

North Tower DA 26 Mann Street, Gosford

Construction Noise and Vibration Management Plan

SYDNEY

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Project ID	20201083.8
Document Title	Construction Noise and Vibration Management
Attention To	St Hilliers Contracting Pty Limited

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	28/06/2022	20201083.8/2806A/R0/AR	AR		VF

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1 INTRODUCTION

This report presents our assessment of the processes which will be followed in order to manage noise and vibration from the construction works associated with the mixed-use development to be located at 26 Mann Street, Gosford. This report has been prepared to address condition C9 of the development consent for SSD 23588910.

The principal objective of this study is to undertake an evaluation of the work to be performed during the project and forecast the potential impacts of noise and vibration. The evaluation will be used to formulate and streamline effective regulation and mitigation measures where reasonable and feasible.

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

- Identification of the noise and vibration standards which will be applicable to this project.
- Identification of potentially impacted nearby development.
- Identify likely sources of noise and vibration generation and predicted noise levels at nearby development.
- Formulation of a strategy to comply with the standards identified and mitigation treatments in the event that compliance is not achievable.

2 SITE DESCRIPTION

The site is located at 26 Mann Street, Gosford. The proposed future development consists of three towers. This report will address construction noise and vibration impacts associated with the Central Coast Quarter – North Tower, which will consist of the following:

- Construction of a 25-storey (26 level) mixed-use building, comprising:
- 621sqm of retail GFA.
- 136 apartments, equating to 13,263sqm of residential GFA.
- Four parking levels for 181 cars, with vehicular access from Baker Street.
- Storage areas and services.
- Communal open space.
- Publicly accessible through site link, including stairs, walkways, public lift, public art and landscaping.
- Excavation for the site will be primarily in clay, and partially in sandstone.

Development in the vicinity of the site is generally commercial. The nearest noise sensitive residential development to the subject site are current/future residences approximately 60m to the east across Mann Street at 21-37 Mann Street. Further east there are existing residential apartments along Henry Parry Drive at 25 Mann Street & 127 Georgiana Terrace, approximately 100m to the east of the site.

The nearest commercial development is located at 99 Georgina Terrace adjoining the site to the north and 32 Mann Street to the east of the site. In addition, there is also commercial development further east of the site (on the opposite side of Mann Street). To the west of the site there is an active recreation area known as the Leagues Club Field, and Gosford Waterfront Park.

Nearby noise sensitive receivers have been summarised in the table below.

Table 1 – Summary of Nearby Sensitive Receivers

Receiver Number	Receiver Type	Description
R1	Commercial	Existing multi-commercial building adjoining the project site to the north at 99 Georgina Terrace.
R2	Commercial	Existing multi-commercial building adjoining the project site to the east at 32 Mann Street.
R3	Residential	Existing multi-story residential apartment building approximately 100m east of the project site at 25 Mann Street.
R4	Active Recreation	Existing Leagues Club Field and Gosford Waterfront Park active recreation areas adjoining the site to the west.

An aerial photo of the site is presented in Figure 1 below, which also shows nearby receivers and the location of noise monitoring conducted during the SSDA acoustic assessment.

Acoustic Logic has also been provided with a site establishment plan in Figure 2 which shows a general site layout during the expected works.



Figure 1: Aerial Photo of Site, Receiver Locations and Monitoring Positions

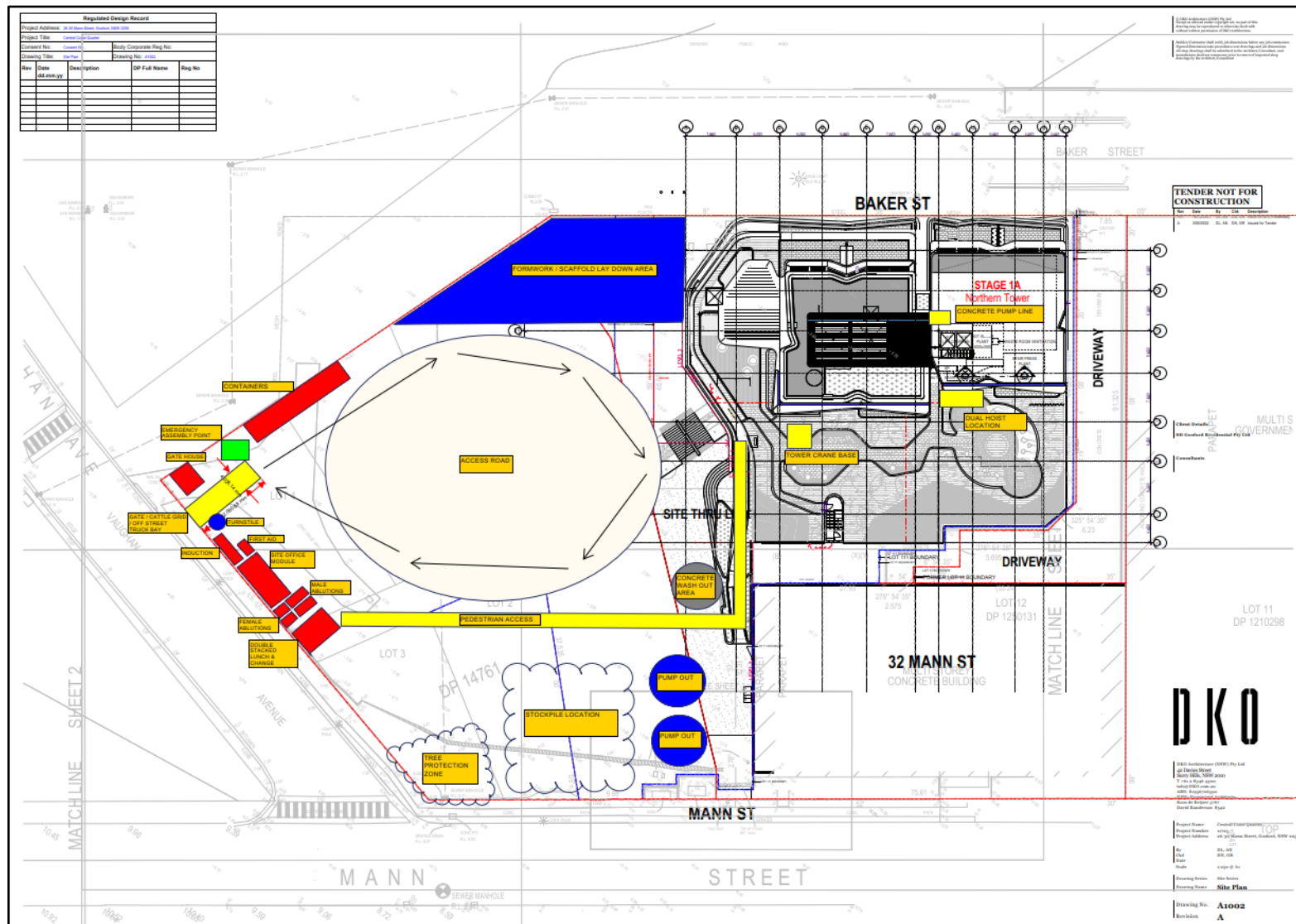


Figure 2 – Site Establishment Plan

3 CONDITIONS OF CONSENT

3.1 HOURS OF WORK

The SSDA approved construction hours as per Condition D6 to D9 of the development consent are as follows:

- Construction (including material delivery/removal)
 - Between 7am and 6pm, Mondays to Fridays inclusive; and
 - Between 8am and 4pm, Saturdays
 - No work on Sundays or public holidays.
- Rock breaking, rock hammering, sheet piling, pile driving and similar activities generating high noise impact (i.e. work exceeding a NML of LA_{eq} 75dB(A)) as measured at the sensitive receiver, may only be carried out between the following hours:
 - 9am to 12pm, Monday to Friday;
 - 2pm to 5pm, Monday to Friday; and
 - 9am to 12pm, Saturday.

The duration of each major stage of construction are as follows:

- | | |
|---|------------------------------|
| • Demolition | No demolition works required |
| • Early Civil Works (Excavation & Piling) | 3-4 Months |
| • Construction and Fitout | Approximately 26 months. |

3.2 CONSTRUCTION NOISE GUIDELINES

Condition C9 of the development consent states the noise management plan must be prepared in accordance with the Interim Construction Noise Guideline (DECC, 2009). The condition is replicated below:

Noise and Vibration Management Sub-Plan

- C9. Prior to the commencement of any demolition, earthworks or construction, the Applicant must submit a Construction Noise and Vibration Management Sub-Plan (CNVMSP) to the Certifier.

The CNVMSP shall be prepared in consultation with Council and 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 Interim Construction Noise Guideline (DECC, 2009); Where resultant site noise levels are likely to be in exceedance of this noise criteria then a suitable proposal must be given as to the duration and frequency of respite periods that will be afforded to the occupiers of neighbouring property;
- (c) incorporate the recommendations of the noise report prepared by Acoustic Logic and titled '*Central Coast Quarter – Northern Tower, 26-30 Mann Street, Gosford NSW Noise and Vibration Impact Assessment Revision 2*' dated 30 August 2021 as updated by letter from Acoustic Logic titled '*North Tower DA 26 Mann Street, Gosford – Response to Submissions (RTS)*' dated 18 November 2021;
- (d) details of non-tonal alarms, materials handling and work site training;
- (e) include strategies that have been developed with the community for managing high noise generating works and describe the community consultation/liaison to develop the strategies;

- (f) details of any noise mitigation measures that have been outlined by an acoustic consultant or otherwise that will be deployed on site to reduce noise impacts on the occupiers of neighbouring noise sensitive property to a minimum;
- (g) what plant and equipment is to be used on site, the level of sound mitigation measures to be undertaken in each case and the criteria adopted in their selection taking into account the likely noise impacts;
- (h) include a complaints management system that would be implemented for the duration of the construction; and
- (i) include a program to monitor and report on the impacts and environmental performance of the development and the effectiveness of the management measures.

4 EXISTING BACKGROUND NOISE LEVELS

Unattended long-term noise monitoring has been conducted by this office to establish background noise levels at the project site as part of the approval stage *Noise and Vibration Impact Assessment* (ref: 20201083.2/0709A/R3/AS dated 7th September 2021).

Monitoring was conducted using four Acoustic Research Laboratories Pty Ltd noise loggers. The loggers were set to A-weighted, fast response and was programmed to store 15-minute statistical noise levels through the monitoring period. The monitors were calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted.

Refer to Figure 1 for detailed location for the placements of monitors on site. The table below summarises the results obtained from the unattended monitoring.

**Table 2 – Long Term Noise Logging Data
(Rating Background Noise Level and Ambient Noise Level)**

Location	Time of Day*		
	Day	Evening	Night
Noise Monitor Location 1 – Southwest corner of subject site	55dB(A) _{Leq(Period)} 51dB(A) _{L90}	55dB(A) _{Leq(Period)} 49dB(A) _{L90}	53dB(A) _{Leq(Period)} 41dB(A) _{L90}
Noise Monitor Location 2 – Rear of 79-87 Henry Parry Drive	57dB(A) _{Leq(Period)} 54dB(A) _{L90}	55dB(A) _{Leq(Period)} 51dB(A) _{L90}	53dB(A) _{Leq(Period)} 41dB(A) _{L90}
Noise Monitor Location 3 – Balcony of Apartment 804 at 25 Mann Street	64dB(A) _{Leq(Period)} 55dB(A) _{L90}	61dB(A) _{Leq(Period)} 45dB(A) _{L90}	57dB(A) _{Leq(Period)} 41dB(A) _{L90}
Noise Monitor Location 4 – Corner of Vaughan Avenue and Mann Street	62dB(A) _{Leq(Period)} 51dB(A) _{L90}	59dB(A) _{Leq(Period)} 46dB(A) _{L90}	56dB(A) _{Leq(Period)} 43dB(A) _{L90}

*Note – Time of day is as described within the NSW EPA Noise Policy for Industry (NPI) 2017.

5 NOISE AND VIBRATION MANAGEMENT LEVELS

5.1 NOISE OBJECTIVES

5.1.1 NSW EPA Interim Construction Noise Guideline

The EPA Interim Construction Noise Guideline (ICNG) assessment requires:

- Determination of noise management levels (based on ambient noise monitoring).
- Review 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.

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.

Section 4.12 and 4.1.3 of the guideline also specifies management levels for land used for other than residential. A summary of the recommended noise levels from the ICNG is presented in the tables below.

Table 3 – Noise Management Levels - Residential

Location	"Noise Affected" Level - dB(A) $L_{eq(15min)}$	"Highly Noise Affected" Level - dB(A) $L_{eq(15min)}$
Nearest Residences to East along Mann Street	65	75

Table 4 – Noise Management Levels – Commercial

Receiver	Noise Management Level dB(A) $L_{eq(15min)}$
Nearby Commercial Development	70 (External)
Active Recreation Areas	65 (External)

If noise levels exceed the management levels identified in the tables above, reasonable, and feasible noise management techniques will be reviewed.

5.1.2 Australian Standard AS2436:2010 “Guide to Noise Control on Construction, Maintenance and Demolition Sites

Australian Standard AS2436 does not provide specific noise management targets. The guideline focuses on strategies for developing feasible and reasonable mitigation methodologies, management controls and community liaison to reach realistic compromises between the needs of construction activities and potentially affected receivers.

For the control and regulation of noise from construction sites AS2436:2010 *Guide to noise control on construction, maintenance and demolition sites* nominates the following:

- That reasonable suitable noise management objectives are established.
- That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes to locations of the site where they can be shielded, selecting less noisy processes, and if required regulating demolition hours, and
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the demolition site.

5.2 VIBRATION OBJECTIVES

The criteria for vibration caused by any demolition, excavation or construction works to nearby residences or structure outside the project site is governed by the following guidelines/standards:

- For structural damage, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures*
- For human exposure to vibration, the Department of Environment and Conservation NSW “Assessing Vibration: A Technical Guideline” (Feb 2006) is based on the guidelines contained in BS 6472:1992 *Guide to Evaluate Human Exposure to Vibration in Buildings (1Hz to 80Hz)* for low probability of adverse comment.

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

5.2.1 Structure Borne Vibration (Building 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 summarised in Table 5.

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

5.2.2 Assessing Amenity

The NSW EPA document "*Assessing Vibration: A Technical Guideline*" is based on the guidelines contained in BS 6472:1992. 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 regulate vibration within the excavation/construction site.

Table 6 – EPA Recommended Vibration Criteria

Place	Time	RMS acceleration (m/s ²)		RMS velocity (mm/s)		Peak velocity (mm/s)	
		Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Critical Working Areas	Daytime	0.005	0.01	0.1	0.2	0.14	0.28
Residences		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							
Critical Working Areas	Daytime	0.005	0.01	0.1	0.2	0.14	0.28
Residences		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 NOISE AND VIBRATION ASSESSMENT AND RECOMMENDATIONS

6.1 ACTIVITIES TO BE CONDUCTED AND THE ASSOCIATED NOISE LEVELS

Noise and vibration impacts on nearby development will be dependent on the activity in question and where on the site the activity is undertaken. Typically, the most significant sources of noise generated during a construction project will be demolition, excavation, civil works and piling. A summary of sound power levels of the expected major construction processes/equipment is detailed in Table 7.

Table 7 - Sound Power Levels of the Proposed Equipment

Equipment / Process	Sound Power Level – dB(A)*
Excavation	
Excavator Mounted Hydraulic Hammering	120
Excavator (Bucket)	115
Large Trucks	110
Piling	
CFA Piling	110
Sheet Piling (Hydraulic Jack)	100
Construction	
Large Trucks	110
Electric Crane	95
Concrete Pump	105
Concrete Vibrator/Helicopters	100
Powered Hand Tools	100

***Noise levels take into account correction factors (for duration, tonality, intermittency where necessary).**

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.

6.2 PREDICTED NOISE LEVELS

Noise generated by plant and equipment will be managed to generally comply with the nominated noise management levels outlined in **Table 3** and **Table 4**, and where this noise goal may be exceeded, noise will be managed based on principles consistent with Australian Standard 2436. Noise levels will vary depending on where in the construction site the work is undertaken. To address this, a range of predicted noise levels is provided as per the tables below. Predictions take into account the noise reduction as a result of distance, and noise screening from existing building forms where applicable.

6.2.1 Predicted Noise Levels to Receiver R1

Table 8 – Predicted Noise Levels at Receiver R1 (Commercial – 99 Georgina Terrace)

Activity	Predicted Level – dB(A) $L_{eq(15min)}$ (External Areas)	Comment
Excavation		
Excavator Mounted Hydraulic Hammering	75 - 92	Exceedance of noise management level.
Excavator (Bucket)	70 - 87	Generally exceeds noise management level. Satisfies noise management level when working along southern edge of future building.
Large Trucks	60 - 82	Intermittent exceedance of noise management level. Satisfies noise management level when working close to southern corner of the site.
Piling		
CFA Piling	65 - 76	Intermittent exceedance of noise management level. Satisfies noise management level when working close to southern edge of future building.
Sheet Piling (Hydraulic Jack)	45 - 45	Satisfies noise management level of 70dB(A).
Construction		
Large Trucks	60 - 82	Intermittent exceedance of noise management level. Satisfies noise management level when working close to southern corner of the site.
Concrete Pump	60	Satisfies noise management level of 70dB(A).
Concrete Vibrator/Helicopters	55 - 72	Generally satisfies noise management level. Intermittent, minor exceedance when working along northern edge of future building.
Electric Crane	49 - 67	Satisfies noise management level of 70dB(A).
Powered Hand Tools	55 - 72	Generally satisfies noise management level. Intermittent, minor exceedance when working along northern edge of future building.

6.2.2 Predicted Noise Levels to Receiver R2

Table 9 – Predicted Noise Levels at Receiver R2 (Commercial – 32 Mann Street)

Activity	Predicted Level – dB(A) $L_{eq}(15min)$ (External Areas)	Comment
Excavation		
Excavator Mounted Hydraulic Hammering	77 - 92	Exceedance of noise management level.
Excavator (Bucket)	72 - 87	Exceedance of noise management level.
Large Trucks	64 - 82	Intermittent exceedance of noise management level. Satisfies noise management level when working close to southern corner of site.
Piling		
CFA Piling	69 - 78	Intermittent exceedance of noise management level. Satisfies noise management level when working close to western edge of future building.
Sheet Piling (Hydraulic Jack)	72 - 78	Exceedance of noise management level.
Construction		
Large Trucks	64 - 82	Intermittent exceedance of noise management level. Satisfies noise management level when working close to southern corner of site.
Concrete Pump	82	Exceedance of noise management level.
Concrete Vibrator/Helicopters	57 - 72	Generally satisfies noise management level. Intermittent, minor exceedance when working along eastern edge of future building.
Electric Crane	52 - 67	Satisfies noise management level of 70dB(A).
Powered Hand Tools	57 - 72	Generally satisfies noise management level. Intermittent, minor exceedance when working along eastern edge of future building.

6.2.3 Predicted Noise Levels to Receiver R3

Construction noise impacts to Receiver R3 have been predicted for residences at higher levels which will receive a lower amount of noise screening from the commercial building at 32 Mann Street relative to ground floor apartments. Notwithstanding, certain activities (i.e. those conducted to the south of the building footprint such as concrete pump locations, or elevated equipment such as the tower crane) will not receive any shielding.

Table 10 – Predicted Noise Levels at Receiver R3 (Residential– 25 Mann Street)

Activity	Predicted Level – dB(A) $L_{eq}(15min)$ (External Areas)	Comment
Excavation		
Excavator Mounted Hydraulic Hammering	63 - 66	Generally satisfies noise management level. Intermittent, minor 1dB(A) exceedance.
Excavator (Bucket)	58 - 62	Satisfies noise management level of 65dB(A).
Large Trucks	53 - 62	Satisfies noise management level of 65dB(A).
Piling		
CFA Piling	53 - 57	Satisfies noise management level of 65dB(A).
Sheet Piling (Hydraulic Jack)	55 - 55	Satisfies noise management level of 65dB(A).
Construction		
Large Trucks	53 - 62	Satisfies noise management level of 65dB(A).
Concrete Pump	65	Satisfies noise management level of 65dB(A).
Concrete Vibrator/Helicopters	43 - 46	Satisfies noise management level of 65dB(A).
Electric Crane	43 - 47	Satisfies noise management level of 65dB(A).
Powered Hand Tools	43 - 52	Satisfies noise management level of 65dB(A).

6.2.4 Predicted Noise Levels to Receiver R4

Table 11 – Predicted Noise Levels at Receiver R4 (Active Recreation)

Activity	Predicted Level – dB(A) $L_{eq}(15min)$ (External Areas)	Comment
Excavation		
Excavator Mounted Hydraulic Hammering	77 - 92	Exceedance of noise management level.
Excavator (Bucket)	72 - 87	Exceedance of noise management level.
Large Trucks	67 - 82	Exceedance of noise management level.
Piling		
CFA Piling	67 - 78	Exceedance of noise management level.
Sheet Piling (Hydraulic Jack)	52 - 52	Satisfies noise management level of 65dB(A).
Construction		
Large Trucks	67 - 82	Exceedance of noise management level.
Concrete Pump	62	Satisfies noise management level of 65dB(A).
Concrete Vibrator/Helicopters	57 - 72	Intermittent exceedance of noise management level. Satisfies noise management level when working close to eastern edge of the future building.
Electric Crane	52 - 67	Intermittent, minor exceedance of noise management level. Satisfies noise management level when working close to eastern edge of the future building.
Powered Hand Tools	57 - 72	Intermittent exceedance of noise management level. Satisfies noise management level when working close to eastern edge of the future building.

6.3 DISCUSSION – NOISE

6.3.1 Residential Receivers

To residential receiver R3, a minimum line of sight noise screening effect will be provided by the commercial tower at Receiver R2 (32 Mann Street) which will minimise noise impacts from ground level works during early civil works. Construction activities which are elevated (use of electric crane, and use of hand tools on higher levels elevated off ground) will not receive any noise screening, however these works generate a low level of noise relative to early civil works and are still expected to satisfy noise management levels. Exceedance of the noise management level of 65dB(A) will be minimal (up to 1dB(A) during early civil works), and exceedance of the highly noise affected level of 75dB(A) is not expected.

6.3.2 Commercial and Other Receivers

The worst affected receivers are multi-storey commercial towers which overlook the site (Receiver R1 and R2). Exceedances of the NSW EPA noise management levels are unavoidable given their proximity and elevation where working close to the common property boundary. As expected, excavation activities will have the greatest noise impact to nearby receivers, especially where needed for rock breaking and material removal.

The consent already contains a requirement to provide respite periods for certain activities and these should be observed unless alternative respite is agreed through negotiation with the occupants.

It is recommended that the managers of the adjacent commercial buildings be advised when these activities are likely to occur and that respite periods are being provided.

A similar level of impact is expected to users of the active recreation space (Receiver R4), in this instance plywood hoarding will provide noise screening benefits to ground level receivers and trafficable pathways bounding the site. More significant measures are not considered reasonable for this receiver type.

6.4 DISCUSSION - VIBRATION

Excavator mounted hammering of rock during excavation and sheet piling will have the greatest potential for vibration generation.

Given the proximity of occupied commercial buildings along the northern and eastern site boundaries, vibration monitoring is recommended during these stages of work. Specific recommendations regarding vibration monitoring are detailed in Section 6.5 below.

6.5 RECOMMENDATIONS

In light of the above assessment, and to mitigate any potential noise impacts from the development at 26 Mann Street, we recommend the following management controls be implemented:

- As per condition D6 to D9 of the development consent construction activities should be limited to the following:
 - Construction (including material delivery/removal)
 - Between 7am and 6pm, Mondays to Fridays inclusive; and
 - Between 8am and 4pm, Saturdays
 - No work on Sundays or public holidays.
 - Rock breaking, rock hammering, sheet piling, pile driving and similar activities generating high noise impact (i.e. work exceeding a NML of L_{Aeq} 75dB(A) as measured at the sensitive residential receiver, or 60 dB(A) internally in a commercial office space) may only be carried out between the following hours:
 - 9am to 12pm, Monday to Friday;
 - 2pm to 5pm, Monday to Friday; and
 - 9am to 12pm, Saturday.
- In light of the hours of work conditions above, we recommend that attended noise measurements be undertaken at the start of major stages (demolition, piling, construction) to determine the actual noise impact from the construction activities to determine suitable hours of work for high noise generating activities such as hydraulic hammering, use of excavators and piling.
- Site Perimeter Hoarding
 - Plywood or similar hoarding is recommended to the site perimeter to provide noise screening to ground level receivers to the nearby active recreation area (Receiver R4), and to trafficable areas bounding the site which serve adjoining commercial development.
- Quiet work methods/technologies:
 - The primary noise generating activity at the site will be the bulk excavation period. As much as practicable, use of quieter excavation methods is adopted.
 - Where rock strength permits, use of rock rippers (as opposed to hydraulic hammers and rock saws) should be considered.
- Materials handling/vehicles:
 - Trucks and forklifts in general use on site are to use a non-tonal reversing beacon where possible (subject to OH&S requirements) to minimise potential disturbance of surrounding receivers.
 - Avoid careless dropping of construction materials into empty trucks.
 - Trucks should turn off their engines whenever possible on site (unless needed for concrete pumping or similar).
- Community consultation is recommended to be undertaken throughout the construction process. In this regard regular letterbox drops detailing site progress and scheduled works is proposed. In particular, these should detail the extent and times of hammering and piling which is planned to be undertaken during the early civil works.
- Complaints handling:
 - An afterhours contact number is to be displayed outside of the building site, so that in the event that surrounding development believes that a noise breach is occurring, they may contact the site.
 - In the event of complaint, the procedures outlined in Section 9 are adopted.

- Where persistent noise complaints are received from surrounding properties, attended noise measurements can be undertaken at affected to quantify the level of construction noise typically emitted from the site. This may be used to inform any mitigation strategies which could be implemented.
- Vibration Monitoring
 - Vibration monitoring service is to be carried out by the Acoustic Consultant. We recommend up to three Texcel type monitors with externally mounted geophones installed at the nearest building façade of the affected receiver.
 - Refer to the figure below for indicative locations. In the event on-going complaints are received from other receivers, additional monitoring or attended noise/vibration measurements are to be carried out.

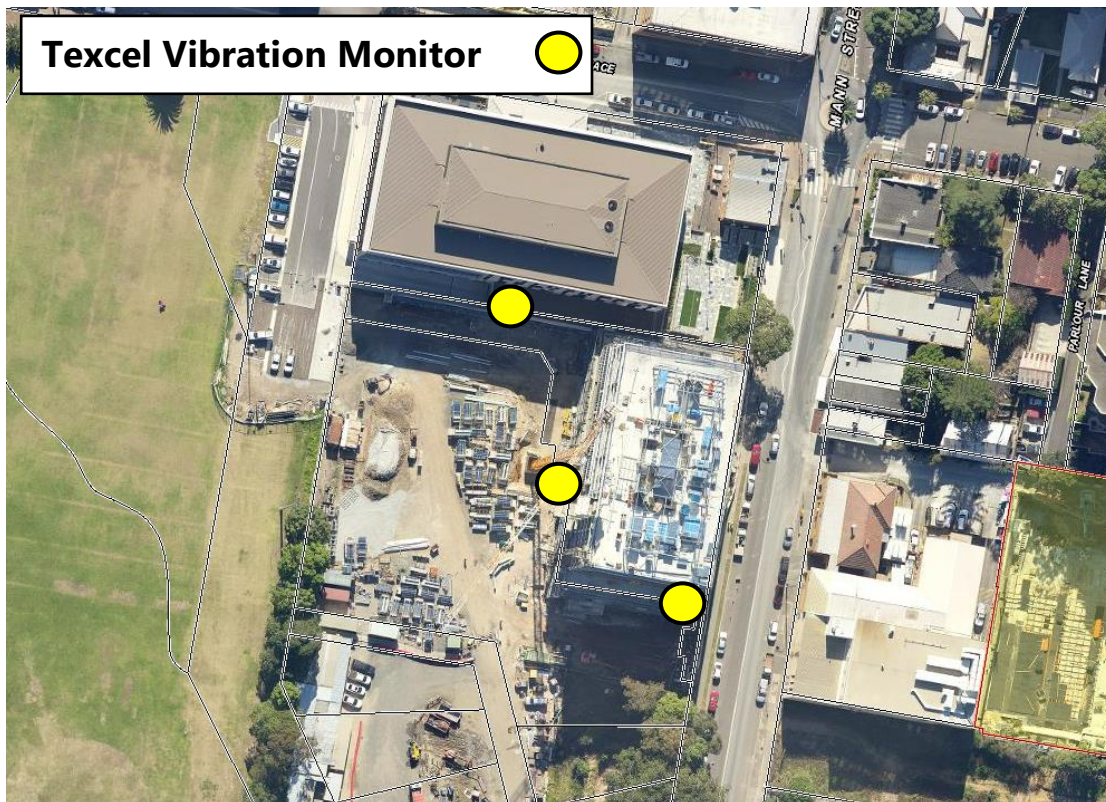


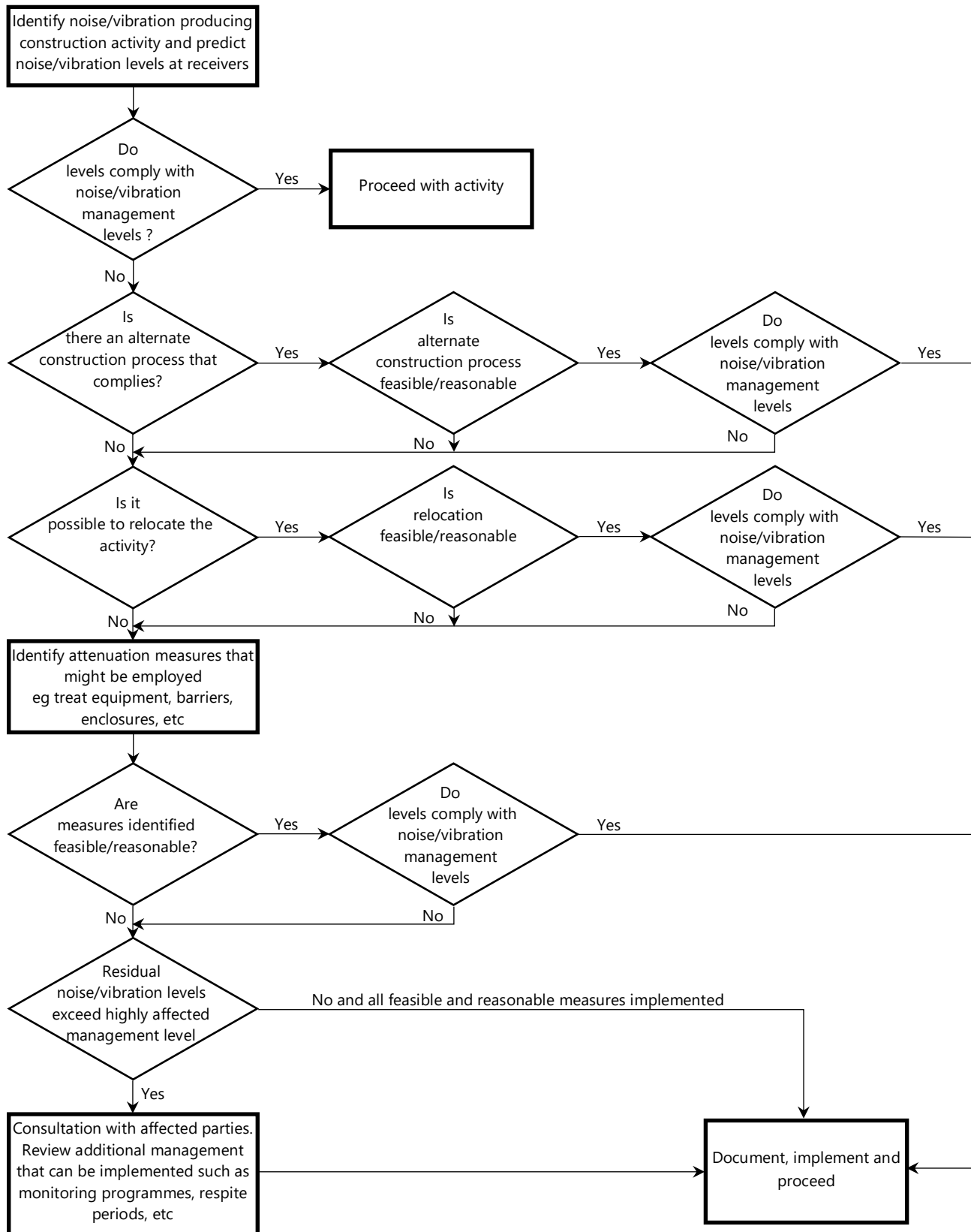
Figure 3 – Proposed Vibration Monitoring Locations

- Vibration monitor locations have been nominated based on the facades being in close proximity to vibration intensive works (excavation in rock, piling in rock, sheet piling).
- The monitors are proposed to be fitted with GSM modems for vibration exceedance. The vibration loggers will be downloaded remotely using the GSM modem. The vibration monitors should be programmed to issue alerts (whether visual or via SMS alert) as detailed below to notify the relevant parties of potential exceedances of the DIN 4150-3 criteria (refer to section 6.2).
- Commercial Receivers
 - Monitors to be installed as close as possible to the footing of residential building.
 - Alarm Level – 15mm/s PPV at receiver location, SMS alarm message will be sent to operator, project manager and acoustic engineer if magnitude of vibration events exceed this level. Project manager shall respond immediately by taking courteous work methodology.
 - Stop work level – 20mm/s PPV at receiver location, SMS alarm message will be sent to operator, project manager and acoustic engineer if magnitude of vibration events exceed this level. Project manager shall stop the work at geophone immediately.

In addition to the unattended monitoring, it is recommended that attended vibration monitoring be carried out at the commencement of any new processes to establish "safe" working distances to the receivers that comply with the management levels, as well as worst case levels that may indicate an alternative process is needed (if structural limits are exceeded) or respite periods if comfort levels are exceeded.

7 CONTROL OF CONSTRUCTION NOISE AND VIBRATION – PROCEDURAL STEPS

The flow chart presented below illustrates the process that should be followed in assessing construction activities.



8 ADDITIONAL NOISE AND VIBRATION CONTROL METHODS

In the event of complaints, there are a number of noise mitigation strategies available which can be considered. 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.

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. Undertaking this activity using bulldozers, ripping and/or milling machines will result in lower noise levels.

8.2 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).

8.3 COMBINATION OF METHODS

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

8.4 NOISE MONITORING TECHNIQUES

Where noise monitoring is undertaken (either by attended short-term measurements or long-term unattended noise monitoring), it should be conducted at a practical location representative of the impact to nearby noise sensitive receivers. Where this is not possible, noise measurements of construction processes should be taken such that noise levels can be accurately predicted to receivers. Any reporting of noise measurement results may include the following information:

- The date and time that the measurements were undertaken;
- The location of measurements, noise receivers and construction processes. A site map should be included for clarity.
- A description of the construction processes being undertaken during the measurement period.
- The measured noise construction noise levels, and the noise level at the façade of nearby receivers (if noise levels are predicted).
- A comparison to the NSW EPA Interim Construction Noise Guideline noise management levels.

9 DEALING WITH COMPLAINTS

Should ongoing complaints of excessive noise or vibration recommendations occur immediate measures shall be undertaken to investigate the complaint, the cause of the exceedances and identify the required changes to work practices.

If a noise complaint is received the complaint should be recorded. Any 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.

10 CONCLUSION

This document presents a noise and vibration management plan for the excavation, piling and construction works to be conducted at 26 Mann Street, Gosford in line with the procedures recommended by the NSW EPA *Interim Construction Noise Guideline* (ICNG) as required by Condition C9 of the development consent for SSD 23588910.

The assessment of noise and vibration indicates that:

- Excavation activities associated with the subject site are likely to generate noise levels that will require additional management. Adoption of the elements of these controls will ensure that noise impacts will be minimised, however some exceedance is unavoidable given the proximity and elevation of nearby commercial development.
- With regard to permitted construction hours in Condition D6 to D9, it is recommended that attended noise measurements be conducted at nearby noise sensitive receivers at the beginning of major stages in the construction to determine real-world noise impacts from noisy activities such as hammering in rock and piling.
- Ground vibration goals have been set in this report to safeguard existing structures close to the project site. In this regard.
 - Attended and Unattended vibration monitoring is proposed during high vibration intensive works at the nearest commercial structures adjoining the site. Refer to Figure 3 for further detail.
 - Vibration monitors will alert the excavation contractor as well as site foreman in the event of any vibration exceedance. Where this occurs a detailed review of the activities generating exceedance and potential mitigation techniques may be explored.
 - In the event of complaints from neighbouring properties, attended noise or vibration measurements may be considered where access is permitted.

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

Yours faithfully,



Acoustic Logic Pty Ltd
Artie Rattananikom