Construction Noise and Vibration Management Plan

New Grafton Correctional Centre
313 Avenue Road, Lavadía, NSW

REPORT No
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Revision History

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<thead>
<tr>
<th>Report</th>
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<tbody>
<tr>
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<td>26/05/2017</td>
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<td></td>
</tr>
</tbody>
</table>

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TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY .................................................................................................................. 5

2.0 PROJECT DESCRIPTION ................................................................................................................. 7

3.0 CONDITIONS OF APPROVAL (NOISE AND VIBRATION) .......................................................... 9

4.0 EXISTING NOISE ENVIRONMENT ............................................................................................... 9

4.1 Background Noise Level ............................................................................................................... 10

4.2 Residential Receiver Locations .................................................................................................. 10

5.0 NOISE AND VIBRATION CRITERIA ............................................................................................ 12

5.1 EPA Interim Construction Noise Guideline .................................................................................. 12

5.2 Construction Vibration ............................................................................................................... 14

5.2.1 EPA Vibration Guideline ...................................................................................................... 14

5.2.2 German Standard DIN 4150 - Structural Damage ................................................................. 14

6.0 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT .................................................... 15

6.1 Construction Method .................................................................................................................. 15

6.2 Construction Hours .................................................................................................................... 15

6.3 Construction Activities .............................................................................................................. 16

6.4 Construction Traffic .................................................................................................................. 17

6.5 Vibration Impacts ...................................................................................................................... 19

7.0 CONSTRUCTION NOISE AND VIBRATION MITIGATION ....................................................... 20

7.1 Noise Measurement Equipment ................................................................................................ 20

7.2 Attended Noise Monitoring Procedure ...................................................................................... 20

7.3 Noise Monitoring of Equipment ................................................................................................ 21

7.4 Reporting on Attended Noise Monitoring ................................................................................ 21

7.5 Construction Hours .................................................................................................................. 22

7.6 Work Practices .......................................................................................................................... 22

7.7 Heavy Vehicles and Staff Vehicles ............................................................................................ 23

7.8 Community Relations ................................................................................................................ 23

7.9 Managing a Noise Complaint ................................................................................................... 25

7.10 Out-of-Hours Work Protocol ................................................................................................... 26

7.11 Amendments to the Construction Noise and Vibration Management Plan ................................ 26

7.12 Noise Monitoring ..................................................................................................................... 27

7.13 Vibration Monitoring ............................................................................................................... 27

8.0 CONCLUSION ............................................................................................................................... 28
TABLES

Table 1  Rating Background Levels .......................................................... 10
Table 2  $L_{eq}$ Noise Management Levels from Construction Activities ................................. 13
Table 3  Vibration Dose Values (VDV) from Construction Activities ..................................... 14
Table 4  Transient Vibration Guide Values for Structural Damage ....................................... 14
Table 5  Typical Mobile Plant - Sound Power Levels.......................................................... 16
Table 6  Calculated Receptor Noise Levels from Stage 1 Works ........................................ 17
Table 7  Construction Traffic Volume .................................................................................. 17
Table 8  Calculated Receptor Noise Levels from Stage 1 Traffic (Dec 2017) .......................... 18
Table 9  Recommended safe working distances for vibration generating plant ....................... 19
1.0 EXECUTIVE SUMMARY

Infrastructure NSW on behalf of the NSW Department of Justice proposes to construct a new correctional centre at 313 Avenue Road, Lavdia, NSW known as the New Grafton Correctional Centre (NGCC).

The NGCC will include a maximum and minimum security correctional centre of 1,700 beds comprised of:

- 1,000 maximum security beds for male inmates,
- 300 maximum security beds for female inmates.
- 400 minimum security bed for male inmates.

The complex will cover a gross floor area of up to 100,000 square metres and buildings of up to 12 metres high (3 storeys). Car parking for 500 cars will be included.

The proposed site is located approximately 12.5 km south-east of Grafton within the Clarence Valley Local Government Area. Clarence Valley Regional Airport is located approximately 3 km to the west of the project site. An upgrade to the Pacific Highway is proposed to pass 200 m to the south of the project site.

This Construction Noise and Vibration Management Plan (CNVMP) presents information to address relevant Stage 1 and 2 approval Consent Conditions.

NORTHERN Pathways has engaged Day Design Pty Ltd to prepare a Construction Noise and Vibration Management Plan for the construction of the NGCC. The construction will be carried out in two stages.

The approved Stage 1 Construction includes the majority of the earthmoving equipment being utilised including excavators, scrapers, bulldozers and dump trucks. These works are currently underway under approval.

Stage 2 will include mobile plant such as cranes, concrete pumps and trucks, delivery trucks, jack-hammers and scabbling equipment, generators and various hand tools to construct the built form.

Noise and vibration criteria for Stages 1 and 2 construction have been considered and summarised in Section 5 of this report. Measures to minimise and mitigate the potential noise impacts on surrounding residences have been considered and noise controls to be implemented.

Given the distances to the nearest sensitive receptors, exceedance of the vibration criteria is unlikely. However, vibration monitoring will be carried out in response to any unresolved complaints reported during the works.
This CNVMP has been prepared in accordance with the Australian Standard AS2436 – 2010 “Guide to noise and vibration control on construction, demolition and maintenance sites”. Construction noise management levels have been derived from the Environment Protection Authority’s Interim Construction Noise Guideline and are used for a quantitative assessment at the nearest affected residential receiver locations.

All feasible and reasonable methods to limit the noise emissions and minimise the noise impact on neighbouring properties have been provided in Section 7 of this report. These include; selecting quiet equipment, incorporating periods of respite, maintaining community consultation relations, managing noise complaints and conducting noise and vibration monitoring in response to complaints.
2.0 PROJECT DESCRIPTION

The building envelope including the configuration, location and number of buildings proposed for the project are shown in the Site Establishment Master Plan, Appendix A. Stage 2 construction works for the Project is primarily construction of facilities including accommodation, administration, wastewater treatment plant, batch plant, pre-fab yard, installation of services and other facilities and operation of the facility.

The layout of the Site, including work areas, site compounds and access points are shown in Appendix A.

Construction activities associated with Stage 1 within the cadastral boundaries of Lot 26 DP 751376 and Lot 1 DP1190399 included:

- Vegetation clearance and biodiversity management activities.
- Construction of access roads including fire access roads to the extent required to conduct Stage 1 works.
- Construction of auxiliary facilities such as construction compound, construction staff parking facilities and stockpiles sites.
- Temporary provision of water, power and communication services within the site to the extent required to conduct Stage 1 and Stage 2 works.
- Demolition of the existing house and sheds.
- Bulk excavation and site stabilisation works.
- Landscaping.

Broadly, activities associated with construction of Stage 2 within the cadastral boundaries of Lot 26 DP 751376 and Lot 1 DP1190399 will include:

- Construction and operation of accommodation, administration and other facilities
- Construction and operation of wastewater treatment plant
- Operation of concrete batching plant
- Operation of pre-fab yard
- Installation of services

It is intended that the consent will approve Stage 2 works to be undertaken during the following construction hours:

- 7:00am to 6:00pm, Monday to Friday inclusive; and
- 8:00am to 5:00pm Saturdays;
- At no time on Sundays or public holidays.
Works may be carried out outside of these hours in accordance with Section 7.10 of this report.
3.0 CONDITIONS OF APPROVAL (NOISE AND VIBRATION)

The NSW Minister for Planning granted approval for Application No SSD 8368 which consists of the Stage 2 Works of the New Grafton Correctional Centre at 313 Avenue Road, Lavadia, as defined in the Consent. The Consent contains several conditions relating to noise impact as detailed below.

The following table lists the Conditions of Approval, relating to noise and vibration impact, required to be satisfied.

<table>
<thead>
<tr>
<th>Approval Reference</th>
<th>Consent Condition</th>
<th>Sub-Plan Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schedule 2 B27</td>
<td>The construction management noise level for the evening period must be revised and calculated in accordance with the Interim Construction Noise Guideline.</td>
<td>7.0</td>
</tr>
<tr>
<td>Schedule 2 B28</td>
<td>Prior to the commencement of works on the Subject Site, a Construction Noise and Vibration Management Plan (CNVMP) must be prepared and approved by the Certifying Authority. The CNVMP must: a) be prepared by a suitably qualified expert; b) describe the measures that would be implemented to ensure: i) best management practice is being employed; and ii) compliance with the relevant conditions of this consent; c) describe the proposed noise and vibration management measures in detail; d) include strategies that have been developed to address impacts to noise sensitive receivers where noise levels exceed the construction noise management level, for managing high noise generating works; e) describe the consultation undertaken to develop the strategies in d) above; and f) evaluates and reports on the effectiveness of the noise and vibration management measures.</td>
<td>Note</td>
</tr>
<tr>
<td>Schedule 2 B29</td>
<td>The applicant must submit a copy of the CNVMP to the Department and Council prior to the commencement of works approved under this consent.</td>
<td>7.5 7.10</td>
</tr>
</tbody>
</table>

4.0 EXISTING NOISE ENVIRONMENT

A Noise and Vibration Working Paper was prepared by Jacobs Australia for the NGCC, dated 1 August 2016.

The Paper discusses the assessment requirements in Section 4 and sets noise and vibration criteria for the project. Day Design has reviewed the Paper and will adopt the noise criteria proposed. A summary of the criteria is set out in the following sections.
4.1 Background Noise Level

Background noise levels were measured as part of the Woolgoolga to Ballina Pacific Highway upgrade EIS at a site 4 km east of the project site. It is assumed that this location is exposed to a similar acoustic environment as the residences adjacent to the project site. Once the Grafton By-pass is complete, the road will pass to the south of the site. It is likely that ambient noise levels will increase due to the additional traffic on the By-pass, however we have adopted the measured levels as a conservative assumption. The measured Rating Background Levels are given below in Table 1.

Table 1 Rating Background Levels

<table>
<thead>
<tr>
<th>Noise Measurement Location</th>
<th>Time Period</th>
<th>Rating Background Level (L90, 15 minute)</th>
<th>Existing Leq noise levels (Leq, time period)</th>
</tr>
</thead>
<tbody>
<tr>
<td>961 Wooli Road, Pillar Valley</td>
<td>Day (7 am to 6 pm)</td>
<td>48 dBA</td>
<td>L90,15hour 52 dBA</td>
</tr>
<tr>
<td></td>
<td>Evening (6 pm to 10 pm)</td>
<td>48 dBA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Night (10 pm to 7 am)</td>
<td>36 dBA</td>
<td>L90,9hour 43 dBA</td>
</tr>
</tbody>
</table>

4.2 Residential Receiver Locations

The area surrounding the site is predominantly rural farming land. A total of nine residential properties are located within 1.5 km from the site. Six rural residential properties are located to the South off Old Six Mile Lane and Wants Lane and are between 300 and 1,500 metres away from the southern end of the site. An additional three properties are located on Avenue Road, approximately 50 to 350 metres north of the site, see Figure 1.

For the purposes of this assessment, there are two ‘most affected’ residential locations. Receptor R1 (493 Avenue Road, Lavadia) is nominated to represent the most affected of the three residences to the North on Avenue Road, and Receptor R2 (37 Old Six Mile Lane, Glenugie) is nominated to represent the most affected of the six residences to the south of Old Six Mile Lane. Receptors R1 and Receptor R2 are shown in Figure 1 below.
Figure 1  Residential Receiver Locations
5.0 NOISE AND VIBRATION CRITERIA

5.1 EPA Interim Construction Noise Guideline

The NSW Environment Protection Authority published the *Interim Construction Noise Guideline* in July 2009. While some noise from construction sites is inevitable, the aim of the Guideline is to protect the majority of residences and other sensitive land uses from noise pollution most of the time.

The Guideline presents two ways of assessing construction noise impacts; the quantitative method and the qualitative method.

The quantitative method is generally suited to longer term construction projects and involves predicting noise levels from the construction phase and comparing them with noise management levels given in the guideline.

The qualitative method for assessing construction noise is a simplified way to identify the cause of potential noise impacts and may be used for short-term works, such as repair and maintenance projects of short duration.

In this instance, the quantitative method is the most appropriate and has been used in this assessment. Details of the quantitative method are given in Section 4 of the Guideline.

Standard construction hours are defined by the EPA as follows:

- 7.00 am to 6.00 pm Monday to Friday;
- 8.00 am to 1.00 pm Saturday; and
- No work on Sunday or Public Holiday.

Table 2 in Section 4 of the Guideline sets out noise management levels at affected residences and how they are to be applied during normal construction hours. The Noise Management Level (NML) is derived from the rating background level (RBL) plus 10 dB in accordance with the Guideline. This level is considered to be the 'noise affected level' which represents the point above which there may be some community reaction to noise.

The 'highly noise affected' level of 75 dBA represents the point above which there may be strong community reaction to noise. This level is provided in the Guideline and is not based on the RBL. Restrictions to the hours of construction may apply to activities that generate noise at residences above the 'highly noise affected' noise management level.

Based on the minimum RBL at nearby residential receiver locations of 48 dBA in the daytime, the recommended noise management level during all aspects of the construction program are shown below in Table 2.
### Table 2  \( L_{eq} \) Noise Management Levels from Construction Activities

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Day</th>
<th>Evening</th>
<th>Night</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBL</td>
<td>48</td>
<td>48</td>
<td>36</td>
</tr>
<tr>
<td>Allowance</td>
<td>+10</td>
<td>+10</td>
<td>+5</td>
</tr>
<tr>
<td>NML</td>
<td>58</td>
<td>58</td>
<td>41</td>
</tr>
</tbody>
</table>
5.2 Construction Vibration

5.2.1 EPA Vibration Guideline

The NSW EPA published the *Assessing Vibration: a technical guideline* in February 2006. This guideline is based on the British Standard BS 6472:1992 “Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz).”

The guideline presents preferred and maximum vibration values for use in assessing human responses to vibration and provides recommendations for measurement and evaluation techniques. The guideline considers vibration from construction activities as Intermittent Vibration. Table 2.4 of the guideline sets out qualitative limits for Vibration Dose Values to assess intermittent vibration and is replicated in Table 3 below for residential receptor locations.

The EPA published the Interim Construction Noise Guidelines in July 2009. This recent document is designed to simplify the assessment of the impact of construction noise on neighbouring properties.

### Table 3 Vibration Dose Values (VDV) from Construction Activities

<table>
<thead>
<tr>
<th>Receptor Location</th>
<th>Daytime</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preferred value (m/s$^{1.75}$)</td>
<td>Maximum value (m/s$^{1.75}$)</td>
</tr>
<tr>
<td>All Residences</td>
<td>0.20</td>
<td>0.40</td>
</tr>
</tbody>
</table>

5.2.2 German Standard DIN 4150 - Structural Damage

The German Standard DIN 4150-Part 3 provides guide values for transient vibration relating to structural damage, replicated in Table 4 below.

### Table 4 Transient Vibration Guide Values for Structural Damage

<table>
<thead>
<tr>
<th>Type of building</th>
<th>Peak component particle velocity in frequency range of predominant pulse – mm/sec</th>
<th>Vibration at the Foundations</th>
<th>Horizontal plane on highest floor – All frequencies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt; 10Hz</td>
<td>10 – 50Hz</td>
</tr>
<tr>
<td>Residential</td>
<td></td>
<td>5</td>
<td>5 - 15</td>
</tr>
</tbody>
</table>
6.0 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

6.1 Construction Method

The main sources of noise on the site during the two Stages of construction will be from heavy machinery such as excavators, dump trucks, cranes, cement mixers, etc.

Construction activities associated with Stage 1 within the cadastral boundaries of Lot 26 DP 751376 and Lot 1 DP1190399 will include:

- Vegetation clearance and biodiversity management activities.
- Construction of access roads including fire access roads to the extent required to conduct Stage 1 works.
- Construction of auxiliary facilities such as construction compound, construction staff parking facilities and stockpiles sites.
- Temporary provision of water, power and communication services within the site to the extent required to conduct Stage 1 and Stage 2 works.
- Demolition of the existing house and sheds.
- Bulk excavation and site stabilisation works.
- Landscaping.

6.2 Construction Hours

Construction activities for the Stage 1 works are expected to commence in mid-2017 and last for a period of 6 months.

Some construction activities may need to be undertaken outside of the normal construction hours as conditioned by Condition C1 of the Stage 1 consent. These activities are categorised by the NSW EPA in the Interim Construction Noise Guideline as follows:

- Delivery of oversized plant of structures
- Emergency work
- Maintenance and repair of public infrastructure works
- Public infrastructure works that shorten the project and are approved by the affected community
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.
6.3 Construction Activities

Typical equipment likely to be used and their corresponding sound power levels for works in Stage 2 are presented in Table 5. The acceptable working distances are calculated based on no more than 5 items of mobile plant operating within 350 m of the northern boundary of the site closest to residences at Location R1 (see Figure 1). The remaining items of plant are evenly distributed across the site.

<table>
<thead>
<tr>
<th>Description</th>
<th>Sound Power Level, dBA</th>
<th>Acceptable minimum Working Distance from Residence, m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silenced Diesel Generator</td>
<td>89</td>
<td>30 m or more</td>
</tr>
<tr>
<td>Diesel Generator</td>
<td>99</td>
<td>100 m or more</td>
</tr>
<tr>
<td>Dump Truck (8 off)</td>
<td>107</td>
<td>8 at 380 m</td>
</tr>
<tr>
<td>Bulldozer (5 off)</td>
<td>108</td>
<td>5 at 380 m</td>
</tr>
<tr>
<td>Compact Roller (2 off)</td>
<td>110</td>
<td>1 at 380 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 at 500 m or more</td>
</tr>
<tr>
<td>Excavator (4 off)</td>
<td>112</td>
<td>2 at 380 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 at 750 m or more</td>
</tr>
<tr>
<td>Scraper (2 off)</td>
<td>116</td>
<td>1 at 380 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 at 600 m or more</td>
</tr>
<tr>
<td>100 tonne crawler cranes (up to 5)</td>
<td>115</td>
<td>1 at 380 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 at 800 m or more</td>
</tr>
<tr>
<td>Hydraulic hammers (up to 5)</td>
<td>113</td>
<td>1 at 380 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 at 750 m</td>
</tr>
<tr>
<td>Hand scabbling equipment (up to 5)</td>
<td>108</td>
<td>5 at 380 m</td>
</tr>
<tr>
<td>Elevated Work Platforms (up to 20)</td>
<td>100</td>
<td>20 at 380 m</td>
</tr>
<tr>
<td>Batch plant</td>
<td>115</td>
<td>Fixed at 550 m</td>
</tr>
<tr>
<td>Agi trucks (up to 5)</td>
<td>107</td>
<td>5 at 380 m</td>
</tr>
<tr>
<td>Concrete pump</td>
<td>105</td>
<td>1 at 380 m</td>
</tr>
<tr>
<td>Concrete vibrators</td>
<td>110</td>
<td>1 at 380 m</td>
</tr>
</tbody>
</table>

(All sound power levels are based on previous noise measurements at various sites and AS2436)
Knowing the sound power level of a noise source, the sound pressure level (as measured with a sound level meter) can be calculated at a remote location using suitable formulae to account for distance losses, barrier effects, etc.

The range of sound pressure levels due to the mobile plant operating were calculated at each receptor location. The calculated noise levels are presented in Table 6.

**Table 6  Calculated Receptor Noise Levels from Stage 1 Works**

<table>
<thead>
<tr>
<th>Receptor Location</th>
<th>Calculated Noise Levels (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1 - 493 Avenue Road, Lavadia</td>
<td>34 – 58</td>
</tr>
<tr>
<td>R2 - 37 Old Six Mile Lane, Glenugie</td>
<td>29 – 43</td>
</tr>
</tbody>
</table>

### 6.4 Construction Traffic

The Stage 1 works will generate road traffic due to the delivery of earth moving machinery and the arrival and departure of staff at the site. Large items are of plant will be delivered to site by semi-trailer and will remain until they are no longer required on site, when they will be removed. Typically, the daily traffic movements will consist of cars and small trucks.

John Holland has estimated the number of construction workers, cars and trucks that will be accessing the site on a daily basis during Stage 2 as shown in Table 7 below.

**Table 7  Construction Traffic Volume**

<table>
<thead>
<tr>
<th>Month</th>
<th>April 2018</th>
<th>August 2018</th>
<th>December 2018</th>
<th>April 2019</th>
<th>August 2019</th>
<th>December 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>526</td>
<td>1032</td>
<td>894</td>
<td>568</td>
<td>286</td>
<td>130</td>
</tr>
<tr>
<td>Cars</td>
<td>421</td>
<td>826</td>
<td>716</td>
<td>455</td>
<td>229</td>
<td>104</td>
</tr>
<tr>
<td>Trucks</td>
<td>53</td>
<td>104</td>
<td>90</td>
<td>87</td>
<td>70</td>
<td>40</td>
</tr>
<tr>
<td>Total vehicles</td>
<td>474</td>
<td>930</td>
<td>806</td>
<td>542</td>
<td>299</td>
<td>144</td>
</tr>
</tbody>
</table>

The residential properties in the vicinity of Receptor R1 on the southern side of Old Six Mile Lane are set back more than 100 m from the road. The noise impact due to the highest traffic volumes (Dec 2017) have been modelled at R1 (600m setback from the site entry) and R2 (100 m setback from Old Six Mile Road) assuming that the entire days traffic arrives in one hour. Traffic speeds are assumed to be 80 km/h on Old Six Mile Lane and 60 km/h on The Avenue. The results are shown in Table 8 below.
### Table 8  Calculated Receptor Noise Levels from Stage 1 Traffic (Dec 2017)

<table>
<thead>
<tr>
<th>Receptor Location</th>
<th>Traffic $L_{Aeq}$ Noise Levels (dBA)</th>
<th>NML, dBA</th>
<th>Existing $L_{Aeq}$ Noise Levels (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1 - 493 Avenue Road, Lavadia</td>
<td>35</td>
<td>58</td>
<td>53</td>
</tr>
<tr>
<td>R2 - 37 Old Six Mile Lane, Glenugie</td>
<td>48</td>
<td>58</td>
<td>53</td>
</tr>
</tbody>
</table>

The results show that construction traffic noise will comply with the NML at all residential receivers.
6.5 Vibration Impacts

Past measurements of ground borne vibration show that vibration levels can vary significantly at different distances and receptor locations. Recommended safe working distances for various items of vibration generating plant are given in Section 6.3 of Transport for NSW Construction Noise Strategy 2012. This information is shown below in Table 9.

Table 9 Recommended safe working distances for vibration generating plant

<table>
<thead>
<tr>
<th>Plant Item</th>
<th>Rating/Description</th>
<th>Safe Working Distance</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cosmetic Damage</td>
<td>Human Response</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(BS 7385)</td>
<td>(OH&amp;E Assessing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vibration – A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Technical Guideline)</td>
</tr>
<tr>
<td>Vibratory Roller</td>
<td>&lt;300kN (Typical 7 – 13 Tonnes)</td>
<td>15 m</td>
<td>100 m</td>
</tr>
<tr>
<td></td>
<td>&gt;300kN (Typical &gt;18 Tonnes)</td>
<td>25 m</td>
<td>100 m</td>
</tr>
<tr>
<td>Large Hydraulic Hammer</td>
<td>1600 kg – 18 to 34T Excavator</td>
<td>22 m</td>
<td>73 m</td>
</tr>
</tbody>
</table>

Given the large intervening distances (>250 metres) between the site and neighbouring residences, it is unlikely levels of vibration will approach those specified in Section 4.3. However, we recommend that compliance monitoring of ground borne vibration is carried out at the nearest residence if complaints of unacceptable vibration are made by nearby residents. Refer to Section 7.13 for the mitigation measures to be engaged to reduce the impact of adverse vibration.
7.0 CONSTRUCTION NOISE AND VIBRATION MITIGATION

The calculated level of noise (Section 6.3) and vibration (Section 6.4) emission from Stage 1 construction works show that noise levels will comply with Noise Management Levels established in Section 5 of this report. Distance and ground absorption provide sufficient noise attenuation and additional mitigation measures such as hoardings and enclosures, are not necessary to achieve noise goals.

However, given the wide range of activities and the large area over which the works will take place, the following work practices will be implemented where necessary and practicable, to ensure compliance throughout the project.

- Works will be staged to minimise noise impact,
- Substitution of equipment will be considered to minimise noise
- Activities required to be conducted outside of the standard hours will be undertaken in accordance with the OOH protocol in Section 7.10.

7.1 Noise Measurement Equipment

All acoustic instrumentation employed throughout the monitoring programme will comply with the requirements of AS IEC 61672.1-2004 Electroacoustics – Sound level Meters Specifications. All sound level meters must have a current calibration certificate from a NATA accredited laboratory in accordance with NATA guidelines. Instrument calibration shall be checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dB.

7.2 Attended Noise Monitoring Procedure

Attended measuring at nearby residential dwellings should be carried out in response to complaints from neighbours.

The measurements will be conducted in accordance with the procedures outlined in Australian Standard AS1055 Acoustics – Description and measurement of environmental noise and in accordance with methods outlined in the NSW Industrial Noise Policy (INP). The following points should be followed when conducting noise monitoring:

- A field calibration should be conducted before and after measurements;
- The sound level meters must be set to A-weighting and Fast response;
- The sound level meters sample period should be set to 15 minutes;
- The following descriptors should be measured as a minimum: $L_{A1}$, $L_{Aeq}$ and $L_{A90}$; and
- Measurements should be conducted a minimum of 3 metres from the nearest façade and/or solid fence/wall. If it is not possible to do this corrections for façade reflection should be applied to the measurement results.
7.3 **Noise Monitoring of Equipment**

In addition to the residential noise monitoring procedures described in Section 7.2, the following equipment measurements may be undertaken in response to complaints from neighbours:

- Noise emission levels of all critical items of mobile plant and equipment checked by the for compliance with noise limits appropriate to those items as part of site mobilisation requirements;
- For equipment and mobile plant used for construction works, $L_{Aeq}$ measurements will be taken at an appropriate distance, normally 7m and converted to a Sound Power Level;

The equipment sound power levels will be compared to the levels contained in Table 5. If noise checks on any equipment result in a prediction of non-compliance, quieter equipment will be substituted.

7.4 **Reporting on Attended Noise Monitoring**

The following information must be included in noise monitoring reports when applicable:

- Field calibration results (before and after measurements);
- Measurement times and dates;
- Qualitative description of the noise environment during measurement;
- $L_{A1}$, $L_{Aeq}$ and $L_{A90}$ levels;
- Meteorological conditions during the measurements;
- Estimation of recorded noise contribution from other major noise sources.

The Construction Contractor Project Manager shall establish and maintain a system of records which provides full documentation of all noise monitoring results, complaint handling and responses to non-compliances. The Construction Contractor Project Manager shall establish and maintain procedures for the collection, indexing, filing, storage and maintenance of the records.
7.5 Construction Hours

All activities associated with the Stage 2 works shall take place within the EPA standard hours, with the exception of Saturday afternoon until 5pm, as shown below:

- 7:00am to 6:00pm, Monday to Friday inclusive; and
- 8:00am to 5:00pm Saturdays;
- At no time on Sundays or public holidays.

Works may be undertaken outside these hours where:

i) works are inaudible at the nearest sensitive receivers; or

ii) the delivery of materials is required outside these hours by the Police or other authorities; or

iii) it is required in an emergency to avoid the loss of life, damage to property and/or to prevent environmental harm; or

iv) a variation is approved, in advance, in writing, by the Secretary or her nominee.

Activities required to be conducted outside of the standard hours will be undertaken in accordance with the Outside of Hours (OOH) protocol in Section 7.10.

7.6 Work Practices

Workers and contractors shall be trained in work practices to minimise noise emission such as the following:

- Avoid dropping materials from a height.
- Avoid shouting and talking loudly outdoors.
- Avoid the use of radios outdoors that can be heard at the boundary of residences.
- Turn off equipment when not being used.
- Carry out work only within the approved hours of operation.

Activities required to be conducted outside of the standard hours will be undertaken in accordance with the OOH protocol in Section 7.10.
7.7  Heavy Vehicles and Staff Vehicles

The following points shall be implemented in conjunction with the Construction Traffic and Pedestrian Management Plan (CTPMP), as required under Condition B19 of the Stage 1 Consent.

- Truck drivers shall be informed of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (for example, minimising the use of engine brakes, and no extended periods of engine idling).
- Site vehicle entrances shall be located no closer than 600 m from residential premises.
- The number of vehicle trips shall be configured to reduce the number of trips to and from the site – movements shall be organised to amalgamate loads rather than using a number of vehicles with smaller loads.
- Staff parking areas shall be located within a dedicated area within the site.
- Parking and queuing of staff vehicles and other construction vehicles shall be avoided as far as is practicable on streets outside of the site.
- All vehicles operated within 300 m of the northern boundary shall be fitted with broadband reversing alarms or alternative, non-tonal proximity warning systems.

7.8  Community Relations

- A Community and Stakeholder Manager shall be appointed by the contractor prior to the commencement of any works;
- The manager will approach all potentially affected residents prior to the commencement of any works as an initial introduction and provide their contact details;
- The manager will explain the project, duration of works, potentially noisy periods as well as determine any particularly sensitive receivers or sensitive time periods and schedule works accordingly, as far as reasonably practical;
- A community information telephone number has been established to provide access and information about the project. The telephone number is 1800 449 848 and is the primary contact number for inquiries from the community. It is accessible 24 hours a day, 7 days a week.
- An email address has been established to manage correspondence and to provide access and information about the project. The email address for all enquiries is info@northernpathways.com.au
- A postal address has been established to manage correspondence and to provide access and information about the project. The postal address for all enquiries is GPO Box 508, SYDNEY, NSW, 2001.
• A newspaper advertisement shall be prepared and placed in local media at least 7-days in advance, where there are significant out-of-hours work that have the potential to impact the community, and or at key project milestones that are of interest to the community. Information would typically include an overview of work, including specific construction information, expected duration, and the above contact details for complaints and correspondence.

• Community notifications and newsletters shall be prepared and distributed, at least 7 days prior to commencement of any works, to the community in areas that are potentially affected by the project. The contents of the notifications shall include information on the nature of the works, location of works being carried out, possible impacts to amenity, traffic flow or services, and the contact details as listed above.

• Community drop-in sessions shall be organised to engage with the community and to provide a conduit for direct consultation between those affected, or with an interest in the project, and the project team. To encourage the widest attendance and accessibility to the community, drop-in sessions shall be arranged outside of business hours such as weeknights or on Saturday.

• Information cards with the above contact details shall be prepared and distributed to the project management team and other staff on site. These cards shall be given to members of the community or other interested parties should they approach staff on site for information.

Once works commence, communication with the community shall be maintained by the Community and Stakeholder Manager. Communication shall be maintained via the aforementioned methods.

Consultation and cooperation between the contractor and the neighbours and the removal of uncertainty and rumour can help to reduce adverse reaction to noise.
7.9 Managing a Noise Complaint

The Community and Stakeholder Manager shall receive and manage noise complaints and implement a Construction Complaints Management System.

All complaints shall be treated promptly and with courtesy.

In the event that a noise complaint is received, noise monitoring will be carried out at the affected receptor location and appropriate measures be taken to reduce the noise emission as far as reasonably practicable. If the NML is found to be exceeded, works on the site will stop and site staff determine the best method of reducing the noise based on the mitigation measures described in this CNVMP. Noisy works will be restricted to outside the nominated respite periods.

Where it is not practicable to stop the noise, or reduce the noise, a full explanation of the event taking place, the reason for the noise and times when it will stop shall be given to the complainant.

The following guidelines are recommended in Section 6 of the Interim Construction Noise Guideline to manage a noise complaint:

- Provide a readily accessible contact point, for example, through a 24 hour toll-free information and complaints line.

- Give complaints a fair hearing.

- Have a documented complaints process, including an escalation procedure so that if a complainant is not satisfied there is a clear path to follow.

- Call back as soon as possible to keep people informed of action to be taken to address noise problems. Call back at night-time only if requested by the complainant to avoid further disturbance.

- Provide a quick response to complaints, with complaint handling staff having both a good knowledge of the project and ready access to information.

- Implement all feasible and reasonable measures to address the source of complaint, which may include standing equipment down.

- Keep a register of any complaints, including details of the complaint such as date, time, person receiving complaint, complainant’s contact number, person referred to, description of the complaint, work area (for larger projects), time of verbal response and timeframe for written response where appropriate.
7.10 Out-of-Hours Work Protocol

Any work proposed to be conducted out of standard construction hours shall be subject to approval by the Environmental Representative. Details of proposed work shall be submitted for evaluation which will include; location of work to be conducted, types of plant and equipment proposed, character and likelihood of noise being generated, anticipated effect on traffic flow to and from the site.

In the event that it is unavoidable to conduct work outside of standard construction hours and work is likely to be audible at residential premises, an acoustic assessment shall be carried out to determine the extent of potential exceedance, recommendations for reasonable and feasible noise mitigation measures to be employed and predicted levels at the nearest sensitive receptors.

The relevant local council, residential areas and other sensitive receivers and stakeholders that are potentially affected by any work approved to be conducted outside of standard construction hours shall be notified at least 7 days prior to the commencement of work. Methods of notification may include letter drops, door-knocking, publications in local media and on the NorthernPathways website (http://www.northernpathways.com.au). The Community Liaison Officer shall promptly be informed of all work approved outside of standard construction hours to allow appropriate time to arrange community notifications.

7.11 Amendments to the Construction Noise and Vibration Management Plan

Should changes to the Conditions of Approval, schedule, nature of the works, equipment used during the works or locations of work change significantly during the course of the project, amendments to this plan and the calculations and recommendations contain herein, may be amended to reflect the changes.

A review should be carried out once a month by the Construction Environment Manager and be revised if necessary.

This CNVMP should be viewed as a live document and updated as necessary, noting that revision of the CNVMP may result in the monitoring regime increasing or decreasing.
7.12 Noise Monitoring

In the event of a noise complaint, noise monitoring shall be conducted at the most affected residence at each receptor location to determine which activities are generating excessive noise. If practicable, noise mitigation measures, such as those outlined above, shall be implemented and further monitoring shall then be employed to determine the efficacy of noise mitigation.

If compliance with the NMLs is demonstrated, the complainant will be advised and noise monitoring will be discontinued.

If exceedances are measured, it shall be determined from the time code of the recorded data as to which specific activities are causing the exceedance. Noise mitigation strategies and methods shall be implemented to reduce noise to within acceptable levels at the nearest sensitive receptors.

7.13 Vibration Monitoring

Given the distances to the nearest sensitive receptors, it is not anticipated that vibration levels will approach those shown in Tables 3 & 4. However, if complaints or concerns are raised from nearby residents regarding high impact activities, such as rock hammering or piling, vibration measurements shall be carried out at a residence within each of the nearest receptor locations at the commencement of high impact activities to determine the maximum levels of vibration during these peak vibration generating events.

In the event of an exceedance of the Peak Particle Velocity (PPV) vibration criteria as defined in Table 4 above, unattended vibration monitor or monitors shall be installed at each residential location where an exceedance was measured.

Unattended vibration monitors shall have the capability to trigger an alert to make the site manager and/or plant operator aware immediately when the vibration limit is exceeded. The vibration monitor should be set to trigger the alert when the overall PPV exceeds the criteria within each frequency range, as stipulated in Table 4, at the nearest residential building.

In the event that levels of ground-borne vibration exceed the recommended acceptable levels for cosmetic damage vibration causing works should cease immediately and alternative methods shall be considered.
8.0 CONCLUSION

Day Design was engaged to prepare a Construction Noise and Vibration Management Plan for the Stage 1 works associated with the New Grafton Correctional Centre at 313 Avenue Road, Lavadia, NSW.

The construction noise and vibration impacts from the approved Stage 1 works have been considered in accordance with the Consent Conditions imposed by the NSW Minister for Planning.

We are of the opinion that the noise impact due to the construction methodology in Stage 1 will comply with the Noise Management Levels recommended by the Environment Protection Authority in their Interim Construction Noise Guideline and be considered acceptable at all nearby residential premises.

The vibration from the Stage 1 works will be significantly less than the acceptable vibration limits at all nearby residential premises.

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Principal Acoustical Consultant
for and on behalf of Day Design Pty Ltd

AAAC MEMBERSHIP
Day Design Pty Ltd is a member company of the Association of Australasian Acoustical Consultants, and the work herein reported has been performed in accordance with the terms of membership.