MANAGING DIRECTORS
MATTHEW PALAVIDIS
VICTOR FATTORETTO

DIRECTORS
MATTHEW SHIELDS
BEN WHITE

Prince of Wales, CCBDC

Condition D1 Modification - Extension of Construction Hours

SYDNEY
A: 9 Sarah St Mascot NSW 2020
T: (02) 8339 8000
F: (02) 8338 8399

SYDNEY MELBOURNE BRISBANE CANBERRA
LONDON DUBAI SINGAPORE GREECE

www.acousticlogic.com.au
ABN: 11 068 954 343

DOCUMENT CONTROL REGISTER

Project Number	20120199.7
Project Name	Prince of Wales, CCBDC
Document Title	Condition D1 Modification - Extension of Construction Hours
Document Reference	20120199.7/0511A/R1/TA
Issue Type	Email
Attention To	Health Infrastructure (ABN 89 600 377 397) Mr Matthew Owen

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	5/11/2012	20120199.7/0511A/R0/TA	TA		BW
1	5/11/2012	20120199.7/0511A/R1/TA	TA		TA

TABLE OF CONTENTS

1 INTRODUCTION 4
2 PROJECT PROPOSAL AND ASSOCIATED PLANT 4
3 SITE DESCRIPTION & POTENTIALLY AFFECTED RECEIVERS 6
4 NOISE EMISSION CRITERIA 8
4.1.1 Australian Standard AS2436:1981 “Guide to noise control on construction, maintenance and demolition sites 8
4.1.2 EPA Construction Noise Guideline 8
4.1.3 EPA Construction Noise Guideline - Quantitative Assessment Method 9
4.2 NOISE EMISSION GOALS 10
5 VIBRATION CRITERIA 11
5.1.1 German Standard DIN 4150-3 (1999-02) 11
5.1.2 British Standard BS 6472:1992 12
6 NOISE AND VIBRATION EMISSION ASSESSMENT 13
6.1 NOISE SOURCE LEVELS 13
6.2 PREDICTED NOISE LEVELS 13
6.2.1.1 Receiver 1 14
6.3 VIBRATION EMISSIONS 14
6.4 DISCUSSION AND RECOMMENDATIONS 14
7 DISUCUSSION 15
8 CONCLUSION 16

1 INTRODUCTION

This report presents an assessment of potential noise impacts to surrounding residential receivers arising from the proposed extension of construction hours for certain activities at the Price of Wales Comprehensive Cancer and Blood Disorder Centre (CCBDC). It is proposed to undertake some preparatory and delivery works outside the approved operating periods of 7:00am to 5:00pm Monday – Friday and Saturday 8:00am to 5:00pm as per condition D1 of Department of Planning and Infrastructure Application SSD-5036-2011.

In recognition of the potential noise impacts associated with these works, a study has been undertaken to assess the noise impacts arising from the extended hour's works, and to recommend appropriate management and physical controls to prevent any adverse impacts.

2 PROJECT PROPOSAL AND ASSOCIATED PLANT

It is proposed that the currently permissible work time from 7:00am – 5:00pm Mondays to Fridays be extended to 6:30am – 6:30pm, (an increase of 120 mins). Additionally, it is proposed that Saturday's construction hours be shifted from 8:00am - 5:00pm to 7:00am - 4:00pm. There is no additional construction time on site associated with Saturday's proposal.

The activities and associated plant proposed during the extension of the morning extension of works hours are as follows:

- Equipment setup/minor operation – Manual works involved with existing site equipment, which include safety checks.

- Loading dock setup – It is proposed to setup the loading dock during this half hour period in order to avoid congestion on site and delays this may cause to other construction activities. The setup of the loading dock involves trucks arriving on site and setting up prior to works commencing.

- General services installation – this includes the set-up of all services, but not the active site operations

- Deliveries – Due to the time restrictions imposed on trade deliveries (especially in the morning period), it is proposed to start trade deliveries to the site from 6:30am to reduce traffic congestion to the site and on adjoining roads.

- Concrete Pumps – To avoid congestion on site during the setup of a pump and pouring, it is proposed to undertake the setting up of concrete pumps during this early period. ***Note: The pumps will not operate during this period.*** The activities associated are as follows:

    - Ensuring the pump is set up in the correct location & positioned on stable surface;
    - Ensuring traffic control signs are in place;
    - Pipe line securely set up & supported;
    - Overhead boom lengths are sufficient to reach the pour; and
    - Fixing of formwork and steel fixing;

    - Outriggers.

- Site activities which are conducted within the building shell including carpentry and plasterboard wall construction.

3 SITE DESCRIPTION & POTENTIALLY AFFECTED RECEIVERS

The proposed Prince of Wales Hospital CCBDC Project is located within the Randwick Hospital precent on corner of High Street and Avoca Street.

The activities contained within the proposed scope of works are as follows:

- Excavation Stage – Bulk excavation of existing on grade car park.
- Construction Stage – Construction of a new lower ground treatment area with four radiotherapy bunkers and a corridor connecting the new radiotherapy treatment area to Prince of Wales Hospital.

The nearest potentially worst affected receivers are:

- Residential development to the east of the site on Belmore Road.
- Existing buildings within the Princes of Wales Hospital campus.

It is noted that the proposed extension of hours is outside of the typical operating hours of the existing Prince of Wales Hospital development and as such, noise emissions to the external residential receivers will only be addressed in this report. Compliance at the residential receivers on Belmore Road will result in compliance at all other surrounding residential receivers.

Figure 1 below details the proposed site location as well as the potentially affected surrounding receivers within the vicinity of the site.

Figure 1 below details the proposed site location as well as the potentially affected surrounding receivers within the vicinity of the site.

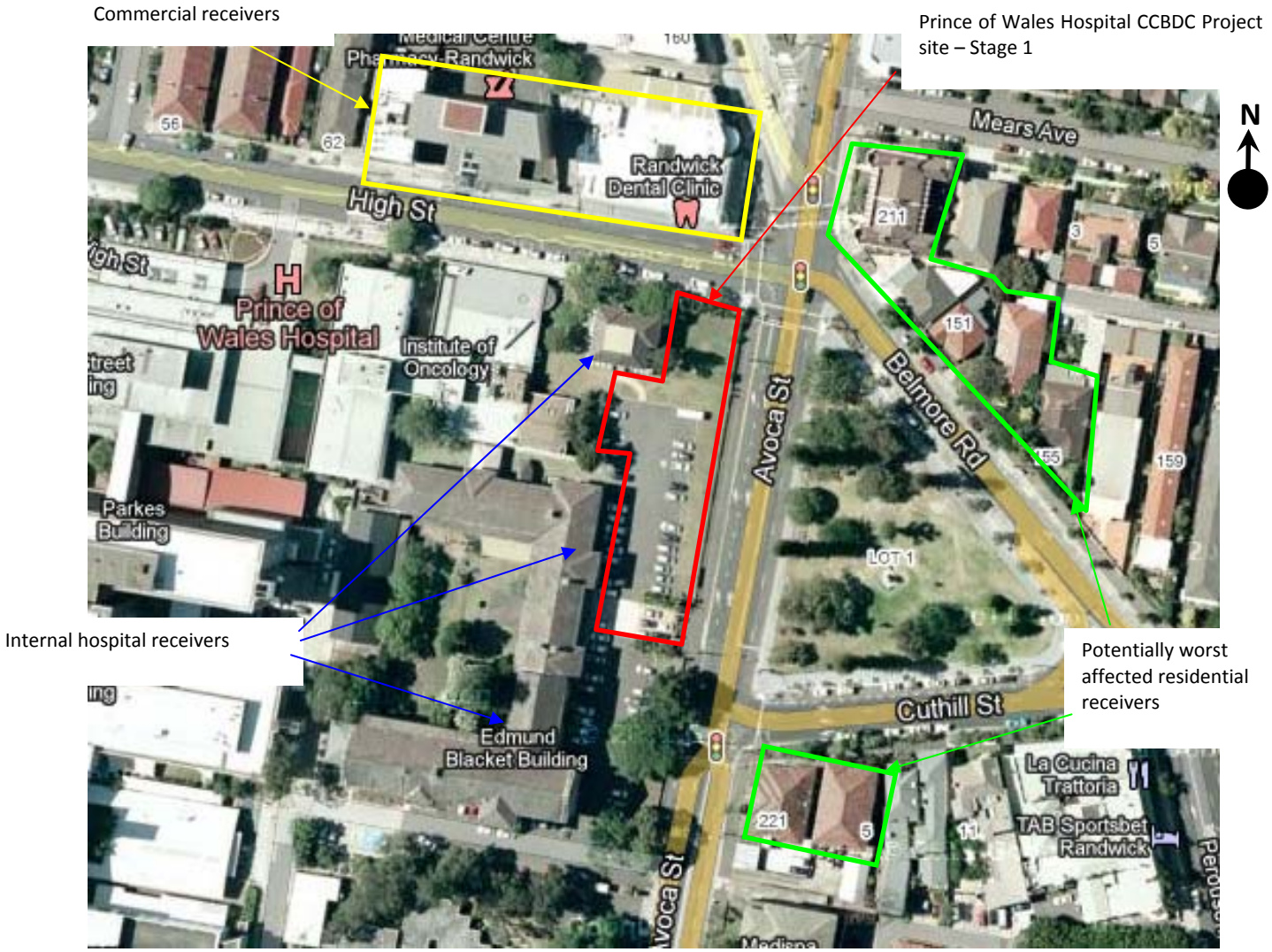

Figure 1 – Site Location and Surrounding Receivers

4 NOISE EMISSION CRITERIA

It is proposed to utilise Australian Standard AS2436:1981 *"Guide to noise control on construction, maintenance and demolition sites"*, which is the standard commonly applied by Councils for the regulation of construction noise and the New South Wales Construction Noise Guideline developed by The NSW Environmental Protection Authority (EPA).

4.1.1 Australian Standard AS2436:1981 "Guide to noise control on construction, maintenance and demolition 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 AS2436:1981 *"Guide to noise control on construction, maintenance and demolition sites"* nominates the following:

- That reasonable suitable noise criterion is established,
- That all practicable measures be taken on the building site to regulate noise emissions, including the sitting 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
- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the demolition, excavation and construction site.

4.1.2 EPA Construction Noise Guideline

The Environmental Protection Authority (EPA) has developed a specific construction noise guideline in the aid of reducing the impact of construction associated noise.

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

4.1.3 EPA Construction Noise Guideline - Quantitative Assessment Method

The guideline refers to a quantitative assessment method in which construction noise is assessed on a case by case basis with regard to various activities to be conducted on site. This assessment method was developed to smaller scale projects.

Essentially this method of assessment requires that the proponent take into consideration and employ all reasonable and feasible measures to ensure that the impact on noise receivers is minimised. This is generally conducted in the following manner:

- The drafting of a noise management plan outlining all reasonable and feasible mitigation methods for the reduction of noise impact;
- The assessment of high impact equipment such as rock-hammers and piling equipment for lower noise producing methods of construction/excavation;
- The implementation of a complaints handling register and community consultation system;
- Employee (builders, contractors etc) education in effective noise reducing techniques and site etiquette; and
- The operation of plant in a quiet and efficient manner (i.e. turning off machinery when not in use).

This quantitative assessment method has been used for the basis of this report and has been used as the basis for the development of acoustic management and treatments of proposed construction activities.

In addition, the guideline specifies goals which can be used in the effort of minimising noise from construction related activities. These noise goals are presented within the table below.

Table 1 – EPA Recommended Construction Noise Goals

Governing Body	Receiver Type	External sound level Goal, $L_{eq\ 15\ min}$ dB(A)
EPA	Residential	Background + 10 dB(A)[1]
		75 dB(A)[2]

1: Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to minimise noise. (DECCW CNG, 2008).

2: Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided. (DECCW CNG, 2008).

These criteria for resultant noise from construction activities are aimed at maintaining comfort levels within the surrounding residential dwellings. Additionally, noise mitigation techniques as discussed in this report should be used if noise emissions exceed the above criteria. All work is to be carried out in accordance with AS 2436:1981 *"Guide to noise control on construction, maintenance and demolition sites"*.

4.2 NOISE EMISSION GOALS

Background noise measurements for the period of 6:30am to 7:00am and 5:00 to 6:30pm were taken at the site. Measurements were conducted using an ARL Precision Noise Logger. The equipment was calibrated at the beginning and end of the measurements using a Norsonic 1252 calibrator; no significant drift was detected. Measurements were taken on A-weighted fast response mode.

Noise emissions from the site during these proposed extended periods will be assessed to comply with the BG + 10dB criterion.

Background noise levels at residential receivers are as follows:

Table 2 – External Noise Objectives - Belmore Road

Time	Measured Daytime (6:30am – 7:00am) Background Noise Level dB(A) $L_{90(15minutes)}$	Noise Goal dB(A) $L_{10\ (15minutes)}$
6:30am to 7:00am	48	BG +10= 58
5:00pm to 6:30pm	53	BG +10= 63

As the 6:30am to 7:00am period represents the most stringent time period for noise emissions, site activities will be assessed against this period's noise goal.

5 VIBRATION CRITERIA

Construction vibration criteria associated with works on the Prince of Wales Hospital CCBDC Project when measured at the potentially affected receivers should not exceed the following sets of vibration criteria to ensure no architectural or structural damage to surrounding buildings and human comfort is maintained. These standards have been selected as they are widely used in the assessment of vibration associated with construction activities within Australia, namely:

- German Standard DIN 4150-3 (1999-02): *"Structural Vibration – Effects of Vibration on Structures"*; and

- British Standard BS 6472:1992 *"Guide to Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)*.

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

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

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in the Table below.

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 3 – 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 (eg buildings that are under a preservation order)	3	3 to 8	8 to 10	8

5.1.2 British Standard BS 6472:1992

British Standard BS 6472:1992 develops criteria relating to levels of building vibration that may be expected to give rise to *"adverse comment"*, in the frequency range most applicable to impacts associated with construction, which is 1 to 80Hz. These threshold values are used as criteria for assessing the loss of amenity and are presented below in Table 3.

Table 4 – BS 6472:1992 Criteria to Avoid *"Adverse Comment"*

Type of Occupancy	Time of Day	Peak Particle Velocity (mms^{-1}) between 1Hz to 80Hz Likely to Cause *"Adverse Comment"*			
		Continuous Vibration		Intermittent Vibration and Impulsive Vibration Excitation with Several Occurrences per day	
		Vertical	Horizontal	Vertical	Horizontal
Residential	Day	0.3 to 0.6	0.8 to 0.6	8.4 to 12.6	24 to 36
	Night	0.2	0.6	2.8	8
Offices	Day	0.6	1.6	18	51
	Night	0.6	1.6	18	51
Workshops	Day	1.2	3.2	18	51
	Night	1.2	3.2	18	51

The limits indicate that people in buildings are significantly less susceptible to horizontal vibration than to vertical vibration. Furthermore, Section 4.1 of BS 6472 notes that situations can exist where vibration magnitudes above those generally corresponding to minimal *"adverse comment"* levels can be tolerated, particularly for temporary disturbances and infrequent and intermittent events such as those associated with construction projects.

6 NOISE AND VIBRATION EMISSION ASSESSMENT

6.1 NOISE SOURCE LEVELS

Most of the activities proposed during the extended hours of construction include setup and preparatory works, with the exception of trucks accessing the site for deliveries. The A-weighted sound power levels (SWL) for the proposed equipment/processes anticipated to occur during the finishing works of the project are outlined below:

Setup/Preparatory works/minor operation – SWL of a vocal noise from a construction worker on site (raised voice) is 80 dB(A)L_{10}, with no more than 20 workers on site during the subject 06:30 – 07:00 and 5:00pm to 6:30pm periods and one on two talking at any one time.

Deliveries – Typical SWL of semi-trailers servicing a construction site is 105 dB(A)L_{10}.(***Semi – trailers will be the noisiest vehicle accessing the site in comparison to small fuel trucks or other rigid trucks).***

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

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

6.2 PREDICTED NOISE LEVELS

Resultant noise levels at the identified residential receiver locations around the site have been predicted for the proposed rectification works.

The predicted noise levels take into account the following:

- Any penalties associated with the characteristics of the noise source (intermittent, tonality etc.).
- Any barrier or screening affects from existing structures.
- Any attenuation resulting from distance between the equipment and receiver.

6.2.1.1 Receiver 1

The following table presents a summary of noise levels predicted at the boundary of the three storey apartment building located to the east of the subject site on the other side Belmore Road.

Table 5 - Predicted Worst Case Noise Levels – Residential Receiver 1 – Belmore Road

EQUIPMENT /PROCESS	PREDICTED NOISE LEVEL dB(A)L_{10}	RECEIVER NOISE MANAGEMENT LEVEL dB(A) $L_{10(15mins)}$	Comments
		06:30 – 07:00	
Setup / Preparatory Works – Includes equipment and concrete pumps setup.	44 – 51	58	Complies with the management level for setup / preparatory works.
Deliveries and Fuelling – Trucks/Semi-trailers accessing the site	48 - 55	58	

6.3 VIBRATION EMISSIONS

There are no predicted exceedances of the vibration criteria in Section 5.3 with the proposed site activities between the proposed extended hours of operation.

6.4 DISCUSSION AND RECOMMENDATIONS

All setup, preparatory site works and deliveries are in compliance with noise emission goals.

In order to ensure ongoing compliance with the noise management levels during the proposed extended construction period of 6:30am to 7:00am and 5:00pm to 6:30pm, we recommend the following:

- Setup and preparatory works proposed for the existing site equipment and concrete pumps can proceed during this period with no adverse impacts predicted on the worst affected residential receivers.
- Site manager to ensure that the excavators and pumps are not used during this period.
- To ensure ongoing compliance, any new plant item proposed to be used as part of these works will have to be assessed by an acoustic consultant.

The general site practices nominated within the existing CNVMP should be adopted at all times.

7 DISUCUSSION

The proposed extension of hours of operation of Stage One of the CCBDC site will enable preliminary construction works to be completed in a shorter construction timetable. All works proposed within the extension of hour's period are in compliance with noise goals and there will be significant benefit to the community if the construction works are expedited and the community gained two additional weeks of without any noise being emitted from the site.

8 CONCLUSION

A noise impact assessment has been undertaken for the proposed extension of construction hours for the Stage One CCBDC site.

Noise levels associated with the proposed extension of hours periods have been predicted in section 6 of this report. The proposed setup and preparatory works can be undertaken during the proposed extended periods with noise emissions from these activities being in compliance with noise goals at these times.

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

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Thomas Aubusson