



SUITE 17, 808 FOREST ROAD, PEAKHURST 2210 P. 02 9046 3800  
ACOUSTICS@DAYDESIGN.COM.AU WWW.DAYDESIGN.COM.AU ABN: 73107291494

# Stage 2 - Environmental Noise and Vibration Assessment

New Grafton Correctional Centre  
313 Avenue Road, Lavadia, NSW

REPORT No  
6100-3.2R

**PRO-ACO-CD-RPT-01-[D]**

DATE ISSUED  
30 May 2017



**Revision History**

| Report    | Date       | Prepared     | Checked       | Comment        |
|-----------|------------|--------------|---------------|----------------|
| Draft [A] | 15/05/2017 | William Wang | Stephen Gauld | Initial Review |
| Draft [B] | 23/05/2017 | William Wang | Stephen Gauld | Final Draft    |
| Final [C] | 26/05/2017 | William Wang | Stephen Gauld |                |
| Rev [D]   | 30/05/2017 | William Wang | Stephen Gauld |                |

Document R\6100-3.2R, 51 pages plus attachments

**Disclaimer**

The work presented in this document was carried out in accordance with the Day Design Pty Ltd Quality Management System. Day Design is certified to ISO9001.

Day Design Pty Ltd reserves all copyright of intellectual property in any or all of Day Design's documents. No permission, license or authority is granted by Day Design to any person or organisation to use any of Day Design's documents for any purpose without written consent of Day Design.

This report has been prepared for the client identified and cannot be relied or used by any third party. Any representation, statement, opinion or advice, expressed or implied in this report is made in good faith but on the basis that Day Design is not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in any respect of any representation, statement, or advice referred to above.

Recommendations made in this report are intended to resolve acoustical problems only. No claims of expertise in other areas are made and no liability is accepted in respect of design or construction for issues falling outside the specialist field of acoustical engineering including but not limited to structural, fire, thermal, architectural buildability, fit for purpose, waterproofing or other aspects of building construction. Supplementary professional advice should be sought in respect of these issues.

The information in this document should not be reproduced, presented or reviewed except in full. Prior to passing onto a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.



## TABLE OF CONTENTS

|       |                                                            |    |
|-------|------------------------------------------------------------|----|
| 1.0   | EXECUTIVE SUMMARY .....                                    | 6  |
| 2.0   | INTRODUCTION AND OVERVIEW .....                            | 8  |
| 2.1   | Background .....                                           | 8  |
| 2.2   | Stage 1 Consent .....                                      | 8  |
| 2.3   | Approvals Framework .....                                  | 10 |
| 2.4   | The Site and Its Context .....                             | 10 |
| 2.4.1 | Regional Context .....                                     | 10 |
| 2.4.2 | The Site .....                                             | 12 |
| 2.5   | The Proposal .....                                         | 13 |
| 2.6   | Purpose of This Report .....                               | 16 |
| 2.7   | Report Structure .....                                     | 17 |
| 3.0   | EXISTING NOISE ENVIRONMENT .....                           | 19 |
| 3.1   | Background Noise Level .....                               | 19 |
| 3.2   | Residential Receiver Locations .....                       | 20 |
| 3.3   | Pacific Highway Upgrade .....                              | 22 |
| 4.0   | NOISE AND VIBRATION CRITERIA .....                         | 23 |
| 4.1   | EPA Interim Construction Noise Guideline .....             | 23 |
| 4.2   | Construction and Operational Vibration .....               | 24 |
| 4.2.1 | EPA Vibration Guideline .....                              | 24 |
| 4.2.2 | German Standard DIN 4150 - Structural Damage .....         | 25 |
| 4.3   | Operational Noise .....                                    | 26 |
| 4.3.1 | Industrial Noise Policy .....                              | 26 |
| 4.3.2 | Intrusiveness Criterion .....                              | 26 |
| 4.3.3 | Amenity Criteria .....                                     | 27 |
| 4.4   | Road Traffic Noise .....                                   | 27 |
| 4.4.1 | Traffic Generated By the Development .....                 | 27 |
| 4.4.2 | Traffic Noise Affecting the Development .....              | 28 |
| 4.5   | Project Specific Noise Emission Goals (Construction) ..... | 29 |
| 4.6   | Project Specific Noise Emission Goals (Operation) .....    | 29 |
| 5.0   | STAGE 2 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT .....  | 30 |
| 5.1   | Stage 2 Construction .....                                 | 30 |
| 5.2   | Hours .....                                                | 31 |
| 5.3   | Noise Assessment .....                                     | 32 |
| 5.4   | Construction Traffic .....                                 | 33 |



|      |                                                                         |    |
|------|-------------------------------------------------------------------------|----|
| 5.5  | Pacific Highway Upgrade Cumulative Noise Impact.....                    | 35 |
| 5.6  | Vibration Impacts.....                                                  | 36 |
| 5.7  | Management of Construction Related Impacts.....                         | 36 |
| 6.0  | CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN.....                   | 37 |
| 6.1  | Noise Measurement Equipment.....                                        | 37 |
| 6.2  | Attended Noise Monitoring Procedure .....                               | 37 |
| 6.3  | Noise Monitoring of Equipment.....                                      | 38 |
| 6.4  | Reporting on Attended Noise Monitoring.....                             | 38 |
| 6.5  | Construction Hours.....                                                 | 39 |
| 6.6  | Work Practices.....                                                     | 39 |
| 6.7  | Heavy Vehicles and Staff Vehicles .....                                 | 40 |
| 6.8  | Community Relations .....                                               | 40 |
| 6.9  | Managing a Noise Complaint .....                                        | 42 |
| 6.10 | Out-of-Hours Work Protocol .....                                        | 43 |
| 6.11 | Amendments to the Construction Noise and Vibration Management Plan..... | 43 |
| 6.12 | Noise Monitoring.....                                                   | 44 |
| 6.13 | Vibration Monitoring.....                                               | 44 |
| 6.14 | Pacific Highway Upgrade Consultation .....                              | 44 |
| 7.0  | OPERATIONAL NOISE AND VIBRATION ASSESSMENT .....                        | 45 |
| 7.1  | Hours .....                                                             | 45 |
| 7.2  | Noise Assessment.....                                                   | 45 |
| 7.3  | Traffic Noise Assessment.....                                           | 48 |
| 7.4  | Vibration Assessment.....                                               | 50 |
| 7.5  | Mitigation Measures.....                                                | 50 |
| 7.6  | Significance of Risk.....                                               | 50 |
| 8.0  | CONCLUSION.....                                                         | 51 |
|      | APPENDICES.....                                                         | 51 |



## TABLES

|          |                                                                         |    |
|----------|-------------------------------------------------------------------------|----|
| Table 1  | Report Structure .....                                                  | 17 |
| Table 2  | Report Structure .....                                                  | 18 |
| Table 3  | Rating Background Levels.....                                           | 19 |
| Table 4  | $L_{eq}$ Noise Management Levels from Construction Activities .....     | 24 |
| Table 5  | Vibration Dose Values (VDV) from Construction Activities.....           | 24 |
| Table 6  | Transient Vibration Guide Values for Structural Damage .....            | 25 |
| Table 7  | Intrusive Noise Criteria.....                                           | 26 |
| Table 8  | Amenity Noise Criteria .....                                            | 27 |
| Table 9  | Road Traffic Noise Criteria – Affecting Residential Locations .....     | 28 |
| Table 10 | Road Traffic Noise Criteria - affecting NGCC .....                      | 28 |
| Table 11 | Summary of Construction Noise Management Levels.....                    | 29 |
| Table 12 | Summary of INP Noise Criteria .....                                     | 29 |
| Table 13 | Typical Mobile Plant - Sound Power Levels.....                          | 32 |
| Table 14 | Calculated Receptor Noise Levels from Stage 2 Construction .....        | 33 |
| Table 15 | Stage 2 Construction Traffic Volume .....                               | 34 |
| Table 16 | Calculated Receptor Noise Levels from Stage 2 Construction Traffic..... | 35 |
| Table 17 | Recommended safe working distances for vibration generating plant ..... | 36 |
| Table 18 | Day Time Operational Noise Sources – Calculated Noise Levels .....      | 46 |
| Table 19 | 24 hr Operational Noise Sources – Calculated Noise Levels.....          | 47 |
| Table 20 | Stage 2 Operational Traffic Volume - Staff .....                        | 48 |
| Table 21 | Stage 2 Operational Traffic Volume - Visitors.....                      | 49 |
| Table 22 | Calculated Receptor Noise Levels from Stage 2 Operational Traffic.....  | 49 |



## 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, Lavadia, 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 Environmental Noise Assessment has been prepared in accordance with the relevant Secretary's Environmental Assessment Requirements (SEARs). Potential noise and vibration impacts associated with the construction and operation of the Project have been considered in accordance with the following guidelines and legislation:

- *Interim Construction Noise Guideline (ICNG)*, Department of Environment and Climate Change (DECC), 2009
- *Industrial Noise Policy (INP)*, Environmental Protection Authority (EPA), 2000
- *Road Noise Policy (RNP)*, Office of Environment & Heritage (OEH), 2011
- *Assessing Vibration: A Technical Guideline (AVATG)*, Department of Environment and Conservation (DEC) (2006)

Approval for Stage 1 of the Proposal was granted on 14 March 2017 for concept proposal and Stage 1 works prior to subsequent construction as envisaged in the concept proposal. Condition B3 in Schedule 2, Part B of the Stage 1 Consent requires the potential noise and vibration impacts on adjoining sensitive land uses be considered.

Stage 2 will include the design, construction and operation of the Proposal. The assessment required in Condition B3 in Schedule 2 is incorporated in the assessment required by the SEARs for Stage 2.

Noise and vibration impacts associated with the construction of the proposal will be managed through the implementation of a Construction and Vibration Management Plan (CNVMP) for Stage 2 construction.



Noise and vibration impacts associated with the operation of the facility are considered insignificant at the nearest residential premises due to the intervening distance and 6 m high concrete perimeter wall.

This report has considered and fulfilled the SEARs No 5 and No 10 to assess the acoustic amenity impacts on the surrounding locality and to identify and provide a quantitative assessment of the main noise and vibration generating sources and activities during Stage 2 design, construction and operation. Measures to minimise and mitigate the potential noise impacts on surrounding occupiers of land have been included and consider relevant policies and guidelines.



## 2.0 INTRODUCTION AND OVERVIEW

### 2.1 Background

In 2016, the NSW Government called for Expressions of Interest from the private sector to design, build, operate and maintain the NGCC. Following a competitive tender process, NorthernPathways were announced as the preferred bidder. The project is being delivered a Public Private Partnership (PPP) which means NorthernPathways will design, construct, operate and maintain the new facility on behalf of the NSW Government for the next 20 years.

Infrastructure NSW (INSW) is the Proponent for the environmental impact statement and lodgement of an application for environmental and planning approval. INSW is working with NorthernPathways on the community consultation and public exhibition of this environmental impact statement.

NGCC will be the major multifunctional, regional correctional facility servicing the northern part of NSW and will be the primary correctional facility for all corrections operations from the Queensland border in the north to Kempsey in the south, and Tamworth in the southwest.

The vision for the project is to operate in accordance with innovative best practice, both in providing safety and security and providing dynamic, pro-social management of inmates.

### 2.2 Stage 1 Consent

On 14 March 2017 consent was granted to the concept proposal for the staged development of New Grafton Correctional Centre (NGCC) comprising:

- 1,700 maximum and minimum security beds, consisting of:
  - o - 1,000 maximum security beds for male inmates;
  - o - 300 maximum security beds for female inmates; and
  - o - 400 minimum security beds for male inmates.
- core correctional facility buildings including: maximum and minimum accommodation units; special accommodation units; health facilities; education and programs areas; administration; workshops; staff amenities; and visitor facilities;
- a recreational oval within the perimeter of the facility;
- a six metre high fence or wall around the perimeter of the facility, with light and security camera poles up to 10 metres in height;
- store buildings, small ancillary facilities, a central energy plant, black-water treatment facilities and a drug dog detection unit and yard located outside the perimeter wall / fence;
- fire access roads on the inside and the outside of the perimeter wall/ fence of the facility;
- water, power, wastewater and communication utilities within the site;



- a maximum building height of 12 metres (approximately three storeys);
- total GFA of approximately 100,000 sqm;
- vegetative buffer of 50 metres along the northern boundary, 15 metres along the eastern boundary and 30 metres along the southern boundary; and
- asset protection zone of 100 metres from every boundary or vegetation buffer;
- one vehicular entry/exit point from Avenue Road;
- 500 car parking spaces;
- 1.5 metre high boundary fence; and
- landscaping of ground cover and /or shrubbery.

All development under the concept proposal consent (Stage 1 consent) is to be the subject of a subsequent development application with the exception of the Stage 1 works.

The approved Stage 1 works include:

- vegetation clearance and biodiversity management activities;
- bulk excavation and site stabilisation works;
- demolition of the existing house and sheds;
- 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 works; and
- landscaping.

These Stage 1 works will be undertaken to facilitate the subsequent development as envisaged in the concept proposals.

At the same time, Infrastructure New South Wales (INSW) is arranging for the delivery of services to the site including a mains water supply, electricity, telecommunications and access.

The subsequent development application (Stage 2 DA) will be generally consistent with the concept proposal as outlined on the previous page.

NGCC will be constructed and maintained by John Holland and Serco will operate the correctional centre.



## 2.3 Approvals Framework

NGCC is a State significant development with planning approval being obtained in two stages:

- Stage 1 – for the concept proposal and Stage 1 works; and
- Stage 2 – for the design and construction of the facility.

The Stage 1 consent was obtained by the Infrastructure NSW (INSW) on behalf of Corrective Services NSW (CSNSW), a division of the Department of Justice, with approval perceived 14 March 2017.

INSW, on behalf of Corrective Services NSW (CSNSW), a division of the Department of Justice is the applicant for this Stage 2 development application.

The development to which the Stage 2 development application relates is also State significant development. Clause 8(1)(b) in Part 2 of State Environmental Planning Policy (State and Regional development) 2011 (“the SRD SEPP”), development is declared to be State significant development if the development is specified in Schedule 1 or 2 of the SRD SEPP. Schedule 1 includes paragraph 16:

*16 Correctional centres*

*Development for the purpose of correctional centres that has a capital investment value of more than \$30 million.*

The proposed NGCC has a capital investment value of over \$30 million and is State Significant Development.

The Minister for Planning is the consent authority for State Significant Development.

## 2.4 The Site and Its Context

### 2.4.1 Regional Context

The site is located 23 kilometres by road to the south east of Grafton, 5 kilometres north east of Grafton Airport and 7 kilometres east of the Pacific Highway at 313 Avenue Road Lavadia on the Mid North Coast of New South Wales.

The Pacific Highway provides connections north towards Queensland and south towards the Hunter and Sydney. The Gwydir Highway provides a connection between the North Coast and the New England and Summerland Way extends north connecting Grafton, Casino and Kyogle to the Mt Lindesay Highway.

Grafton is a focal point for regional road, river and other transport networks and a focus for higher order services to the Clarence Valley sub-region. It is the sub-region’s major employment centre and a centre for government administration.



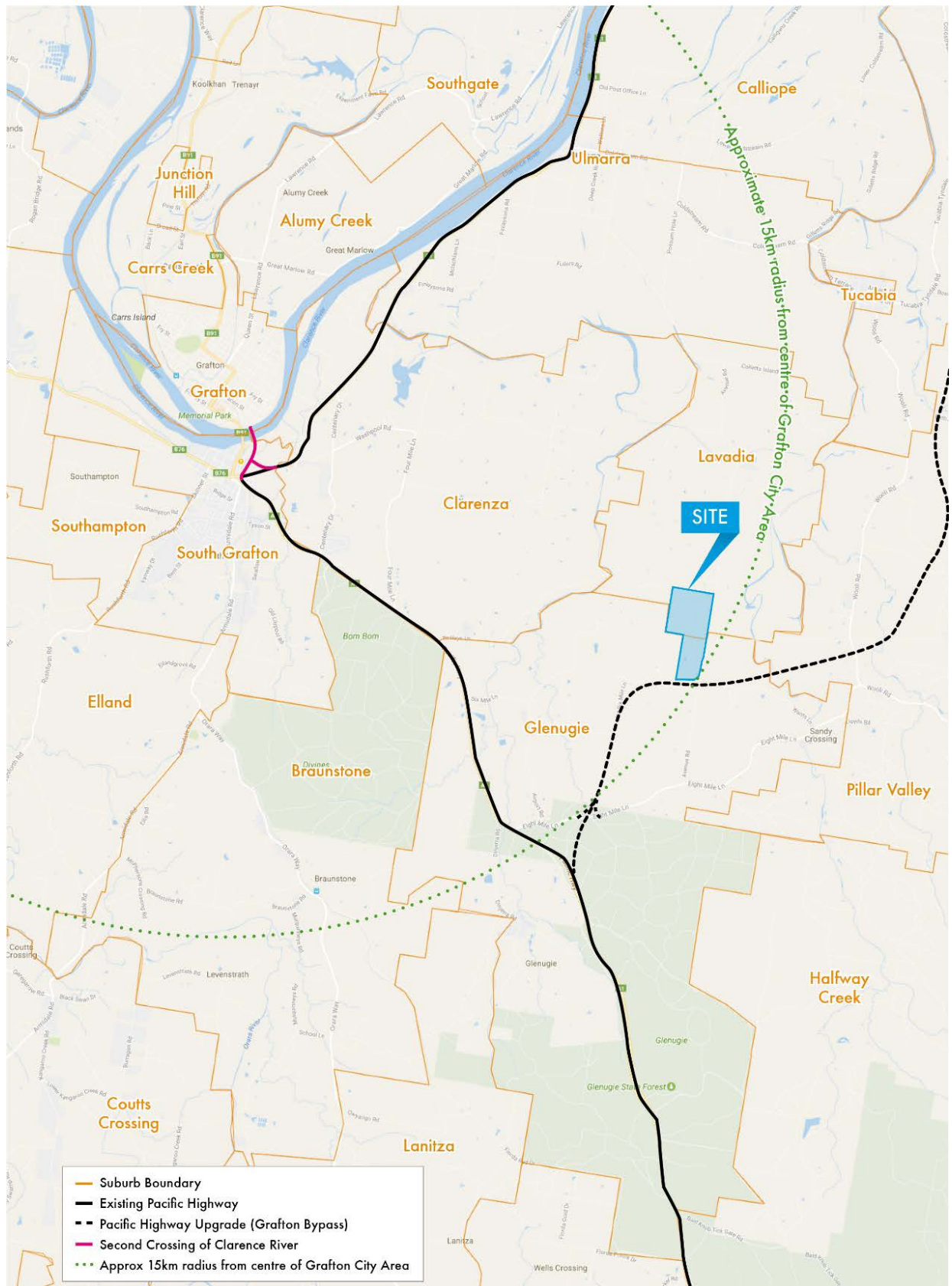


Figure 1 - Location



### 2.4.2 The Site

The site comprises Lot 26 DP751376 and Lot 1 DP 1190399 each roughly rectangular with a total area of 195 hectares. It is known as 313 Avenue Road Lavadia although the site straddles the boundary between the localities of Lavadia and Glenugie.

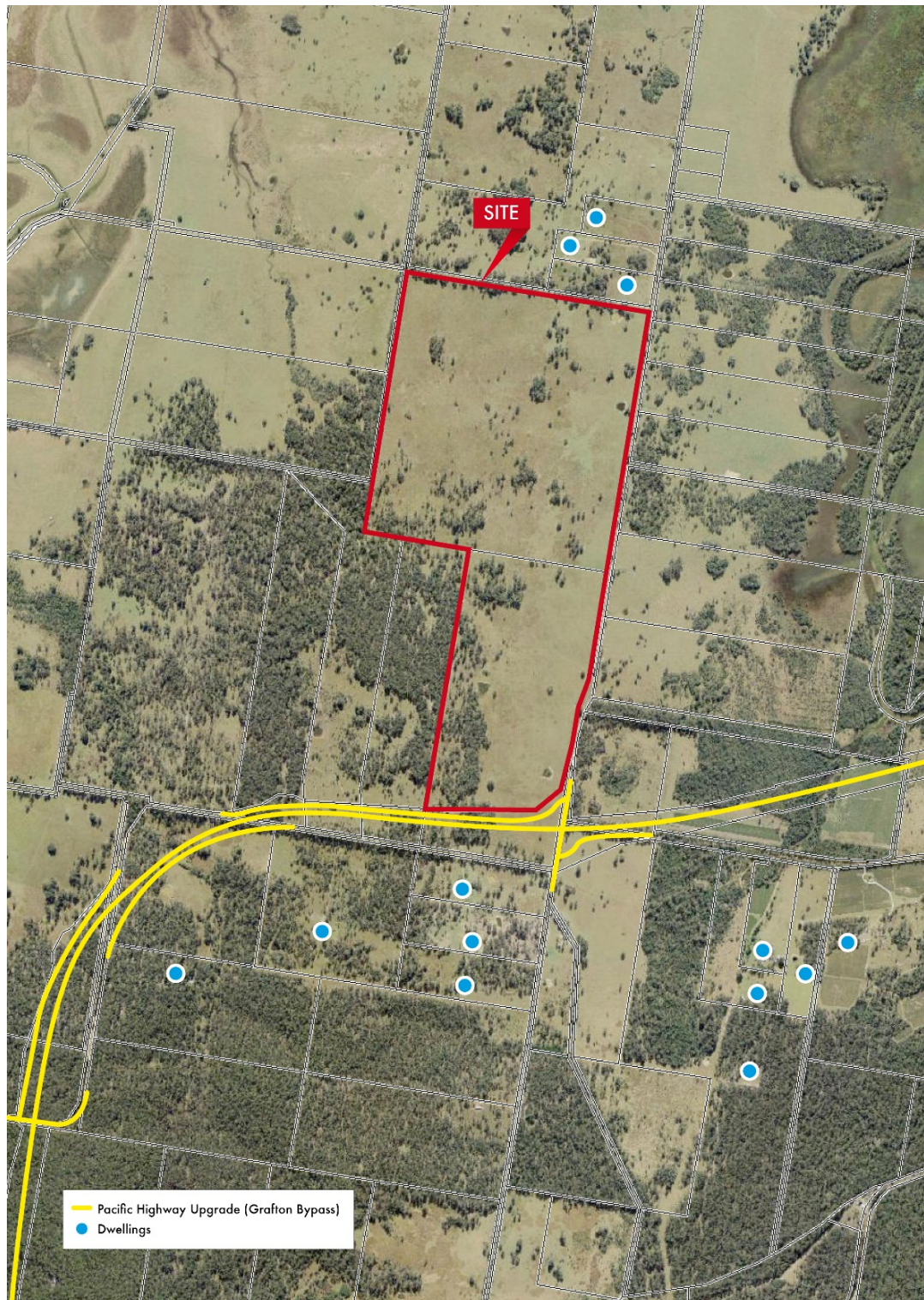


**Figure 2 - Site**



It has a frontage to Avenue Road of approximately 2.2 km, a northern boundary to an unformed Crown road of 1.1 km, a western boundary to adjoining private property and unformed Crown roads of 2.3 km and a southern boundary of 627 metres to the Pacific Highway under construction including the relocated Old Six Mile Lane.

## 2.5 The Proposal

The proposed development comprises the construction of a new correctional centre designed to accommodate 1,700 male and female inmates comprising 14 different cohorts including but not limited to:

| Classification                          | Number | Gender |
|-----------------------------------------|--------|--------|
| Maximum Security Classification Inmates | 1000   | Male   |
| Maximum Security Classification Inmates | 300    | Female |
| Minimum Security Classification Inmates | 400    | Male   |
| Total                                   | 1,700  |        |

Other associated facilities include but are not limited to:

- Recreational oval, special accommodation units, administration, industries and educational facilities, workshops, staff amenities, visitor facilities, prisoner reception and health facilities (including beds and some diagnostic facilities), access, parking and utilities;
- An overall Gross Floor Area (GFA) of approximately 90,700 square metres;
- Secure perimeter fences to the two correctional precincts comprising concrete and anti-climb mesh fences with a Sterile Zone;
- Additional beds for remand/reception management and management of unforeseen contingencies such as a requirement to separate inmates;
- Associated support and ancillary buildings for the delivery of services (other than functions);
- Provision of integrated power, fire, general infrastructure and security & communications backbone;
- Provision of furniture, fittings & equipment (FF&E) to deliver the services and other functions.

Two distinct correctional precincts for the management of maximum and minimum security inmate cohorts are proposed with movement of staff, inmates and visitors managed through individual gatehouses.

These are located either side of central facilities such as parking areas, visitor arrivals areas and staff amenities.



The facility has been designed to be legible for all users, engendering a feeling of personal safety. In providing the physical spaces requisite for the execution of day-to-day operations and achievement of high-level goals, the design results in efficiencies and minimised impact on the environment through the location of buildings and design of movement systems.

The design provides a campus-style layout for the three correctional centres – male maximum, female maximum and male minimum and positions each centre on either side of the existing ridgeline running on a north–south axis through the Site. This ridgeline offers views to Glenugie Peak in the distance to the south, captured by the proposed cultural centre located between the male maximum and female maximum centres. Views to this significant feature are symbolic and meaningful to locals, and particularly for the Indigenous community.

Each centre is designed with a ‘spine’ or ‘street’ of support facilities, and a number of neighbourhoods of residential accommodation. These spines are set out along a gentle curve, generated from the existing topography and natural landforms.

The male maximum and female maximum centres are enclosed by one maximum-security perimeter and designed with physical, visual and acoustic separation between male and female inmates. This is achieved through the natural ridgeline layering the support facilities spines for each centre on either side of a green space. A secure line between each of the centres prevents inmates from accessing the other.

Each centre is accessed from the support facilities spine through a series of managed secure officer posts in lieu of a central movement control post, facilitating ease of movement into the campus facilities (e.g. recreation, industries, programs and education). The facilities are set out along a curved communication spine determined by functional requirements, acting as the ‘wayfinding’ across the facility. This pathway network provides a functional solution aligned with operational needs and accommodates natural ‘desire’ lines of pedestrians. Movement areas are observed by staff points, and movement within the centres’ shared spaces is controlled using buildings and landscape elements to define circulation routes.

The landscape design follows the campus style design approach being integrated into the existing local environmental context. Areas of existing vegetation are retained, wherever possible, and extensive screen planting of endemic trees, shrubs and grasses to the boundaries, the drainage lines, and the hill to the north. The entrance road planting of informal groves of local trees, retains the local rural character.

Secure perimeter fences would be provided to the two correctional precincts comprising 6.0m high concrete and anti-climb mesh fences with a secure sterile zone. Detection monitoring and CCTV coverage of perimeter security zones will be provided with security lighting.



A single point of entry and control would be provided from Avenue Road. Internal access roads and parking carparking for approximately 700 car spaces comprising:

- 350 staff car parking spaces and 10 motorcycles spaces
- 350 visitor car parking spaces and 10 motorcycles with a standover space with an overflow area accommodating a further 150 cars

A bus stop close to the visitor reception area would be provided with provision for bus

NorthernPathways propose to design, build and operate a Membrane Bioreactor (MBR) Waste Water Treatment Plant to accommodate inmates, staff and visitors and all peak load periods. The proposed MBR system is the combination of an activated sludge biological treatment plant with Ultra filtration membrane process utilising a suspended growth bioreactor producing Class A+ potable water. This water would be reticulated as recycle water through the facility, with excess directed to travelling surface irrigators. The plant would be fully automated and be remotely monitored for additional offsite technical support.

The facility would be constructed in one stage with occupancy managed by gradual ramp up to capacity over a period of 6 months. The facility will commence construction pursuant to the Stage 1 consent issued in March 2017 and, subject to works under a Stage 2 DA, is due for completion in early 2020 ready for occupation from July 2020.

The construction and delivery of the project will be undertaken in coordination with other major projects in the region, namely the Pacific Highway upgrade currently under construction by the Roads and Maritime Services and the additional bridge crossing of the Clarence River in Grafton.

Detailed consideration has been given to construction planning and management.

It is estimated that some 580 jobs would be provided at the facility with approximately 350 of these being custodial officers. During construction, some 1,100 jobs would be provided.



## 2.6 Purpose of This Report

The purpose of this report is to address SEARs No 5 (acoustic amenity) and No 10 for SSD 7413:

### **5. Environmental Amenity**

*Detail amenity impacts including acoustic impacts, visual privacy, view sharing/loss and lighting impacts. A high level of environmental amenity for any surrounding residential land uses must be demonstrated.*

### **10. Noise and Vibration**

*Identify and provide a quantitative assessment of the main noise and vibration generating sources during construction and operation. Outline measures to minimise and mitigate the potential noise impacts on surrounding properties.*

*Relevant Policies and Guidelines:*

- *NSW Industrial Noise Policy (EPA)*
- *Interim Construction Noise Guideline (DECC)*
- *Assessing Vibration: A Technical Guideline 2006*



## 2.7 Report Structure

This report will be used to support the preparation of the Environmental Impact Statement (EIS) required under Division 4.1, Part 4 of the EP&A Act. The structure of the report is summarised in Table 1. SEARs relevant to this report and where they have been addressed are summarised in Table 2.

**Table 1 Report Structure**

| Section Reference | Section Heading                                                                                                                                                                                                                                  | Description                                                                                                                          |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1                 | Executive Summary                                                                                                                                                                                                                                | Concise summary of this report and the key findings.                                                                                 |
| 2                 | Introduction and Overview <ul style="list-style-type: none"> <li>• Background</li> <li>• Stage 1 Consent</li> <li>• Approvals Framework</li> <li>• The site and its context</li> <li>• The Proposal</li> <li>• Purpose of this Report</li> </ul> | Provides a description of the Project, the Project objectives and structure of this report.                                          |
| 3                 | Existing Noise Environment                                                                                                                                                                                                                       | Establishes local background noise level and noise sensitive receivers.                                                              |
| 4                 | Noise and Vibration Criteria                                                                                                                                                                                                                     | Lists noise criteria that the Project must comply with.                                                                              |
| 5                 | Construction Noise and Vibration Assessment                                                                                                                                                                                                      | Identifies key noise and vibration related construction activities and assesses the potential impacts on the local receivers.        |
| 6                 | Construction Noise and Vibration Management Plan                                                                                                                                                                                                 | Establishes management measures to manage construction noise impacts.                                                                |
| 7                 | Operational Noise and Vibration Assessment                                                                                                                                                                                                       | Identifies key noise and vibration related to operational activities and considers the potential impacts on the local receivers.     |
| 8                 | Conclusion                                                                                                                                                                                                                                       | Statement of key findings of the Stage 2 construction and operational impacts of the Project on local levels of noise and vibration. |



**Table 2 Report Structure**

| SEARs                                                                                                                                                                                                                                                                                           | Cross Reference            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| <b>SEAR Key Issues</b>                                                                                                                                                                                                                                                                          |                            |
| Grafton Correctional Centre Concept Proposal – In accordance with section 83D(3) of the Environmental Planning and Assessment Act 1979, demonstrate that the proposal is not inconsistent with the development consent granted for the Grafton Correctional Centre concept proposal (SSD 7413). | Section 5.0 (Construction) |
| Condition B3 in Schedule 2, Part B of the Stage 1 Consent.                                                                                                                                                                                                                                      | Section 7.0 (Operation)    |
| <b>SEAR No 5 Environmental Amenity</b>                                                                                                                                                                                                                                                          |                            |
| Detail amenity impacts including acoustic impacts, visual privacy, view sharing/loss and lighting impacts. A high level of environmental amenity for any surrounding residential land uses must be demonstrated.                                                                                | Section 3.0                |
| <b>SEAR No 10 Noise and Vibration</b>                                                                                                                                                                                                                                                           |                            |
| Identify and provide a quantitative assessment of the main noise and vibration generating sources during construction and operation. Outline measures to minimise and mitigate the potential noise impacts on surrounding properties.                                                           | Section 5.0 (Construction) |
|                                                                                                                                                                                                                                                                                                 | Section 7.0 (Operation)    |
| <b>Relevant Policies and Guidelines:</b>                                                                                                                                                                                                                                                        |                            |
| <ul style="list-style-type: none"> <li>• NSW Industrial Noise Policy (EPA)<sup>1</sup></li> <li>• Interim Construction Noise Guideline (DECC)</li> <li>• Assessing Vibration: A Technical Guideline 2006</li> <li>• Road Noise Policy (EPA)<sup>2</sup></li> </ul>                              |                            |

<sup>1</sup> The EPA's draft Industrial Noise Guideline has not been considered as the NSW Industrial Noise Policy is the current and relevant policy.

<sup>2</sup> The RNP is not specifically mentioned in Sear 10, however this policy is relevant to the impact of traffic noise on surrounding properties.



### 3.0 EXISTING NOISE ENVIRONMENT

A Noise and Vibration Working Paper has been 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 agree with and will adopt the noise criteria proposed. A summary of the criteria is set out in the following sections.

#### 3.1 Background Noise Level

Background noise levels were measured at 961 Woolli Road, Pillar Valley, by Jacobs Australia as part of the Woolgoolga to Ballina Pacific Highway upgrade EIS at a site 4 km east of the project site. In the report, 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.

The Jacobs report states *“Although this receiver is located around four kilometres east of the Proposal site, the acoustic environment is influenced by similar rural sources. Background levels at this location are similar to those in the vicinity of the Proposal and this receiver is considered representative of typical noise levels for the wider surrounding area.”*<sup>3</sup>

We agree with the assertion by Jacobs and have assumed that the background noise level at the most affected residences will be equal or greater than the background noise level at the measured location. In the future, 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 3.

**Table 3 Rating Background Levels**

| Noise Measurement Location     | Time Period             | Rating Background Level (L <sub>90</sub> , 15 minute) | Existing L <sub>eq</sub> noise levels (L <sub>eq</sub> , time period) |
|--------------------------------|-------------------------|-------------------------------------------------------|-----------------------------------------------------------------------|
| 961 Woolli Road, Pillar Valley | Day (7 am to 6 pm)      | <b>48 dBA</b>                                         | <b>L<sub>eq,15hour</sub> 52 dBA</b>                                   |
|                                | Evening (6 pm to 10 pm) | <b>48 dBA</b>                                         |                                                                       |
|                                | Night (10 pm to 7 am)   | <b>36 dBA</b>                                         | <b>L<sub>eq,9hour</sub> 43 dBA</b>                                    |

<sup>3</sup> Jacobs Report, Section 2.2



### 3.2 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 3.

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 ten residences to the south of Old Six Mile Lane and Wants Lane. Receptors R1 and Receptor R2 are shown in Figure 3.



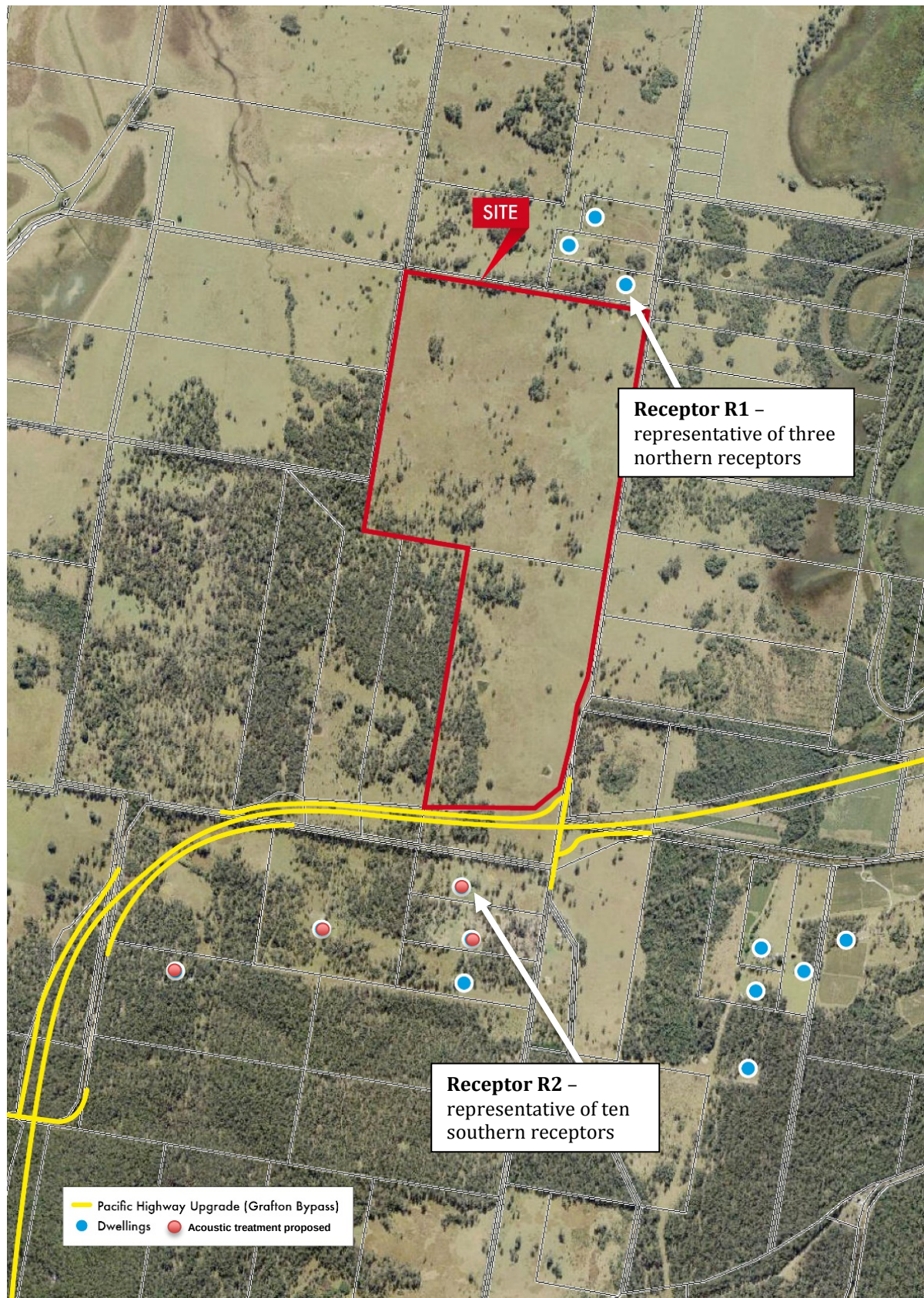


**Figure 3 Residential Receiver Locations**



### 3.3 Pacific Highway Upgrade

Prior to the NGCC becoming operational in July 2020, the Pacific Highway upgrade (Grafton Bypass) to the south of the site will be complete. Currently a local road, Old Six Mile Lane, carries local traffic only. The Highway will pass directly to the south of the site and therefore the road traffic noise in the immediate vicinity will be significantly higher than current noise levels.

The Environmental Impact Statement prepared by NSW Roads and Maritime Services for the Woolgoolga to Ballina, Pacific Highway Upgrade has identified four dwellings directly to the south of the site near Old Six Mile Lane to receive acoustic treatment due to increased road traffic noise, marked with a red dot in Figure 3.

Once the Highway upgrade is complete, the ambient noise level in the area is likely to increase. For this assessment however, the future increase in ambient noise level has not been considered.



## 4.0 NOISE AND VIBRATION CRITERIA

### 4.1 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.

These construction hours are also conditioned for Stage 1 construction works in Schedule 3 Condition C1 of the Stage 1 Consent.

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 4.



**Table 4** **L<sub>eq</sub> Noise Management Levels from Construction Activities**

| Parameter  | Construction NMLs (L <sub>eq</sub> , 15 min), dBA |           |           |
|------------|---------------------------------------------------|-----------|-----------|
|            | Day                                               | Evening   | Night     |
| RBL        | 48                                                | 48        | 36        |
| Allowance  | +10                                               | +10       | +5        |
| <b>NML</b> | <b>58</b>                                         | <b>58</b> | <b>41</b> |

## 4.2 Construction and Operational Vibration

### 4.2.1 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 5 below for residential receptor locations.

**Table 5** **Vibration Dose Values (VDV) from Construction Activities**

| Receptor Location     | Daytime                                |                                      |
|-----------------------|----------------------------------------|--------------------------------------|
|                       | Preferred value (m/s <sup>1.75</sup> ) | Maximum value (m/s <sup>1.75</sup> ) |
| <b>All Residences</b> | 0.20                                   | 0.40                                 |



#### 4.2.2 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 6 below.

**Table 6 Transient Vibration Guide Values for Structural Damage**

| Type of building | Peak component particle velocity in frequency range of predominant pulse – mm/sec |           |            |                                                     |
|------------------|-----------------------------------------------------------------------------------|-----------|------------|-----------------------------------------------------|
|                  | Vibration at the Foundations                                                      |           |            | Horizontal plane on highest floor – All frequencies |
|                  | < 10Hz                                                                            | 10 – 50Hz | 50 – 100Hz |                                                     |
| Residential      | 5                                                                                 | 5 - 15    | 15 - 20    | 15                                                  |



### 4.3 Operational Noise

#### 4.3.1 Industrial Noise Policy

The NSW Environment Protection Authority (EPA) published the NSW Industrial Noise Policy (INP) in January 2000. The policy is specifically aimed at assessing noise from industrial noise sources scheduled under the Protection of the Environment Operations Act 1997.

The objective of the policy is to establish noise criteria that will protect the community from excessive intrusive noise and to preserve amenity for particular land uses.

#### 4.3.2 Intrusiveness Criterion

The EPA in Section 2.1 of its NSW Industrial Noise Policy states that:- *“The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the  $L_{Aeq}$  descriptor) measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB.”*

Where the noise source contains characteristics such as prominent tonal components, impulsiveness, intermittency, irregularity or dominant low-frequency content adjustments to the measured level are applied to allow for the increase in the annoyance value.

Based on the results of noise monitoring summarized in Table 3, the intrusive noise criteria has been calculated and shown in Table 7.

**Table 7 Intrusive Noise Criteria**

| Time Period | RBL, dBA | Allowance, dB | Intrusive Criteria, dBA |
|-------------|----------|---------------|-------------------------|
| Day         | 48       | 5             | 53                      |
| Evening     | 48       | 5             | 53                      |
| Night       | 36       | 5             | 41                      |



### 4.3.3 Amenity Criteria

Depending on the type of area in which the noise is being made, there is a certain reasonable expectancy for noise amenity. Table 2.1 of the NSW Industrial Noise Policy provides a schedule of recommended  $L_{eq}$  noise levels that under normal circumstances should not be exceeded. If successive developments occur near a residential area, each one allowing a criterion of background noise level plus 5 dB, the ambient noise level will gradually creep higher.

Compliance with the Amenity levels in Table 2.1 will limit ambient noise creep. Table 2.1 of the INP is replicated in Table 8 below.

**Table 8 Amenity Noise Criteria**

| Type of Receiver | Indicative Noise Amenity Area | Time of Day | Recommended $L_{eq}$ Noise Level, dBA |                     |
|------------------|-------------------------------|-------------|---------------------------------------|---------------------|
|                  |                               |             | Acceptable                            | Recommended Maximum |
| Residence        | Rural                         | Day         | 50                                    | 55                  |
|                  |                               | Evening     | 45                                    | 50                  |
|                  |                               | Night       | 40                                    | 45                  |

## 4.4 Road Traffic Noise

The assessment of road traffic noise impacts has been undertaken using the guidance detailed in the NSW Department of Environment, Climate Change and Water's *Road Noise Policy* (RNP) (2011) and the Roads and Maritime Services *Environmental Noise Management Manual* (ENMM) (Roads and Maritime, 2001). These guidelines detail the criteria and methods used to assess impacts on sensitive receivers for road projects undertaken in NSW.

The criteria for the assessment of road traffic noise outlined in the RNP and ENMM have been supplemented with the *Noise Criteria Guideline* and the *Noise Mitigation Guideline* by Roads and Maritime in 2015, which have been released as updates to practice notes contained within this document.

### 4.4.1 Traffic Generated By the Development

Additional traffic will be generated on local roads as a result of construction and operation of the NGCC, the acceptability of these increases is considered under the RNP. This document provides the following guidance for the consideration of additional road traffic noise generated by a development:

*'For existing residences and other sensitive land uses affected by **additional traffic on existing roads generated by land use developments**, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build' option'.*



Table 9 provides a summary of the road traffic noise traffic criteria at nearby residential locations.

**Table 9 Road Traffic Noise Criteria – Affecting Residential Locations**

| Existing Noise Level     |                            |           | Noise Criteria           |                            |
|--------------------------|----------------------------|-----------|--------------------------|----------------------------|
| Daytime<br>Leq,(15 hour) | Night time<br>Leq,(9 hour) | Allowance | Daytime<br>Leq,(15 hour) | Night time<br>Leq,(9 hour) |
| 52 dBA                   | 43 dBA                     | +2 dB     | 54 dBA                   | 45 dBA                     |

An assessment of the noise impact of traffic generated by the development during Stage 2 construction and operation is provided in Tables 16 and 22.

#### 4.4.2 Traffic Noise Affecting the Development

The proposed Pacific Highway upgrade will pass approximately 200 m south of the development site (refer to Figure 3), which is due to be completed in 2019. Traffic noise generated by this upgrade may impact inmates and workers residing at the NGCC facility.

This section of the Pacific Highway will be classified as a “new road” in the EPA’s NSW Road Noise Policy.

The road traffic noise criteria, for inmates and workers residing at the NGCC facility is shown in Table 10.

**Table 10 Road Traffic Noise Criteria - affecting NGCC**

| Road Category                                  | Type of Project/land use                                                                       | Noise Criteria                       |                                      |
|------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------|--------------------------------------|
|                                                |                                                                                                | Daytime                              | Night time                           |
| Freeway/<br>arterial/<br>sub-arterial<br>roads | Existing residences affected by noise from new<br>Freeway/arterial/sub-arterial road corridors | L <sub>Aeq</sub> (15 hour)<br>55 dBA | L <sub>Aeq</sub> (15 hour)<br>50 dBA |



#### 4.5 Project Specific Noise Emission Goals (Construction)

The quantitative assessment is applicable and the acceptable noise management levels for Stage 2 construction are shown in Table 11 below:

**Table 11 Summary of Construction Noise Management Levels**

| Parameter | RBL | Allowance | Construction NMLs<br>( $L_{eq}$ , 15 min), dBA |
|-----------|-----|-----------|------------------------------------------------|
| Day       | 48  | +10       | 58                                             |
| Evening   | 48  | +10       | 58                                             |
| Night     | 36  | +5        | 41                                             |

#### 4.6 Project Specific Noise Emission Goals (Operation)

A summary of the operational noise criteria is provided below in Table 12.

**Table 12 Summary of INP Noise Criteria**

| Time Period | Intrusive, dBA | Amenity, dBA | Applicable INP<br>Noise Criteria, dBA |
|-------------|----------------|--------------|---------------------------------------|
| Day         | 53             | 55           | 53                                    |
| Evening     | 53             | 50           | 50                                    |
| Night       | 41             | 45           | 41                                    |



## 5.0 STAGE 2 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

### 5.1 Stage 2 Construction

The proposed development comprises the construction of a new correctional centre designed to accommodate 1,700 male and female inmates. The Site Establishment Plan is shown in **Appendix A**.

Other associated facilities include but not limited to:

- Recreational oval, special accommodation units, administration, industries and educational facilities, workshops, staff amenities, visits facilities, prisoner reception and health facilities (including beds and some diagnostic facilities), access, parking and utilities;
- An overall Gross Floor Area (GFA) of under 100,000 square metres;
- Secure perimeter fences to the two correctional precincts comprising concrete and anti-climb mesh fences with a Sterile Zone;
- Additional beds for remand/reception management and management of unforeseen contingencies such as a requirement to separate inmates;
- Associated support and ancillary buildings for the delivery of services (other than functions);
- Provision of integrated power, fire, general infrastructure and security & communications backbone;
- Provision of furniture, fittings & equipment (FF&E) to deliver the services and other functions.

Stage 2 Construction activities include:

- Operation of the concrete batching plant, pre-cast yard and concrete trucks
- Excavators, delivery trucks, cranes
- Construction of perimeter walls.
- Erection of buildings and scaffolding.
- Internal building fitouts.
- Landscaping.



## 5.2 Hours

Construction activities for the Stage 1 works are expected to commence in mid-2017 and last for a period of 6-12 months. Subject to approval, Stage 2 works are proposed for completion in early 2020 and ready for occupation from July 2020.

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

- Delivery of oversized plant or 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.



### 5.3 Noise Assessment

Typical equipment likely to be employed on site for works in Stage 2 and their corresponding sound power levels are presented in Table 13. The acceptable working distances are calculated based on no items of mobile plant operating within 250 m of the northern or southern boundaries of the site closest to residences at Location R1 and R2 (see Figure 3). The remaining items of plant will be evenly distributed across the site.

**Table 13 Typical Mobile Plant - Sound Power Levels**

| Description                                                      | Sound Power Level, dBA | Acceptable Working Distance from Residence, m |
|------------------------------------------------------------------|------------------------|-----------------------------------------------|
| Silenced Diesel Generator                                        | 89                     | 30 m or more                                  |
| Diesel Generator                                                 | 99                     | 100 m or more                                 |
| Hand Tools                                                       | Up to 100              | 100 m                                         |
| Mobile Crane                                                     | 105                    | 150 m                                         |
| Delivery Trucks                                                  | 107                    | 2 at 250 m<br>6 at 400 m or more              |
| Concrete Truck                                                   | 108                    | 2 at 250 m<br>3 at 400 m or more              |
| Compact Roller (2 off)                                           | 110                    | 1 at 250 m<br>2 at 450 m or more              |
| Bore Pile Driver                                                 | 111                    | 1 at 250 m                                    |
| Excavator (4 off)                                                | 112                    | 1 at 250 m<br>3 at 500 m or more              |
| Concrete Precast Yard<br>Fixed batching plant<br>Concrete Trucks | 115                    | 500 m                                         |

*(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.

During Stage 2 construction, work will be more evenly dispersed across the site compared to Stage 1. Calculations consider distance attenuation only and the range of levels are based on the closest potential distance and furthest potential distance at which each item of plant may



operate from each respective residential location. Additional noise attenuation will be achieved through ground. The calculated noise level ranges at nearby residential receptors are presented in Table 14.

**Table 14**      **Calculated Receptor Noise Levels from Stage 2 Construction**

| Receptor Location                   | Calculated Noise Levels (dBA) |
|-------------------------------------|-------------------------------|
| R1 - 493 Avenue Road, Lavadia       | 35 – 57                       |
| R2 - 37 Old Six Mile Lane, Glenugie | 32 – 49                       |

Once the masonry perimeter wall is constructed, the noise impact from Stage 2 construction within the perimeter wall, will be significantly less than stated in Table 14.

It can be seen from Table 14 that the predicted levels of noise from construction noise will comply with the noise management level of 58 dBA during the daytime. This is assuming that bore pile driving does not occur closer than 250 metres from the boundaries of the site.

#### **5.4 Construction Traffic**

The Stage 2 will generate road traffic due to the arrival of construction workers and delivery of materials throughout the construction period. Large items of plant, such as cranes will be transported to site and will remain on site until they are no longer required, when they will be removed. Typically, the daily traffic movements during construction will consist of contractor cars and delivery 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 15 below.



**Table 15 Stage 2 Construction Traffic Volume**

| Month                 | Jan 2018 | Feb 2018 | Mar 2018 | Apr 2018 | May 2018 | Jun 2018 |
|-----------------------|----------|----------|----------|----------|----------|----------|
| <b>People</b>         | 106      | 196      | 326      | 526      | 724      | 860      |
| <b>Cars</b>           | 85       | 157      | 261      | 421      | 580      | 688      |
| <b>Trucks</b>         | 31       | 35       | 40       | 53       | 73       | 86       |
| <b>Total vehicles</b> | 116      | 192      | 301      | 474      | 653      | 774      |

| Month                 | Jul 2018 | Aug 2018 | Sep 2018 | Oct 2018 | Nov 2018 | Dec 2018 |
|-----------------------|----------|----------|----------|----------|----------|----------|
| <b>People</b>         | 962      | 1032     | 1048     | 972      | 940      | 894      |
| <b>Cars</b>           | 770      | 826      | 839      | 778      | 752      | 716      |
| <b>Trucks</b>         | 97       | 104      | 105      | 98       | 94       | 90       |
| <b>Total vehicles</b> | 867      | 930      | 944      | 876      | 846      | 806      |

| Month                 | Jan 2019 | Feb 2019 | Mar 2019 | Apr 2019 | May 2019 | 2019 |
|-----------------------|----------|----------|----------|----------|----------|------|
| <b>People</b>         | 862      | 704      | 646      | 568      | 504      | 430  |
| <b>Cars</b>           | 690      | 564      | 517      | 455      | 404      | 344  |
| <b>Trucks</b>         | 87       | 87       | 87       | 87       | 87       | 87   |
| <b>Total vehicles</b> | 777      | 651      | 604      | 542      | 491      | 431  |

| Month                 | Jul 2019 | Aug 2019 | Sep 2019 | Oct 2019 | Nov 2019 | Dec 2019 |
|-----------------------|----------|----------|----------|----------|----------|----------|
| <b>People</b>         | 406      | 286      | 206      | 130      | 130      | 130      |
| <b>Cars</b>           | 325      | 229      | 165      | 104      | 104      | 104      |
| <b>Trucks</b>         | 87       | 70       | 60       | 60       | 50       | 40       |
| <b>Total vehicles</b> | 412      | 299      | 225      | 164      | 154      | 144      |



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 (Sep 2018) 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 16 below.

**Table 16      Calculated Receptor Noise Levels from Stage 2 Construction Traffic**

| Receptor Location                   | Traffic $L_{Aeq}$<br>Noise Levels (dBA) | NML,<br>dBA | Existing $L_{Aeq}$<br>Noise Levels (dBA) |
|-------------------------------------|-----------------------------------------|-------------|------------------------------------------|
| R1 - 493 Avenue Road, Lavadia       | 45                                      | 58          | 53                                       |
| R2 - 37 Old Six Mile Lane, Glenugie | 58                                      | 58          | 53                                       |

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

### 5.5 Pacific Highway Upgrade Cumulative Noise Impact

The construction of the Pacific Highway (Grafton Bypass) directly south of the site and north of residences at R2 will include mobile earth moving plant that is similar to the mobile plant used in the Stage 1 construction of the NGCC.

The Environmental Impact Statement prepared by NSW Roads and Maritime Services for the Woolgoolga to Ballina, Pacific Highway Upgrade has identified dwellings directly to the south of Old Six Mile Wants Lanes that may be affected by construction noise.

Residences at R1 will not be affected by the Pacific Highway Upgrade construction due to the large distance in excess of 2km. Therefore the cumulative effect of noise will be equal to the calculated noise levels at R1 in Table 14 of 35-57 dBA.

Residences at R2 will be primarily affected by noise from the Pacific Highway Upgrade. The additional noise impact from the Stage 2 construction is shown in Table 14 at a maximum of 49 dBA. Assuming the Pacific Highway Upgrade construction meets the NML of 58 dBA, the maximum addition of 49 dBA (Table 14) due to the NGCC construction, will have an insignificant effect on the Highway upgrade noise level.

The cumulative effect of the Highway upgrade construction and the NGCC construction at all nearby residences is considered insignificant.



## 5.6 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 17.

**Table 17 Recommended safe working distances for vibration generating plant**

| Plant Item             | Rating/Description             | Safe Working Distance        |                                                                               |
|------------------------|--------------------------------|------------------------------|-------------------------------------------------------------------------------|
|                        |                                | Cosmetic Damage<br>(BS 7385) | Human Response<br>(OH&E Assessing<br>Vibration – A<br>Technical<br>Guideline) |
| Vibratory Roller       | <300kN (Typical 7 – 13 Tonnes) | 15 m                         | 100 m                                                                         |
|                        | >300kN (Typical >18 Tonnes)    | 25 m                         | 100 m                                                                         |
| Large Hydraulic Hammer | 1600 kg – 18 to 34T Excavator  | 22 m                         | 73 m                                                                          |
| Pile Boring            | ≤800 mm                        | 2 m (nominal)                | N/A                                                                           |

The distance from the areas where vibration inducing machinery will be used during construction, to the closest residential premises (R1) is more than 200 m. Given this distance is more than twice the safe working distance between the site and neighbouring residences, the levels of vibration will be significantly less than the vibration criteria specified in Section 4.2. It is unlikely that vibration from construction activities will be able to be felt by residences surrounding the site.

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 6.13 for the mitigation measures to be engaged to reduce the impact of adverse vibration.

## 5.7 Management of Construction Related Impacts

Standard techniques for controlling noise impacts during construction are presented in the *Interim Construction Noise Guideline*. A Construction Noise and Vibration Management Plan (CNVMP) has been prepared in Section 6.0 which considers the construction methodology and relevant mitigation measures.



## 6.0 CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

The calculated level of noise (Section 5.3) and vibration (Section 5.5) emission from Stage 2 construction works show that noise levels will comply with Noise Management Levels established in Section 4 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 6.10.

### 6.1 Noise Measurement Equipment

All acoustic instrumentation employed throughout the monitoring program 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  $\pm 0.5$  dB.

### 6.2 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.



### 6.3 Noise Monitoring of Equipment

In addition to the residential noise monitoring procedures described in Section 6.2, 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 13. If noise checks on any equipment result in a prediction of non-compliance, quieter equipment will be substituted.

### 6.4 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.



## 6.5 Construction Hours

All activities associated with the Stage 2 works shall take place within the standard hours, as shown below:

- 7:00am to 6:00pm, Monday to Friday inclusive; and
- 8:00am to 1:00pm 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 6.10.

## 6.6 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 6.10.



## 6.7 Heavy Vehicles and Staff Vehicles

The following points shall be implemented for Stage 2 construction in line with the Construction Traffic and Pedestrian Management Plan (CTPMP), 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.

## 6.8 Community Relations

- A Community Liaison Officer shall to be appointed by the contractor prior to the commencement of any works;
- The officer will approach all potentially affected residents prior to the commencement of any works as an initial introduction and provide their contact details;
- The officer 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](mailto: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 Liaison Officer. 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.



## 6.9 Managing a Noise Complaint

The Liaison Officer 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.



## **6.10 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.

## **6.11 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 Contractor Project 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.



### 6.12 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.

### 6.13 Vibration Monitoring

Given the distances to the nearest sensitive receptors, it is not anticipated that vibration levels will approach those shown in Tables 5 and 6. 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 Vibration Dose Value (VDV) vibration criteria as defined in Table 5 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 VDV exceeds the criteria within each frequency range, as stipulated in Table 5, 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.

### 6.14 Pacific Highway Upgrade Consultation

The Pacific Highway is proposed to be upgraded in the vicinity of the site concurrently with the construction of the NGCC. Consultation will occur between the John Holland, builders for the NGCC and Pacific Complete, who are constructing the upgrade to the Pacific Highway, in order to provide coordinated feedback to residents potentially affected by the construction noise from either project.



## **7.0 OPERATIONAL NOISE AND VIBRATION ASSESSMENT**

Operational noise from the facility will be insignificant, primarily due to the 6 m high masonry perimeter wall to be constructed around the two correctional precincts. The main noise impacts associated with the operation of the facility will be due to traffic to and from the facility.

### **7.1 Hours**

The NGCC is a 24 hours a day, 7 days a week facility. Operational functions will primarily occur between 6am and 8pm. Outside these hours operations are within buildings from which noise could occur, are strictly controlled.

Visitors to the facility will be limited to the daytime hours only.

### **7.2 Noise Assessment**

The main sources of noise from the NGCC will be the mechanical plant serving the various buildings within the facility. The majority of the mechanical plant serving the facility will be within the 6 m high perimeter masonry wall surrounding the Minimum and Maximum Correctional Precincts. However, some items of plant will be located outside the perimeter wall between the Precincts, such as the emergency generators and pump/filtration units (see Appendix B). The sewage treatment facility is proposed to be located to the south of the Male Minimum precinct no closer than 700 m from the closest residences.

During operation of the facility, the use of loudspeakers, alarms or sirens will be designed to be effective within the building or area of use and are unlikely to be audible at nearby residential properties. During commissioning, the noise levels of speakers will be checked to ensure compliance with the operational noise criteria.

The noise sources expected to occur during the daytime and throughout the night have been assessed in Tables 18 and 19.



**Table 18 Day Time Operational Noise Sources – Calculated Noise Levels**

| Description                                      | Sound Power Level, dBA        | Distance from Residences, m |       | Calculated Noise Level, dBA |          |  |
|--------------------------------------------------|-------------------------------|-----------------------------|-------|-----------------------------|----------|--|
|                                                  |                               | R1                          | R2    | R1                          | R2       |  |
| Ground Maintenance                               |                               |                             |       |                             |          |  |
| Grass slasher                                    | 104 dBA                       | 120                         | 300   | < 53                        | < 45     |  |
| Inspection Vehicle                               | 93 dBA                        | 120                         | 300   | < 43                        | <34      |  |
| Industries Building                              |                               |                             |       |                             |          |  |
| Power Tools                                      | Up to 105 dBA                 | 500                         | 1,000 | 26                          | 19       |  |
| Fixed Machinery                                  | Up to 95 dBA                  | 500                         | 1,000 | 16                          | 9        |  |
| Sporting Activities                              | Male 117 dBA                  | 500                         | 1,200 | 31                          | 23       |  |
| Sporting Activity, whistle and 100 'loud' people | Female 107 dBA                | 400                         | 1,800 | 27                          | 13       |  |
| Siren Testing                                    | 100 dBA per speaker           | > 300                       | > 900 | < 28                        | < 18     |  |
| Cumulative Noise Level                           | Normal Daytime Operation      |                             |       | < 33 dBA                    | < 25 dBA |  |
|                                                  | Ground Maintenance Activities |                             |       | < 53 dBA                    | < 45 dBA |  |

The noise criteria for operational noise is 53 dBA during the day. The calculated noise levels at the two most affected residential receivers, R1 and R2 due to normal daytime activities is significantly less than the noise criteria during the day.

It is expected that the noise emission from the facility will be inaudible at all nearby residential premises. The only exception will be the maintenance of the grounds outside of the Correctional Centre precincts in close proximity to the boundaries of the site, when the operation of a grass slasher may approach the noise criteria temporarily.



**Table 19 24 hr Operational Noise Sources – Calculated Noise Levels**

| Description                                        | Sound Power Level, dBA | Distance from Residences, m |       | Calculated Noise Level, dBA |                    |
|----------------------------------------------------|------------------------|-----------------------------|-------|-----------------------------|--------------------|
|                                                    |                        | R1                          | R2    | R1                          | R2                 |
| Waste Water Filtration Plant                       |                        | 1,500                       | 700   | 26                          | 33                 |
| Blowers in enclosure                               | 80 dBA                 |                             |       |                             |                    |
| Pumps                                              | Up to 90 dBA           |                             |       |                             |                    |
| Muncher/Drum Screen                                | 95 dBA                 |                             |       |                             |                    |
| Emergency Diesel Generator (1,000 kW) - Attenuated | 99 dBA                 | 1,000                       | 1,500 | 23 <sup>4</sup>             | 27                 |
| Public address ('Tannoy') system                   | 95 dBA per speaker     | 400                         | 1,000 | 25 <sup>5</sup>             | 18 <sup>5</sup>    |
| Mechanical Services                                |                        | 400                         | 1,000 | 22 <sup>5</sup>             | 14 <sup>5</sup>    |
| Exhaust Fans                                       | Up to 90 dBA           |                             |       |                             |                    |
| <b>Cumulative Noise Level</b>                      |                        |                             |       | <b>&lt; 30 dBA</b>          | <b>&lt; 34 dBA</b> |

The noise criteria for operational noise is 41 dBA at night. The calculated noise levels at the two most affected residential receivers, R1 and R2 is significantly less than the noise criteria during the night. It is expected that the noise emission from the facility at night will be inaudible at all nearby residential premises.

<sup>4</sup> Attenuation from a 6 m high wall included



### 7.3 Traffic Noise Assessment

Operational traffic will be generated by staff and visitors to the NGCC will be as predicted in Table 20 and 21.

**Table 20 Stage 2 Operational Traffic Volume - Staff**

| Staff                    | People per time slot | Vehicles per time slot | Time Slots per day                            | Vehicles per day |
|--------------------------|----------------------|------------------------|-----------------------------------------------|------------------|
| Day Shift                | 77                   | 60 <sup>5</sup>        | Arrive 7:10 – 7:30 am<br>Leave 5 – 5:20 pm    | 60               |
| Day Shift – non officers | 120                  | 95 <sup>5</sup>        | Arrive 7:45 – 9:15 am<br>Leave 3:45 – 5 pm    | 95               |
| Night Shift              | 20                   | 16 <sup>5</sup>        | Arrive 6:25 – 6:45 pm<br>Leave 7:05 – 7:25 am | 16               |
| Escort Vehicles          |                      | 6                      | Arrive 6 – 7 am or<br>4 – 8 pm                | 14 <sup>6</sup>  |
| Delivery Vehicles        |                      |                        | Low volumes as required                       | 10 <sup>6</sup>  |
| General Traffic          |                      |                        | Low volumes as required                       | 10 <sup>6</sup>  |
| <b>Total</b>             | <b>217</b>           | <b>177</b>             |                                               | <b>205</b>       |

<sup>5</sup> Assumption 20% sharing

<sup>6</sup> Estimated by Serco



**Table 21 Stage 2 Operational Traffic Volume - Visitors**

| Visitors        | Numbers per time slot | Vehicles per time slot   | Time Slots per day                                          | Vehicles per day |
|-----------------|-----------------------|--------------------------|-------------------------------------------------------------|------------------|
| <b>Male Max</b> | 200                   | 80 <sup>7</sup>          | 8:30-9:30 am<br>10 – 11 am<br>1 – 2 pm<br>2:30 – 3:30 pm    | 320              |
| <b>Female</b>   | 60                    | 24 <sup>7</sup>          | 9 - 10 am<br>10:30 – 11:30 am<br>1:30 – 2:30 pm<br>3 – 4 pm | 96               |
| <b>Male Min</b> | 30 per hour           | 12 per hour <sup>7</sup> | 9 - 11 am<br>1 – 4 pm                                       | 60               |
| <b>Total</b>    | 290                   | 116                      |                                                             | 476              |

The residential properties in the vicinity of Receptor R1 on the southern side of the future completed Pacific Highway are set back more than 100 m from the road. The noise impact due to (205+476=) 681 vehicles, including 24 heavy vehicles (Escort and Delivery) has been calculated to the most affected residences at R1 (600m setback from the site entry) and R2 (100 m setback from Old Six Mile Road). Traffic speeds are assumed to be 80 km/h on the exit from the completed Pacific Highway and 60 km/h on The Avenue. The results are shown in Table 22.

**Table 22 Calculated Receptor Noise Levels from Stage 2 Operational Traffic**

| Receptor Location                   | LAeq Traffic Noise Levels, dBA |                      | LAeq Traffic Noise Criteria, dBA |                      |
|-------------------------------------|--------------------------------|----------------------|----------------------------------|----------------------|
|                                     | Daytime<br>Leq,15hr            | Nighttime<br>Leq,9hr | Daytime<br>Leq,15hr              | Nighttime<br>Leq,9hr |
| R1 - 493 Avenue Road, Lavadia       | 28                             | 12                   | 54                               | 45                   |
| R2 - 37 Old Six Mile Lane, Glenugie | 41                             | 25                   | 54                               | 45                   |

The results show that operational traffic noise will comply with the Road Noise Policy noise criteria established in Table 9, at all residential receivers.

<sup>7</sup> Assumption 60% sharing



#### **7.4 Vibration Assessment**

The only sources of vibration that will occur during operation of the facility will be the major items of plant and equipment such as emergency generators, waste water treatment plant and other items of mechanical plant located within various buildings on the site.

Vibration isolation will be provided as required to satisfy the vibration criteria in Tables 5 and 6 at the nearest accommodation buildings within the Correctional Centre, the closest of which are at distances of 150 m away.

Since the vibration criteria will be satisfied at a distance of 150 m, the level of vibration at the nearest residential premises (>600 m away) will be significantly reduced. The vibration level from the major items of plant and equipment will be unable to be measured at the most affected residential premises.

Following development consent and during the detailed design phase of the mechanical plant and equipment, a detailed assessment of the vibration impacts during operation of the facility should be carried out in accordance with the Stage 2 Consent Conditions.

#### **7.5 Mitigation Measures**

No adverse noise impacts are likely to be associated with noise emission due to the operation of the NGCC.

Following development consent and detailed design of the facility, a detailed assessment of the noise and vibration impacts due to operation of the facility should be carried out in accordance with the Stage 2 Consent Conditions and mitigation measures implemented to ensure the operational noise criteria are met at all residential locations.

#### **7.6 Significance of Risk**

Overall noise impacts associated with operation of the facility are likely to be low.



## 8.0 CONCLUSION

Potential noise and vibration impacts associated with Stage 2 construction and operation of the New Grafton Correctional Centre have been considered.

Noise and vibration impacts associated with the construction of the proposal will be managed through the implementation of a Construction and Vibration Management Plan (CNVMP) for Stage 2 construction.

No vibration impacts are expected to be associated with either construction or operation of the Project.

Noise impacts associated with the operation of the facility have been considered and will be less than the operational noise criteria during the day and night.

This acoustic assessment has considered and fulfilled the relevant SEARs as detailed in Table 1 to assess the acoustic amenity impacts on the surrounding locality and to identify and provide a quantitative assessment of the main noise and vibration generating sources and activities during the Stage 2 construction and operation of the facility. Measures to minimise and mitigate the potential noise impacts on surrounding occupiers of land have been included and consider relevant policies and guidelines, including the DECC (2009) *Interim Construction Noise Guideline*, DEC (2006) *Assessing Vibration: A Technical Guideline* and EPA (2000) *NSW Industrial Noise Policy*.



**Stephen Gauld**, MEngSc (Noise and Vibration), BE(Mech), MIEAust, MAAS

Principal Acoustical Consultant

for and on behalf of Day Design Pty Ltd

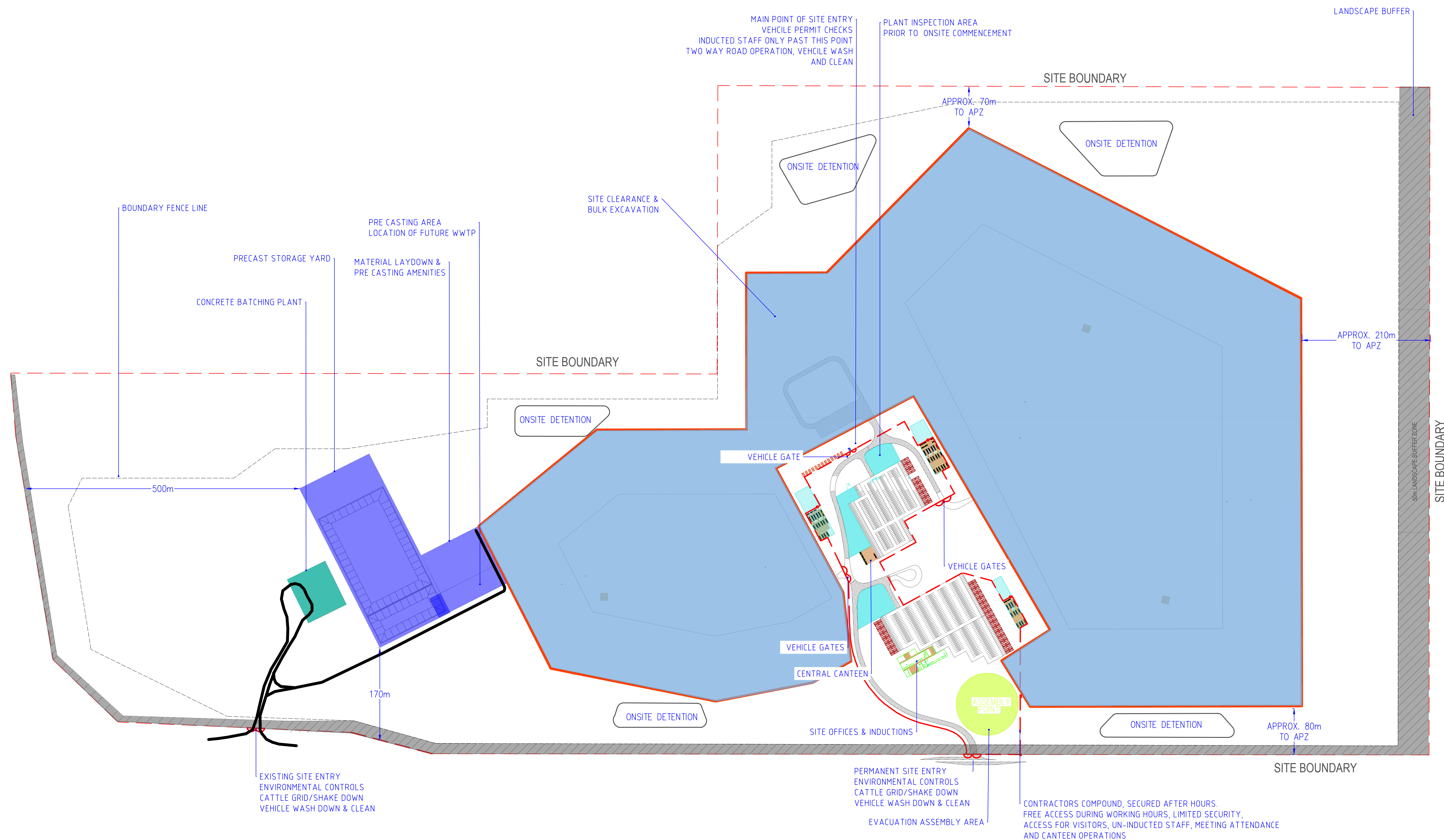
## AAAC MEMBERSHIP

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.

## APPENDICES

- **Appendix A** – Site Establishment Plan
- **Appendix B** – Overall Masterplan





|                                |          |    |      |         |                                    |                                                                                       |
|--------------------------------|----------|----|------|---------|------------------------------------|---------------------------------------------------------------------------------------|
| 1 DRAFT FOR INITIAL DISCUSSION |          | EC | PC   | 18/3/17 | Approved<br>R.BROOKE               | Client:<br>Project: NEW GRAFTON CORRECTIONAL CENTRE<br>Title: SITE ESTABLISHMENT PLAN |
| 2 DRAFT FOR DA PRESENTATION    |          | AH | RB   | 13/4/17 | Date: 13/4/17<br>DRAWN BY: A.HUANG |                                                                                       |
| No.                            | REVISION | BY | APP. | DATE    |                                    | Original Size<br>A1                                                                   |
|                                |          |    |      |         | Drawing No: NCCG-SE-001            | Rev: 1                                                                                |





PLOTFILE DATE: 26/05/2017 PLOTFILE TIME: 4:17:13 PM

| AMENDMENTS |    |      |             |
|------------|----|------|-------------|
| REV        | BY | DATE | DESCRIPTION |
|            |    |      |             |
|            |    |      |             |
|            |    |      |             |
|            |    |      |             |
|            |    |      |             |
|            |    |      |             |
|            |    |      |             |
|            |    |      |             |
|            |    |      |             |

NOTE:  
REFER TO 3206-ARC-DA2\_00\_003 FOR  
FENCE TYPES



**NORTHERN**pathways  
building communities improving lives



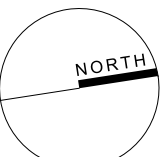
**NSW**  
GOVERNMENT



**PERUMAL  
PEDAVOLI**  
ARCHITECTS

NEW GRAFTON CORRECTIONAL  
CENTRE  
313 Avenue Rd, Lavadia NSW 2462

OVERALL MASTERPLAN 1:2500



0 25 50 75 100 125 250m  
SCALE 1:2500 @ A1  
26 MAY 2017

| DRAWING NUMBER | DISCIPLINE | PHASE | SHEET NUMBER | REVISION |
|----------------|------------|-------|--------------|----------|
| 3206           | ARC        | DA2   | _00_002      | -        |