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Dee Why Town Centre Development

Excavation Works - Noise and Vibration Impact Assessment

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1 INTRODUCTION

Acoustic Logic has been engaged to assess potential noise and vibration impacts on nearby developments arising from the proposed excavation and piling works as part of the Dee Why Town Centre development project.

We note that a detailed program for the excavation and construction of the development is not available at this stage (this is not typically undertaken prior to project approval) and as such, a detailed noise and vibration impact assessment cannot be undertaken at this stage.

As such, this report presents an “in principle” analysis of potential noise and vibration impacts, and identified activities with the greatest risk to adversely impact nearby development. This should be developed in greater detail once a construction program is finalised.

2 SITE DESCRIPTION / AFFECTED PROPERTIES

The subject site is located at the corner of Pittwater Road and Howard Avenue.

The site is bounded by Pittwater Road to the west, Howard Avenue to the north and Oaks Avenue to the south.

It is proposed to develop this portion of land into a mixed-use residential and commercial precinct, consisting of four residential towers, with two podium levels of retail and commercial tenancies, and four levels of basement car parking.

This assessment relates to the noise and vibration impacts resulting from the proposed excavation works on site, which will primarily include bulk earthworks and shoring activities to enable the development of two basement levels.

Acoustic Logic is instructed that the ground is predominantly sand and hence no rock hammering or sawing operations are envisaged. The proposed works are expected to occur across the entire site (refer Figure 2 below), over an approximate 6 – 8 month period.

The nearest potentially affected receivers within the vicinity of the site are as follows;

- Multi-storey mixed-use development to the east, at 23 Howard Avenue;
- Multi-storey mixed-use developments to the north and south, across Howard Avenue and Oaks Avenue respectively. These developments generally comprise of ground level retail areas with upper level of residential tenancy;
- Dee Why Post Office to the east, at 32-34 Oaks Avenue.

Figure 1 below illustrates the location of subject site, nearest potentially affected properties and unattended noise monitor.



Subject Site

Multi-storey mixed-used commercial and residential properties

Mixed-use property at 23 Howard Avenue

Unattended noise monitor location

Dee Why Post Office

Multi-storey mixed-used commercial and residential properties

Figure 1 – Site Description (source: SixMaps)

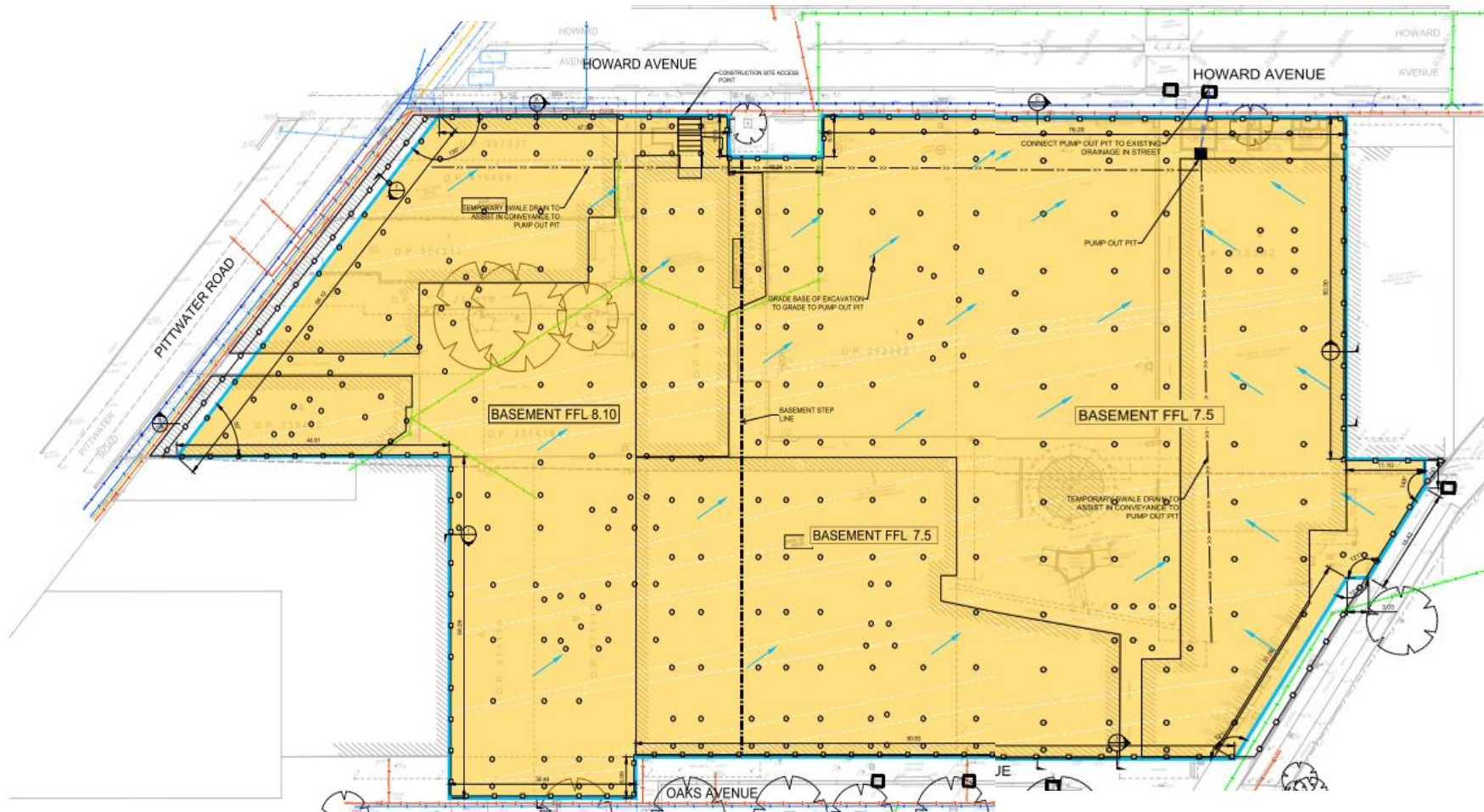


Figure 2 – Proposed Early works, Bulk Earthworks & Shoring Area Plan

3 AMBIENT NOISE MONITORING

Unattended long term noise monitoring was previously conducted by this office at the subject site, to gauge the existing ambient levels. The noise monitor was installed adjacent to the mixed-use receiver at 30 Howard Avenue (refer Figure 1), away from the heavy traffic noise from Pittwater Noise and commercial activities of Oaks Avenue. Monitoring was conducted from the 5th to 11th December 2014, using an Acoustic Research Laboratories noise monitor. The logger was programmed to record in an A-weighted fast response mode, storing 15-minute statistical noise levels throughout the monitoring period. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted.

Measured background noise levels at this location will be representative of the lowest background noise levels at the nearest affected sensitive receivers. Refer to Appendix 1 for detailed noise monitoring data.

Table 1 – Measured Background Noise Levels

Location	Background noise level dB(A) $L_{90(15minutes)}$		
	Daytime (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)
Monitor Location (figure 1)	50	50	43

4 PROPOSED HOURS OF WORK

Section 2.2 of the EPA's Interim Construction Noise Guideline (ICNG) recommends the following standard hours of construction. Certain activities can be performed outside of these hours, and these are detailed in section 2.3 of the ICNG.

Table 2 – Recommended Standard Hours of Construction Work

Work Type	Recommended standard hours of work
Normal construction	Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays and Public Holidays

5 ASSESSMENT CRITERIA

In the absence of there being any construction noise guidelines in the Warringah Council DCP excavation and construction noise and vibration impacts will be assessed with reference to the following guidelines:

- NSW Environmental Protection Authority (EPA) *Interim Construction Noise Guideline* (ICNG);
- NSW EPA *Assessing Vibration: a technical guideline*;
- German Standard DIN 4150-3 '*Structural Vibration: Effects of Vibration on Structures*'; and
- Australian Standard 2435-2010 '*Guide to noise and vibration control on construction, demolition and maintenance sites*'.

5.1 NOISE IMPACTS

Noise impacts resulting from the bulk excavation and shoring activities will be assessed against the provisions of the NSW EPA ICNG and AS 2436-2010.

5.1.1 EPA Interim Construction Noise Guideline

This guideline nominates acceptable levels of noise emissions above the background noise level. For projects within the recommended standard hours, the guideline recommends a noise level of 10 dB(A) above the background for surrounding affected residential properties. This level is referred to as the "Management Level". Additionally, section 4.1.3 of this guideline also nominates acceptable external noise levels for commercial and industrial receivers and is presented below.

Table 3 – Noise Emission Goal – Residential Properties

Time of Day	Measured Background Noise Level dB(A) _{L90}	Management Level = Background Level + 10dB(A) _{L_{eq}(15min)}
Day (7am-6pm)	51*	61

*This level has been determined based on daytime on-site noise measurements.

Table 4 – Noise Emission Goal – Other Land Uses

Type of Land Use	Management Level dB(A) _{L_{eq}(15min)}
Offices and Retail Outlets	70

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

If noise emissions are likely to exceed 75 dB(A)_{L_{eq}(15min)} at the boundary of surrounding affected residential receivers, the receiver is deemed to be "highly noise affected". Introduction of

management controls such as scheduling of noisy periods, or respite periods is then recommended.

5.1.2 Australian Standard 2436-1981 “Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites”

The Australian Standard AS2436 states that where all reasonable and available measures have been taken to reduce construction noise, mitigation strategies may be put in place to reduce levels noise levels to within a reasonable and acceptable level.

For the control and regulation of noise from construction sites, AS 2436:1981 nominates the following:

- a. That reasonable suitable noise criterion is established,
- b. 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 construction hours, and
- c. The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the construction site.

The guideline reflects on feasible and reasonable mitigation strategies, management controls and public liaising in the effort to reach realistic compromises between construction sites and potential noise affected receivers.

Based on these criteria the following procedure will be used to assess noise emissions:

- Predict noise levels produced by typical construction activities at the sensitive receivers.
- Adopt management conditions as per AS 2436 in the event of a non-compliance.

5.2 VIBRATION

Vibration caused by construction should be limited to:

- For structural damage vibration, German Standard DIN 4150-3 *Structural Vibration: Effects of Vibration on Structures; and*
- For human exposure to vibration (amenity), the evaluation criteria presented in the NSW EPA's *Assessing Vibration: a technical guideline* document.

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

5.2.1 Structure Borne Vibrations

German Standard DIN 4150-3 (1999-02) provides a guideline for acceptable levels of vibration velocity in building foundations, to assess the effects of vibration on structures. The table give guidance on the maximum accepted values of velocity at the foundation and in the plane of the highest floor of various types of buildings, to prevent any structural damage.

The table below lists the peak particle velocity, which is the maximum absolute value of the velocity signals for the three orthogonal components. This is measured as a maximum value of any of the three orthogonal component particle velocities when 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 – Human Comfort

The NSW EPA's *Assessing Vibration – a technical guideline* is based on the guidelines contained in British Standard BS 6472-1992 'Guide to Evaluate Human Exposure to Vibration Buildings (1Hz to 80Hz)'. This guideline provides procedures for assessing tactile vibration and regenerated noise within potentially affected buildings.

The recommendations of this guideline should be adopted to assess and manage vibration from the site. Where vibration exceeds, or is likely to exceed, the recommended levels then an assessment of reasonable and feasible methods for the management of vibration should be undertaken.

Table 6 – BS 6472 Vibration Criteria

		RMS acceleration (m/s ²)		RMS velocity (mm/s)		Peak velocity (mm/s)	
Place	Time	Preferred	Maximum	Preferred	Maximum	Preferred	Maximum
Continuous Vibration							
Residences	Daytime	0.01	0.02	0.2	0.4	0.28	0.56
Offices	Day or night-time	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	Day or night-time	0.64	1.28	13	26	18	36
Workshops		0.64	1.23	13	26	18	36

6 COMMENT / ASSESSMENT

Potential noise and vibration impacts are reviewed below.

6.1 NOISE IMPACTS

6.1.1 Analysis

Noise impacts on nearby development will be dependent on the activity and where on the site the activity is undertaken.

As the subject land is predominantly sand, no hammering or sawing operations are proposed. Piling operations associated with the excavation works will be the loudest typical activity. Work close to the eastern boundary of the site (predominantly along the north-east boundary) will have greatest impact on the adjoining residential receivers at 23 Howard Avenue.

Initial analysis indicates:

- Excavators (dozers with buckets) and Piling rigs will typically be the loudest plant/equipment.
- The following Sound Power Levels are typical for the plant/equipment;
 - Piling –Sheet piling approx. 115 – 20 dB(A)_{L_{eq}} & CFA piling approx. 108 dB(A). We have been informed by the client that sheet piling only proposed in the central part of site.
 - Excavators (no hammer or saw attachments) – approx. 110 dB(A)_{L_{eq}}.

- Piling:
 - Noise levels of upto 81 dB(A) will potentially be generated at the façade of the adjoining multi-storey development at 23 Howard Avenue, from CFA operations when operating within 10m of the site boundary. This will drop to <75 dB(A) for piling operations approx. 15m from this receiver. Typically, noise levels between 63 – 75 dB(A) can be expected from CFA operations.
 - Noise levels of upto 73 dB(A) can be expected from the sheet piling operations, at the façade of the adjoining multi-storey development at 23 Howard Avenue. This type of piling is only proposed across the central part of the site. Typically, noise levels between 60 – 73 dB(A) can be expected from sheet piling activities
- General Excavation Works – Noise levels of upto 81 dB(A) will potentially be generated at the façade of the adjoining multi-storey development at 23 Howard Avenue, when excavation works occur within 20m of the site boundary. This will drop to <75 dB(A) for piling operations approx. 25m from this receiver.

Lower noise levels of between 65 – 70 dB(A) can be expected from excavation operations at all other areas of the site.

- The multi-storey mixed use properties to the north (across Howard Avenue) and south (across Oaks Avenue) will not be as severely impacted as the property at 23 Howard Avenue. The followings levels are predicted;
 - Sheet or Bored Piles – 69 to 75 dB(A)_{Leq}.
 - CFA Piling – 58 to 63 dB(A)_{Leq}.
 - Excavation Works – 60 to 65 dB(A)_{Leq}.

Noise levels at these residences are predicted to be below 75dB(A)_{Leq}.

Noise impacts can be minimised using the following:

- Selection of equipment and process.
- Location of static plant as far as possible from residences.
- Use of screens or enclosures (typically only feasible for static plant).
- Scheduling of noisy activities and provision of respite periods.

Detailed construction noise planning is typically undertaken after engagement of a builder and a construction program is prepared (i.e. – after DA stage) and therefore, detailed planning is not possible at this stage.

6.1.2 Recommendations

In light of the above, we recommend:

- On completion of the construction program, acoustic review of proposed construction activities and plant/methods should be undertaken to identify work items likely to exceed EPA guidelines.
- Use of continuous flight auger piling (CFA) in place of sheet or bored piling, if practicable.
- For those activities likely to generate high noise levels (typically, excavation and piling within 30m of property boundaries) the analysis should identify where on the site are the areas likely to result in high noise levels. This will then assist in determining the likely time period for which high noise levels will occur.
- Identify feasible acoustic controls or management techniques (use of hoardings to provide screening, scheduling of noisy works, notification of adjoining land users) when exceedance of Noise Management Levels are predicted.
- For activities where acoustic controls and management techniques still cannot guarantee compliance with “Highly Noise Effected” targets, implement a notification process whereby nearby development is made aware of the time and duration of noise intensive construction processes.
- In the event of complaint, use of respite periods or similar should be considered. (Typically respite periods should be implemented as a last resort given that they will extend the excavation/shoring time period and in the event that the respite period occurs in the middle for the day, they will serve to prolong the noisy period while providing respite when the majority of residents will not be home in any event.

Through adoption of the above, noise impacts on nearby development can be suitably managed to prevent excessive impacts.

6.2 VIBRATION IMPACTS

Sheet piling operations within the 10-15m of the eastern (north-east) and western (south-western) boundaries of the site, will have potential to impact on the amenity of adjoining land uses. Figure 3 below illustrates these locations.

Excavation in sand (using dozer with bucket) and augured piling is unlikely to generate significant levels of vibration until within 5m of a residential building.



Figure 3 – Potential Excavation Vibration Impact Zones

We recommend:

- For at least the initial stages of excavation and piling, vibration monitoring should be undertaken at the adjoining properties at 23 Howard Avenue and 876A & 878 Pittwater Road, to ensure excessive vibration is not generated from the works. Any monitoring system should allow for rapid feedback to the contractor (for example, SMS notification) in the event that excessive levels are reached.
- Use of continuous flight auger piling (CFA) in place of sheet or bored piling wherever practicable.

Adoption of the above will provide a framework to ensure that appropriate systems for monitoring and management of vibration can be implemented.

7 CONCLUSION

Acoustic Logic has conducted an analysis of noise and vibration impacts as a result of proposed excavation and piling works at the Dee Why Town Centre development.

As with any large scale development, the site has the potential to create noise and vibration impacts on nearby development is not managed, particularly given the proximity to the nearest residences.

We note that bulk excavation (being primarily in sand) will have comparatively small noise and vibration impacts. Shoring works, particularly if sheet piling is proposed, has the potential to create noise and vibration impacts close to or exceeding EPA guidelines. The potential need for noise/vibration mitigation, in particular monitoring of vibration, has been recommended in section 6 of this report.

Detailed analysis of potential noise and vibration impacts, particularly the likely duration of any period when a nearby residence will be significantly impacted, should be determined once a construction program for the excavation process is finalised to determine which of the treatments outlined above is the most practicable at the site.

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

Yours faithfully,



Acoustic Logic Consultancy Pty Ltd
Yogendra Kalkunte