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Review of Construction Noise Impacts

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1 INTRODUCTION

Acoustic Logic (AL) have undertaken a preliminary review of potential noise impacts associated with future construction activities across the new proposed Medical Ambulatory Care and Medical Imaging areas of the Wollongong Hospital.

The principal objective of this study is to undertake an evaluation of potentially disruptive construction activities to be conducted across the various phases of the project and forecast their associated impacts on the acoustic amenity of internal receptors within existing areas of the hospital. The evaluation will be used to formulate suitable noise mitigation measures and controls as part of a wider Review of Environment Factors (REF) prepared by Health Infrastructure.

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

- Construction activities that will be conducted and the associated noise sources (indicative)
- Identification of potentially affected noise sensitive areas
- Hours of work and construction periods (indicative)
- Construction noise objectives
- Discussion of noise impacts from proposed construction activities
- Noise response procedures
- Acoustic ameliorative treatments

This report does not assess potential noise impacts to any receivers located externally.

This assessment has been conducted based on the documentation supplied by Health Infrastructure and should be updated once detailed construction methodologies have been formulated.

2 SITE DESCRIPTION AND PROPOSED WORKS

Construction activities are to be undertaken in the following areas:

Table 1 – Planned Construction Activities

Location	General Description of Main Works
Level 8 Medical Ambulatory Care Unit (MAC)	• Demolition of existing internal office fit-out space and associated services • Fit-out construction works for new MAC with associated services and finishes.
Level 1 – Level 2 Medical Imaging Services	• Demolition of existing atrium/courtyard and structures • Construction of a new two-storey building, comprising o New CT, ultrasound and MRI machines o Control rooms, preparation zones o Associated services and amenities

Typical machines /equipment are outlined below:

- Saw cutters
- Drilling
- Crane
- Hammers
- Hand tools

The nearest noise-sensitive areas within the hospital are identified as follows:

- MAC Unit
    - Existing seminar rooms, offices and auditoriums on level 8
    - Existing spaces directly above and below on levels 7 and 9
- Medical Imaging
    - Existing multi-faith chapel, public and staff corridor areas on level 1
    - External public and staff courtyards on level 2
    - Offices and other sensitive areas within internal areas overlooking the existing atrium/courtyard.

Existing demolition floor plans are outlined in the figures below.

Figure 1 – Medical Ambulatory Care (MAC) Unit Demolition Floor Plan

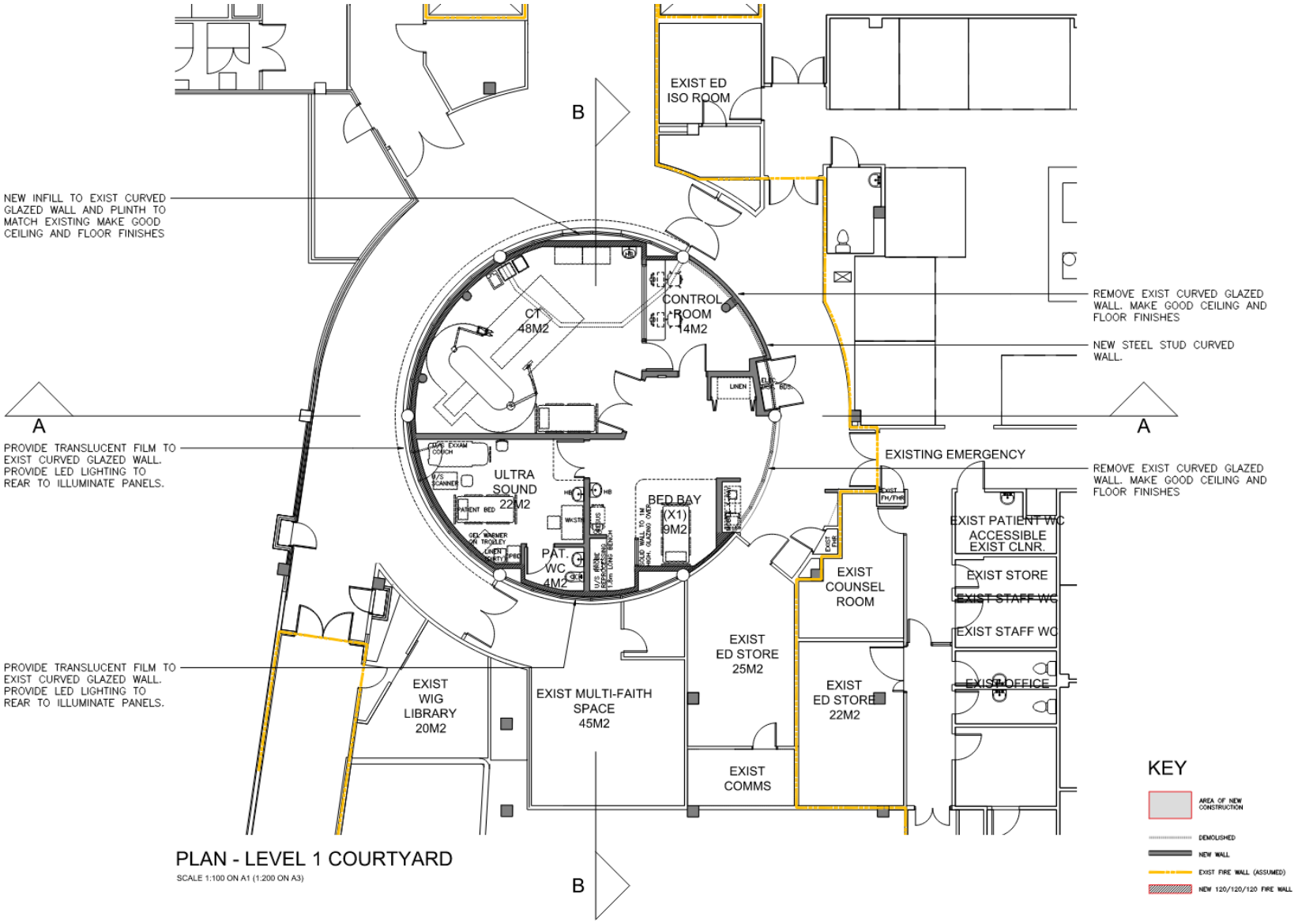


Figure 2 – Medical Imaging Services Floor Plan (Level 1)

3 NOISE MANAGEMENT LEVELS

Construction noise management levels will be formulated with reference to the following documents:

- NSW EPA Interim Construction Noise Guideline (ICNG);
- NSW Health Engineering Services Guide (ESG)
- Australian Standard AS 2107:2016

With respect to the application of the above criteria, it is open for the proponent (Health Infrastructure) to negotiate noise goals/management strategies directly, as it is an impact within their own development. However, for assistance, target noise goals for all internal locations in the hospital have been provided.

3.1 EPA INTERIM CONSTRUCTION NOISE GUIDELINE (ICNG)

Section 4.1.2 of the ICNG recommends the following construction noise management levels for internal hospital receivers:

Table 2 – ICNG Noise Trigger Levels – Internal Areas

Land Use	Noise Management Level – dB(A)$L_{eq(15\ min)}$
Hospital Wards and Operating Theatres	Internal noise level – 45dB(A)

The ICGN does not have construction noise management levels (**NMLs**) for other noise sensitive areas within hospital receivers such as offices and consulting rooms. In lieu of this, Australian Standard AS2107:2016/ ESG are commonly used standards for the assessment of noise impacted to internal areas.

Given that construction noise is a temporary, not a permanent noise source, it is reasonable that a more relaxed acoustic criteria is adopted as opposed to a straight application to the AS2107/ESG recommended internal noise levels. In our experience, in the assessment of construction noise, it is common to adopt a noise target which is between 5dB(A) to 10dB(A) more relaxed than the strict application of AS2107/ESG noise levels for permanent noise. This being the case, management noise levels for spaces other than wards and operating theatres is as follows:

Table 3 – Construction Noise Goals for Typical Internal Areas

Room Use	ESG Noise Level dB(A)	Proposed Construction NML dB(A)$L_{eq,15min}$
Multifaith chapel	35	45
Private office, classrooms, training rooms, meeting rooms	40	50
Consulting room, treatment rooms	45	50
ICU	45	50
Open plan office and staff rooms	45	55
Laboratories and work rooms	50	60
Public corridors and lobby spaces	50	60

4 ACTIVITIES TO BE CONDUCTED AND ASSOCIATED SOURCE NOISE LEVELS

Typically, the most significant sources of noise generated during a construction project will be demolition, excavation, civil works (compaction, asphalting), piling and erecting of structures.

Noise levels from fit-out works will generally have only a localised effect to spaces immediately adjacent to construction areas, as works will be carried out internally and potentially behind closed façades.

A typical list of significant noise -producing construction equipment are provided below (note: not all equipment will be applicable to the development):

Table 4 - Sound Power Levels of Typical Main Noise Producing Equipment Items

Equipment / Process	Sound Power Level dB(A)	Usage in 15-Minute Period (Minutes)	Time Corrected Sound Power Level dB(A) $L_{eq,15\text{-}min}$
Concrete Saw	115	5	110
Pneumatic Jack Hammer	113	5	108
Piling Rig	112	5	107
Excavator with bucket/ concrete "muncher"	110	10	108
Rock ripper/ Dozer	110	5	105
Compactor (Vibratory)	110	5	105
Electric Tower Crane	105	5	100
Trucks and Concrete Trucks/Pumps	105	10	103
Powered Hand Tools	95-100	10	93-98
Bobcat	100	5	97
Electric Hoist	100	10	98

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

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

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

5 PRELIMINARY CONSTRUCTION NOISE ASSESSMENT

Construction noise levels will depend on:

- The activity undertaken.
- The distance between the work site and the receiver. For many of the work areas, the distance between the noise source and the receiver will vary depending on which end of the work zone the work is being undertaken in.
- The presence of any natural or other barriers between the source and receiver.

5.1 PREDICTED NOISE LEVELS

A prediction of construction noise impacts is presented below, and take into account the following assumptions:

- All façades overlooking into the existing level 1 atrium are enclosed and adequately sealed (i.e., all windows to internal areas are closed).
- When predicting noise impacts to internal areas, a conservative noise reduction of 25dB(A) is assumed through the façade (equal to 6mm glazing or similar, as determined based on initial site investigations) or internal separating partition.
    - A higher noise reduction of 33dB(A) is typical for solid/masonry façades

Predicted noise levels are presented in the table below:

Table 5 – Predicted Noise Generation – General Construction Activities

Activity Noise Level	Predicted Level – dB(A)$L_{eq,15min}$	Noise Management Level dB(A)$L_{eq,15min}$	Comment
Heavy Machinery Sound Power Level: >105	35-50	45 to 60 dB(A) depending on room usage (internal)	Exceeds NML for the most noise-sensitive rooms when operating within 3m of the affected area. Refer to discussion below.
Fit out works (powered hand tools) Sound Power Level: ≤100	30-36		Generally satisfies requirements*

*refer to Section 5.2.1 for a discussion of the limitations of this assessment.

5.2 DISCUSSION AND RECOMMENDATIONS

The predictions indicate that noise levels during some construction activities may exceed the NMLs when the plant is operating close to the façade of the adjacent noise-sensitive area. Satisfactory noise levels are predicted for most offices, staff rooms, meeting rooms and the like.

Given that intensive works close to the building are likely to occur close to areas like the multi-faith chapel located on the first floor, it is unlikely that barrier treatments are likely to be practical in this case.

The following noise management strategies are recommended to minimise noise impacts to noise-sensitive spaces:

- Selecting the quietest practical plant and methodologies.
- Liaising with staff to advise them of the scheduling of activities and the likely level of impact.
- Determining whether the affected façade contains ward rooms and preventing early morning works, or other respite if that is the case.
- Additional investigations to determine the effectiveness of the façade and predicted internal noise levels and an examination of treatment options for critical rooms.
- A hoarding which provides a barrier screen between the works and surrounding areas.
- If required, installation of temporary acoustically rated partitions (Rw 45 wall or greater) to further separate works from circulation areas which will reduce transmitted sound to below the NMLs for most of the time.
- If necessary, noise monitoring to establish impacts based on site conditions, and safe working distances, and to continuously monitor noise levels during critical periods. The results of monitoring should feed back into the construction management plan.

5.2.1 Limitations of this Assessment

- It is expected that given the age of the building some operable façades (windows and the like) will not perform as well as they are expected to (e.g. as a result of worn out/poor sealing of windows, etc).
- The assessment does not take into consideration areas of façades which cannot be closed (e.g. some operable windows/louvre openings, if any).
    - For affected areas, these should be assessed once further investigation has been undertaken or where noise complaints are received on a case-by-case basis (per the advice provided on the following pages).

5.3 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 contractor and the regulatory authority. This establishes a dynamic response process which allows for the adjustment of control methods and criteria for the benefit of all parties.

The objective in undertaking a consultation processes is to:

- Inform and educate the groups (e.g. hospital staff) 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 Complaints Register which will be used to address any construction noise related problems should they arise.

5.4 DEALING WITH COMPLAINTS

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

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

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

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

A permanent register of complaints should be held.

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

The investigation of a complaint shall involve where applicable;

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

Where an item of plant is found to be emitting excessive noise, 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.

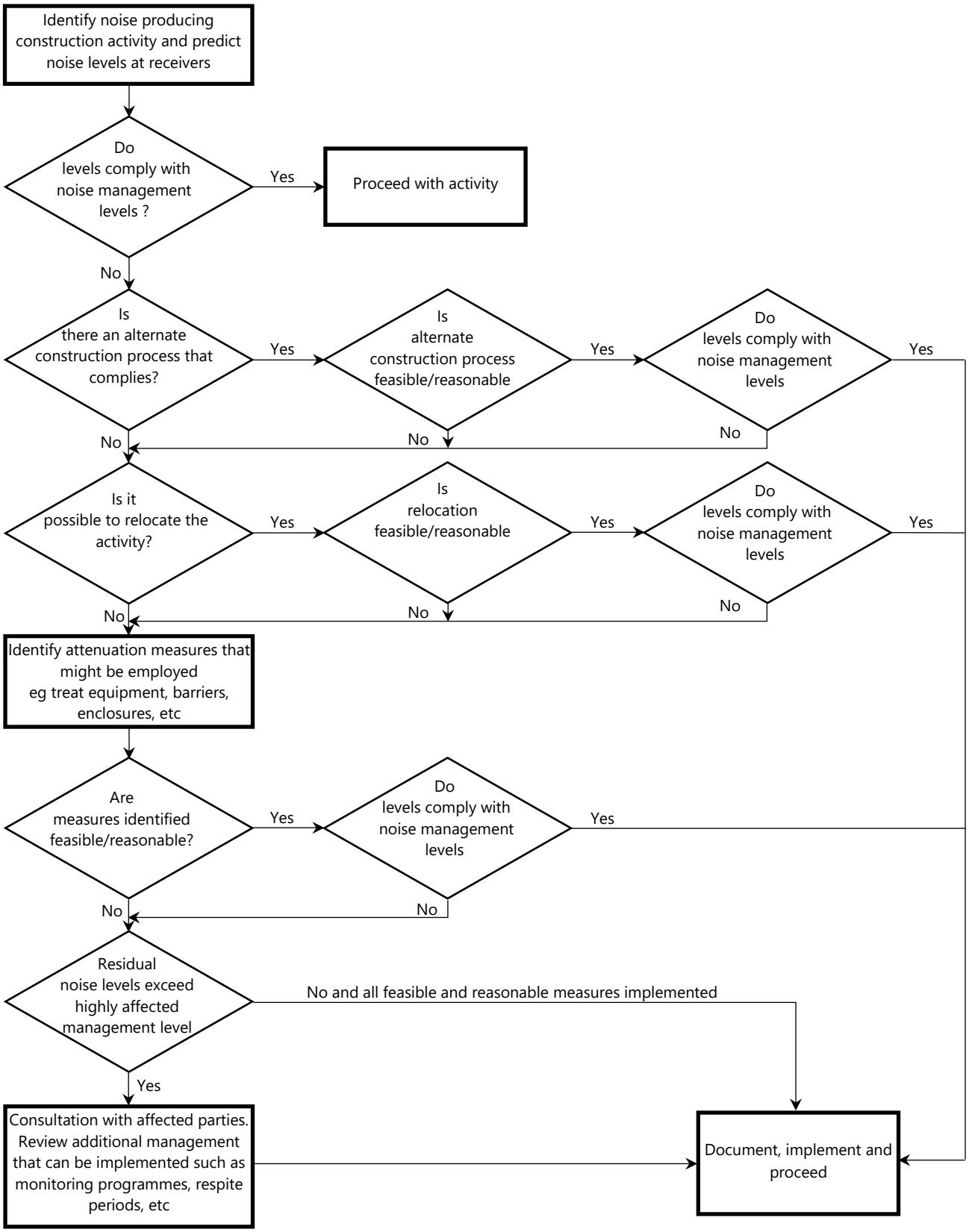
5.5 CONTINGENCY PLANS

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 monitoring devices at locations representing the nearest affected receivers and provide data for each complain time period. Analysis is required to determine suitable mitigation measures.

Complaints associated with noise 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.

6 CONTROL OF CONSTRUCTION NOISE– PROCEDURAL STEPS FLOW CHART



7 CONCLUSION

Potential noise impacts associated with future construction works at Wollongong Hospital have been assessed to determine the processes likely to require additional management to minimise impacts.

Where impacts have been identified, additional management has been recommended including physical controls, management of construction activities and monitoring. An accompanying construction management plan should be developed and refined as additional information regarding site activities and construction methodologies are further developed.

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

Yours faithfully,

Acoustic Logic Pty Ltd
Hyde Deng
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