines when on site to reduce impacts on adjacent land use (unless truck ignition needs to remain on during concrete pumping).

6.1.5 Other Activities

In the event of complaint, noise management techniques identified in this report should be employed to minimise the level of noise impact. This may include community consultation and scheduling of loud construction processes.

Notwithstanding above, general management techniques and acoustic treatments are included below which may be implemented on a case-by-case basis to reduce noise emissions to surrounding receivers.

7 CONTROL OF CONSTRUCTION NOISE AND VIBRATION

The execution of demolition, renovation and construction work associated with this development will facilitate the formulation of noise and vibration control strategies. The flow chart presented in Figure 7.1 illustrates the process that will be followed in assessing construction activities.

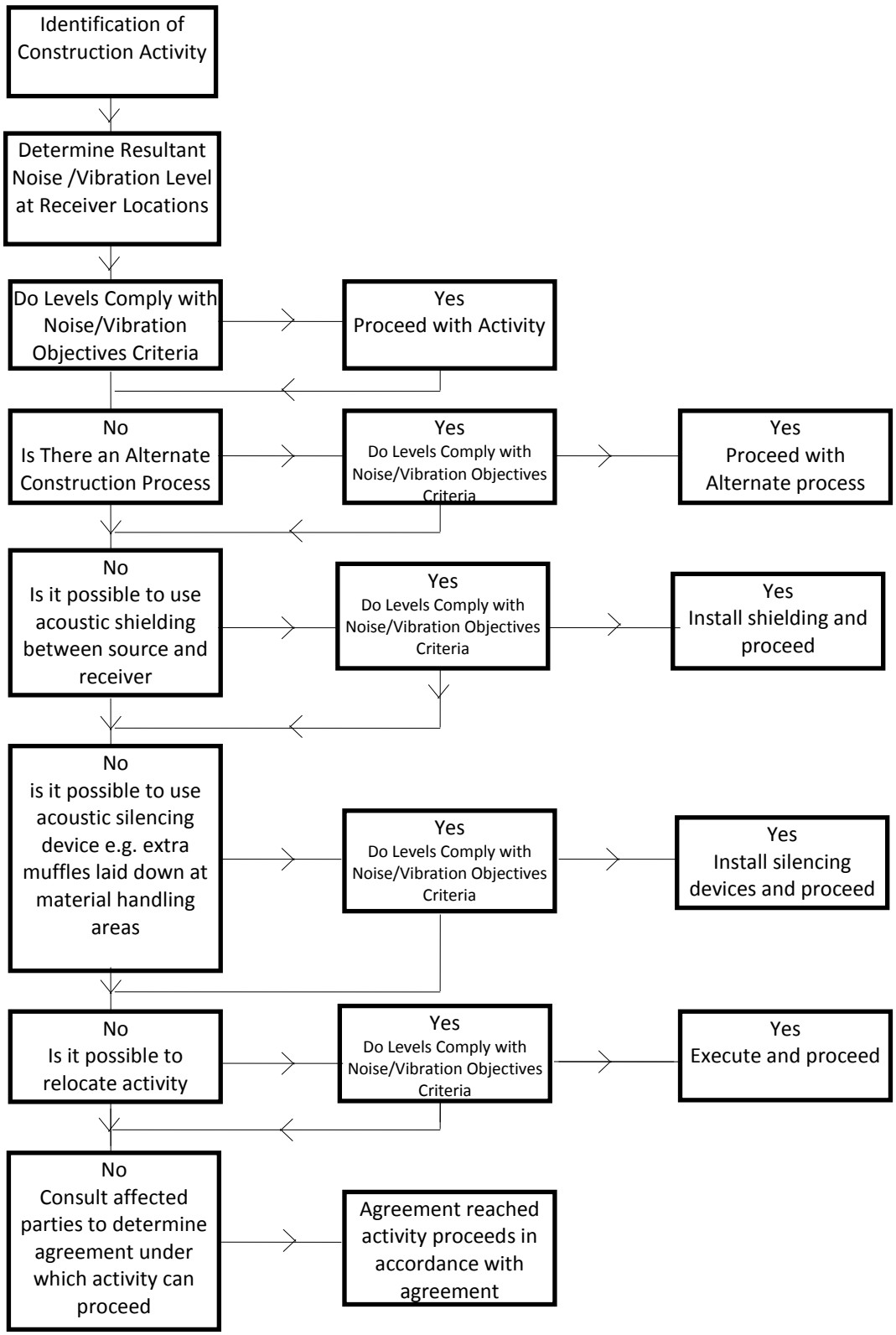

Figure 7.1 – Construction Process Flowchart

8 ADDITIONAL NOISE AND VIBRATION CONTROL METHODS

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

8.1 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 hammer on certain areas of the site may potentially generate high levels of noise. By carrying this activity by use of pneumatic hammers, concrete munchers, ripping and/or milling machines lower levels of noise will result.

8.2 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 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 affected. 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.

8.3 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.

8.4 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).

8.5 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.

8.6 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.

8.7 NOISE & VIBRATION MONITORING

Noise and vibration monitoring can be undertaken to determine the effectiveness of measures which have been implemented. The results of monitoring can be used to devise further control measures and identify noise and vibration generating activity.

Vibration monitoring is recommended to be undertaken during the demolition and detailed excavation period to monitor the level of vibration effective at the nearest vibration sensitive structures most effected by vibration.

9 COMMUNITY INTERACTION AND COMPLAINTS HANDLING

9.1 ESTABLISHMENT OF DIRECT COMMUNICATION WITH AFFECTED PARTIES

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 criteria for the benefit of all parties.

The objective in undertaking a consultation process is to:

- Inform and educate the groups about the project and the noise/vibration controls being implemented;
- Increase understanding of all acoustic issues related to the project and options available;
- Identify group concerns generated by the project, so that they can be addressed; and
- Ensure that concerned individuals or groups are aware of and have access to a Constructions Complaints Register which will be used to address any construction noise related problems should they arise.

An additional step in this process is to produce a newsletter informing nearby residents of upcoming activities that are likely to generate higher noise/vibration levels.

It is recommended that community consultation has been undertaken prior to works taking place. This includes meetings and correspondence with the residents/tenants in the vicinity of the work site (see section 2 of this report) with a priority placed on the adjoining residential dwellings along Bridge Street (Receiver 1) and the high rise commercial structures to the east and south, given the proximity of these receivers to the location of the main works and the fact they overlook the construction site with very little scope for noise emission treatments.

9.2 DEALING WITH COMPLAINTS

Should ongoing complaints of excessive noise or vibration occur immediate measures shall be undertaken to investigate the complaint, determine the cause of the exceedances and formulate 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.

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 (or generating non-compliant vibration levels), 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.

9.3 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 above.

2. Where noise/vibration complaints require noise/vibration monitoring, results from monitoring shall be retained on site at all times.

3. Details of any noise exceedances that occur including the actions taken and results of follow up monitoring.

A report detailing complaints received and actions taken shall be presented to the construction liaison committee if required.

9.4 CONTINGENCY PLANS

Where non-compliances or noise/vibration complaints are raised the following methodology will be implemented.

1. Identify the offending plant/equipment/process

2. Relocate the plant/equipment/process further away from the affected receiver(s) if possible.

3. Implement additional acoustic treatment in the form of localised barriers, silencers etc. where practical.

4. Select alternative equipment/processes where practical.

10 CONCLUSION

This report presents an assessment of noise and vibration impacts associated with the excavation and construction works at the approved Sandstone Precinct re-development, located at 23-33 & 35-39 Bridge Street, Sydney.

Specifically, the assessment has been compiled to address condition C8 of the Minister for Planning conditions of development consent for the Sandstones Precinct (ref: SSD 7484).

In accordance with relevant acoustic standards for the site, noise emission goals for the site have been set with reference to conditions D8, D9 and D10. Vibration emission goals have been based on the standards referenced in condition D11.

A prediction of noise levels associated with the works have been discussed in this report. The outcomes are as follows:

- There is likely to be some exceedances of the construction noise criteria during the demolition, excavation and construction phases. Community consultation and scheduling conditions would be recommended to ensure that noise impacts and exposure are minimised.
- General construction works and internal renovation activities will have significantly lower impact on surrounding receivers due to the nature of the proposed works and shielding from newly constructed building elements.
- Vibration monitoring has been recommended at the location of the buildings/structures nearest to the site during the excavation and early construction phase to ensure vibration impacts on the surrounding development is minimised.

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

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd.
Jeff Robinson

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Victor Fattoretto MI (Aust)

APPENDIX A – AUSTRALIAN ACOUSTICAL SOCIETY MEMBERSHIP

A.1 – VICTOR FATTORETTO (AAS)

Australian Acoustical Society

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Please see EXPLANATORY NOTES for more information.

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Underwater Acoustics and Sonar	NSW	QLD	SA	VIC	WA
Vibration	NSW	QLD	SA	VIC	WA