Central Park, Block 11

Noise Impact Assessment
## DOCUMENT CONTROL REGISTER

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<tr>
<td>Document Title</td>
<td>Noise Impact Assessment</td>
</tr>
<tr>
<td>Document Reference</td>
<td>20140855.1/0212A/R2/BW</td>
</tr>
<tr>
<td>Issue Type</td>
<td>Email</td>
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<td>Attention To</td>
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<td>Mr Michael Goldrick</td>
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<th>Date</th>
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<th>Prepared By</th>
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<td>20140855.1/0309A/R0/BW</td>
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1 INTRODUCTION

This report presents an analysis of acoustic impacts associated with the proposed residential development located at Block 11 with the Frasers Broadway site.

In this report we will:

- Conduct an external noise impact assessment and recommend acoustic treatments to ensure that internal noise levels comply with the requirements of AS 2107 “Recommended Design Sound Levels and Reverberation Times for Building Interiors”, The State Environmental Planning Policy including SEPP and Sydney City Council DCP.

- Identify potential noise sources generated by the site, and determine noise emission goals for the development to meet acoustic requirements of the City of Sydney Council and those of the NSW EPA Industrial Noise Policy.

This report has been prepared based on architectural drawings forwarded to this office from FJMT.

2 SITE DESCRIPTION

The proposed development consists of a 13 storey residential development with 3 basement levels located on Block 11 of the Frasers Broadway site, Sydney. The site is located with the block bound by Wellington Street, O’Connor Street and Kensington Streets. Other major roadways within the vicinity of the site include Regent Street to the east of the site.

The following noise sources are potentially impact on the project site:

- Traffic Noise within the surrounding vicinity of the site.

Noise potentially generated by the site will primarily consist of noise from the mechanical plant and equipment.

The nearest potentially affected noise receivers are:

- Residential properties on Kensington Street to the east of the site;
- Residential properties on Wellington Street to the south of the site; and
- Future and existing residential properties within other buildings within the Central Park present to the north of the site.

Refer to Figure 1 below, which is an aerial photo of the subject site.
Figure 1 - Site and Measurement Locations

- Subject Site
- Unattended Noise Measurement Location
- Attended Noise Measurement Location
- Residential Receivers
- Commercial receivers

Existing residential buildings

Commercial building

Mixed use residential, commercial and industrial

Proposed Block 11 development site

Subject Site

Unattended Noise Measurement Location

Attended Noise Measurement Location

Residential Receivers

Commercial receivers
3 NOISE DESCRIPTORS

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise three principle measurement parameters are used, namely $L_{10}$, $L_{90}$ and $L_{eq}$.

The $L_{10}$ and $L_{90}$ measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement interval.

The $L_{10}$ parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the $L_{90}$ level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The $L_{90}$ parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the $L_{90}$ level.

The $L_{eq}$ parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. $L_{eq}$ is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Current practice favours the $L_{eq}$ parameter as a means of measuring traffic noise, whereas the $L_{10}$ parameter has been used in the past and is still incorporated in some codes. For the reasons outlined above, the $L_{90}$ parameter is not used to assess traffic noise intrusion.
4 ASSESSMENT OF TRAFFIC NOISE INTRUSION

The Significant traffic noise sources in the vicinity of the site are as follows:

- Regent Street, on the east of the site, which carries medium to high traffic volumes of greater than 40,000 vehicles as AADT and is required to be assessed on conjunction with NSW State Environmental Planning Policy (Infrastructure) 2007 criteria.

Traffic noise impacts should comply with the requirements of the City of Sydney Council DCP, the SEPP (including Development Near Rail Corridors And Busy Roads) and the Australian Standard AS2107:2000.

4.1 TRAFFIC NOISE CRITERIA

4.1.1 City of Sydney Council DCP - Sydney Development Control Plan 2012

The Draft Sydney DCP 2012 states the following with regards to the control of traffic noise intrusion:

“Dwellings are to be constructed so that in a naturally ventilated situation the repeatable maximum LAeq (1 hour) level does not exceed:

i) for closed windows and doors:
   bedrooms (10pm-7am), 35dB; and
   main living area (24 hours), 45dB

ii) for open windows and doors:
   bedrooms (10pm-7am), 45dB; and
   main living area (24 hours), 55dB.

Where natural ventilation of a room cannot be achieved, the repeatable maximum LAeq (1 hour) level when doors are windows are shut and mechanical ventilation/air conditioning is operating in a dwelling is not to exceed, within:

i) bedrooms (10pm-7am), 38dB; and

ii) main living area (24 hours), 48dB

These levels are to include the combined measured level of noise from both external sources and the ventilation system operating normally.”

4.1.2 Australian Standards AS2107:2000

The Australian Standard AS2107-2000 “Recommended Design Sound Levels and Reverberation Times for Building Interiors” recommends maximum design sound levels for different areas of occupancy in the residential development while AS 3671 -1989 “Road Traffic Noise Intrusion - Building Siting and Construction” recommends that an appropriate $L_{eq}$ or $L_{10}$ traffic noise descriptor be used for the occupancy being assessed. Traffic noise criteria for AS2107-2000 is presented in the table below, based on developments near major roadways.
4.1.3 State Environmental Planning Policy

The NSW Department of Planning’s policy, Development Near Rail Corridors And Busy Roads – Interim Guideline, sets out internal noise level criteria adapted from the State Environmental Planning Policy (Infrastructure) 2007 (the ‘Infrastructure SEPP’) for developments with the potential to be impacted by traffic or rail noise and vibration.

The Infrastructure SEPP defines busy roads that are subject to an acoustic assessment as:

“Clause 102: development for any of the following purposes that is on land in or adjacent to a road corridor for a freeway, a tollway or a transit way or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data available on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:

- building for residential use
- a place of public worship
- a hospital
- an educational establishment or childcare.”

The Infrastructure SEPP sets out the following criteria for internal noise levels from airborne traffic noise:

“For Clauses 87 (Rail) and 102 (Road):

“If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following \( L_{eq} \) levels are not exceeded:

- in any bedroom in the building: 35dB(A) at any time 10pm–7am
- anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time.”

Internal requirements are for residential spaces and are measured internally with windows closed.

4.1.4 Summary of Internal Traffic Noise Criteria

Based on the requirements of Sydney City Council DCP, SEPP and AS2107-2000 the following assessment criteria would apply to the proposed development.

<table>
<thead>
<tr>
<th>Table 1 - Traffic Noise Criteria for All Spaces</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LOCATION</strong></td>
</tr>
<tr>
<td>Bedrooms</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Living areas</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
4.2 MEASUREMENTS PROCEDURE

As part of this investigation, traffic noise from the surrounding perimeter roadways has been measured. The results of this measurement will be used to determine the treatments required to reduce noise levels to within the project acoustic objectives.

Measurements included attended and unattended noise levels measurements conducted at the locations as detailed in Figure 1 above.

4.2.1 Unattended Noise Monitoring

Unattended noise monitoring was conducted using an Acoustic Research Laboratories Pty Ltd series 315 noise monitor. The monitor was programmed to store 15-minute statistical noise levels throughout the unmanned monitoring period. Equipment was calibrated at the beginning and the end of the measurement using a Rion NC-74 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode. The unattended noise monitor was installed from 12th to 19th November, 2012.

4.2.2 Attended Monitoring

Attended monitoring was conducted on Abercrombie Street at the boundary of the site were obtained using a Norsonics type 140 Precision Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonics Sound Calibrator type 1251. No significant drift was noted. Measurements were conducted on 22nd August 2014 during the morning traffic peak time of 8am to 9.30am.

4.2.3 Resultant Noise Levels

The following table presents the resultant noise levels at the proposed façade of the development. The noise levels are based on both the attended and unattended noise measurement results conducted by this office. The noise levels are based on the manned background noise measurement results adjusted by the difference with the noise monitor results of similar time periods and distance attenuation.

Table 2 – Measured Traffic Noise Levels

<table>
<thead>
<tr>
<th>Locations</th>
<th>Traffic Noise Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daytime (7am-10pm)</td>
</tr>
<tr>
<td>Regent Street Corner</td>
<td>72 dB(A) ( L_{eq}(1 \text{ Hour}) )</td>
</tr>
<tr>
<td>Wellington Street</td>
<td>67 dB(A) ( L_{eq}(1 \text{ Hour}) )</td>
</tr>
<tr>
<td>O’Connor Street</td>
<td>66 dB(A) ( L_{eq}(1 \text{ Hour}) )</td>
</tr>
</tbody>
</table>
4.3 RECOMMENDED CONSTRUCTIONS

Traffic noise intrusion into the proposed development was assessed using the measured external noise levels reported above as a basis.

Calculations were performed taking into account the orientation of windows, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted. Acoustic treatment required to ensure compliance with the assessment criteria are detailed in this section.

Internal noise levels will primarily be as a result of noise transfer through the windows and doors as these are relatively light building elements that offer less resistance to the transmission of sound. Noise transfer through the masonry elements will not be significant and need not be considered further.

The constructions necessary to achieve the noise levels are detailed below. The predicted noise levels have been based on the expected level and spectral characteristics of the external noise, the area of building elements exposed to traffic noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

Details of glazing are indicative of the proposed acoustic treatments required to comply with the relevant internal noise levels presented in this report. Details of external glazing to be provided to the project will be provided at the CC stage of the project.

4.3.1 Glazed Windows and Doors

The following constructions are recommended to comply with the traffic noise objectives stated in this report and are the typical selections to ensure the internal noise level criteria presented in this report are achieved.

Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.
The recommended constructions are listed in the table below.

**Table 3 – Glazing Construction**

<table>
<thead>
<tr>
<th>Façade</th>
<th>Level</th>
<th>Room</th>
<th>Glazing</th>
<th>Acoustic Seals</th>
</tr>
</thead>
<tbody>
<tr>
<td>O’Connor Street (Northern Façade)</td>
<td>All Levels</td>
<td>Living Areas</td>
<td>6.38mm laminated</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bedrooms</td>
<td>6.38mm laminated</td>
<td>Yes</td>
</tr>
<tr>
<td>Wellington Street (Southern Façade)</td>
<td>All Levels</td>
<td>Living Areas</td>
<td>6.38mm laminated</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bedrooms</td>
<td>6.38mm laminated</td>
<td>Yes</td>
</tr>
<tr>
<td>Western Façade</td>
<td>All Levels</td>
<td>Living Areas</td>
<td>6.38mm laminated</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bedrooms</td>
<td>6.38mm laminated</td>
<td>Yes</td>
</tr>
<tr>
<td>Eastern Façade (Areas facing Regent Street)</td>
<td>All Levels</td>
<td>Living Areas</td>
<td>10.38mm laminated</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bedrooms</td>
<td>10.38mm laminated</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The proposed glazing thickness will satisfy all acoustic requirements of Section 4.1. Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.

It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

In addition to complying with the minimum scheduled glazing thickness, the STC rating of the glazing fitted into open-able frames and fixed into the building opening should not be lower than the values listed in the table below for all rooms. Where nominated, this will require the use of acoustic seals around the full perimeter of open-able frames and the frame will need to be sealed into the building opening using a flexible sealant.

**Table 4 - Minimum STC of Glazing (with Acoustic Seals)**

<table>
<thead>
<tr>
<th>Glazing Assembly</th>
<th>Minimum STC of Installed Window</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.38mm laminated</td>
<td>31</td>
</tr>
<tr>
<td>10.38mm laminated</td>
<td>31</td>
</tr>
</tbody>
</table>

**4.4 ROOF CONSTRUCTION**

Concrete roof will not require any acoustic treatment.
4.5 EXTERNAL CONCRETE WALLS

External walls of concrete construction are acoustically acceptable for traffic noise intrusion. There should not be vents on the internal skin of external walls. All penetrations in the internal skin of external walls should be acoustically sealed.

4.6 VENTILATION REQUIREMENTS

As the recommended internal noise levels cannot be achieved with windows open within the development, an alternative outside air supply system or air conditioning will be required to be installed in accordance with the Sydney City Council DCP.

All proposed tenancies are required to be provided with an alternative ventilation or air conditioning system to maintain adequate ventilation with the windows closed.

Any alternative ventilation system that is installed should be acoustically designed to ensure that the acoustic performance of the recommended constructions is not reduced and does not exceed Council criteria for noise emission to nearby properties.
5  EXTERNAL NOISE EMISSION ASSESSMENT

Noise emissions from the site should be assessed to ensure that the amenity of nearby land users is not adversely affected.

Potential noise sources which should be assessed are:

- Noise generated by mechanical plant.

The nearest potentially affected noise receivers are:

- Residential properties on Abercrombie Street to the west of the site;
- Future student housing project (assessed as residential) to the north of the site within the Frasers Broadway precinct.
- Existing residential receivers to the south of the site on Wellington Street.

Noise emissions noise will be assessed to the following criteria:

- City of Sydney Standard Conditions
- The NSW EPA Industrial Noise Policy

5.1  BACKGROUND NOISE MONITORING

Unattended noise monitoring was conducted using an Acoustic Research Laboratories Pty Ltd series 315 noise monitor. The monitor was programmed to store 15-minute statistical noise levels throughout the unmanned monitoring period. Equipment was calibrated at the beginning and the end of the measurement using a Rion NC-74 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode. The unattended noise monitor was installed from 12th to 19th November, 2012.

Measured background noise levels are presented below. Refer to Appendix 1 for unmanned noise monitoring data.

<table>
<thead>
<tr>
<th>Description</th>
<th>Day Noise Level 7am to 6pm (dB(A))</th>
<th>Evening Noise Level 6pm to 10pm (dB(A))</th>
<th>Night Noise Level 10pm to 7am (dB(A))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Repeatable Background L_{90,15min}</td>
<td>52</td>
<td>49</td>
<td>44</td>
</tr>
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</table>
5.2 NOISE EMISSION OBJECTIVES

Noise emissions from the development will have to achieve the following requirements.

5.2.1 City of Sydney Standard Conditions

(62) NOISE - MECHANICAL PLANT AND EQUIPMENT

Noise associated with the use of mechanical plant and equipment must not give rise to any one or more of the following:


b) A sound pressure level at the boundary of any affected receiver that exceeds the background (LA90, 15minutes) noise level by more than 5dB. The background noise level must be measured in the absence of noise emitted from the use in accordance with Australian Standard AS1055.

Note: The method of measurement of vibration being carried out in accordance with "assessing Vibration; Technical Guidelines" – DEC (EPA) AS1055 for sound level measurements.

Table 6 – Day (7am-6pm) Noise Emission Limit Background + 5dB(A) Leq (15min)

<table>
<thead>
<tr>
<th>Location</th>
<th>31.5Hz</th>
<th>63Hz</th>
<th>125Hz</th>
<th>250Hz</th>
<th>500Hz</th>
<th>1kHz</th>
<th>2kHz</th>
<th>4kHz</th>
<th>8kHz</th>
<th>A-wt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Site</td>
<td>62</td>
<td>62</td>
<td>57</td>
<td>54</td>
<td>53</td>
<td>53</td>
<td>49</td>
<td>42</td>
<td>37</td>
<td>57</td>
</tr>
</tbody>
</table>

Table 7 – Evening (6pm-10pm) Noise Emission Limit Background + 5dB(A) Leq (15min)

<table>
<thead>
<tr>
<th>Location</th>
<th>31.5Hz</th>
<th>63Hz</th>
<th>125Hz</th>
<th>250Hz</th>
<th>500Hz</th>
<th>1kHz</th>
<th>2kHz</th>
<th>4kHz</th>
<th>8kHz</th>
<th>A-wt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Site</td>
<td>59</td>
<td>60</td>
<td>55</td>
<td>51</td>
<td>50</td>
<td>50</td>
<td>46</td>
<td>39</td>
<td>34</td>
<td>54</td>
</tr>
</tbody>
</table>

Table 8 – Night-time (10pm-7am) Noise Emission Limit Background +5dB(A) Leq (15min)

<table>
<thead>
<tr>
<th>Location</th>
<th>31.5Hz</th>
<th>63Hz</th>
<th>125Hz</th>
<th>250Hz</th>
<th>500Hz</th>
<th>1kHz</th>
<th>2kHz</th>
<th>4kHz</th>
<th>8kHz</th>
<th>A-wt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Site</td>
<td>54</td>
<td>54</td>
<td>50</td>
<td>46</td>
<td>45</td>
<td>45</td>
<td>41</td>
<td>34</td>
<td>29</td>
<td>49</td>
</tr>
</tbody>
</table>
(63) AIR CONDITIONERS IN RESIDENTIAL BUILDINGS

The air conditioner/s must not:

   a) emit noise that is audible within a habitable room in any other residential property (regardless of whether any door or window to that room is open):

      (i) before 8.00am and after 10.00pm on any Saturday, Sunday or public holiday; or

      (ii) before 7.00am and after 10.00pm on any other day; or

   b) emit a sound pressure level when measured at the boundary of any other residential property, at a time other than those specified in (i) and (ii) above, which exceeds the background (LA90, 15minutes) by more than 5dB(A). The source noise level must be measured as a LAeq 15 minute.

Table 9 – Noise Emission Limits from Air Conditioners

<table>
<thead>
<tr>
<th>Description</th>
<th>Day 7am to 6pm</th>
<th>Evening 6pm to 10pm</th>
<th>Night 10pm to 7am</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise Emission Limit dB(A) L_{eq,15min}</td>
<td>57</td>
<td>54</td>
<td>49 (inaudible internally)</td>
</tr>
</tbody>
</table>
5.2.2 NSW EPA Industrial Noise Policy

The NSW EPA Industrial Noise Policy, has two criteria which need to be satisfied namely Intrusiveness and Amenity. These are described below:

- **Intrusiveness Criteria** - This guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the $L_{eq}$ descriptor not exceed the background noise level by more than 5 dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

- **Amenity Criteria** - This guideline is intended to limit the absolute noise level from all “industrial” noise sources such as mechanical plant to a level that is consistent with the general environment.

The EPA’s Industrial Noise Policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

Noise levels are to be assessed at the property boundary or nearby dwelling, or at the balcony or façade of an apartment.

5.2.2.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the $L_{eq}$ descriptor do not exceed the background noise level by more than 5 dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 5.1. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

**Table 10 – Intrusiveness Noise Emission Goals**

<table>
<thead>
<tr>
<th>Location</th>
<th>Period/Time</th>
<th>Intrusiveness Noise Emission Goal $L_{eq(15min)}$ (dB(A))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nearby Residences</td>
<td>Day (7am-6pm)</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>Evening (6pm-10pm)</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>Night (10pm-7am)</td>
<td>49</td>
</tr>
</tbody>
</table>
5.2.2.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The EPA Industrial noise policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different areas. They are rural, suburban, urban and urban/industrial interface. This site is categorised by suburban receivers.

For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays.

**Table 11 – Amenity Noise Emission Goals**

<table>
<thead>
<tr>
<th>Location</th>
<th>Period/Time</th>
<th>Amenity Noise Emission Goal dB(A) L_{eq}(Period)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nearby Residences</td>
<td>Day (7am-6pm)</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Evening(6pm-10pm)</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Night(10pm-7am)</td>
<td>40</td>
</tr>
<tr>
<td>Commercial premises</td>
<td>When in use</td>
<td>70</td>
</tr>
</tbody>
</table>

5.3 NOISE EMISSION ASSESSMENT - MECHANICAL PLANT

Mechanical plant items are not typically selected at DA stage.

Detailed review of all external mechanical plant should be undertaken at construction certificate stage (once plant selections and locations are finalised). Acoustic treatments should be determined in order to control plant noise emissions to the levels set out in section 5.2 of this report.

All plant can be satisfactorily attenuated to levels complying with noise emission criteria through appropriate location and (if necessary) standard acoustic treatments such as noise screens, enclosures, in-duct treatments (silencers/lined ducting) or similar.
6  CHILDCARE CENTRE

As part of the proposed there is a childcare centre to be built on the ground and 1st floors of the proposal which have been assessed in this section of the report.

This section of the report details the assessment of environmental noise impact into the proposed child care centre.

6.1  INTERNAL NOISE CRITERIA

6.1.1  City of Sydney DCP 2012

“Section 4.4.4.5 Control of noise impacts to child care centres

(2) The repeatable maximum LAeq(1hour) must not exceed 40 dBA (Leq1hr) within the internal spaces of the child care centre.”

6.1.2  Australian Standard 2107:2000

Australian Standard 2107:2000 details the following control for external noise intrusion to childcare facility. The applicable criteria from that standard are as follows:

<table>
<thead>
<tr>
<th>Type of Occupancy/Activity</th>
<th>Recommended Design Sound Level dB(A) L_{eq, 1hr}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleeping Rooms</td>
<td>35</td>
</tr>
<tr>
<td>Indoor Play Areas</td>
<td>40</td>
</tr>
</tbody>
</table>

The recommended acoustic treatments to the building façade to ensure internal noise levels comply with the criteria above is 6.38mm laminated glass to the perimeter of the proposed childcare centre.
6.2 NOISE EMISSION PREDICTIONS

The assessment of noise emissions from the proposed child care centre has been assessed in conjunction with the proposed development conditions including the following:

1. The centre will cater for up to 90 children within the centre.

2. The centre including external play areas to the south (0-2 year olds) and the north (2 years and above) of the property.

3. Internal areas as detailed in the architectural plan of the development.

4. Details of the proposed centre are including in Appendix B.

6.2.1 Noise Source Data

This section of the report details the source noise data which has been used as the basis of this report and the recommended treatments are those required to comply with the noise level criteria detailed in the Sections above.

6.2.1.1 Outdoor Play Area Noise Measurements

Outdoor play area noise measurements were undertaken at a typical Child Care Centre for the purpose of using a source noise level in this assessment. Noise measurements were taken of the 3 to 6 year age group with 8 kids at play which have then been corrected to the sound power level for 1 child and used as the basis of the noise source in this assessment. This group represents the most active of the age groups and hence are likely to generate the maximum noise levels. Although noise measurements have not been conducted for the 0-2 year age group, it would be expected that they would be likely to generate lower levels of sound than the older age group.

The noise level recorded by this play group has been corrected for the sound power level of 1 child at play and then corrected for the assessment of the proposed number of children with the development of 90 children within the centre total.

6.2.1.2 Measurement Equipment

Noise measurements were obtained using a CEL-593 Type 1 Sound Level Analyser, set to A-weighted fast response. The sound level meter was calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.
6.2.1.3 Measured Noise Levels

The measured activity noise levels from the 8 children playing are listed below in table below.

Table 13 - Measured Children Activity Noise Levels dB(A) $L_{A10}$

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>Activity</th>
<th>Distance</th>
<th>NOISE LEVEL $L_{A10}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoor Play Area</td>
<td>Bikes + Sandpit play</td>
<td>3m</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>Blocks + Sandpit play</td>
<td>4m</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Stepping Blocks + Sandpit play</td>
<td>4m</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>Play gym + Sandpit play</td>
<td>3-4m</td>
<td>65</td>
</tr>
</tbody>
</table>

The noise levels detailed above will be sued as the basis of noise emissions from the proposed site.

6.2.2 Predicted Noise Levels

6.2.2.1 Outdoor Noise

Noise emissions from the play areas are predicted based on the following assumptions:

- The measured typical kids’ play noise data above
- Play areas are assumed to be operating at the nominated capacity, and the children are distributed evenly across the outdoor play area.
- Outdoor playing time will be restricted to between 8am and 6pm
- The recommended constructions and management controls presented in Section 6 of this report have been implemented in the building.
The noise level at the nearest residents was predicted using the above data and by taking into account any expected noise reduction provided by the building fabric, distance losses, directivity, barrier effects, number of children playing etc.

Table below shows the predicted noise levels from the children in outdoor play area.

### Table 14 - Predicted Noise Levels from Outdoor Play (Day time only as this is when external play area will be used)

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Predicted Noise Level $L_{eq, 15min} \text{dB(A)}$</th>
<th>Criteria $L_{eq, 15min} \text{dB(A)}$</th>
<th>Complies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future residence within the development</td>
<td>55 External</td>
<td>55 External</td>
<td>Yes</td>
</tr>
<tr>
<td>Residential development to the south of the site</td>
<td>44 External</td>
<td>55 External</td>
<td>Yes</td>
</tr>
<tr>
<td>Future Residential development to the north of the site</td>
<td>47 External</td>
<td>55 External</td>
<td>Yes</td>
</tr>
</tbody>
</table>

6.2.3 Indoor Noise Impact to Future Residence Above

Noise Levels generated from indoor structured activities (i.e. lessons) are based on a raised speech sound power level of 78dB(A) for the teacher.

The noise level at the nearest residents was predicted using the above data and by taking into account any expected noise reduction provided by the building fabric, distance losses, directivity, barrier effects, etc. Table below shows the predicted noise levels from lessons.

The assessment has been conducted assuming a minimum concrete construction of the floor slab above of 200mm.

### Table 15 - Predicted Noise Levels from Indoor Play

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Predicted Noise Level $L_{eq, 15min} \text{dB(A)}$*</th>
<th>Criteria $L_{eq, 15min} \text{dB(A)}$</th>
<th>Complies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future residential receivers above the child care centre</td>
<td>&lt; 30 External</td>
<td>30 (internally)</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*Note: Predicted noise levels assume windows are fitted with 6.38mm lamed glazing with acoustic seals and a concrete slab of 200mm.
6.3 RECOMMENDED CHILDCARE CENTRE TREATMENTS AND CONTROL

The following building and management controls are required to control noise impact form the proposed child care centre on Level 1 of the proposed development to the surrounding receivers, including the future residential receivers within the Block 11 development.

- Children’s outdoor play area to be operational between 8am and 6pm on any given day.
- Minimum 6.38mm laminated glazing with acoustic seals around perimeter is required, with minimum Rw of 30.
- Signs reminding staff and visitors to minimise noise at all times shall be installed at ingress/egress points from the child care centre.
- The outdoor area to the south of the building is used by children between the ages of 0-2 years.
- The outdoor area to the north of the building and under the building structure above to be used for children older than 2 year old.
- The underside of the building structure to the over 2 year olds external area is to be acoustically absorptive treatment such as envirospray, absorptive insulation or the like. Treatments should be to a minimum of 40% of the soffit area. Details to be provided at the CC stage of the project.
- Management is to ensure children are supervised at all times to minimise noise generated by the children whenever practical and possible.
- Install a contact phone number at the front of the centre so that any complaints regarding centre operation can be made.
7 CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

This section of the report presents a specification for the processes, which will be followed to manage noise and vibration associated with the proposed construction activities which are required as part of the Central Park, Block 11 project. The assessment has been conducted to investigate the potential for noise and vibration impact to surrounding receivers within close proximity to the project including the residential receivers within the Broadway development precinct.

The principal objective of this study is to undertake an evaluation of works to be performed during the operation of the various activities during construction and develop a management plan to ensure noise and vibration:

1. Does not impact on surrounding receivers.
2. Is minimised to surrounding receivers in compliance with the relevant EPA and Australian Standards.
3. Does not exceed OH&S standards at surrounding receivers.
4. Is monitored when potentially high noise and vibration generating activities are being used.

This assessment will formulate/present the relevant noise and vibration criteria which construction activities are required to comply with. Additionally effective mitigation measures will be recommended where possible to ensure criteria is achieved and impacts are minimised to surrounding receivers.

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.
- Formulation of a strategy for construction activities to comply with the standards identified in the above point.
- Development of construction methods which will minimise the impact on surrounding receivers.
7.1 PROJECT OBJECTIVES

The objective of this management plan is to set up a protocol to ensure noise and vibration emissions from the construction works associated with the Central Park, Block 11 Project comply with applicable standards, recommend required management controls and treatments are adopted where required and detail the required monitoring to ensure standards are met.

7.2 CONSTRUCTION ACTIVITIES

Construction activities to be undertaken at the site includes limited demolition of the existing buildings and construction of the proposed project.

Working hours on the site will be undertaken within those hours detailed within the Conditions of Consent.

All machines to be used are to be serviced and in good working order to reduce the noise. It is anticipated that hammering will not be required due to the demolishing not involving extensive structures or excavation.

Based on the required activities to be undertaken as part of the demolition and excavation noise levels are not expected to negatively impact on the surrounding receivers.

7.3 CONSTRUCTION NOISE 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, the New South Wales Construction Noise Guideline developed by The NSW Environmental Protection Authority (EPA) and OH&S requirements are presented in this section of the report.

7.3.1 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 construction site.
7.3.2 EPA Construction Noise Guideline

The NSW Environmental Protection Authority (EPA) in recognition of construction noise, have 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.

7.3.3 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;
- 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 16 – DECCW Recommended Construction Noise Goals

<table>
<thead>
<tr>
<th>Governing Body</th>
<th>Receiver Type</th>
<th>External sound level Goal, ( L_{eq 15 \text{ min}} ) dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NSW Environmental Protection Authority (EPA)</td>
<td>Residential (also adopted for school receivers)</td>
<td>Background + 10 dB(A)(^1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75 dB(A)(^2)</td>
</tr>
<tr>
<td></td>
<td>Commercial Receivers</td>
<td>65 dB(A)(^1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75 dB(A)(^2)</td>
</tr>
</tbody>
</table>

1: Where the predicted or measured \( L_{eq} \) (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”.

7.3.4 OH&S guidelines

Regulation 49 of the Occupational Health and Safety Regulation specifies maximum levels of noise which a ‘worker’ may be exposed to. Acoustic treatment to the work environment or hearing protection is recommended for workers exposed to higher noise levels. These maximum OH&S noise levels are presented in the table below.

Table 17 – OH&S Maximum Noise Level Exposure

<table>
<thead>
<tr>
<th>OH&amp;S maximum noise level exposure</th>
<th>Energy Averaged Over 8 Hour Day</th>
<th>Maximum Noise Level During Day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( 85 \text{ dB(A) } L_{eq} )</td>
<td>( 140 \text{ dB(C) } \text{Peak} )</td>
</tr>
</tbody>
</table>
7.3.5 Measured background noise levels

Measured background noise levels at the site based on unattended noise logging conduct as part of the DA submission period have concluded that the existing noise levels at the site during the day time working hours is 57 dB(A). Noise logging data is included in Appendix 1 of this report.

Based on the proposed activities to be conducted at the site (not including high noise generating activities such as concrete or rock hammering, noise levels at the surrounding receivers will comply with the noise level criteria detailed within this section of the report.

During the construction period acoustic testing of construction noise at the surrounding receivers will be undertaken to ensure compliance with the project criteria.

7.4 CONSTRUCTION VIBRATION CRITERIA

Construction vibration criteria associated with works on the Aster, 139-147 West Street, Crows Nest 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


The criteria and the application of these Standards are discussed in separate sections below.
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 18 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

<table>
<thead>
<tr>
<th>TYPE OF STRUCTURE</th>
<th>PEAK PARTICLE VELOCITY (mms⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At Foundation at a Frequency of</td>
</tr>
<tr>
<td></td>
<td>&lt; 10Hz</td>
</tr>
<tr>
<td>1 Buildings used in commercial purposes, industrial buildings and buildings of similar design</td>
<td>20</td>
</tr>
<tr>
<td>2 Dwellings and buildings of similar design and/or use</td>
<td>5</td>
</tr>
<tr>
<td>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)</td>
<td>3</td>
</tr>
</tbody>
</table>
### 7.4.2 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 19 – BS 6472:1992 Criteria to Avoid “Adverse Comment”

<table>
<thead>
<tr>
<th>Type of Occupancy</th>
<th>Time of Day</th>
<th>Continuous Vibration</th>
<th>Intermittent Vibration and Impulsive Vibration Excitation with Several Occurrences per day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Vertical</td>
<td>Horizontal</td>
</tr>
<tr>
<td>Residential</td>
<td>Day</td>
<td>0.3 to 0.6</td>
<td>0.8 to 0.6</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>0.2</td>
<td>0.6</td>
</tr>
<tr>
<td>Offices</td>
<td>Day</td>
<td>0.6</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>0.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Workshops</td>
<td>Day</td>
<td>1.2</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td>Night</td>
<td>1.2</td>
<td>3.2</td>
</tr>
</tbody>
</table>

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.

### 7.4.3 Vibration Criteria

Based on the vibration criterion detailed in the sections above the suitable construction vibration criteria to ensure there is no structural or architectural damage to surrounding receivers includes the following:

- Surrounding residential buildings – 10 mm/s
- Surrounding Commercial buildings – 10 mm/s
7.5 CONSTRUCTION HOURS

Woking hours are subject to planning approval conditions and will be conducted within the approved construction times within the Conditions of Consent. Typically the hours of work at sites will be:

- 7:00am to 5:00pm Monday to Friday
- 8:00am to 5:00pm on Saturdays
- No work on Sundays, Public Holidays or Saturdays adjacent to a Public Holiday.

Works which are proposed to be conducted outside of these hours will be subject to special approval.

As there are no normal construction activities to be conducted during night time hours (without special approval) there is no requirement to conduct an assessment of sleep disturbance.

7.6 CONTROL OF CONSTRUCTION NOISE AND VIBRATION

As a part of the noise management of noise and vibration on each site the following process should be conducted when investigating the impact and construction activities.
Figure 1 – Process Flowchart
7.6.1 noise and VIBRATION control methods

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.

7.6.1.1 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. By carrying this activity by use of pneumatic hammers, bulldozers ripping and/or milling machines lower levels of noise will result.

7.6.1.2 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 15dB(A) can be effected. Where only partial obstruction of line of sight occurs, noise reductions of 5 to 8dB(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 that is approximately 10dB(A) greater than the maximum reduction provided by the barrier. In this case the use of a material such as 10mm or 15mm thick plywood (radiata plywood) would be acceptable for the barriers.

7.6.1.3 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.

7.6.1.4 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).

7.6.1.5 Treatment of Specific Equipment

In certain cases it may be possible to specially treat a piece of equipment to dramatically reduce the sound levels emitted.
7.6.1.6 Establishment of Site Practices

This involves the formulation of work practices to reduce noise generation. A noise plan will be developed for this project outlining work procedures and methods for minimising noise.

7.6.1.7 Regular Noise Checks of Equipment

To determine the requirement for silencing devices on machinery it is proposed to undertake fortnightly noise check. Noise levels of all machines on site will be measured and if they are found to be higher than nominated for that equipment type, items such as mufflers and engine shrouds will be examined to ensure they are in good working order.

A record of these measurements will be kept on a form similar to that shown in Appendix 1. This measure is expected to maintain noise at constant levels, and prevent any increases.

7.6.1.8 Combination of Methods

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

7.6.2 Noise and Vibration Monitoring

Noise and vibration monitoring will be undertaken to determine the effectiveness of measures which are been implemented. The results of monitoring can be used to devise further control measures.

The minimum requirement for noise and vibration monitoring includes the following:

- Noise and vibration monitoring to be provided as deemed necessary based on construction activities to be undertaken and neighbouring users impact.
7.7 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

Potential noise and vibration impacts are reviewed below.

7.7.1 Noise impacts

Obviously, noise impacts on nearby development will be dependent on the activity and where on the site the activity is undertaken. Work close to the eastern and northern boundaries will have greatest impacts on surrounding receivers to the south and east of the project.

The potentially worst case activities are identified and discussed below:

- Primary noise emissions occur during with equipment items typically having sound power levels (SWL) of approximately 117dB(A)L10(15min). Excavators, sawing and hammering works are typically the loudest activity during construction. Noise levels of between 70-80 dB(A) at the façade of the receivers to the south and east.

- During erection of structure, the use of hand tools (angle grinders, jack hammers etc.) and concrete pumps are the loudest typical activity (sound power levels of approximately 105dB(A)Leq(15min)). Noise levels of between 55-65 dB(A) at the boundaries of the receivers to the south and east.

- Obviously, once construction of the building shell is complete, noise from hand tools will be relatively low, as the new building construction will provide considerable noise attenuation for internal fitout. Once the building shell is largely complete, use of hand tools in internal areas will be complaint with construction noise criteria at surrounding receivers.

- Noise levels generated by the construction activities will generally comply with the noise management levels at the boundaries of surrounding receivers. Some exceedances (depending on type of activity and location) may occur during limited operation of specific equipment. A detailed construction management plan will be required to be provided once a building contractor is appointed as part of the construction approval process.

7.7.2 Vibration impacts

Excavation and demolition are the primary vibration generating activities and the proposed construction activities are unlikely to generate significant ground born vibrations.

- Vibration impacts from construction activities on the identified of the receivers to the south and east are unlikely to exceed the criteria outlined in this report.

- As part of the construction programme, vibration monitoring/measurements will be required to ascertain specific levels from individual plant items impacting the sensitive equipment of the Centenary institute. Based on monitoring conducted during the excavation stage of the project vibration from construction is unlikely to exceed specified criteria.
7.7.3 Impact to Surrounding Receivers

As part of the Block 11 project detailed communication and investigations into the surrounding operations of other surrounding buildings will be conducted. Suitable noise and vibration management controls will be adopted as part of the construction of the project to ensure no structural, architectural or operation issues occur during the construction phase of the project.

Based on the results of impact from the excavation period of the project exceedences in the projects criteria are unlikely to occur.

7.7.4 Community Interaction and Complaints Handling

In order for any construction noise management programme to work effectively, continuous communication is required between all parties, which may be potentially impacted upon including the builder and neighbours. 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 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.

To ensure that this process is effective, regular information regarding the proposed works and period when they will be required to be conducted should be provide to neighbouring receivers, until all issues have been addressed and the evidence of successful implementation is embraced by all parties.

7.7.5 Dealing with Complaints

Should ongoing complaints of excessive noise or vibration criteria occur 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 limits all work potentially producing vibration 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 location 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;
• 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.

7.7.6 Community Consultation

The building will be required to undertake a meeting with the adjoining neighbours to discuss numerous aspects of the project which will include potential noise and vibration impacts. During these meetings noise management is to be raised. The neighbouring receivers will have the suitable builder representative details to raise any concerns (including noise) during the construction period.

7.7.7 Contingency Plans

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

• Determine the offending plant/equipment/process
• Locate the plant/equipment/process further away from the affected receiver(s) if possible.
• Implement additional acoustic treatment in the form of localised barriers, silencers, vibration separation etc where practical.
• Selecting alternative equipment/processes where possible

Complaints associated with noise and vibration generated by site activities shall be recorded on a Noise 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.
8 CONCLUSION

This report presents the results from the acoustic assessment of noise impacts associated with the proposed residential project at Block 11 within the Frasers Broadway precinct.

Noise intrusion from traffic associated with surrounding roadways will comply with the Sydney City Council, Australian Standards and The State Environmental Planning Policy including SEPP noise criteria on the proviso that the acoustic treatments detailed in this report are adopted.

External noise emission criteria have been setup in Section 5 of this report based on the requirements of the NSW EPA Industrial Noise Policy and the Sydney City Council DCP for the operation of the building and the use of the childcare centre on Level 1 of the project. Detailed plant noise emission shall be designed to comply with this criterion during CC stage.

Additionally a construction noise and vibration assessment of the proposed activities to be undertaken to construct the project has been presented in this report.

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

Yours faithfully,

[Signature]

Acoustic Logic Consultancy Pty Ltd
Ben White
APPENDIX 1
UNATTENDED NOISE MONITORING DATA
Frasers Broadway
Tuesday November 13, 2012
Frasers Broadway
Wednesday November 14, 2012

Noise Level (dB(A))
L10
Leq
L90

Time
000 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 000
Frasers Broadway
Thursday, November 15, 2012

Noise Level (dB(A))
L10
Leq
L90
Frasers Broadway
Friday November 16, 2012

Noise Level (dB(A))

L10
Leq
L90

Time

0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00

90
80
70
60
50
40
30
20
10

20
30
40
50
60
70
80
90
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00

L10
Leq
L90
Frasers Broadway
Saturday November 17, 2012

Time
Noise Level (dB(A))
L10
Leq
L90
Frasers Broadway

Sunday November 18, 2012

Noise Level (dB(A))

- L10
- Leq
- L90

Time

00:00
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
00:00

Noise Level (dB(A))

- L10
- Leq
- L90
Frasers Broadway
Monday November 19, 2012

Noise Level (dB(A))

Time

L10
Leq
L90

Monday November 19, 2012
Frasers Broadway