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Construction Noise and Vibration Management Plan

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1 INTRODUCTION

Acoustic Logic (AL) has been engaged to prepare a construction noise and vibration management plan for the proposed Western Sydney University (WSU) campus to be located at 74 Rickard Road, Bankstown.

This report has been prepared to address the requirements of SSD-9831, condition B18 *"Construction Environmental Management Plan"* detailed below:

"B18. Construction Environmental Management Plan

A Construction Noise and Vibration Management Plan (CNVMP) 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 EPA's InterimConstruction Noise Guideline (DECC, 2009);

(c) describe the measures to be implemented to manage high noise generating works inclose proximity to sensitive receivers;

(d) include strategies that have been developed with the community for managing high noisegenerating works;

(e) describe the community consultation undertaken to develop the strategies in conditionB18(d);

(f) include a complaints management system that would be implemented for the duration ofthe construction; and include a program to monitor and report on the impacts and environmental performanceof the development and the effectiveness of the management measures."

This document presents a discussion of the processes which will be followed in order to manage the noise and vibration from the proposed construction works.

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

- Identification of nearby residents and other sensitive locations near to the site.
- Description of hours of work and what work will be undertaken.
- Identification of the noise and vibration standards which will be applicable to this project.
- Identify likely sources of noise generation and predicted noise levels at nearby development.
- Formulation of a strategy for construction to comply with the standards identified in the above point.

2 SITE DESCRIPTION

The site is located at 74 Rickard Road, Bankstown. The site is bound to the north by Rickard Road, to the south by Paul Keating Park, to the east by Appian Way, further is Bankstown Community Services Centre & Canterbury Bankstown Council and to the west by Bankstown Library and Knowledge Centre.

The closest affected sensitive receivers within the vicinity of the site are as follows:

- **Receiver 1:** Bankstown Community Services Centre & Canterbury Bankstown Council commercial receiver to the east located at 68 Rickard Road, Bankstown, across Appian Way. Commercial receiver is multi-storey.
- **Receiver 2:** Bankstown Library and Knowledge Centre commercial receiver to the west located at 80 Rickard Road, Bankstown. Commercial receiver is multi-storey.
- **Receiver 3:** Paul Keating Park to the South.
- **Receiver 4:** Hoyts Cinema and commercial receivers to the south-east located at 63-69 The Mall, Bankstown. Receivers are multi-storey.
- **Receiver 5:** Bankstown Medical Centre Pharmacy to the north located at 67 Rickard Road, Bankstown.
- **Receiver 6:** Mixed-use receiver located at 61-63 Rickard Road, Bankstown. The mixed-use receiver is multi-storey.

See an aerial photo in Figure 1 below for a detailed location.

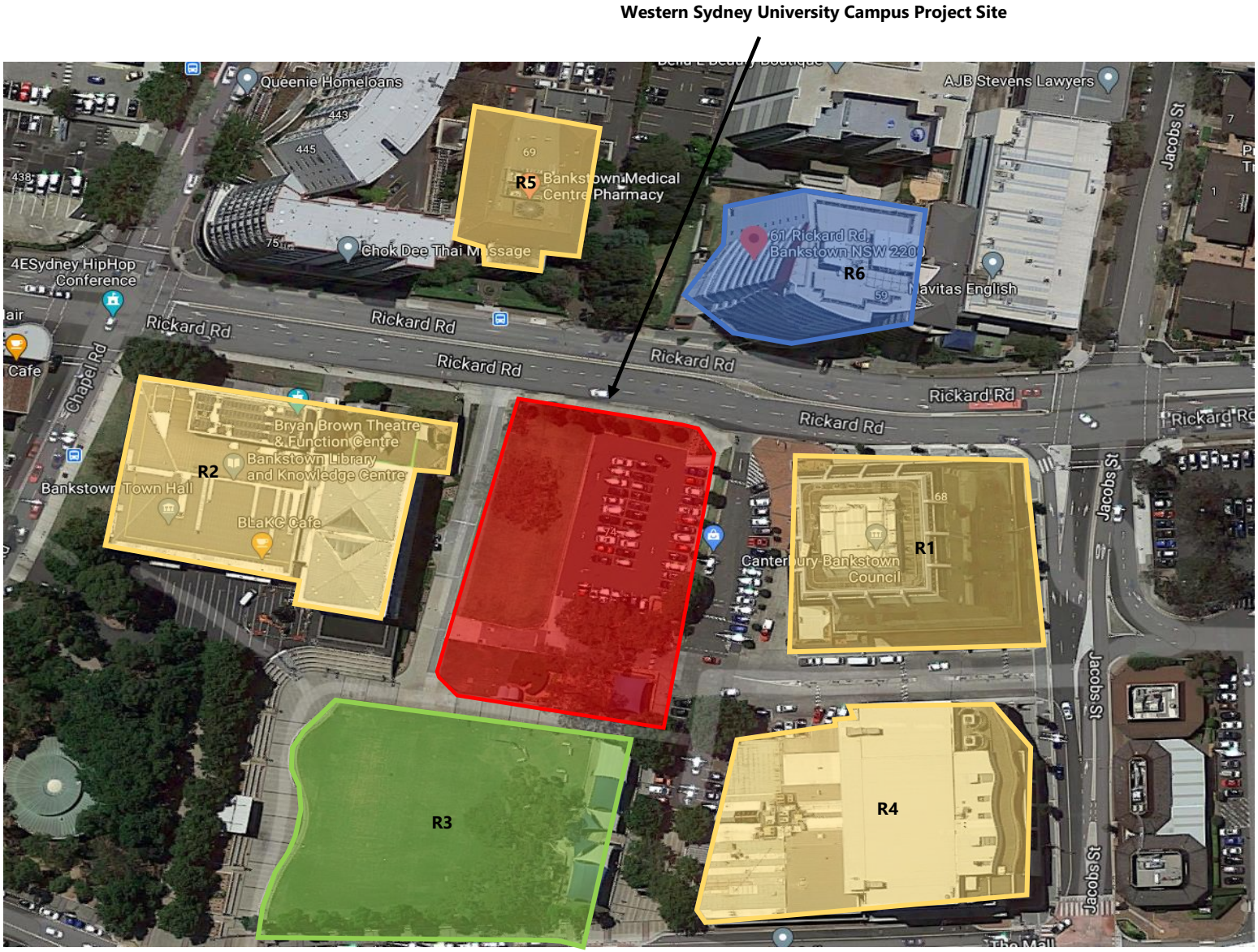


Figure 1: Aerial Site Map

Commercial Receiver

Residential Receiver

Active Recreation Area

3 CONSTRUCTION ACTIVITIES

The information provided to this office of the primary noise producing activities (and estimated duration) associated with the site are as follows below:

- Detailed Excavation Stage (1 month)
    - Grading and detailed excavation of the site with the use of excavators including bucket and hydraulic hammer attachments.
    - Trucks and articulated vehicles to remove waste and debris.
- Construction Stage (Base Building only) (19 months)
    - Erection of the external structure.
    - Internal works.
    - General hand and power tools will be used on the site.

Vehicles will access the site and deliver goods via the "Delivery/Lifting Zone" situated along Rickard Road to the north of the project site. Concrete trucks and pumping of concrete will be undertaken from the "Concrete pumping zone" located along the north-eastern boundary of the project site.

See Figure 2 below for an aerial view of the construction zone layout provided to this office.

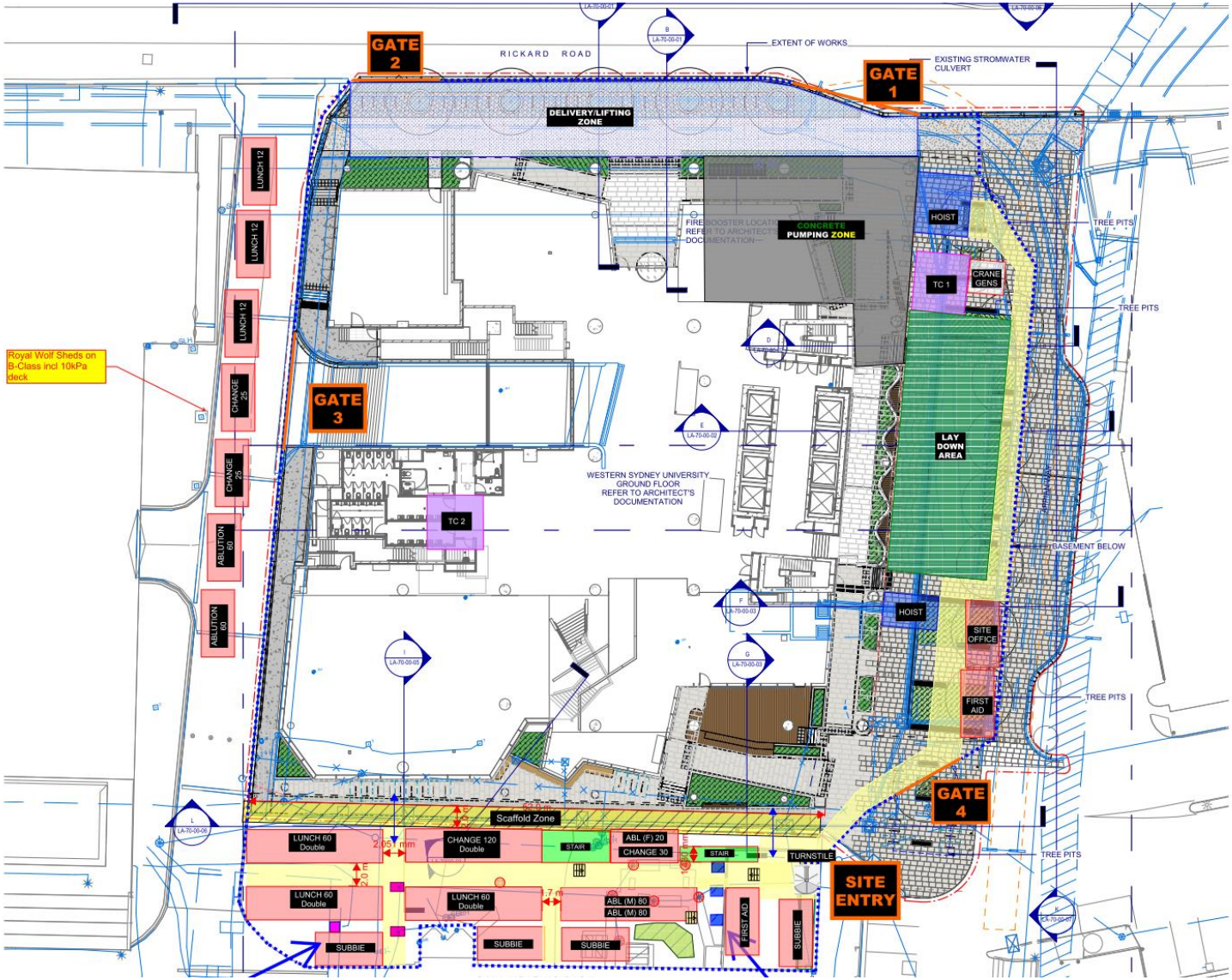


Figure 2: Aerial view of construction zone layout

4 HOURS OF WORK

4.1 CONDITIONS OF CONSENT SSD-9831, CONDITIONS C4, C5, C6 & C7

The hours of work on site will be conducted as per conditions C4, C5, C6 & C7 below.

"C4. Construction Hours

Construction, including the delivery of materials to and from the site, may only be carried outbetween the following hours:

(a) between 7am and 6pm, Mondays to Fridays inclusive; and

(b) between 8am and 5pm, Saturdays.

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

C5. Construction Hours

Construction activities may be undertaken outside of the hours in condition C4 if required:

(a) by the Police or a public authority for the delivery of vehicles, plant or materials; or

(b) in an emergency to avoid the loss of life, damage to property or to prevent environmentalharm; or

(c) where the works are inaudible at the nearest sensitive receivers; or

where a variation is approved in advance in writing by the Planning Secretary or hisnominee if appropriate justification is provided for the works.

C6. Construction Hours

Notification of such construction activities as referenced in condition C5 must be given toaffected residents before undertaking the activities or as soon as is practical afterwards.

C7. Construction Hours

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

(a) 9am to 12pm, Monday to Friday;

(b) 2pm to 5pm Monday to Friday; and 9am to 12pm, Saturday"

5 EXISTING BACKGROUND NOISE LEVELS

Long term unattended noise monitoring at the project site was conducted by Norman Disney and Young as part of the "Acoustic Services - Base Building" report prepared for Walker Corporation dated 17-Dec-20 which is approved as part of the SSD-9831 Conditions of Consent.

Therefore, the noise logging data is also suitable for use in this assessment. The results of the previously conducted noise monitoring are presented in Figure 3 below.

Table 3-1: Unattended Noise Measurements Leq dBA

Noise Index	Noise Level dB re 20 µPa		
	Daytime 0700 to 1800	Evening 1800 to 2200	Night-time 2200 to 0700
Location A – Rickard Rd			
L_{A90} (RBL)	54	54	41
L_{Aeq}	65	65	60
Location B – Chapel Rd			
L_{A90} (RBL)	54	51	42
L_{Aeq}	64	63	61

Figure 3: Unattended Noise Monitoring Data undertaken by Norman Disney & Young detailed in the "Acoustic Services - Base Building" report prepared for Walker Corporation dated 17-Dec-20

The measured Rating Background Noise Level (RBL) outlined in the red boxes above will be used to determine the Noise Management Level in accordance with the requirements of the EPA Interim Construction Noise Guideline (ICNG).

6 NOISE AND VIBRATION MANAGEMENT LEVELS

6.1 CONDITIONS OF CONSENT SSD-9831, CONDITION C14, C15, C16, C17, C18 & C19

"C14. Construction Noise Limits

The development must be constructed to achieve the construction noise management levels detailed in the Interim Construction Noise Guideline (DECC, 2009). All feasible and reasonablenoise mitigation measures must be implemented and any activities that could exceed the construction noise management levels must be identified and managed in accordance with themanagement and mitigation measures identified in the approved Construction Noise and Vibration Management Plan.

C15. Construction Noise Limits

The Applicant must ensure construction vehicles (including concrete agitator trucks) do not arrive at the site or surrounding area outside of the construction hours of work outlined undercondition C4.

C16. Construction Noise Limits

The Applicant must implement, where practicable and without compromising the safety of construction staff or members of the public, the use of 'quackers' to ensure noise impacts onsurrounding noise sensitive receivers are minimised.

C17. Construction Vibration Limits*

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

(a) *for structural damage, the latest version of DIN 4150-3 (1992-02) Structural vibration - Effects of vibration on structures (German Institute for Standardisation, 1999); and*

(b) *for human exposure, the acceptable vibration values set out in the Environmental Noise Management Assessing Vibration: a technical guideline (DEC, 2006) (as may be updatedor replaced from time to time).*

C18. Construction Vibration Limits*

Vibratory compactors must not be used closer than 30 metres from residential buildings unlessvibration monitoring confirms compliance with the vibration criteria specified in condition C17.

C19. Construction Vibration Limits*

The limits in conditions C17 and C18 apply unless otherwise outlined in a Construction Noiseand Vibration Management Plan, approved by the Planning Secretary."

***We note that the provided development consent conditions C17, C18 and C19 have referenced these to be construction noise limits when referring to vibration as the condition. Therefore; this has been labelled "Construction Vibration Limits" in this report.**

6.2 EPA INTERIM CONSTRUCTION NOISE GUIDELINE

Given the scale of the proposed works, the "quantitative" assessment procedure, as outlined in the Interim Construction Noise Guideline (ICNG) will be used.

The quantitative assessment method requires:

- Determination of noise generation management levels (based on ambient noise monitoring).
- Prediction of operational noise levels at nearby development.
- If necessary, recommendation of noise controls strategies in the event that compliance with noise emission management levels is not possible.

6.2.1 To 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)$L_{eq(15min)}$.

- "*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.

6.2.2 To Commercial & Industrial Receivers

Section 4.1.3 *"Commercial and industrial premises"* of the ICNG outlines the following external management noise levels to the most-affected point of the premises:

Table 1 – Noise Management Level for Commercial & Industrial Premises (ICNG)

Space	Management Level dB(A)$L_{eq\ (15\ min)}$
Offices, retail outlets	70

6.2.3 To Active Recreation Areas (Receiver 3)

Section 4.1.2 *"Other sensitive land uses"* of the ICNG outlines the following external management noise levels to the most-affected point of the premises:

Table 2 – Noise Management Level for Active Recreation Areas

Space	Management Level dB(A)$L_{eq\ (15\ min)}$
Active Recreation Area (Receiver 3)	65

A summary is presented below.

Table 3 – Noise Emission Management Levels

Receiver Type	"Noise Affected" Management Level - dB(A)$L_{eq(15min)}$	"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$
Residential Receivers	BG + 10 = 64	75
Commercial Receivers	70	-
Active Recreation Areas (Receiver 3)	65	-

6.3 VIBRATION

Vibrations caused by any proposed activities on site, at the façade or incident on the structure of any surrounding sensitive receivers, will be assessed against the following provisions:

- 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 NSW Environmental Protection Authority (EPA) "*Assessing Vibration: A Technical Guideline*" guideline.

The criteria and the application of these guidelines are discussed in separate sections below.

6.3.1 Structure Borne Vibrations

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 6.

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 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

6.3.2 Assessing Amenity

The NSW Environment Protection Authority's (EPA) publication "Assessing Vibration: A Technical Guideline" (Feb 2006), outlines vibration criteria to assess the effects on human exposure to vibration from industry, transportation and machinery. This will ensure the amenity of tenants within surrounding residential properties is not adversely impacted.

This document classifies vibrations in buildings into continuous (with magnitudes varying or remaining constant with time), impulsive (such as shocks) or intermittent (with the magnitude of each event being either constant or varying with time). Criteria stipulated in this publication is based on the type of vibrations generated by the source.

Criteria relevant to the proposed excavation and construction activities on site are detailed below.

Table 5 – EPA Recommended Human Comfort 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

6.3.3 Recommended Vibration Limits

The table below presents the recommended vibration limit at the nearest vibration sensitive receivers.

Table 6 – Recommended Vibration Limit

Vibration Receiver	Recommended Vibration Limits
Residential Receivers	≤5mm/s PPV
Active Recreation Areas	≤20mm/s PPV
Commercial Receivers	≤20mm/s PPV

7 ACTIVITIES TO BE CONDUCTED AND THE ASSOCIATED NOISE SOURCES

Noise impacts will be determined from primary processes and equipment. The sound power levels of these activities are presented below.

Table 7 - Sound Power Levels of the Proposed Equipment

STAGE	EQUIPMENT /PROCESS	SOUND POWER LEVEL dB(A)
Detailed Excavation	Saw Cutter	114
	Excavator with Hydraulic Hammer	118
	Semi-Trailer Truck	105
Construction	Angle Grinder	105
	Electric Saw	102
	Hammering	110
	Drill	95
	Concrete Pump	105
	Cement Mixing Truck	105
	Electric Tower Crane	96
	Diesel Mobile Crane	105

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

- Table A1 of Australian Standard 2436-2010.
- Data held by this office from other similar studies.

8 NOISE AND VIBRATION ASSESSMENT

8.1 PREDICTED NOISE EMISSIONS

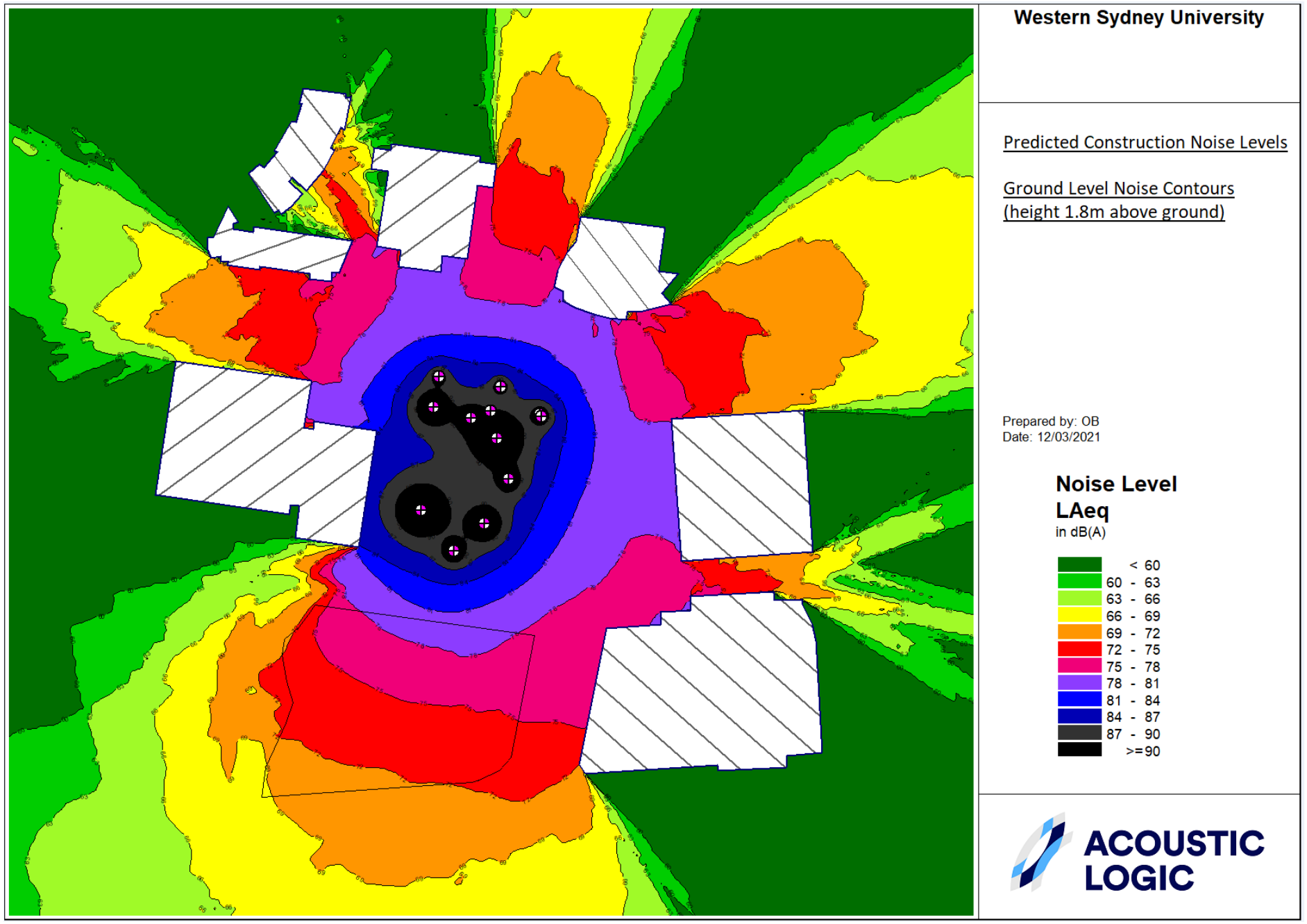
An assessment of the principal sources of noise emissions has been undertaken to identify the activities that may produce noise and/or vibration impacts so that appropriate ameliorative measures can be formulated. In addition, SoundPLAN noise modelling has been conducted based on information provided to this office of construction methodology and activities likely to be undertaken and presents the cumulative predicted external noise levels to the nearest surrounding receivers

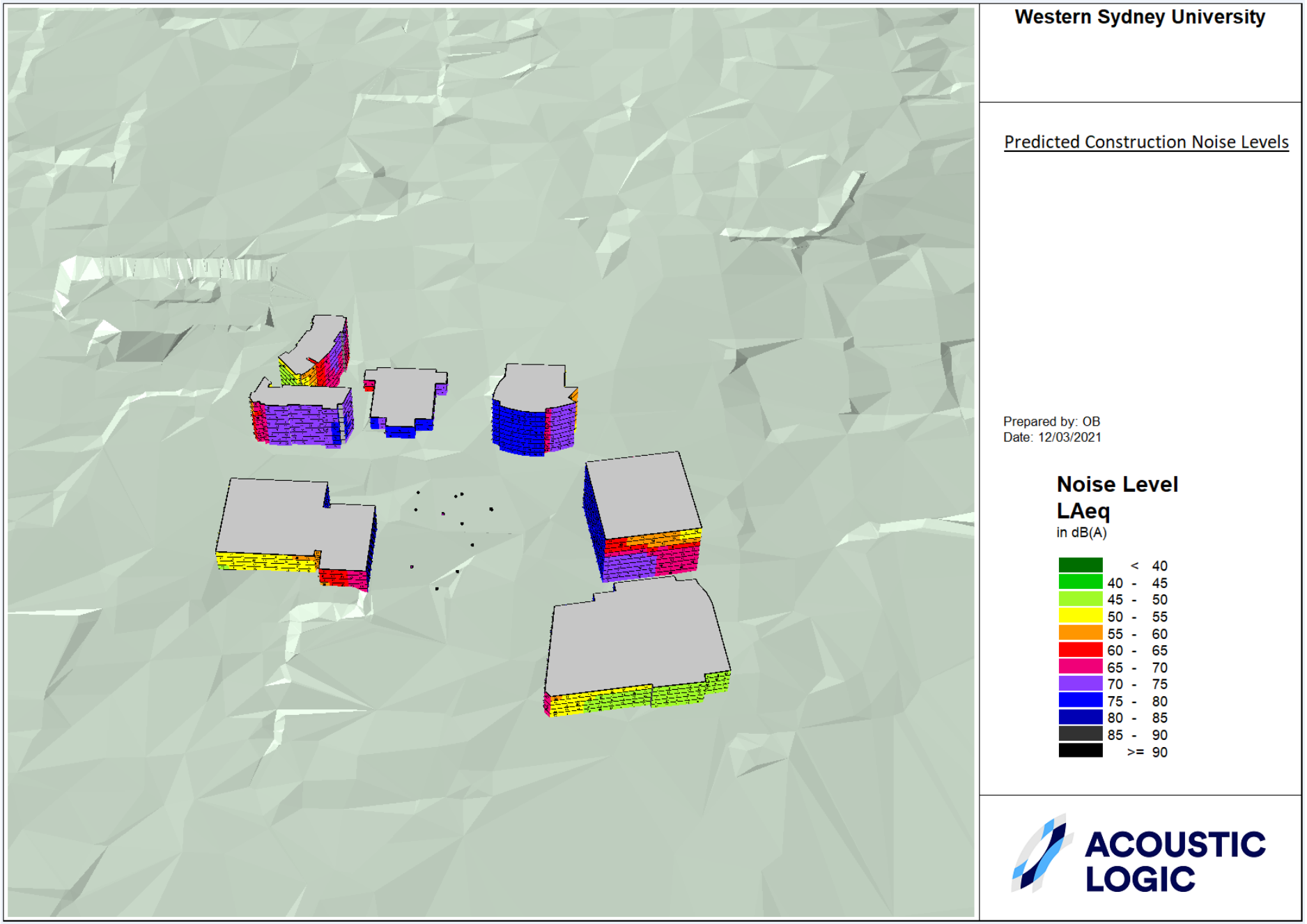
Noise levels from construction works have been predicted at the nearby development and assessed against EPA the "Noise Management Level", as identified in section 6.

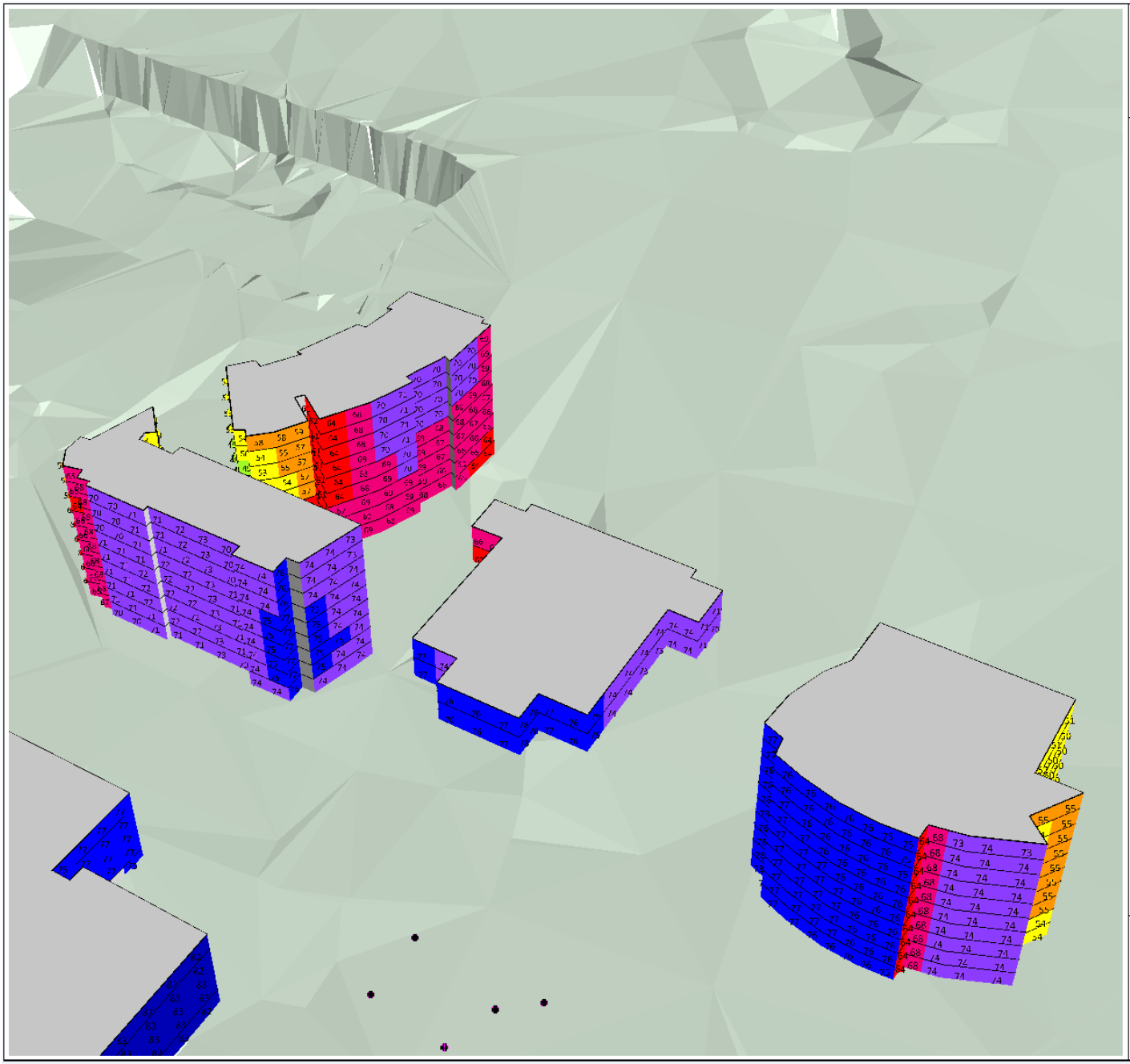
With regard to the noise level generated at the nearest receivers, noise levels will vary depending where on the construction site the work in undertaken. To address this, a range of predicted noise levels is provided. Predicted noise levels are presented below.

The noise level predictions at the receivers from concrete pumping/pouring have been assessed with the concrete truck/pump being located along the northern boundary within the "Concrete Pumping Zone" and the crane manoeuvring has been assessed with the crane located within the project site near northern boundary "delivery/lifting zone".

The predicted noise levels are based on the assumption that the recommendations in section 9 have implemented/observed.


Western Sydney University
Predicted Construction Noise Levels
Ground Level Noise Contours
(height 1.8m above ground)
Prepared by: OB
Date: 12/03/2021
Noise Level
LAeq
in dB(A)
< 60
60 - 63
63 - 66
66 - 69
69 - 72
72 - 75
75 - 78
78 - 81
81 - 84
84 - 87
87 - 90
>=90
ACOUSTIC
LOGIC


Western Sydney University
Predicted Construction Noise Levels
Prepared by: OB
Date: 12/03/2021
Noise Level
LAeq
in dB(A)
< 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85
85 - 90
>= 90
ACOUSTIC LOGIC



Western Sydney University

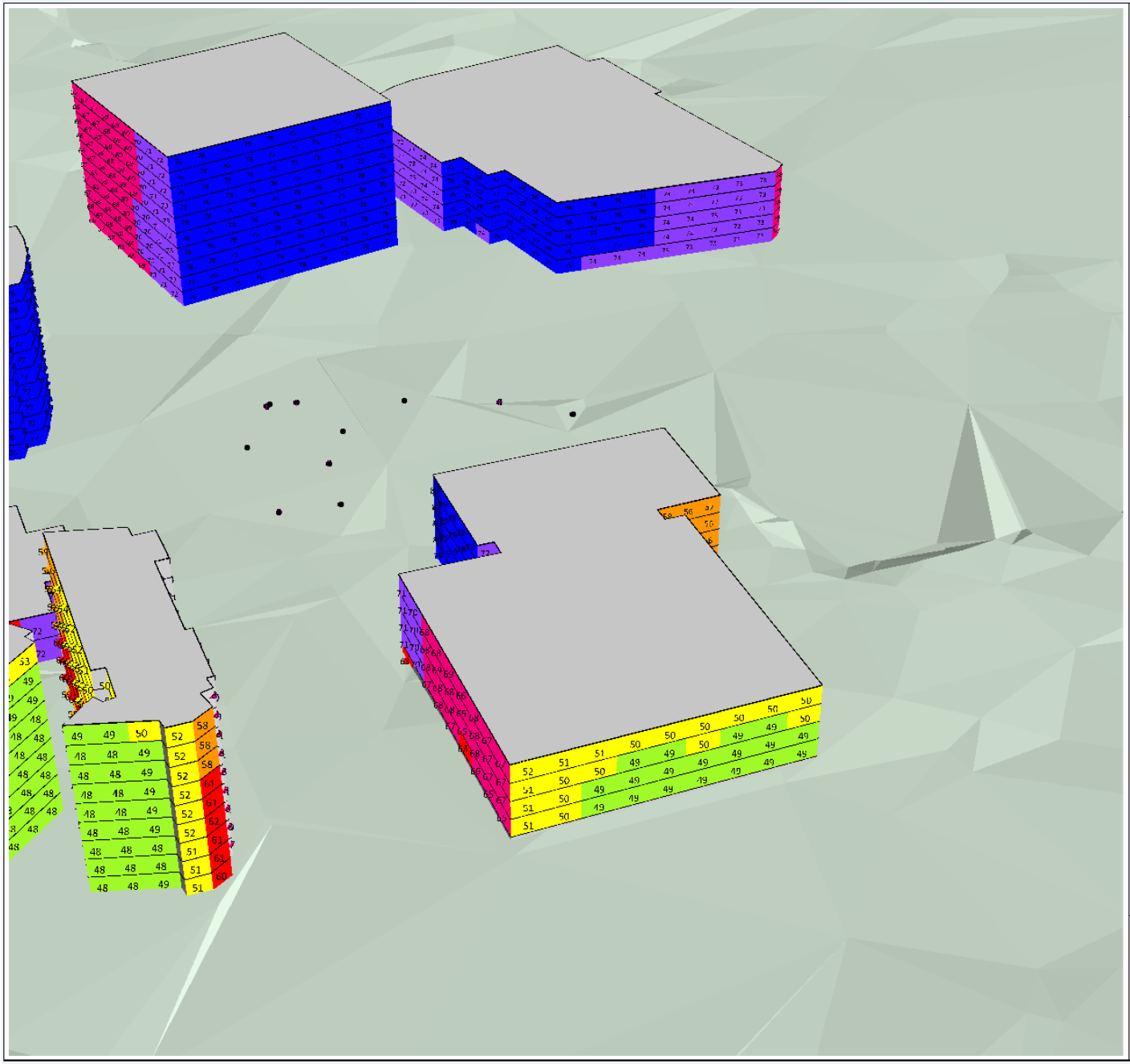
Predicted Construction Noise Levels

Prepared by: OB
Date: 12/03/2021

Noise Level
LAeq
in dB(A)

	< 40
	40 - 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	65 - 70
	70 - 75
	75 - 80
	80 - 85
	85 - 90
	>= 90

ACOUSTIC LOGIC



Western Sydney University

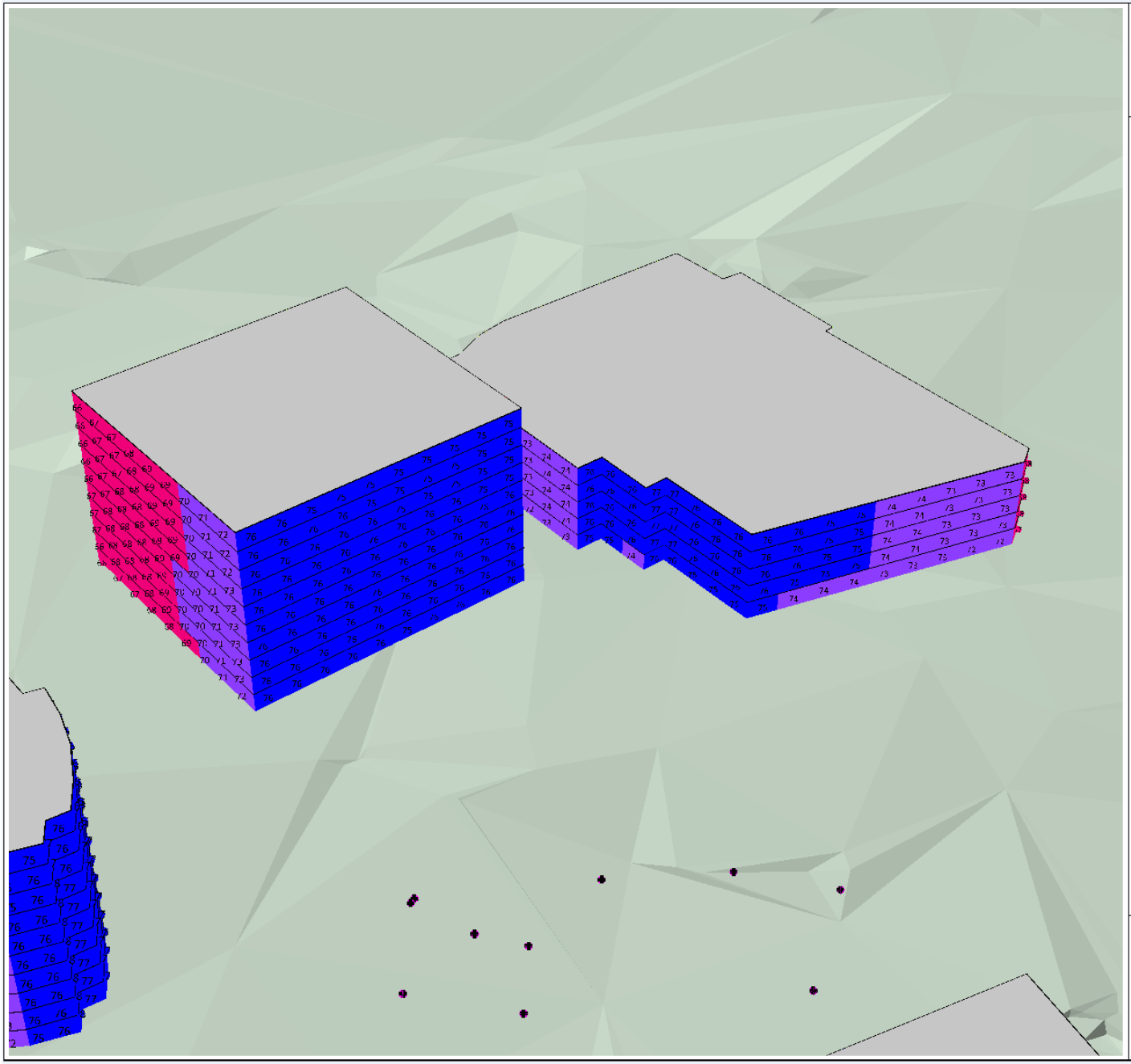
Predicted Construction Noise Levels

Prepared by: OB
Date: 12/03/2021

Noise Level
LAeq
in dB(A)

<	40
40 -	45
45 -	50
50 -	55
55 -	60
60 -	65
65 -	70
70 -	75
75 -	80
80 -	85
85 -	90
>=	90

ACOUSTIC LOGIC



Western Sydney University

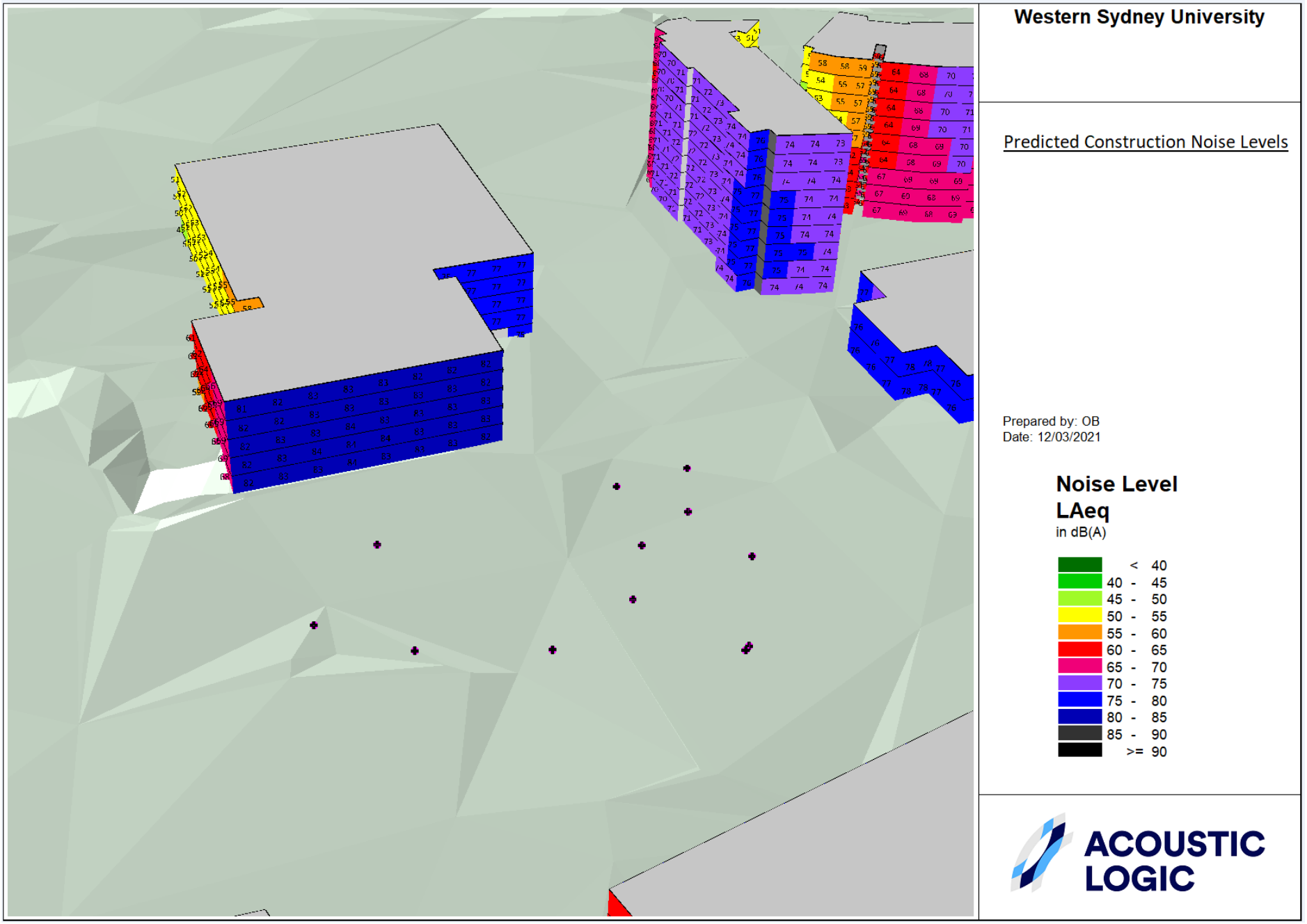
Predicted Construction Noise Levels

Prepared by: OB
Date: 12/03/2021

Noise Level
LAeq
in dB(A)

<	40
40 -	45
45 -	50
50 -	55
55 -	60
60 -	65
65 -	70
70 -	75
75 -	80
80 -	85
85 -	90
>=	90

ACOUSTIC LOGIC


Western Sydney University
Predicted Construction Noise Levels
Prepared by: OB
Date: 12/03/2021
Noise Level
LAeq
in dB(A)
< 40
40 - 45
45 - 50
50 - 55
55 - 60
60 - 65
65 - 70
70 - 75
75 - 80
80 - 85
85 - 90
>= 90
ACOUSTIC LOGIC

8.2 PREDICTION TO RECEIVER 1:

Predicted noise levels are as follows below:

Table 8 - Predicted Noise Levels to Receiver 1

Stage	Equipment	External Noise Management Level dB(A) $L_{eq\ (15min)}$	Predicted Noise Level at Receiver dB(A)$L_{eq(15mins)}$
Detailed Excavation	Saw Cutter	70	66-87
	Excavator with Hydraulic Hammer		70-91
	Semi-Trailer		48-69
Construction	Angle Grinder		57-78 prior to construction of building shell 37-58 after construction of building shell
	Electric Saw		54-75 prior to construction of building shell 34-55 after construction of building shell
	Hammering		62-83 prior to construction of building shell 42-63 after construction of building shell
	Drill		47-68 prior to construction of building shell 27-48 after construction of building shell
	Concrete Pump		67
	Cement Mixing Truck		67
	Electric Tower Crane		50
	Diesel Mobile Crane		59

8.3 PREDICTION TO RECEIVER 2:

Predicted noise levels are as follows below:

Table 9 - Predicted Noise Levels to Receiver 2

Stage	Equipment	External Noise Management Level dB(A) $L_{eq\ (15min)}$	Predicted Noise Level at Receiver dB(A)$L_{eq(15mins)}$
Detailed Excavation	Saw Cutter	70	66-82
	Excavator with Hydraulic Hammer		70-86
	Semi-Trailer		48-65
Construction	Angle Grinder		57-73 prior to construction of building shell 37-53 after construction of building shell
	Electric Saw		54-70 prior to construction of building shell 34-50 after construction of building shell
	Hammering		62-78 prior to construction of building shell 42-58 after construction of building shell
	Drill		47-63 prior to construction of building shell 27-43 after construction of building shell
	Concrete Pump		63
	Cement Mixing Truck		63
	Electric Tower Crane		57
	Diesel Mobile Crane		66

8.4 PREDICTION TO RECEIVER 3:

Predicted noise levels are as follows below:

Table 10 - Predicted Noise Levels to Receiver 3

Stage	Equipment	External Noise Management Level dB(A) $L_{eq\ (15min)}$	Predicted Noise Level at Receiver dB(A)$L_{eq(15mins)}$
Detailed Excavation	Saw Cutter	65	67-86
	Excavator with Hydraulic Hammer		71-90
	Semi-Trailer		49-68
Construction	Angle Grinder		58-77 prior to construction of building shell 38-57 after construction of building shell
	Electric Saw		55-74 prior to construction of building shell 35-54 after construction of building shell
	Hammering		63-82 prior to construction of building shell 43-62 after construction of building shell
	Drill		48-67 prior to construction of building shell 28-47 after construction of building shell
	Concrete Pump		59
	Cement Mixing Truck		59
	Electric Tower Crane		50
	Diesel Mobile Crane		59

8.5 PREDICTION TO RECEIVER 4:

Predicted noise levels are as follows below:

Table 11 - Predicted Noise Levels to Receiver 4

Stage	Equipment	External Noise Management Level dB(A) $L_{eq\ (15min)}$	Predicted Noise Level at Receiver dB(A)$L_{eq(15mins)}$
Detailed Excavation	Saw Cutter	70	65-83
	Excavator with Hydraulic Hammer		69-87
	Semi-Trailer		48-65
Construction	Angle Grinder		56-74 prior to construction of building shell 36-54 after construction of building shell
	Electric Saw		53-71 prior to construction of building shell 33-51 after construction of building shell
	Hammering		61-79 prior to construction of building shell 41-59 after construction of building shell
	Drill		46-64 prior to construction of building shell 26-44 after construction of building shell
	Concrete Pump		61
	Cement Mixing Truck		61
	Electric Tower Crane		50
	Diesel Mobile Crane		59

8.6 PREDICTION TO RECEIVER 5:

Predicted noise levels are as follows below:

Table 12 - Predicted Noise Levels to Receiver 5

Stage	Equipment	External Noise Management Level dB(A) $L_{eq\ (15min)}$	Predicted Noise Level at Receiver dB(A)$L_{eq(15mins)}$
Detailed Excavation	Saw Cutter	70	64-75
	Excavator with Hydraulic Hammer		68-79
	Semi-Trailer		46-58
Construction	Angle Grinder		55-66 prior to construction of building shell 33-44 after construction of building shell
	Electric Saw		52-63 prior to construction of building shell 32-43 after construction of building shell
	Hammering		60-71 prior to construction of building shell 40-51 after construction of building shell
	Drill		45-56 prior to construction of building shell 25-36 after construction of building shell
	Concrete Pump		59
	Cement Mixing Truck		59
	Electric Tower Crane		54
	Diesel Mobile Crane		63

8.7 PREDICTION TO RECEIVER 6:

Predicted noise levels are as follows below:

Table 13 - Predicted Noise Levels to Receiver 6

Stage	Equipment	External Noise Management Level dB(A) $L_{eq\ (15min)}$	Predicted Noise Level at Receiver dB(A)$L_{eq(15mins)}$
Detailed Excavation	Saw Cutter	64 (7:00am – 6:00pm) Monday to Friday (8:00am – 1:00pm) Saturday	65-78
	Excavator with Hydraulic Hammer		69-82
	Semi-Trailer		47-60
Construction	Angle Grinder		56-69 prior to construction of building shell 36-49 after construction of building shell
	Electric Saw		53-66 prior to construction of building shell 33-46 after construction of building shell
	Hammering		61-74 prior to construction of building shell 41-54 after construction of building shell
	Drill		46-59 prior to construction of building shell 26-39 after construction of building shell
	Concrete Pump		65
	Cement Mixing Truck		65
	Electric Tower Crane		58
	Diesel Mobile Crane		67

9 AMELIORATIVE MEASURES

9.1 SITE SPECIFIC RECOMMENDATIONS

- Notification - Prior to commencement of excavation, neighbouring development should be notified of the anticipated duration of the excavation period.
- Excavation:
    - Is to be done using an excavator with bucket as much as possible (as opposed to using hydraulic hammering).
    - Where hydraulic hammering cannot be avoided, saw cutting of the rock for pad footings, trenches and the like, should be undertaken first in order to isolate the material to be removed from the surrounding ground to reduce vibration transfer to surrounding properties.
    - If hydraulic hammering of rock is required:
        - Vibration monitoring at adjacent development is recommended. Any vibration monitor is to have SMS notification capability to enable contractor to be immediately informed when vibration limits are reached.
- High Noise Generating Works:
    - Where high noise generating works are proposed to be undertaken, respite hours should be implemented to reduce the impact on surrounding receivers. Limit the use of hydraulic hammers, saw cutters and grinding activities to between 9:30am – 1:00pm and 2:00pm - 4:30pm Monday to Friday and between 9:30am - 1:30pm on Saturdays.
    - Notification of scheduled high noise generating activities should be provided to surrounding residents to include the duration of high noise works and when/where it will be occurring on the construction site.
- Vehicle Noise - Trucks must turn off their engines during idling to reduce impacts on nearby receivers (unless truck ignition needs to remain on during concrete pumping).
- In the event of a complaint, noise management procedure identified in section 10 of this report are to be followed. 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.

9.2 GENERAL RECOMMENDATIONS

Other noise management practices which may be adopted are discussed below. In addition, notification, reporting and complaints handling procedures should be adopted as recommended in section in this report.

9.2.1 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.

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 15 dB(A) can be affected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8 dB(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 which is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10 or 15mm plywood would be acceptable for the barriers.

9.2.2 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.

9.2.3 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).

9.2.4 Treatment of Specific Equipment

In certain cases, it may be possible to specially treat a piece of equipment to reduce the sound levels emitted. These may take the form of engine shrouding, or special industrial silencers fitted to exhausts.

9.2.5 Establishment of Site Practices

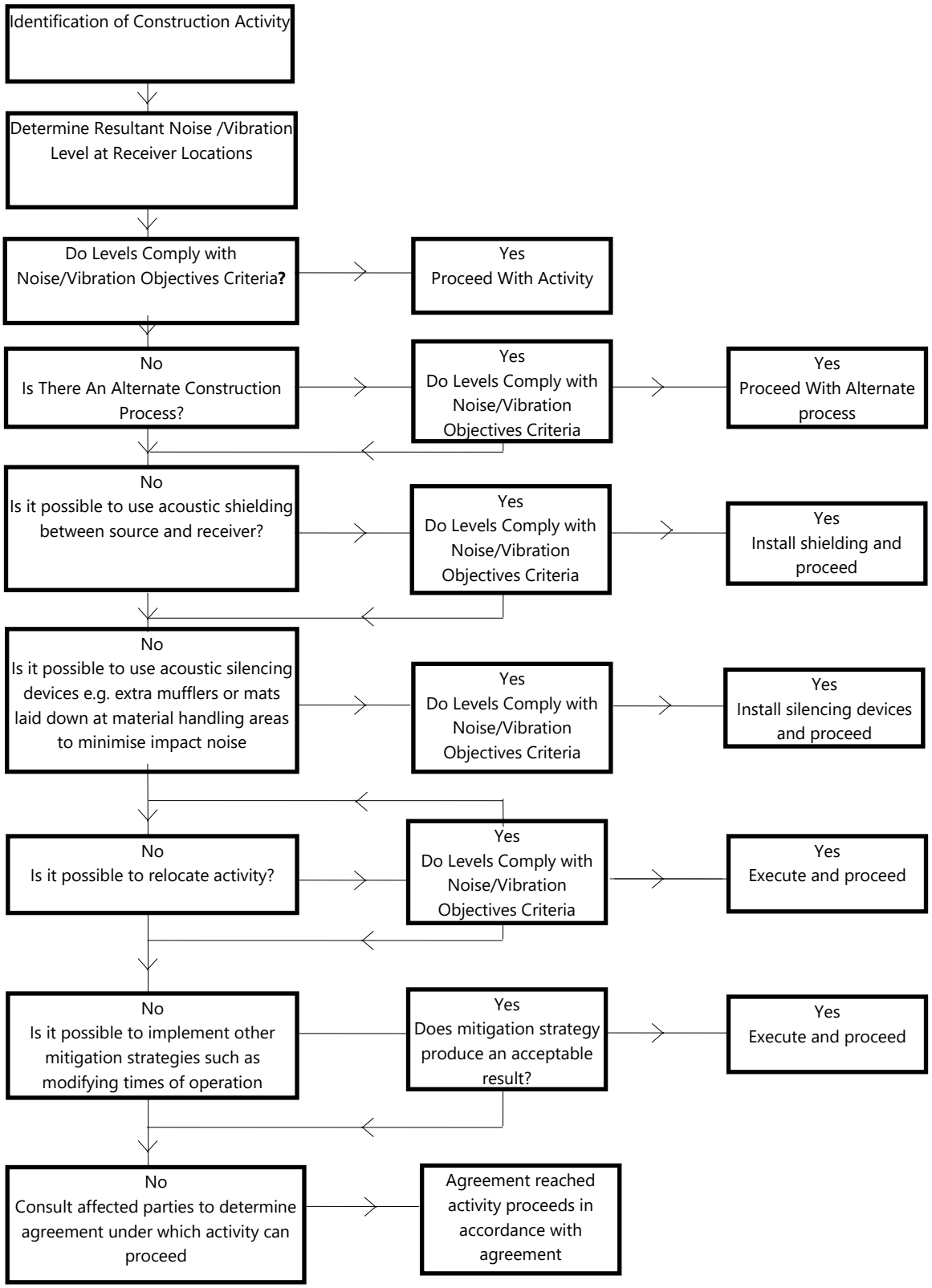
This involves the formulation of work practices to reduce noise generation. This includes locating fixed plant items as far as possible from residents as well as rotating plant and equipment to provide respite to receivers.

Construction vehicles accessing the site should not queue in residential streets and should only use the designated construction vehicle routes. Loading of these vehicles should occur as far as possible from any sensitive receiver.

10 ASSESSMENT METHODOLOGY AND MITIGATION METHODS

The flow chart that follows illustrates the process to be followed to minimise the impact associated with these activities.

Noise sources with the potential to exceed the criteria set out in section 4 have been identified and discussed in section 6.



11 ASSESSMENT OF VIBRATION

11.1 VIBRATION PRODUCING ACTIVITIES

Proposed activities that have the potential to produce significant ground vibration include:

- Excavation Work.

11.2 SAFEGUARDS TO PROTECT SENSITIVE STRUCTURES

It is impossible to predict the vibrations induced by the excavation operations on site at potentially affected receivers. This is because vibration levels are principally proportional to the energy impact which is unknown, the nature of the terrain in the area (type of soil), drop weight, height etc.

11.3 VIBRATION MONITORING (IF REQUIRED)

In the event that complaints are made from neighbouring properties regarding vibration impacts from the subject site, vibration monitors will be installed at the property boundaries of the neighbouring properties nearest to the subject site to monitor vibration levels.

11.3.1 Downloading of Vibration Monitor Data

Downloading of the vibration monitor data will be conducted on a regular basis. In the event of exceedance of the vibration criteria, downloading of the vibration monitor data will be conducted more frequently. Results obtained from the vibration monitor will be presented in a graph format and will be forwarded to the client for review. It is proposed that reports are provided fortnightly with any exceedances in the vibration criteria reported as detailed in this report.

11.3.2 Presentation of Vibration Monitor Results

A fortnightly report will be submitted to the client via email summarising the vibration events. The vibration exceedance of criteria is recorded, and the report shall be submitted within 24 hours. Complete results of the continuous vibration logging will be presented in fortnight reports including graphs of the collected data.

12 COMMUNITY INTERACTION AND COMPLAINTS HANDLING

12.1 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.

This office has been advised that to date, Built has managed expectations relating to construction noise and vibration through meetings with Canterbury Bankstown Council as a point of contact and intermediary to the local community.

These meetings were held prior to the commencement of the main construction works and contact with Council remains ongoing in respect to all interfaces with the public, local residents and other stakeholders who may be impacted by the works.

The objective in undertaking a consultation processes is to:

- Inform and educate the groups about the project and the noise 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 the Site Complaints Register which will be used to address any construction noise related problems should they arise.

To ensure that this process is effective, regular scheduled meetings may be required for a finite period, until all issues have been addressed and the evidence of successful implementation is embraced by all parties.

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.

12.2 DEALING WITH COMPLAINTS

Should ongoing complaints of excessive noise, vibration or dust 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 and dust limits, all work potentially producing vibration or dust 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
- If necessary, setup vibration monitoring at the location representing the nearest affected vibration receiver, with alarm device which can inform the project manager on site if the vibration exceedance happened.
- 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, 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 CONTINGENCY PLANS

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

1. Determine the offending plant/equipment/process
2. Locate 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. Selecting alternative equipment/processes where practical
5. If necessary, setup noise and vibration monitoring devices at locations representing the nearest noise/vibration and dust affected receivers and provide data for each complain time period. Analysis is required to determine suitable mitigation measures.

Complaints associated with noise and vibration generated by site activities shall be recorded on a Complaint Form. The person(s) responsible for complaint handling and contact details for receiving of complaints shall be established on site prior to construction works commencing. A sign shall be displayed at the site indicating the Site Manager to the general public and their contact telephone number.

14 CONCLUSION

This report presents a construction noise and vibration management plan for the detailed excavation and construction activities proposed to be conducted at the Western Sydney University (WSU) campus to be located at 74 Rickard Road, Bankstown.

Provided that the practices and recommendations in this report are implemented, the noise and vibration impacts during the excavation and construction stages will be minimised.

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

Yours faithfully,

Acoustic Logic Pty Ltd
Shane Nichols