

APPENDIX B3

Construction Noise and Vibration Management Sub Plan

*The Northern Road Upgrade between
Mersey Road and Eaton Road*

November, 2018

Document control

| | |
|-----------------|---|
| File name | TNR4 App A3 Construction Noise And Vibration Management Sub Plan Rev 0 |
| Report name | The Northern Road Upgrade Between Mersey Road and Eaton Road – Construction Noise and Vibration Management Sub Plan |
| Revision number | 0 |

| | | | |
|---|---|--|---|
|  |  |  |  |
| Adam Boyd | Peter Sheehan | Jeffrey Gilham | Cameron Weller |
| 4/11/2018 | 4/11/2018 | 03/11/2018 | 03/11/2018 |
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Revision history

| Revision | Date | Description | Reviewed by |
|----------|----------|----------------------------|-------------|
| 0 | 1/11/18 | Issued for Construction | |
| E | 1/11/18 | Addressing Review Comments | |
| D | 30/10/18 | Addressing Review Comments | |
| C | 24/10/18 | Addressing Review Comments | |
| B | 26/09/18 | Addressing Review Comments | |
| A | 10/08/18 | Initial for review | |

Distribution of controlled copies

| Copy no. | Issued to | Version |
|----------|-------------------------------|---------|
| 1 | Roads and Maritime for review | A |
| 2 | Roads and Maritime for review | B |
| 3 | Roads and Maritime for review | C |
| 4 | Roads and Maritime for review | D |
| 5 | Addressing Review Comments | E |

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| Annexure C | Construction Noise and Vibration Monitoring Program |

Glossary / Abbreviations

| | |
|-----------------------------------|--|
| AFMP | Ancillary Facilities Management Plan |
| Ambient noise | The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far |
| ANZECC | Australian and New Zealand Environment and Conservation Council |
| Attenuation | The reduction in the level of sound or vibration |
| CCS | Community Communication Strategy |
| CEMP | Construction Environmental Management Plan |
| CoA | Condition of approval |
| Compliance audit | Verification of how implementation is proceeding with respect to a CEMP (which incorporates the relevant approval conditions) |
| CNVMP | Construction Noise and Vibration Management Sub Plan |
| CSSI | Critical State Significant Infrastructure |
| dBA | Decibels using the A-weighted scale measured according to the frequency of the human ear |
| DEC | Department of Environment and Conservation (NSW) (former) |
| DECC | Department of Environment and Climate Change (NSW) (former) |
| DECCW | Department of Environment, Climate Change and Water (NSW) (former) |
| DEOH | Defence Establishment Orchard Hills |
| DoEE | Commonwealth Department of the Environment and Energy |
| DP&E | NSW Department of Planning and Environment |
| EIS | Environmental Impact Statement |
| EMS | Environmental management system |
| Environmental aspect | Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment |
| Environmental impact | Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects |
| Environmental incident | An unexpected event that has, or has the potential to, cause harm to the environment and requires some action to minimise the impact or restore the environment |
| Environmental objective | Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve |
| Environmental Representative (ER) | A suitably qualified and experienced person independent of Project design and Construction personnel employed for the |

| | |
|-------------------------|--|
| | duration of Construction. The principal point of advice in relation to all questions and complaints concerning environmental performance |
| ESR | GEJV Environmental Site Representative |
| Environmental target | Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives |
| EPA | NSW Environment Protection Authority |
| EP&A Act | <i>NSW Environmental Planning and Assessment Act 1979</i> |
| EPBC Act | <i>Commonwealth Environmental Protection and Biodiversity Conservation Act 1999</i> |
| EPL | NSW Environment Protection Licence under the <i>Protection of the Environment Operations Act 1997</i> |
| ERG | Environmental Review Group |
| EWMS | Environmental Work Method Statements |
| Feasible and reasonable | Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements. |
| Federal-CoA | Condition of the Federal Department of the Environment and Energy Approval Decision |
| GEJV | Georgiou Ertech Joint Venture |
| Hold point | Is a verification point that prevents work from commencing prior to approval from Roads and Maritime Services |
| ICNG | Interim Construction Noise Guideline |
| LA _{eq(15min)} | The A-weighted equivalent continuous (energy average) A-weighted sound pressure level of the Construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail and the community |
| LA _(max) | The A-weighted maximum noise level only from the Construction works under consideration, measured using the fast time weighting on a sound level meter |
| MP | Monitoring Program |
| NCA | Noise Catchment Area |
| NCG | Noise Criteria Guideline |
| NML | Noise Management Level |

| | |
|-----------------------------|--|
| Non-compliance | Failure to comply with the requirements of the Project approval or any applicable licence, permit or legal requirements |
| Non-conformance | Failure to conform to the requirements of Project system documentation including this CEMP or supporting documentation |
| NSW-CoA | Condition of the NSW DP&E Infrastructure Approval |
| NSW Infrastructure Approval | The Infrastructure Approval for the Northern Road Upgrade issued by the New South Wales Government |
| OACEMP | Overarching Construction Environmental Management Plan |
| OEH | NSW Office of Environment and Heritage |
| OOHW | Out of hours works |
| POEO Act | <i>Protection of Environment Operations Act 1997</i> |
| Principal, the | NSW Roads and Maritime Services |
| Project, the | The Northern Road Upgrade between Mersey Road and Eaton Road |
| RBL | The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night) |
| REMM | Revised Environmental Management Measure as provided in the Final EIS / SPIR |
| RNP | NSW Road Noise Policy |
| Roads and Maritime, RMS | NSW Roads and Maritime Services |
| SEARs | Secretary's Environmental Assessment Requirements |
| Secretary | Secretary of the NSW Department of Planning and Environment, or delegate |
| SPIR | Submissions and Preferred Infrastructure Report |
| SPL | Sound Pressure Level |
| SWP | Sound Power Level |
| TNR | The Northern Road |

1 Introduction

1.1 Context

This Construction Noise and Vibration Management Sub Plan (CNVMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for The Northern Road Upgrade between Mersey Road and Eaton Road (the Project). The Project is being delivered by Georgiou Ertech Joint Venture (GEJV).

An Overarching Construction Environmental Management Plan (OACEMP) has been developed by Roads and Maritime to address the State and Federal conditions of approval (CoA) and environmental management measures listed in the The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park NSW Environmental Impact Statement / Commonwealth Draft Environmental Impact Statement (EIS) as amended by The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park Submissions and Preferred Infrastructure Report (SPIR), Roads and Maritime specifications, EPL conditions and all applicable legislation..

This CNVMP has been prepared by GEJV to address the requirements in the OACEMP, Roads and Maritime specifications, EPL, and all applicable legislation.

An overview of the Project is shown on Figure 1-1.

1.2 Background

The EIS assessed noise and vibration impacts on sensitive receivers and structures from Construction of the Project. The noise and vibration assessment was included in the EIS as Appendix H.

Further assessment of noise and vibration was undertaken subsequent to exhibition of the EIS. This assessment was included in the SPIR as Appendix B. Additional noise and vibration information in response to submissions was included in the SPIR as Appendix A. Revised environmental management measures (REMMs) were provided within the SPIR.

1.3 Environmental management system overview

The overall Environmental Management System for the Project is described in Section 3.1 of the Construction Environmental Management Plan (CEMP).

The CNVMP is part of the GEJV environmental management framework for the Project, as described in Section 3.3 of the CEMP.

Management measures identified in this Plan will be incorporated into site or activity specific Environmental Work Method Statements (EWMS).

EWMS will be developed, reviewed and signed off by environment and management representatives prior to associated works and Construction personnel will be required to undertake works in accordance with the identified requirements and associated mitigation measures.

Used together, the CEMP, strategies, procedures and EWMS form management guides that clearly identify required environmental management actions for reference by GEJV personnel and subcontractors.

The review and document control processes for this Plan are described in Sections 6.7 and 6.8 of the CEMP.

1.4 Consultation

Ongoing consultation between Roads and Maritime and GEJV, and stakeholders, the community and relevant agencies regarding the management of noise and vibration impacts will be undertaken during the Construction of the Project as required. The process for the consultation will be documented in the Community Communication Strategy (CCS) and the GEJV Construction Community Liaison Plan (CCLP) (refer Appendix B12 of the CEMP).

In accordance with NSW-CoA E25, GEJV will consult with receivers identified as being subject to levels that exceed the Highly Noise Affected criteria (refer to Section 8.1.2) with the objective of determining appropriate hours of respite unless an agreement is reached with those receivers.

During Construction of the Project, it may be necessary for GEJV to undertake work outside standard hours of work in the circumstances described in NSW-CoA E26. On becoming aware of the need for works in accordance with NSW-CoA E26, GEJV will notify the ER and the Environment Protection Authority (EPA) of the need for such works. Prior to carrying out such works, GEJV will use their best endeavours to notify all affected sensitive receivers of the likely impact and duration of the works, as required by NSW-CoA E27.

In accordance with NSW-CoA E29, prior to scheduling the Construction works, GEJV will consult with potentially affected community, religious, educational institutions and noise and vibration-sensitive businesses to identify periods during which they would be adversely affected by noise generating works. GEJV will not schedule works during the periods identified by the stakeholders, unless GEJV, Roads and Maritime and the sensitive receiver, have made other arrangements (at no cost to the affected receiver), or the Secretary has otherwise approved the works.

Roads and Maritime and GEJV will ensure that all Project Construction works are coordinated with utility works, including works undertaken by third parties, to minimise cumulative impacts of noise and vibration and to maximise respite for affected sensitive receivers, as required by NSW-CoA E30.

In accordance with NSW-CoA E35, GEJV will engage a heritage specialist (where required) to provide advice on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures impacted by the Project.

Specific consultation requirements under the EIS and SPIR for management of noise and vibration identified in the REMMs are provided in Table 1-1.

Table 1-1: Consultation requirements identified in the EIS and SPIR

| REMM | Consultation requirements identified in the EIS and SPIR |
|------|--|
| NV-1 | Construction Noise and Vibration Management Plan (CNVMP) would be prepared during the detailed design stage of the Project and applied to all Construction processes throughout the Project. The CNVMP would be prepared in accordance |

REMM Consultation requirements identified in the EIS and SPIR

with the requirements in the ICNG and Roads and Maritime CNVG. The CNVMP would nominate:

- Protocols for engaging with and notifying residents of any work processes that may impact them

CI-1 Consultation would be undertaken with local communities potentially affected by the impacts of multiple Projects in addition to the Project.

CI-2 Where relevant, consultation would be undertaken with proponents of other nearby developments to increase the overall awareness of Project timeframes and impacts

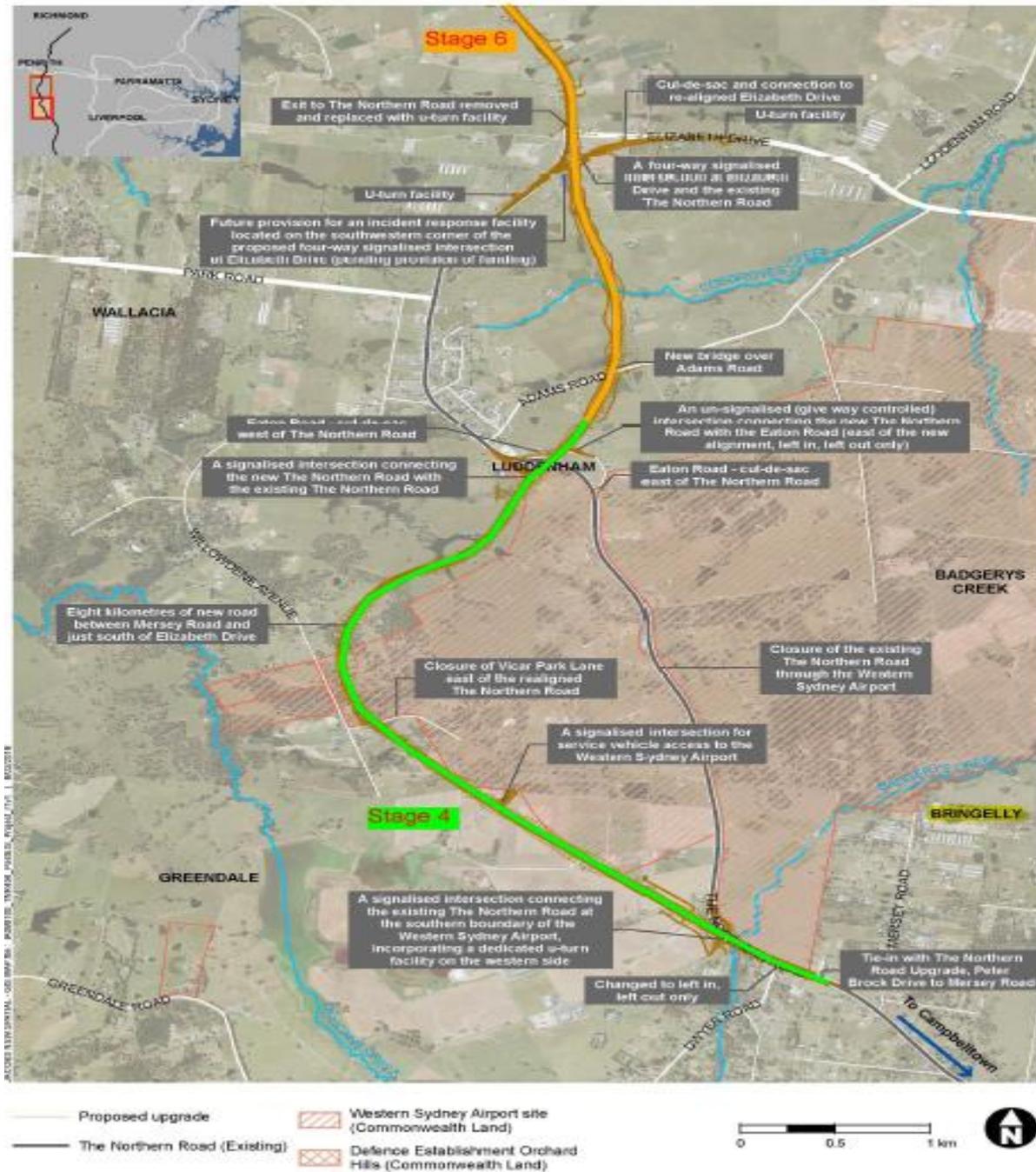


Figure 1-1 Overview of the Project

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to describe how GEJV proposes to manage potential noise and vibration impacts during Construction of the Project.

The management of noise and vibration impacts in this Plan is based on the assessments undertaken as part of the EIS and SPIR. The assessments in the EIS and SPIR considered the following guidelines and standards:

- *NSW Road Noise Policy (RNP)* (DECCW, 2011)
- *Interim Construction Noise Guideline (ICNG)* (DECC, 2009)
- *Assessing Vibration: a technical guideline (The Guideline)* (DEC, 2006)
- *DIN 4150-3 Structural vibration – Effects of vibration on structures* (German standard 1999-02)
- *RTA Environmental Noise Management Manual (ENMM)* (RTA, 2001a)
- *Procedure for Preparing an Operational Traffic and Construction Noise and Vibration Assessment Report* (Roads and Maritime, 2014).

2.2 Objectives

The key objective of the CNVMP is to ensure that impacts to the local community and the built environment from noise and vibration are minimised. Specific objectives include:

- Identify sensitive receivers and ensure appropriate environmental controls and procedures are implemented during Construction activities
- Take reasonable and feasible measures to minimise potential impacts and to achieve the noise goals stated in this CNVMP for Construction works outside standard Construction hours
- Minimise potential adverse noise and vibration impacts to the environment and community by taking reasonable and feasible measures to achieve the noise goals stated in this CNVMP
- Limit the impact of Construction related noise both within and outside standard Construction hours
- Notify potentially affected property owners and occupants at least seven calendar days in advance as to the scale, extent and duration of Construction works
- Manage impacts if they occur through a systematic analysis of mitigation strategies
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in Section 3.1 and Section 3.2 of this Plan.

2.3 Targets

Targets have been established for the management of noise and vibration impacts during the Project to ensure:

- The implementation of feasible and reasonable noise mitigation measures with the aim of achieving the Construction noise management levels detailed in the *Interim Construction Noise Guideline* (DECC, 2009).

- achieving full compliance with relevant legislative requirements and the conditions of approval minimising impacts on, and complaints from, the community and stakeholders.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

Legislation relevant to noise and vibration management includes:

- *Protection of the Environment Operations Act 1997* (POEO Act).
- *Protection of the Environment Operations (Noise Control) Regulation 2008*.

Relevant provisions of the above legislation are explained in the register of legal requirements included in Appendix A1 of the CEMP.

3.1.2 Guidelines

The main guidelines, specifications and policy documents relevant to this Plan include:

- Roads and Maritime QA Specification G1 – Job Specific Requirements for The Northern Road Upgrade
- Roads and Maritime QA Specification G36 – Environmental Protection (Management System)
- *Construction Noise and Vibration Guideline* (CNVG) (Roads and Maritime, 2016)
- *Noise Criteria Guideline* (Roads and Maritime, 2015)
- *Noise Mitigation Guideline* (Roads and Maritime, 2016)
- *Model Validation Guideline* (Roads and Maritime, 2016)
- *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA, 1999).
- *RTA Environmental Noise Management Manual* (ENMM) (RTA, 2001a).
- *Procedure: Preparing an operational traffic and Construction noise and vibration assessment report* (Roads and Traffic Authority, 2011)
- *Calculation of Road Traffic Noise* (UK Department of Transport, 1988)
- *NSW Industrial Noise Policy* (EPA, 2000)
- *Interim Construction Noise Guideline* (ICNG) (NSW Department of Environment and Climate Change, 2009)
- *NSW Road Noise Policy* (RNP) (Department of Environment, Climate Change and Water (DECCW), 2011)
- *Assessing Vibration – a technical guideline* (Department of Environment and Conservation (DEC), 2006)
- *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (Australian and New Zealand Environment and Conservation Council (ANZECC), 1990)
- *Australian Standard AS1055 Acoustics - Description and measurement of environmental noise* (Standards Australia, 1997)
- *Australian Standard AS IEC 61672.1—2004 - Electroacoustics—Sound level meters, Part 1: Specifications* (Standards Australia, 2004)

- *Australian Standard 2187.2 – 2006: Explosives – Storage and use – Use of explosives*
- *British Standard 7385: Part 2-1993 Evaluation and measurement of vibration in buildings Part 2* (BSI, 1993)
- *German Standard DIN4150 Part 3-1999 Structural vibration - Effects of vibration on structures* (Deutsches Institute fur Normung, 1999).

Roads and Maritime specifications are a key source of environmental protection management processes relevant to this CNVMP. The specifications set out environmental protection requirements, including Hold Points, which will be complied with by GEJV during Construction of the Project. A Hold Point is a point beyond which GEJV will not proceed without express written authorisation from Roads and Maritime.

3.2 Environment Protection Licence

The Project is subject to an EPL as a Scheduled Activity for extractive activities and road Construction. The EPL prescribes noise and vibration management requirements that must be complied with. These requirements will be managed by the planned management measures specified in Table 8-1 and the Construction Noise and Vibration Monitoring Program (refer Annexure C).

The EPL conditions relevant to the management of noise and vibration are provided in Table 3Table 3-1. The EPL conditions relevant to the monitoring of noise and vibration are provided in Annexure C.

The EPL also prescribes requirements for complaints handling, reporting and record keeping. These requirements will be implemented in accordance with the incident and complaints reporting outlined in Section 9 of this Plan and Section 5.3 of the CEMP.

Table 3-1 EPL requirements relevant to the management of noise and vibration

| Ref. | Relevant requirement | Reference |
|-----------|---|-----------|
| L3 | Noise Limits | |
| L3.1 | The licensee must implement all feasible and reasonable noise and vibration abatement measures at the premises during Construction work, to minimise noise and vibration impacts on nearby noise sensitive receivers. This must include, but is not limited to: | Table 8-1 |
| | (a) implementing noise and vibration mitigation measures as outlined in The Northern Road Upgrade Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park NSW Environmental Impact Statement / Commonwealth Draft Environmental Impact Statement Volume 1: Main Report June 2017; and | Table 8-1 |
| | (b) implementing further noise mitigation measures as may be necessary throughout the period of Construction work to minimise significant exceedances of Noise Management Levels (NMLs) at nearby noise sensitive receivers; and | |

| Ref. | Relevant requirement | Reference |
|-----------|---|-------------------|
| | (c) consideration of the Interim Construction Noise Guidelines (DECC, 2009). | Sections 3.1.2, 5 |
| L4 | Hours of operation | |
| L4.1 | <p>Unless permitted by another condition of this licence, Construction works and activities must:</p> <p>(a) only be undertaken between the hours of 0700 and 1800 Monday to Friday; and</p> <p>(b) only be undertaken between the hours of 0800 and 1300 Saturday; and</p> <p>(c) not be undertaken on Sundays or Public Holidays.</p> | Section 8.1.1 |
| L4.2 | <p>Exemptions to standard Construction hours in exceptional circumstances</p> <p>(a) The licensee may undertake works outside of standard Construction hours if any of the following applies:</p> <ul style="list-style-type: none"> (i) emergency works is required to avoid the loss of lives or property, or to prevent material harm to the environment; (ii) the delivery of oversized plant or structures has been determined by the police or other authorised authorities to require special arrangements to transport along public roads. <p>(b) The licensee must, on becoming aware of the need to undertake emergency Construction work under this Condition notify the EPA's Environment Line as soon as practicable and submit a report to the EPA by 2 pm on the next business day after the emergency works commenced that describes:</p> <ol style="list-style-type: none"> 1. the cause, time and duration of the emergency; and 2. action taken by or on behalf of the licensee in relation to the emergency; and 3. details of any measures taken or proposed to be taken by the licensee to prevent or mitigate against a recurrence of the emergency. <p>Note: For the purposes of this Condition, 'material harm to the environment' has the same meaning as in section 147 of the POEO Act.</p> | Section 8.1.3 |

| Ref. | Relevant requirement | Reference |
|------|--|---------------|
| L4.3 | <p>Exemptions to standard Construction hours for low noise impact works</p> <p>The following works and activities may be carried out outside of the hours specified in Condition L4.1 if the works and activities do not cause, when measured at the boundary of the most affected noise sensitive receiver:</p> <ul style="list-style-type: none"> (a) LAeq(15 minute) noise levels greater than 5 dB above the day, evening and night rating background level (RBL) as applicable; and (b) LA1(1 minute) or LAmix noise levels greater than 15dB above the night RBL for night works; and (c) continuous or impulsive vibration values greater than those for human exposure to vibration, set out for residences in Table 2.2 in “Environmental Noise Management - Assessing Vibration: a technical guideline” (DEC, 2006); and (d) intermittent vibration values greater than those for human exposure to vibration, set out for residences in Table 2.4 in “Environmental Noise Management - Assessing Vibration: a technical guideline” (DEC, 2006). <p>Note: For the purposes of this Condition, the RBLs are those contained in an environmental assessment for the scheduled activity subject to this licence prepared under the EPA Act 1979. Alternatively, the licensee may use another RBL determined in accordance with the "NSW Noise Policy for Industry" (EPA, 2017) and provided to the EPA prior to carrying out any works or activities under this Condition.</p> | Section 8.1.3 |
| L4.4 | <p>High Noise Impact Works</p> <p>Any high noise impact works and activities must only be undertaken:</p> <ol style="list-style-type: none"> 1. Between 08:00am – 06:00pm Monday to Friday; 2. Between 08:00am – 01:00pm Saturday. <p>Note: For the purposes of this Condition, ‘continuous’ includes any period during which there is less than a 1 hour respite between ceasing and recommencing any of the work that is the subject of this Condition.</p> | Section 8.1.2 |
| L4.5 | <p>Community Agreements</p> <p>The licensee may undertake works outside of standard Construction hours if agreement between the licensee and a substantial majority of noise sensitive receivers has been reached.</p> <p>Note: This Condition applies to out-of-hours works that have not been approved by another Condition of this licence.</p> | Section 8.1.3 |
| L4.6 | <p>Any agreement(s) between the licensee and noise sensitive receivers referred to in Condition L4.5 must be:</p> <ul style="list-style-type: none"> (a) submitted to the EPA for approval prior to any works that are the subject of the agreement being undertaken; and (b) prepared in writing and a copy of the agreement(s) kept on the premises by the licensee for the duration of this licence; and (c) kept on the licensee's Project website for the duration of the agreement (personal details of residents must be omitted); and (d) prepared and implemented in accordance with Condition E1. | Section 8.1.3 |

| Ref. | Relevant requirement | Reference |
|-------------|--|--|
| L4.7 | <p>Works outside of standard Construction hours – Notification</p> <p>The licensee must notify potentially affected noise sensitive receivers of works outside of standard Construction hours not less than 5 calendar days and not more than 14 calendar days before those works are to be undertaken.</p> <p>(a) The notification must be:</p> <ul style="list-style-type: none"> ◦ undertaken by letterbox drop or email; and ◦ be detailed on the Project website. <p>(b) The notification required by this Condition must:</p> <ul style="list-style-type: none"> ◦ clearly outline the reason that the work is required to be undertaken outside the hours specified in Condition L4.1; ◦ include a diagram that clearly identifies the location of the proposed works in relation to nearby cross streets and local landmarks; ◦ include details of relevant time restrictions that apply to the proposed works; ◦ clearly outline in plain English, the location, nature, scope and duration of the proposed works; ◦ detail the expected noise impact of the works on noise sensitive receivers; ◦ clearly state how complaints may be made and additional information obtained; and ◦ include the number of the telephone complaints line required by condition M6.1, an after hours contact phone number specific to the works undertaken outside the hours specified in Condition L4.1, and the Project website address. | Section 5 of Annexure B OOHW Procedure |
| M6 | Telephone complaints line | |
| M6.5 | Noise and Vibration Complaints | |
| | <p>(a) The licensee must investigate noise and vibration complaints:</p> <ul style="list-style-type: none"> (i) within two hours of the complaint being made; or (ii) in accordance with any documented complaint management agreement between the licensee and the complainant. <p>(b) The licensee must ensure that any investigation referred to in this Condition that identifies works or activities being undertaken on the licensee's premises as the likely source of the complaint, includes an offer to the complainant to undertake attended noise or vibration monitoring at their premises.</p> <p>(c) If the occupant of the dwelling or management personnel of a noise sensitive receiver other than a dwelling accepts the offer of attended noise or vibration monitoring the licensee must undertake that attended monitoring:</p> <ul style="list-style-type: none"> (i) As soon as practicable; or (ii) At a time agreed with the complainant. | Sections 9.7 |
| E1 | Community Agreements | |
| E1.1 | Requirements for community agreements | Sections 8.1.4 |

| Ref. | Relevant requirement | Reference |
|------|---|----------------|
| | <p>Any community agreement to permit works to be undertaken outside of standard Construction hours (OOHW) under Condition L4.5 must:</p> <ul style="list-style-type: none"> (a) be prepared and implemented in accordance with the relevant sections of the "Interim Construction Noise Guidelines" (DEC 2009), the "Noise Policy for Industry" (EPA, 2017) and AS2346-2010 "Guide to noise and vibration control on Construction, demolition and maintenance sites"; (b) detail the following: <ul style="list-style-type: none"> 1. the actual works proposed; 2. any expected impacts in clear, simple English based on noise modelling; 3. the expected duration of the works; 4. any expected benefits for receivers; 5. any other concurrent OOHW that will be occurring; and 6. any other OOHW that will be occurring on the nights preceding and following the proposed works or, if the proposed work precedes or follows a weekend period, any other OOHW that will be occurring on the weekend. (c) demonstrate that the noise sensitive receivers party to the agreement understand the nature of the works and any predicted impacts; and (d) be kept for the duration of the agreement and made available to an EPA authorised officer on request. | |
| E1.2 | <p>Consultation and Engagement</p> <p>In relation to consulting and engaging with noise sensitive receivers for a community agreement, the following applies:</p> <ul style="list-style-type: none"> (a) all noise sensitive receivers predicted by modelling to be impacted by noise greater than 5 dB(A) above RBL must be consulted on any proposed community agreement. This includes noise sensitive receivers that have declined to participate in previous agreements; and (b) all proposed agreements must include details for interpreting services for languages other than English where required; and (c) If a licensee is unable to contact a noise sensitive receiver after three attempts during the time of day that the proposed works would be undertaken, including leaving "sorry I missed you" cards explaining the reason for the visit and requesting a return phone call, then the licensee will note that the receiver could not be contacted and the receiver will not be considered to have either agreed or disagreed; and (d) records of the attempts to contact the receiver will be kept by the licensee. | Sections 8.1.4 |

| Ref. | Relevant requirement | Reference |
|------|---|---|
| E1.3 | <p>Agreement Thresholds</p> <p>(a) The EPA will consider agreements reached between the licensee and a substantial majority of both:</p> <ol style="list-style-type: none"> 1. noise sensitive receivers predicted by the licensee to be impacted by noise levels exceeding those specified in Condition L4.3(a) and L4.3(b); and 2. noise sensitive receivers predicted to by the licensee to be impacted by noise levels above a highly noise affected level of 75 dB(A). | Noted |
| E1.4 | <p>Community agreements attained by phone</p> <p>Where a community agreement has been reached with noise sensitive receivers over the phone, the following applies:</p> <ol style="list-style-type: none"> (a) the phone script used to describe the proposed agreement (including information required under Condition E1.1(b)) is to be provided to the EPA with the community agreement for approval; and (b) the script must include a clear question requesting receiver agreement to the proposal; and (c) detailed records are to be maintained by the licensee of all community agreement phone conversations and must be maintained for the duration of the community agreement; and (d) Any noise sensitive receiver who requests a copy of the phone agreement must be supplied with one. | GEJV Construction Community Liaison Plan |
| E1.5 | <p>Notification</p> <p>All noise sensitive receivers must be advised of any community agreement that has been attained in writing within seven days of the agreement being finalised and must:</p> <ol style="list-style-type: none"> (a) include a website link to the Project website, specifically to a summary of the approved Project agreement; and (b) include details of the licensee's complaints line as required by Condition M6; and (c) Include details of the EPA's Environment Line. <p>The notification requirements in Condition L4.6 apply to community agreements.</p> | Sections 8.1.4 |
| E1.6 | <p>Monitoring</p> <p>Validation monitoring must be undertaken for any works that are the subject of a community agreement and must:</p> <ol style="list-style-type: none"> (a) be performed by a suitably qualified and experienced person; and (b) Be performed on at least the first 2 nights where OOHW will be undertaken. | Sections 8.1.4 |
| E1.7 | <p>If validation monitoring undertaken under Condition E1.6 shows that noise levels are higher than those predicted by any noise modelling undertaken as part of the community agreement, work practices must be modified so that measured noise levels do not exceed predicted levels.</p> | Sections 8.1.4 |
| E1.8 | <p>A validation monitoring plan must be submitted to the EPA for approval as part of the community agreement documentation prior to any OOHW occurring.</p> | Sections 8.1.4 |

4 Existing environment

4.1 Sensitive receivers

The Project area is located within a semi-rural area immediately south of Luddenham. Much of the land immediately surrounding the Project area is Commonwealth land. The noise assessments identified and considered potential noise impacts for sensitive receivers of the Project. The Northern Road is a major transport link. The Project area therefore experiences considerable road noise and vibration.

The majority of sensitive receivers within 600m either side of the new or existing road centre line are residential dwellings. Locations of sensitive receivers are shown in Annexure A.

Non-Construction sources of noise and vibration within the vicinity of the Construction area will include light machinery and/or livestock from neighbouring farms.

4.2 Ambient noise

Unattended noise monitoring was completed as part of the EIS in 2016 to quantify the existing ambient noise environment and to collect data for model calibration and sensitivity analysis. The monitoring locations and noise catchment areas (NCAs) are shown in Annexure A. The NCAs relevant to the Project are described below.

- NCA 4 - Semi-rural properties east of Luddenham, presently removed from major roads. Background noise is determined by rural noise sources
- NCA 5 - Properties in suburban Luddenham and its semi-rural surrounds. Existing background noise to these receivers results from traffic on The Northern Road
- NCA 6 - Semi-rural properties in Badgerys Creek at which background noise is determined by traffic on The Northern Road
- NCA 7 - Semi-rural properties located adjacent to new section of the Project with minimal exposure to traffic noise on The Northern Road
- NCA 8 - Semi-rural properties in Greendale and Bringelly at which background noise is determined by traffic on The Northern Road

A summary of the noise monitoring results is provided in

Table 4-1: Noise Monitoring Locations

Table 4-1, Table 4-2 and Table 4-3.

Table 4-1: Noise Monitoring Locations

| Monitoring locations | Description | Distance to Upgraded Northern Road | NCA |
|----------------------|-----------------------------------|------------------------------------|-----|
| N16 | 18 Eaton Road, Luddenham | 20m | 4 |
| N17 | 18 Eaton Road, Luddenham | 30m | 7 |
| N18 | 1675 The Northern Road, Greendale | 20m | 8 |

Table 4-2: Ambient Noise Levels

| Time | Location | Monitored Noise level dB(A) | | | Typical L_{Amax} noise from environmental noise sources dB(A) |
|--------------------------|----------|-----------------------------|-----------|------------|---|
| | | RBL | L_{Aeq} | L_{Amax} | |
| Daytime 7am – 6pm | N16 | 42 | 56 | 70 | LV occasional (40-45), Trucks occasional (<75) |
| | N17 | 37 | 47 | 65 | Distant traffic |
| | N18 | 48 | 59 | 72 | HV occasional (<75) LV common (50) |
| Evening 6pm - 10pm | N16 | 43 | 57 | 68 | Infrequent LV (55), HV (<75) |
| | N17 | 38 | 45 | 59 | |
| | N18 | 47 | 58 | 68 | HV (<75), LV (55-50) |
| Night-Time 10pm – 7am | N16 | 34 | 55 | 66 | Occasional HV idling (65-70) |
| | N17 | 37 | 46 | 54 | Local traffic (65) |
| | N18 | 42 | 54 | 67 | HV (<75), LV (55-60) |

HV = Heavy Vehicles, LV = Light Vehicles

Additionally the road traffic noise descriptors L_{Aeq} , 15 hour (day) and L_{Aeq} , 9 hour (night) were derived for N16 and N18. Existing road traffic noise levels are provided in Table 4-3.

Table 4-3: Existing Road Traffic Noise Levels

| Location | Site | L_{Aeq} (15 hour) | L_{Aeq} (9 hour) | L_{Amax} (15 hour) | L_{Amax} (9 hour) |
|----------|-----------------------------------|---------------------|--------------------|----------------------|---------------------|
| N16 | 18 Eaton Rd, Luddenham | 56 | 55 | 69 | 67 |
| N18 | 1675 The Northern Road, Greendale | 59 | 54 | 70 | 68 |

5 Noise and vibration criteria for NSW

The EPA recommends management levels and goals when assessing Construction noise and vibration. These are outlined in:

- *The Interim Construction Noise Guideline (ICNG) (DECC 2009)*
- *Assessing Vibration: a technical guideline (DEC 2006)*
- *The ANZEC, Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration.*

Relevant elements of these documents are summarised and discussed in this Chapter.

5.1 Construction noise and assessment objectives

The ICNG provides guidelines for the assessment and management of Construction noise. The ICNG focuses on applying a range of work practices to minimise Construction noise impacts rather than focusing on achieving numeric noise levels.

The main objectives of the ICNG are to:

- Identify and minimise noise from Construction works.
- Focus on applying all 'feasible' and 'reasonable' work practices to minimise Construction noise impacts.
- Encourage Construction during the recommended standard hours only, unless approval is given for works that cannot be undertaken during these hours.
- Reduce time spent dealing with complaints at the Project implementation stage.
- Provide flexibility in selecting site-specific feasible and reasonable work practices to minimise noise impacts.

5.2 Quantitative noise assessment criteria

Construction noise assessment goals presented in the ICNG are referenced to noise management levels (NML) for residential, sensitive land uses and commercial/ industrial premises.

5.2.1 Residential land use

Table 5-1 sets out management levels for noise at residences and how they are to be applied.

In Table 5-1 the rating background level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW Industrial Noise Policy (EPA, 2000).

As a guide, the difference between the internal noise level and the external noise level is typically 10dB with windows open for adequate ventilation.

Table 5-1: Noise management levels at residences using quantitative assessment

| Time of day | Management Level $L_{Aeq} (15 \text{ min})^*$ | How to apply |
|--|--|---|
| Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays | Noise affected RBL + 10 dB | <p>The noise affected level represents the point above which there may be some community reaction to noise.</p> <ul style="list-style-type: none"> Where the predicted or measured $L_{Aeq} (15 \text{ min})$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details. |
| | Highly noise affected 75 dB(A) | <p>The highly noise affected level represents the point above which there may be strong community reaction to noise.</p> <ul style="list-style-type: none"> Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: <ul style="list-style-type: none"> times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences if the community is prepared to accept a longer period of Construction in exchange for restrictions on Construction times. |
| Outside recommended standard hours | Noise affected RBL + 5 dB | <ul style="list-style-type: none"> A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. |

* Noise levels apply at the property boundary that is most exposed to Construction noise, and at a height of 1.5m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

5.3 Adopted noise management levels for non-residential receivers

Other sensitive land uses, such as schools and offices, typically find noise from Construction to be disruptive when the properties are being used (such as during work and school times), Table 5-2 presents the NML for sensitive non-residential receivers likely to be affected by the Project. The NML in this table has been determined based on land use type, set at 5dB above the corresponding road traffic noise levels in the *Environmental Criteria for Road Traffic Noise* (EPA 1999) (and the 'maximum' levels in the *NSW Industrial Noise Policy* (EPA 2000) for commercial and industrial uses) to account for the variable and short-term nature of Construction noise.

Table 5-2: Adopted noise management levels of non-residential sensitive receivers

| Non Residential Receiver | No. of buildings | Land Use | NCA | NML* LAeq (15 minute) dB(A) |
|-------------------------------------|------------------|-------------------|-----|-----------------------------|
| Luddenham Public School | 5 | Educational | 5 | 45 (Internal) |
| Holy Family Catholic Primary School | 1 | Educational | 5 | 45 (Internal) |
| St James Anglican Church | 1 | Place of Worship | 5 | 45 (Internal) |
| Sacred Heart Parish | | Place of Worship | 5 | 45 (Internal) |
| Luddenham Uniting Church | 2 | Place of Worship | 5 | 45 (Internal) |
| Sales Park | N/A | Active Recreation | 5 | 65 |
| Willmington Reserve | N/A | Active Recreation | 5 | 65 |
| Luddenham Showground | N/A | Active Recreation | 5 | 65 |
| Caltex Service Station | 2 | Commercial | 5 | 70 |
| Quality Meats Butcher | 1 | Commercial | 5 | 70 |
| 2903 The Northern Road, Luddenham | 1 | Commercial | 5 | 70 |
| Luddenham Auto Repairs | 1 | Commercial | 5 | 70 |
| Ali's Bakery | 1 | Commercial | 5 | 70 |
| Shell Service Station | 1 | Commercial | 5 | 70 |
| IGA | 3 | Commercial | 5 | 70 |
| David's Stall Fruit and Veg | 1 | Commercial | 5 | 70 |
| Luddenham Progress Hall | 1 | Commercial | 5 | 70 |
| Board my Paws | 1 | Commercial | 8 | 70 |

Notes: ¹ Passive recreation areas characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion.

² Active recreation areas are characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.

5.4 Adopted Project noise management levels

The adopted Project Construction NMLs for each NCA have been determined based on the measured noise levels described in Table 4-2.

For work during standard Construction hours:

- The 'noise affected level' represents the point above which there may be some community reaction to noise. The noise affected level is calculated by adding 10 dB(A) to the RBL
- The 'highly noise affected level' represents the point above which there may be strong community reaction to noise. The ICNG specifies that the highly noise affected level is 75 dB(A).

Considering the possibility of work outside standard Construction hours, additional Project Construction NMLs for these times have also been determined.

For work outside standard Construction hours, the Construction NML is calculated by adding 5 dB(A) to the RBL. The NML for sleep disturbance is based on a maximum internal noise level of 55 dB(A) L_{Amax} as recommended by the RNP and a 10 dB(A) reduction in noise from outside the building. The RNP acknowledges that one or two noise events per night with maximum external noise levels of 75 to 80 dB(A) are unlikely to substantially affect health and wellbeing.

Based on measured noise levels described in Section 10.9 of the Annexure H – Technical working paper: Noise and Vibration June 2017 of the EIS, the Project-specific Construction noise management levels for residential receivers have been determined and are presented in Table 5-3.

Table 5-3: Project Construction noise management levels at residences

| NCA | Monitored or determined RBL dB(A) | | | | Noise Management Level (NML) LAeq (15 minute) dB(A) | | | | Sleep disturbance screening criterion LAmax dB(A) (RBL+15dB) |
|-----|-----------------------------------|-------------|-----------------|---------------|---|---------|------------------------------|-----------|--|
| | | | | | STD hours (RBL +10dB) | | Out Of Hours (OOH) (RBL+5dB) | | |
| | STD hours RBL | OOH Day RBL | OOH Evening RBL | OOH Night RBL | Day NML | Day NML | Evening NML | Night NML | |
| 4 | 37 | 38 | 38 | 37 | 47 | 43 | 43 | 42 | 52 |
| 5 | 42 | 44 | 43 | 34 | 52 | 49 | 48 | 39 | 49 |
| 6 | 42 | 44 | 43 | 34 | 52 | 49 | 48 | 39 | 49 |
| 7 | 37 | 38 | 38 | 37 | 47 | 43 | 43 | 42 | 52 |
| 8 | 48 | 53 | 47 | 42 | 58 | 58 | 52 | 47 | 57 |

5.5 Vibration criteria

Effects of ground vibration on buildings resulting from Construction may be segregated into the following three categories:

- Human exposure – disturbance to building occupants: vibration in which the occupants or users of the building are inconvenienced or possibly disturbed.
- Effects on building contents – vibration where the building contents may be affected.
- Effects on building structures – vibration in which the integrity of the building or structure itself may be prejudiced.

Vibration criteria relating to human comfort that are applicable to this Project are taken from the DEC (2006) document Assessing Vibration – A Technical Guideline and include the following:

- Continuous vibration – from uninterrupted sources (see Table 5-4).
- Impulsive vibration – up to three instances of sudden impact e.g. dropping heavy items, per monitoring period (see Table 5-5).
- Intermittent vibration – such as from drilling, compacting or activities that would result in continuous vibration if operated continuously (see Table 5-6).

Table 5-4: Continuous vibration acceleration criteria (m/s²) 1-80Hz

| Location | Assessment period | Preferred Values | | Maximum Values | |
|--|-------------------|------------------|---------------|----------------|---------------|
| | | z-axis | x- and y-axis | z-axis | x- and y-axis |
| Critical Areas | Day or night-time | 0.0050 | 0.0036 | 0.010 | 0.0072 |
| Residences | Daytime | 0.010 | 0.0071 | 0.020 | 0.014 |
| | Night-time | 0.007 | 0.005 | 0.014 | 0.010 |
| Offices, schools, educational institutions and places of worship | Day or night-time | 0.014 | 0.040 | 0.028 | |
| | | 0.04 | 0.029 | 0.080 | 0.028 |
| Workshops | Day or night-time | 0.04 | 0.029 | 0.080 | 0.058 |

Table 5-5: Impulsive vibration acceleration criteria (m/s²) 1-80Hz

| Location | Assessment period | Preferred Values | | Maximum Values | |
|--|-------------------|------------------|---------------|----------------|---------------|
| | | z-axis | x- and y-axis | z-axis | x- and y-axis |
| Critical Areas | Day or night-time | 0.0050 | 0.0036 | 0.010 | 0.0072 |
| Residences | Daytime | 0.30 | 0.21 | 0.60 | 0.42 |
| | Night-time | 0.10 | 0.071 | 0.20 | 0.14 |
| Offices, schools, educational institutions and places of worship | Day or night-time | 0.64 | 0.46 | 1.28 | 0.92 |
| Workshops | Day or night-time | 0.64 | 0.46 | 1.28 | 0.92 |

Table 5-6: Intermittent vibration impacts criteria (m/s²) 1-80Hz

| Location | Daytime | | Night-time | |
|--|------------------|----------------|------------------|----------------|
| | Preferred Values | Maximum Values | Preferred Values | Maximum Values |
| Critical Areas | 0.10 | 0.20 | 0.10 | 0.02 |
| Residences | 0.20 | 0.40 | 0.13 | 0.26 |
| Offices, schools, educational institutions and places of worship | 0.40 | 0.80 | 0.40 | 0.80 |
| Workshops | 0.80 | 1.60 | 0.80 | 1.60 |

Two standards by which building damage from Construction-induced vibration are commonly assessed include:

- British Standard 7385: Part 2-1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (BSI 1993)
- German DIN 4150: Part 3 – 1999 Effects of Vibration on Structure (DIN 1999).

The British Standard BS 7385 is used as a guide to assess the likelihood of building damage from ground vibration. BS 7385 suggests levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur, where the categories of structural damage are defined as:

- Cosmetic - the formation of hairline cracks on drywall surfaces, or the growth of existing cracks in plaster or drywall surfaces; in addition, the formation of hairline cracks in mortar joints of brick/ concrete block Construction
- Minor - the formation of large cracks or loosening of plaster or drywall surfaces, or cracks through bricks/concrete blocks
- Major - damage to structural elements of the building, cracks in supporting columns, loosening of joints, splaying of masonry cracks, etc.

The levels for structural damage outlined in the standard refer to non-continuous vibration sources and are considered 'safe limits' up to which no damage due to vibration effects are expected to occur for the various building types. Where vibration is continuous these levels may be reduced by up to 50% and additional assessment against the standard would be necessary.

BS 7385 is based on peak particle velocity and specifies damage criteria for frequencies within the range 4 to 250 Hz, being the range usually encountered in buildings. Table 5-9 sets out the BS 7385 criteria for cosmetic, minor and major damage.

Table 5-7: BS 7385 structural damage criteria

| Group | Type of structure | Damage level | Peak component particle velocity ¹ (mm/s) | | |
|-------|---|--------------------|--|-----------|-------|
| | | | 4 – 15 Hz | 15 – 40Hz | ≥40Hz |
| 1 | Reinforced or framed structures Industrial and heavy commercial buildings | Cosmetic | 50 | 50 | 50 |
| | | Minor ² | 100 | 100 | 100 |
| | | Major ² | 200 | 200 | 200 |
| 2 | Un-reinforced or light framed structures Residential or light commercial type buildings | Cosmetic | 15 - 20 | 20 - 50 | 50 |
| | | Minor ² | 30 - 40 | 40 - 100 | 100 |
| | | Major ² | 60 - 80 | 80 - 200 | 200 |

Notes: ¹ Peak Component Particle Velocity is the maximum Peak particle velocity in any one direction (x, y, z) as measured by a tri-axial vibration transducer.

² Minor and major damage criteria established based on BS 7385 Part 2 (1993) Section 7.4.2

Where heritage structures are impacted, DIN 4150-3 vibration criteria will be applied. The criteria applicable to heritage buildings are identified in table 5-7. Based on DIN 4150-3, a

measured value exceeding those listed in Table 5-8 will not necessarily lead to damage if it is significantly exceeded, however, further investigations may be necessary. A heritage specialist will be engaged, if required, for the Project to provide GEJV with advice on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures.

Table 5-8: DIN 4150-3 Vibration guidelines for heritage buildings

| Type of Structure | Peak Component Particle Velocity, mm/s | | | |
|---|---|----------------|------------------|---|
| | Vibration at the foundation at a frequency of | | | Vibration of horizontal plane of highest floor at all frequencies |
| | 1 Hz to 10 Hz | 10 Hz to 50 Hz | 50 Hz to 100 Hz* | |
| Structures that, because of their sensitivity to vibration, do not correspond to those listed in lines 1 and 2 of table 5-7 and are of great intrinsic value (e.g. buildings that are under a preservation order) | 3 | 3 to 8 | 8 to 10 | 8 |

* For frequencies above 100Hz, at least the values specified in this column shall be applied.

6 Environmental aspects and impacts

6.1 Environmental aspects

The Project will involve a range of activities incorporating various heavy machinery, plant and equipment that will operate in a number of locations across the Project. In order to assess the level of potential impact on noise and vibration sensitive receivers, the broad categories of Construction activity likely to interact with these receivers are identified below.

- Site establishment
- Clearing and grubbing
- Demolition
- Utility relocation
- Earthworks and drainage
- Drilling and blasting
- Materials haulage
- Concrete batching
- Paving and concrete saw cutting
- Ancillary facilities
- Finishing works such as landscaping
- Road furnishing

6.2 Impacts

The potential for noise and vibration impacts on sensitive receivers or structures will depend on a number of factors. Typically these might include:

- The type of equipment in use.
- The number of equipment simultaneously in use.
- Ground condition.
- Topography and other physical barriers.
- Proximity to sensitive receivers.
- The condition of sensitive receivers.
- Hours/duration of Construction works.
- Proximity of heavy traffic areas such as the existing The Northern Road.

Relevant aspects and the potential for related impacts have been considered in the Construction risk assessment workshop (CRAW) which has been completed. Risk Reviews will be conducted on a monthly basis during Construction. Noise and vibration impacts and aspects will be continually reviewed and documents/methods updated in response to risks identified. This information will be documented in Appendix A2 of the CEMP, which also contains the findings from the CRAW.

Section 8 provides a suite of mitigation measures that will be implemented to avoid or minimise impacts on the receiving community and/or built environment.

7 Construction noise and vibration assessment

A range of plant and equipment will be required to undertake activities associated with the Project. A summary of anticipated Construction scenarios, timing and predicted noise levels are provided below. This information has been used to determine potential impacts on the receiving community. An adaptive management approach will be applied to the implementation of mitigation measures to minimise impacts on the community.

7.1 Construction activities

Table 7-1 provides a summary of Sound Power Levels of typical equipment to be used on the Project for each anticipated scenario and the timing and duration of these scenarios. GEJV has sourced this information from the EIS Annexure H – Technical working Paper: Noise and Vibration. The table identifies Sound Power Level (SWL) at seven metres for the equipment. SWL is independent of measurement position. Plant and equipment may be used in isolation or simultaneously.

Based on the information in Table 7-1, source noise levels from a number of Construction phases have been calculated, and are presented in Table 7 2 and Table 7-3.

Table 7-1: Construction Source Sound Power Levels

| Construction phase | Timing and duration | Typical plant and equipment | Sound Power Level dB(A) L _{Aeq} (15min) |
|------------------------------|--|--|--|
| Early Works | Sept 2018 – Nov 2018 | <ul style="list-style-type: none"> ▪ Truck mounted crane ▪ Light vehicles ▪ Excavator ▪ Generator ▪ Bobcat ▪ Dump trucks | <ul style="list-style-type: none"> ▪ 104 ▪ 88 ▪ 109 ▪ 101 ▪ 104 ▪ 111 |
| Utility Relocation | Nov 2018 – Dec 2018 Will continue sporadically throughout program | <ul style="list-style-type: none"> ▪ Excavator ▪ Light vehicles ▪ Water cart ▪ Grader ▪ Dump truck | <ul style="list-style-type: none"> ▪ 109 ▪ 88 ▪ 107 ▪ 112 ▪ 111 |
| Earthworks | Dec 2018 – May 2019 | <ul style="list-style-type: none"> ▪ Excavator ▪ Dump trucks ▪ Vibratory roller (20-30T) ▪ Light vehicles ▪ Bulldozer ▪ Grader ▪ Water cart ▪ Bobcat | <ul style="list-style-type: none"> ▪ 109 ▪ 114 ▪ 110 * ▪ 88 ▪ 112 ▪ 112 ▪ 107 ▪ 104 |
| Road work – gravel pavements | Aug 2019 – Nov 2019 Then Apr 2020 – July 2020 | <ul style="list-style-type: none"> ▪ Excavator ▪ Bulldozer ▪ Water cart ▪ Grader ▪ Dump truck ▪ Spray sealing equipment ▪ Concrete truck and pump ▪ Asphalt paver (plus truck) ▪ Concrete saw Vibratory roller (20- 30T) ▪ Vibratory roller (20-30T) | <ul style="list-style-type: none"> ▪ 109 ▪ 112 ▪ 107 ▪ 112 ▪ 111 ▪ 103 ▪ 108 ▪ 108 ▪ 114 ▪ 110 * |

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| Construction phase | Timing and duration | Typical plant and equipment | Sound Power Level dB(A) L _{Aeq} (15min) |
|-------------------------------|---|--|---|
| Paving – lean mix and asphalt | Will occur immediately after roadworks (gravel pavements) | <ul style="list-style-type: none"> ▪ Excavator ▪ Light vehicles ▪ Generator ▪ Asphalt paver (plus truck) ▪ Concrete trucks and pump ▪ Concrete saw ▪ Vibratory roller (20-30T) ▪ Slip-forming machine ▪ Truck mounted crane | <ul style="list-style-type: none"> ▪ 109 ▪ 88 ▪ 101 ▪ 108 ▪ 108 ▪ 119 * ▪ 110 * ▪ 102 ▪ 104 |
| Drainage work | March 2019 – Dec 2019 | <ul style="list-style-type: none"> ▪ Excavator ▪ Light vehicles ▪ Generator ▪ Jackhammer ▪ Concrete truck and pump ▪ Truck mounted crane Vibratory roller (20-30T) Bored piling ▪ Bobcat | <ul style="list-style-type: none"> ▪ 109 ▪ 88 ▪ 101 ▪ 118 * ▪ 108 ▪ 104 ▪ 110 * ▪ 112 |
| Finishing works | May 2020 – Jul 2020 | <ul style="list-style-type: none"> ▪ Excavator ▪ Generator ▪ Light vehicles ▪ Dump trucks ▪ Concrete trucks and pump ▪ Hydro mulching equipment ▪ Truck mounted crane ▪ Water cart ▪ Vibratory roller (20-30T) ▪ Bobcat ▪ Road marking machine ▪ Welding equipment | <ul style="list-style-type: none"> ▪ 109 ▪ 101 ▪ 88 ▪ 111 ▪ 108 ▪ 116 ▪ 104 ▪ 107 ▪ 110 * ▪ 104 ▪ 108 ▪ 105 |
| Ancillary Facilities (only) | Nov 2018 – Aug 2020 | <ul style="list-style-type: none"> ▪ Front end loader ▪ Excavator ▪ Road truck ▪ Compressor ▪ Welding equipment ▪ Light vehicles ▪ Generator | <ul style="list-style-type: none"> ▪ 119 ▪ 115 ▪ 113 ▪ 112 ▪ 109 ▪ 100 ▪ 104 |

* Note: sound power level includes a 5dB(A) penalty for annoying noise characteristics

7.2 Construction noise impacts

7.2.1 Predicted impacts to residences during standard hours

From the EIS Annexure H – Technical working Paper: Noise and Vibration a summary of the predicted LAeq noise levels and potential impacts to receivers at each NCA from all standard hours (daytime) are presented in Table 7-2.

The predicted noise levels shown in Table 7-2 have been adopted from the EIS Annexure H – Technical working Paper: Noise and Vibration and represent the worst case Construction noise levels predicted for the least and most affected residences. GEJV has reviewed these predicted LAeq noise levels and potential impacts based on the location, timing and

proximity to receivers and considers this assessment as an accurate representation of the noise levels and impacts for the Project.

The Construction scenarios identified will be staged throughout the program as shown in Table 7-1 and although there will be some overlap between scenarios, the cumulative noise impacts effect will be minimal. For example, earthworks in any one location will need to be completed prior to commencement of the next scenario, roadworks. Roadworks involves the gravel engineering fill layers and this will need to occur before pavement works commence.

Table 7-2: Predicted noise levels at residences from Construction works during standard hours

| NCA | NML (Standard Hours) | Construction Stage | | | | | | | | | |
|-----------------------|----------------------|---|---------------------|----------|----------|--------|--------------------|-----------------|--------------------------------|-------|-------|
| | | Early works | Earthworks | Roadwork | Drainage | Paving | Utility Relocation | Finishing works | Ancillary Facilities operation | | |
| 4 | 47 | Range of predicted noise levels (dB(A)) | | 49 -63 | 50-68 | 52-67 | 51-66 | 52-67 | 50-63 | 51-66 | 46-60 |
| | | Number of Residences | Complying | | | | | | | | 1 |
| | | | 0-10 dBA above NML | 13 | 9 | 8 | 8 | 10 | 8 | 8 | 14 |
| | | | 10-20 dBA above NML | 3 | 6 | 8 | 7 | 6 | 8 | 8 | 1 |
| | | | 20+ dBA above NML | | 1 | | 1 | | | | |
| Highly noise affected | ≥75 dBA | | | | | | | | | | |
| 5 | 52 | Range of predicted noise levels (dB(A)) | | 39-83 | 43-88 | 45-90 | 44-89 | 45-90 | 41-86 | 44-89 | 38-69 |
| | | Number of Residences | Complying | 177 | 146 | 117 | 131 | 117 | 162 | 131 | 211 |
| | | | 0-10 dBA above NML | 33 | 54 | 75 | 69 | 75 | 44 | 69 | 12 |
| | | | 10-20 dBA above NML | 10 | 19 | 23 | 18 | 23 | 13 | 18 | 1 |
| | | | 20+ dBA above NML | 4 | 5 | 9 | 6 | 9 | 5 | 6 | |
| Highly noise affected | ≥75 dBA | 4 | 5 | 5 | 5 | 5 | 4 | 5 | | | |
| 6 | 52 | Range of predicted noise levels (dB(A)) | | 40-48 | 44-53 | 46-55 | 45-54 | 46-55 | 42-51 | 45-54 | 39-47 |
| | | Number of Residences | Complying | 14 | 12 | 11 | 12 | 11 | 14 | 12 | 14 |
| | | | 0-10 dBA above NML | | 2 | 3 | 2 | 3 | | 2 | |
| | | | 10-20 dBA above NML | | | | | | | | |
| | | | 20+ dBA above NML | | | | | | | | |
| Highly noise affected | ≥75 dBA | | | | | | | | | | |
| 7 | 47 | Range of predicted noise levels (dB(A)) | | 43-64 | 48-69 | 50-71 | 49-70 | 50-71 | 46-67 | 49-70 | 40-49 |
| | | Number of Residences | Complying | 4 | | | | | 1 | | 17 |
| | | | 0-10 dBA above NML | 12 | 8 | 5 | 6 | 5 | 14 | 6 | 2 |
| | | | 10-20 dBA above NML | 3 | 10 | 13 | 12 | 13 | 4 | 12 | |
| | | | 20+ dBA above NML | | 1 | 1 | 1 | 1 | | 1 | |
| Highly noise affected | ≥75 dBA | | | | | | | | | | |
| 8 | 58 | Range of predicted noise levels (dB(A)) | | 41-69 | 46-74 | 48-76 | 47-75 | 48-76 | 44-72 | 47-75 | 41-66 |
| | | Number of Residences | Complying | 83 | 78 | 72 | 74 | 72 | 80 | 74 | 93 |
| | | | 0-10 dBA above NML | 20 | 16 | 22 | 20 | 22 | 17 | 20 | 12 |
| | | | 10-20 dBA above NML | 2 | 11 | 11 | 11 | 11 | 8 | 11 | |
| | | | 20+ dBA above NML | | | | | | | | |
| Highly noise affected | ≥75 dBA | | | 2 | 1 | 2 | | 1 | | | |

Table 7-2 above identifies that the highest NML exceedances are predicted to occur at residences within NCA 5, this is because NCA 5 includes the town of Luddenham and has a greater number of residential receivers. All other NCAs within the Project are semi-rural landscapes with fewer residential receivers. NCA 8 is at the southern extent of the Project and this area has the second highest number of residential receivers.

Of all works scenarios, road works and paving are expected to generate the greatest number of NML exceedances at residences, which are mostly located in NCAs 5 and 8. These two

NCAAs are the only areas where residents would be subjected to highly noise affected levels (noise levels > 75dB(A)).

Noise levels from the bulk earthworks scenario, are predicted to be within the NML (earthworks not included as OOH scenario), for 236 residences (60% of all residences) across the Project area.

The reported exceedances represent worst case impacts that would result when works are located nearest to the receiver and all plant listed in the scenario (Table 7-1) is operating concurrently. Construction noise levels at receivers will be lower when not all plant is operating or when Construction works moves on further from the receiver. For example, Construction noise levels from paving works will be approximately 7 dB(A) lower than the levels reported in Table 7-2 when the vibratory rolling and concrete sawing are not in operation.

7.2.2 Predicted impacts to residences from out of hours works

Potential out-of-hours Construction scenarios and predicted impacts are presented in Table 7-3. The predicted noise levels shown in Table 7-3 were sourced from the EIS Annexure H – Technical working Paper: Noise and Vibration. GEJV has adopted the predicted LAeq noise levels and potential impacts for paving in relevant NCAs and the operation of the main compound in NCA 4. The paving during out of hours is likely only to be required at the northern and southern pavement tie ins to the existing The Northern Road and the potential noise impacts will be limited to NCAs 4 and 5 at the northern tie in and NCA 8 at the southern tie in. The only ancillary area that may require out of hours works is the main compound in NCA 4.

There may be other activities that are required during out of hours throughout the Construction program. All out-of-hours work will be subject to a specific noise impact assessment as part of the out-of-hours work procedure (Annexure B) to ensure that they are undertaken in accordance with the relevant EPL conditions.

Table 7-3: Summary of predicted Construction noise impacts at each NCA during out-of-hours work

| NCA | NML OOH (night) | | | Paving | Ancillary Facilities | Sleep Disturbance Screening Criterion | Paving | Ancillary Facilities |
|-----------------------|-------------------|---|---------------------|--------|----------------------|---------------------------------------|--------|----------------------|
| | | | | | | | | |
| 4 | 42 | Range of predicted noise levels (dB(A)) | | 50-62 | 46-60 | 52 | 53-68 | 49-63 |
| | | Number of Residences | Complying | | | | | 1 |
| | | | 0-5 dBA above NML | | 1 | | | 11 |
| | | | 5-15 dBA above NML | 11 | 14 | | | 4 |
| | | | 15-25 dBA above NML | 5 | 1 | | | |
| Highly noise affected | ≥25 dBA above NML | | | | | | | |
| 5 | 39 | Range of predicted noise levels (dB(A)) | | 40-85 | N/A* | 49 | 44-89 | N/A* |
| | | Number of Residences | Complying | | | | 44 | |
| | | | 0-5 dBA above NML | 18 | | | 109 | |
| | | | 5-15 dBA above NML | 159 | | | 48 | |
| | | | 15-25 dBA above NML | 33 | | | 18 | |
| Highly noise affected | ≥25 dBA above NML | 14 | | 5 | | | | |
| 6 | 39 | Range of predicted noise levels (dB(A)) | | N/A** | N/A* | 49 | N/A** | N/A* |
| | | Number of Residences | Complying | | | | | |
| | | | 0-5 dBA above NML | | | | | |
| | | | 5-15 dBA above NML | | | | | |
| | | | 15-25 dBA above NML | | | | | |
| Highly noise affected | ≥25 dBA above NML | | | | | | | |
| 7 | 42 | Range of predicted noise levels (dB(A)) | | N/A** | N/A* | 52 | N/A** | N/A* |
| | | Number of Residence | Complying | | | | | |
| | | | 0-5 dBA above NML | | | | | |
| | | | 5-15 dBA above NML | | | | | |
| | | | 15-25 dBA above NML | | | | | |
| Highly noise affected | ≥25 dBA above NML | | | | | | | |
| 8 | 47 | Range of predicted noise levels (dB(A)) | | 43-71 | N/A* | 57 | 47-75 | N/A* |
| | | Number of Residence | Complying | 20 | | | 63 | |
| | | | 0-5 dBA above NML | 34 | | | 22 | |
| | | | 5-15 dBA above NML | 37 | | | 13 | |
| | | | 15-25 dBA above NML | 14 | | | 7 | |
| Highly noise affected | ≥25 dBA above NML | | | | | | | |

*OOHW for ancillary areas would only be required at the main compound at area C8, this would only affect NCA 4.

**OOHW for paving would only be required at the northern and southern pavement tie ins.

Table 7-3 above indicates that for night works, it is predicted that the highest NML exceedances will occur at residences within NCA 5 during pavement works at the northern tie in. If paving is undertaken at night at the northern tie in, noise levels are predicted to exceed night time NMLs by 25dB(A) at a number of residences. As per the Construction Noise and Vibration Guideline (Roads and Maritime, 2016) these residents will need to be offered alternative accommodation options.

Any proposed out of hours works must follow the out-of-hours work protocol (Annexure B). This protocol includes individual assessment and approval for all proposed out of hours works.

GEJV will apply standard mitigation measures for all proposed out of hours works in an attempt to reduce predicted noise levels below the NMLs. These measures will include noise

shielding, reviewing/modifying the scheduling of works, changing behavioural practices, reviewing and modifying the use and selection of plant and equipment and the use of non-tonal reversing alarms.

After standard noise mitigation measures have been applied and where predicted noise levels still exceed NMLs for the proposed out of hours works, additional mitigation measures will be applied where relevant. These additional mitigation measures will include respite periods, duration respite, and alternative accommodation. Table 8-1 and Annexure B provide further detail on the standard and additional mitigation measures for works undertaken outside of standard construction hours for the Project.

7.2.3 Non-residential receivers

There are five non-residential receivers which are within the town of Luddenham (NCA 5) where exceedances of the NML from work during standard hours are predicted. These include:

- Shell Service Station – moderate exceedances of up to 17 dB(A)
- IGA Luddenham – moderate exceedances of up to 12 dB(A)
- Luddenham Public School - minor exceedances of up to 4 dB(A)
- St James Anglican Church - moderate exceedances of up to 11 dB(A)
- Luddenham Uniting Church – minor exceedances of up to 2 dB(A).

Construction noise impacts will be mitigated using the measures identified in Table 8-1 and the ICNG and Roads and Maritime CNVG to reduce impacts to these non – residential receivers. Where appropriate, GEJV will develop management measures in consultation with affected residents, businesses and community, religious and educational institutions. Consultation will be undertaken in accordance with the principles and procedures outlined in the CCS.

7.2.4 Ancillary facilities

Temporary ancillary facilities required for the Project will include a compound and laydown areas. The main compound will be situated in ancillary area C8 as detailed in the Ancillary Facility Management Plan. An assessment of potential noise impacts at the main compound has been included in the Ancillary Facility Management Plan and this plan has been approved by the DP&E. The main compound area will accommodate a range of activities, plant and equipment including, but not limited to:

- offices and meeting rooms
- staff amenities
- light vehicle parking and delivery access
- storage areas
- perimeter fencing, including visual screening

It is anticipated that establishment and operation of all ancillary facilities will generally be carried out during the standard construction working hours of:

- 7.00am to 6.00pm, Monday to Friday
- 8.00am to 1.00pm on Saturdays; and
- At no time on Sundays or public holidays.

The only out of hours works that would occur at the main compound facility at C8 would be office administrative related activities and these activities will not impact sensitive noise receivers. It is not expected that loading or unloading of materials, processing of materials or operation of plant will be required outside of standard hours at any of the ancillary areas. In the unlikely event that out of hours works are required, they will be undertaken in accordance with the EPL and the out-of-hours work procedure (Annexure B).

7.3 Construction vibration assessment

7.3.1 Vibration assessment

Vibration impacts to residents and buildings are not expected during Construction of the Project. Table 7-4 indicates the safe working distances recommended by the CNVG for typical items of vibration intensive plant that must be complied with unless otherwise approved by Roads and Maritime.

Table 7-4: Safe working distances for vibration intensive plant (TfNSW, 2013)

| Plant Item | Rating / description | Safe Working Distances | |
|--------------------------------|-------------------------------|---------------------------|----------------------------------|
| | | Cosmetic Damage (BS 7385) | Human Response (DECCW) |
| Vibratory roller | <50 kN (typically 1-2 t) | 5 m | 15 m to 20 m |
| | <100 kN (typically 2-4 t) | 6m | 20 m |
| | <200 kN (typically 4-6 t) | 12m | 40 m |
| | <300 kN (typically 7-13 t) | 15m | 100m |
| | >300 kN (typically 13-18 t) | 20m | 100m |
| | >300 kN (> 18 t) | 25m | 100m |
| Small hydraulic hammer | 300 kg – 5 to 12 t excavator | 2m | 7m |
| Medium hydraulic hammer | 900 kg – 12 to 18t excavator | 7m | 23m |
| Large hydraulic hammer | 1600kg - 18 to 34 t excavator | 22m | 73m |
| Vibratory pile driver | Sheet piles | 2m to 20 m | 20m |
| Pile boring | ≤800 mm | 2m | N/A |
| Jackhammer | Hand held | 1m | Avoid Contact with the structure |

In relation to human response, the safe working distances relate to continuous vibration. For most Construction activities, vibration emissions are intermittent and higher vibration levels over shorter periods are acceptable. GEJV may undertake or has undertaken additional assessment where the human response criteria are exceeded.

The greatest vibration impacts are expected from vibratory rollers during earthworks and roadworks. The use of rock hammers is unlikely and there is no bridge works associated with the Project. Based on the safe working distances to preserve the structural integrity of dwellings recommended in Table 7-4, structural damage criteria will be complied with where vibratory rolling (13-18T) or rock breaking (large hammer) is operated 22 m or closer to any building. The vibration criteria for cosmetic damage must be complied with at all times and as such continuous vibration monitoring will be undertaken when vibratory works are close to or within the recommended safe working distances to ensure that the criteria for cosmetic damage is not exceeded. GEJV will implement management measures to ensure that vibration impacts from Construction activities do not exceed the vibration limits for damage to buildings and structures set out in BS 7385 and Australian Standard 2187.2 – 2006 Explosives – Storage and use – Use of explosives.

Table 7-5 indicates the number of vibration-sensitive receivers that likely would be situated within the 22m (preservation of structural integrity of buildings) and 100m (protection of human comfort) safe working distances. Counts of receivers within the 100m buffer zone includes those receivers also within the 22m buffer zone (i.e., receivers within 22m of the Project are included in both counts). GEJV will implement mitigation measures to minimise vibration impacts on residential and commercial receivers to ensure there are no exceedances of the acceptable vibration values set out in *Assessing Vibration: A Technical Guideline* (DEC, 2006),

The sensitive item identified in Table 7-5 is Miss Lawsons Guesthouse heritage site. Where structures are more sensitive such as the Miss Lawsons Guesthouse heritage site, more stringent vibration criteria may be applicable as detailed in Table 5-8 (DIN 4150-3 Vibration guidelines for heritage buildings). As Miss Lawsons Guesthouse is an archaeological heritage site rather than a structure / building, GEJV will consult with the Roads and Maritime Heritage consultant to determine the vibration criteria that will apply to the site prior to conducting vibratory works within 50m of this site.

In accordance with NSW-CoA E34, GEJV will carry out vibration testing prior to and during Construction activities that have the potential to generate vibration impacts that may impact on heritage items. The purpose of the vibration testing is to identify minimum working distances to prevent cosmetic damage to heritage items. Where vibration testing and monitoring indicates that the preferred values for vibration are likely to be exceeded (refer to Table 5-8), GEJV will review the Construction methodology and, if necessary, implement additional mitigation measures.

Table 7-5: Indicative count of receivers within safe working distance from vibration-intensive works

| Noise Catchment Area | Number of receivers within Safe Working Distance for Vibration | | | | | |
|----------------------|--|------------|-----------|---|------------|-----------|
| | Preservation of structural integrity of buildings (22m buffer zone) | | | Protection of human comfort (100m buffer zone) | | |
| | Residential | Commercial | Sensitive | Residential | Commercial | Sensitive |
| NCA 4 | - | - | 1 | 1 | - | N/A* |
| NCA 5 | 4 | 2 | - | 15 | 3 | - |
| NCA 6 | - | - | - | - | - | - |
| NCA 7 | - | - | - | 1 | - | - |
| NCA 8 | 2 | - | - | 12 | - | - |

*Archaeological site – human comfort criteria does not apply

8 Environmental mitigation and management measures

A range of environmental requirements and control measures are identified in the various environmental documents, including the EIS and SPIR, the conditions of approval and relevant Roads and Maritime documents. Specific measures and requirements to address impacts from noise and vibration are outlined in table 8-1. Further detail is provided in Section 8 below.

Table 8-1: Noise and vibration management and mitigation measures

| ID | Measure / requirement | When to implement | Responsibility | Reference |
|--|---|--------------------------|--|--|
| Construction noise impacts on sensitive receivers | | | | |
| NV-1 | Determine noise goals at all sensitive receivers. | Pre-Construction | GEJV ESR | EIS App. H (10.17), G36 Cl. 4.6, (REMM NV-1) |
| NV-2 | Investigate all noise complaints and implement appropriate mitigation measures where practicable to minimise further impacts. | Construction | Community Relations Manager, GEJV ESR. | EIS App. H (10.17), G36 Cl. 4.6, (REMM NV-2) |
| NV-3 | Undertake attended compliance noise and vibration monitoring following the receipt of a complaint and report the results of the monitoring to the roads and maritime and the EPA as soon as possible. | Construction | Community Relations Manager, GEJV ESR | G36 Cl. 3.9, (REMM NV-1, NV-2) NSW-CoA C9(b) |
| NV-4 | Where noise and / or vibration exceedances are detected, procedures will be reviewed in order to identify means to minimise the impacts to residences. All non-compliances will be responded to in a timely manner | Construction | Construction Manager, GEJV ESR | EIS App. H (10.17), G36 Cl. 4.6, (REMM NV-1) |
| NV-5 | Plant and equipment locations and movement will be planned to minimise impact on receivers (i.e. haulage routes, static noise sources and, loading and unloading). | Construction | Construction Manager, GEJV ESR | G36 Cl. 4.6 (REMM NV-2) |
| NV-6 | Hoarding will be installed to a height of 2.4m around facilities, unless there is modelling which shows the acoustic benefit is not warranted. | Construction | Superintendent, GEJV ESR | G36 Cl. 4.6 (REMM NV-2) NSW-CoA E31 |
| NV-7 | When conducting rock breaking or concrete sawing during out of hours works near sensitive receivers investigate the use of mobile hoardings (e.g., acoustic screen curtains mounted on a wheeled trailer) to track moving, but tightly-contained processes. | Construction | Superintendent, GEJV ESR | EIS App. H (10.13), (REMM NV-2) |

| ID | Measure / requirement | When to implement | Responsibility | Reference |
|---------------------------|---|-------------------|--------------------------------|------------------------------------|
| NV-8 | If operational noise controls are included in the design, eg noise walls/ mounds, progressively install these operational noise mitigation measures to minimise Construction noise impacts. | Construction | Superintendent, GEJV ESR | G36 Cl. 4.6 |
| NV-9 | Construction vehicles must not be parked with idling engines Outside normal working hours | Construction | Superintendent | G36 Cl. 4.6 NSW-CoA E28 |
| NV-10 | Select quieter plant and equipment during out of hours works where possible. | Construction | Construction Manager | EIS App. H (10.13), (REMM NV-2) |
| NV-11 | Maximise offset distances between receivers and noisy plant or activities where practical. | Construction | Construction Manager | EIS App. H (10.13) (REMM NV-2) |
| NV-12 | Regularly maintain and monitor plant and equipment to ensure that their noise emissions are not excessive | Construction | Supervisor | EIS App. H (10.13) (REMM NV-2) |
| NV-13 | Minimise annoyance from reversing alarms by either fitting closed circuit monitors or non-tonal reversing alarms (“quackers”) on vehicles or deploying ‘spotters’ to oversee reversing movements. | Construction | Supervisor | EIS App. H (10.13) (REMM NV-2) |
| NV-14 | Switch off equipment when it is not being used. | Construction | Supervisor | EIS App. H (10.13) (REMM NV-2) |
| NV-15 | Implement operational noise mitigation early in the Construction program, where possible, to minimise Construction noise impacts | Construction | Construction Manager, GEJV ESR | EIS Table 7-37 (REMM NV-3) |
| Construction Hours | | | | |
| NV-16 | Develop an out-of-hours work procedure to guide compliance with the relevant conditions of the EPL (see Annexure B). | Pre-Construction | GEJV ESR | EIS App. H (10.17) (REMM NV-2) |
| NV-17 | Develop Construction program to minimise impacts - including time and duration restrictions and respite periods where required. | Pre-Construction | GEJV ESR | G36 Cl. 4.6 |

| ID | Measure / requirement | When to implement | Responsibility | Reference |
|-----------|--|--------------------------|--|-----------------------------------|
| NV-18 | Notify residents and businesses of future works and expected levels of noise at least 5 working days in advance of the works occurring. | Construction | Community Relations Manager | G36 Cl. 4.6 |
| NV-19 | Schedule works for times outside of heightened sensitivity for impacted receivers (e.g. outside of school hours). | Construction | Construction Manager | EIS App. H (10.13) (REMM NV-2) |
| NV-20 | Schedule respite periods for noise intensive processes undertaken near receivers (e.g. limiting operation of pavement sawing to three hours at a time). | Construction | Construction Manager | EIS App. H (10.13) (REMM NV-2) |
| NV-21 | Deliveries to occur within standard Construction hours, unless otherwise agreed by Roads and Maritime and in accordance with the out-of-hours work procedure (see Annexure B) and EPL. | Construction | Construction Manager | G36 Cl. 4.6 (REMM NV-2) |
| NV-22 | Minimise the number of consecutive nights of works adjacent to any particular set of receivers. | Construction | Construction Manager | EIS App. H (10.13) (REMM NV-2) |
| NV-24 | Restrict heavy vehicle movements, heavy deliveries and loading and unloading processes to daytime periods and to areas well away from receivers. | Construction | Construction Manager | EIS App. H (10.13) (REMM NV-2) |
| NV-25 | Where relevant, consultation would be undertaken with proponents of other nearby developments to increase the overall awareness of Project timeframes and impacts | Construction | Construction Manager, Community Relations Manager | EIS Table 12-4 (REMM CI-2) |

8.1 Working hours

8.1.1 Hours of work

In accordance with NSW-CoA E23 and the EPL work will be undertaken during standard Construction hours:

- Monday to Friday: 7:00 am to 6:00 pm
- Saturday: 8:00 am to 1:00 pm
- Sundays and public holidays: no work

8.1.2 High noise impact activities and works

As required by NSW-CoA E24, except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the relevant receiver must only be undertaken:

- Monday to Friday: between 8:00 am to 6:00 pm
- Saturday: between 8:00am to 1:00pm
- Sundays and public holidays: no work

Work with impulsive or tonal noise emissions will be carried out in continuous blocks not exceeding three hours each, with a minimum respite of at least one hour between each block.

'Continuous' includes any period during which there is less than a one hour respite between ceasing and recommencing the work.

In accordance with NSW-CoA E25, GEJV will consult with receivers identified as being subject to noise levels exceeding the Highly Noise Affected criteria with the objective of determining appropriate hours of respite, unless an agreement is reached with those receivers.

All conditions relating to Construction hours outlined in the Project EPL will be complied with.

8.1.3 Variation to hours of work

Works outside of the standard Construction hours may be undertaken in the following circumstances:

- For the delivery of materials required by the NSW Police Force or other authority for safety reasons or
- Where it is required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm or
- Where the works generate noise that is:
 - $L_{Aeq(15\text{ min})}$ noise levels no more than 5 dB(A) above rating background level at any residence in accordance with the ICNG (DECC, 2009) and
 - $L_{Aeq(15\text{ min})}$ noise levels no more than the noise management levels specified in Table 3 of the ICNG (DECC, 2009) at other sensitive receivers and

- continuous or impulsive vibration values, measured at the most affected residence, that are no more than those for human exposure to vibration, specified for residences in Table 2.2 of *Assessing Vibration: a technical guideline* (DEC, 2006) and
- intermittent vibration values, measured at the most affected residence, that are no more than those for human exposure to vibration, specified for residences in Table 2.4 of *Assessing Vibration: a technical guideline* (DEC, 2006) or
- No more than 15 dB(A) above the night time rating background level at any residence during the night time period, when measured using the $L_{Aeq(1\text{ minute})}$ or L_{Amax} noise descriptors.
- Where different hours are permitted or required under an EPL in force in respect of the works, in which case those hours must be complied with.

On becoming aware of the need for emergency works, GEJV will notify the Roads and Maritime Project Manager, the ER and the EPA of the need for the emergency works. GEJV will use its best endeavours to notify all affected sensitive receivers of the likely impact and duration of the emergency works.

GEJV will submit a report to the EPA by 2 pm on the next business day after the emergency works commenced that describes:

- The cause, time and duration of the works
- Action taken by or on behalf of GEJV in relation to the works
- Details of any measures taken or proposed to be taken by GEJV to prevent or mitigate against a recurrence of the requirements for works in accordance with the above.

8.1.4 Out of hours work (OOHW)

OOHW will only occur in accordance with the requirements of NSW-CoA E26 and the EPL. OOHW with predicted noise levels exceeding the requirements of NSW-CoA E26 will only occur if there is a community agreement in place in accordance with EPL Conditions L4.5, L4.6 and E1.1 to E1.8.

GEJV has prepared an Out of Hours Work (OOHW) Procedure in accordance with the *Construction Noise and Vibration Guidelines* (Roads and Maritime, 2016), and Roads and Maritime specifications, provided in Annexure B of this CNVMP. The OOHW Procedure addresses the requirements of NSW-CoA E26, E27 and the EPL. The purpose of the OOHW Procedure is to assess, approve and manage OOHW for the Project.

The OOHW Procedure includes, but is not limited to:

- The process for obtaining Roads and Maritime agreement for OOHW,
- The details to be provided to the Roads and Maritime Environmental Manager (or delegate) and Roads and Maritime Project Manager in any OOHW application, including information on the nature and need and justification for activities to be conducted during the varied Construction hours,
- Requirements for consultation with the EPA, potentially affected receivers and Liverpool City Council, and the evidence of the consultation to be provided to the Roads and

Maritime Environmental Manager (or delegate) and Roads and Maritime Project Manager.

8.1.4 Community agreements for works outside of standard Construction hours

Works outside of standard Construction hours that do not meet the circumstances listed above may be undertaken if agreement between GEJV and a substantial majority of noise sensitive receivers has been reached in accordance with the EPL. Any agreement between GEJV and noise sensitive receivers must be:

- Submitted to the EPA for approval prior to any works that are the subject of the agreement being undertaken
- Prepared in writing and a copy of the agreement kept on the premises by GEJV for the duration of the EPL
- Kept on the Project website for the duration of the agreement (personal details of residents will be omitted).

Any community agreement to permit works to be undertaken outside of standard Construction hours will:

- Be prepared and implemented in accordance with the relevant sections of the ICNG (DECC, 2009), the *NSW Industrial Noise Policy* (EPA 1999) and *AS2346-2010 Guide to noise and vibration control on Construction, demolition and maintenance sites*
- Detail:
 - the actual works proposed
 - any expected impacts in clear, simple English based on noise modelling
 - the expected duration of the works
 - any expected benefits for receivers
 - any other concurrent OOHW that will be occurring
 - any other OOHW that will be occurring on the nights preceding and following the proposed works or, if the proposed work precedes or follows a weekend period, any other OOHW that will be occurring on the weekend.
- Demonstrate that the noise sensitive receivers party to the agreement understand the nature of the works and any predicted impacts
- Be kept for the duration of the agreement and made available to an EPA authorised officer on request.

In relation to consulting and engaging with noise sensitive receivers for a community agreement, the following applies:

- All noise sensitive receivers predicted by modelling to be impacted by noise greater than 5 dB(A) above RBL must be consulted on any proposed community agreement, including noise sensitive receivers that have declined to participate in previous agreements
- All proposed agreements must include details for interpreting services for languages other than English where required
- If GEJV is unable to contact a noise sensitive receiver after three attempts during the time of day that the proposed works would be undertaken, including leaving "sorry I missed you" cards explaining the reason for the visit and requesting a return phone call,

then GEJV will note that the receiver could not be contacted and the receiver will not be considered to have either agreed or disagreed

- Records of the attempts to contact the receiver will be kept by GEJV.

All noise sensitive receivers will be advised of any community agreement that has been attained in writing within seven calendar days of the agreement being finalised. The written notification will include:

- A link to the Project website, specifically to a summary of the approved agreement
- Details of the Project telephone number
- Details of the EPA's Environment Line.

Validation monitoring will be undertaken for any works that are the subject of a community agreement. The monitoring will be performed by a suitably qualified and experienced person on at least the first two nights when OOHW will be undertaken.

If the validation monitoring shows that noise levels are higher than those predicted by any noise modelling undertaken as part of the community agreement, work practices will be modified and/or additional mitigation measures implemented so that measured noise levels do not exceed predicted levels.

GEJV will submit a validation monitoring plan to the EPA for approval as part of the community agreement documentation prior to any OOHW occurring.

In the event of an inconsistency between the requirements relating to community agreements in this CNVMP and the EPL, the conditions of the EPL prevail to the extent of the inconsistency.

8.2 Plant and equipment

Noise impacts from Construction activities will be reduced by implementing measures to control noise at the source. Methods to minimise noise resulting from the use of plant and equipment during Construction of the Project (as identified in the ICNG (DECC, 2009) and Roads and Maritime specifications) include:

- Ensure Construction plant and equipment used are fitted with properly maintained noise suppression devices in accordance with the manufacturer's specifications
- Ensure Construction plant and equipment are maintained in an efficient condition
- Train site personnel to operate Construction plant and equipment in a proper and efficient manner
- Use alternatives to diesel and petrol engines and pneumatic units where feasible and reasonable
- Select less noisy plant and equipment for Construction activities
- Avoid vehicle movements at night
- Reduce plant throttle settings and turn off equipment when not in use
- Avoid or use less irritating alternatives to audible reversing and movement alarms or configure the Construction site/haulage routes to minimise the need for reversing of heavy vehicles and mobile plant

- Use dampening materials where relevant
- Erect temporary noise barriers at site boundaries and ancillary facilities, and/or use mobile hoardings to reduce noise transmission to sensitive receivers
- Position stockpiles and temporary buildings within site layouts to effectively act as acoustic barriers
- Avoid positioning multiple plant near residences and other sensitive land uses
- Construction vehicles arriving at the Project site and Construction compounds outside the standard construction hours described in Section 8.1 will not queue with idling engines
- Avoid the positioning and use of vehicle parking areas and unloading/loading zones near residences and other sensitive land uses Restrict areas where mobile plant can operate so that it is away from residences and other sensitive land uses at particular times
- Locate site access points away from residences and other sensitive land uses
- Ensure drivers are aware of nominated vehicle routes and parking areas
- Locate electrical generators away from residences and other sensitive land uses.

GEJV will make all efforts to implement the measures outlined above during Construction of the Project. Regular inspections, including spot inspections of plant and equipment, will be carried out by the Construction Manager and Supervisor to monitor compliance with these requirements.

9 Compliance management

9.1 Roles and responsibilities

GEJV's Project Team' organisational structure and overall roles and environmental responsibilities are outlined in Section 5.1 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 8 of this Plan. A heritage Consultant (Kelleher Nightingale) has been engaged and they will be providing advice on the Project on an as required basis.

9.2 Communication

Roads and Maritime has prepared a Community Communication Strategy (CCS) in accordance with the requirements of NSW-CoA B1 to document the approach to stakeholder and community communications for the Project. The CCS identifies opportunities and tools for providing information and consulting with the community and stakeholders during Construction of the Project. GEJV will support the delivery of the CCS, with specific measures outlined in the Construction Community Liaison Plan (Appendix B12 of the CEMP).

Noise and vibration management information will be communicated to the community and stakeholders in accordance with the principles and procedures outlined in the CCS and the *Construction Noise and Vibration Guideline* (Roads and Maritime, 2016). GEJV will adhere as a minimum to the following principles and procedures relevant to noise and vibration management:

- good engagement with the community will be maintained to facilitate effective Project delivery with consideration of community impact, including procedures for notifying residents, business owners and other sensitive receivers, of any noise- or vibration intensive Construction activities likely to affect their amenity
- the community will be informed of the dates for the intended works, sequencing, timing and levels of noisy or vibration intensive events at least seven calendar days in advance of the activity being undertaken
- minimising Construction noise and vibration will be viewed as a continuous improvement exercise that is inclusive of stakeholders
- site personnel and the community will be informed of the effort and methods undertaken to reduce noise and vibration impacts for the Project
- Potentially affected community, religious, educational institutions and noise and vibration-sensitive businesses will be consulted prior to scheduling the Construction works to identify periods during which they would be adversely affected by noise generating works. Works will not be scheduled during the periods identified by the stakeholders unless GEJV, Roads and Maritime, and the sensitive receiver have made other arrangements (at no cost to the affected receiver) or the Secretary has otherwise approved the works.

Consultation will be undertaken with local communities potentially affected by the impacts of multiple Projects in addition to the Project.

Where relevant, GEJV's CRM will undertake consultation with proponents of other nearby developments to increase the overall awareness of Project timeframes and impacts.

9.3 Training

All employees, contractors and utility staff working on site will undergo site induction training that includes Construction noise and vibration management issues prior to Construction commencing. The induction training will address elements related to noise and vibration management including:

- Existence and requirements of this CNVMP.
- Relevant legislation, regulations and EPL conditions.
- Incident response, management and reporting.
- Standard Construction hours.
- The process for seeking approval for out of hours works, including consultation.
- Noise management measures during night works.
- Location of noise sensitive areas.
- Complaints response and reporting.
- General noise and vibration management measures.
- Specific responsibilities to minimise impacts on the community and built environment from noise and vibration associated with the works.

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in noise and vibration management or those undertaking an activity with a high risk of environmental impact. Site personnel will undergo refresher training at not less than six monthly intervals.

Daily pre-start meetings conducted by the Superintendent will inform the site workforce of any environmental issues relevant to noise and vibration that could potentially be impacted by, or impact on, the day's activities.

Further details regarding staff induction and training are outlined in Section 5.3 of the CEMP.

9.4 Monitoring

A Construction Noise and Vibration Monitoring Program has been prepared in accordance with NSW-CoA C9 (b) and is provided in Annexure C.

Monitoring will include, but not be limited to:

- monthly noise monitoring at sensitive receivers
- spot checks of noise intensive plant
- continuous vibration monitoring (as required)
- Property condition surveys of buildings and structures.
- Monitoring in response to complaints received.

9.5 Inspections

Regular inspections of sensitive areas and activities will occur for the duration of the Project. The GEJV Environmental Site Representatives will carry out weekly site inspections. Roads

and Maritime will also conduct independent inspections to confirm GEJV's compliance with noise and vibration management requirements.

Weekly and other routine inspections by the Roads and Maritime Environmental Manager (or delegate), Environmental Review Group (ERG) representatives and the ER will occur throughout Construction. Detail on the nature and frequency of these inspections are documented in Section 6.1 of the CEMP.

9.6 Non-conformances

A non-conformance is the failure or refusal to comply with the requirements of Project system documentation, including this CNVMP. Any member of the Project team may raise a non-conformance or improvement opportunity.

When a non-conformance is detected, the process described in Section 6.6 and Appendix A9 of the CEMP and the Monitoring Program will be implemented. The Quality Plan describes the process for managing non-conforming work practices and initiating corrective / preventative actions or system improvements in accordance with the process outlined in Section 6.6.1 of the CEMP.

9.7 Complaints management

Roads and Maritime has developed a Complaints Management System (CMS) to document the overall approach to complaints management for the Project. GEJV will adopt the requirements of the CMS, including reporting requirements. The CMS includes a Complaints Register which will record the details of all complaints relating to the Project. Further detail about the CMS is provided in Section 5.5.3 of the CEMP.

Complaints will be recorded in accordance with the Community Liaison Management Plan. Information to be recorded will include location of complainant, time/s of occurrence of alleged noise or vibration impacts (including nature of impact particularly with respect to vibration), perceived source, prevailing weather conditions and similar details that could be utilised to assist in the investigation of the complaint. All complaints will be responded to in a timely manner and action taken recorded in QHEST and the Roads and Maritime complaints management system.

In accordance with EPL conditions M6.5 and M6.6, GEJV will investigate noise and vibration complaints:

- within two hours of the complaint being made or
- within another timeframe agreed with the complainant.

If the investigation identifies Construction works or activities being undertaken as the likely source of the complaint, the Contractor will make an offer to the complainant to undertake attended noise or vibration monitoring at their premises. If the offer to undertake attended noise or vibration monitoring is accepted, the Contractor will undertake the monitoring:

- as soon as practicable or
- at a time agreed with the complainant.

GEJV will advise each complainant of the results of its investigation of their complaint and any proposed remedial action.

9.8 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of noise and vibration controls, compliance with this CNVMP, conditions of approval and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 6.4 of the CEMP.

9.9 Reporting

Reporting requirements and responsibilities are documented in Section 6.5 of the CEMP.

GEJV will report on noise and vibration monitoring in accordance with the Construction Noise and Vibration Monitoring Program provided in Annexure C.

GEJV will maintain accurate records substantiating all Construction activities associated with the Project or relevant to the conditions of approval, including measures taken to implement this CNVMP. Records will be made available to the DP&E and DoEE upon request, within the timeframe nominated in the request.

9.10 Incident planning and response

Responses to incidents will be undertaken as described in Section 5.6 of the CEMP and in accordance with the Environmental Incident Classification and Reporting Procedure (refer to Appendix A7 of the CEMP).

10 Review and improvement

10.1 Continuous improvement

Continuous improvement of this Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance.
- identify environmental risks not already included in the risk register
- Determine the cause or causes of non-conformances and deficiencies.
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies.
- Verify the effectiveness of the corrective and preventative actions.
- Document any changes in procedures resulting from process improvement.
- Make comparisons with objectives and targets.

GEVJ is responsible for ensuring Project environmental risks are identified and included in the risk register and appropriate mitigation measures implemented throughout the Construction of the Project as part of the continuous improvement process.

GEJV has conducted environmental risk assessment workshops prior to the commencement of Construction and has identified high noise and vibration risk activities and representative sensitive receivers that will require monitoring during Construction, as outlined in Section 4.1 of the monitoring program (refer to Annexure C of this CNVMP).

The process for continuous identification and analysis of new risks associated with noise and vibration that may arise during Construction will be facilitated by the program of noise and vibration monitoring (as outlined in Annexure C of this CNVMP), regular inspections of sensitive areas and activities and observations by site personnel (Section 9.5), and through revision of this CNVMP and/or noise and vibration management measures as required in response to community complaints or requests from regulatory agencies, the ER or the Secretary. This continuous risk analysis approach will ensure prompt identification of new risks and ensure efficient mitigation through implementation of appropriate management measures, as outlined in Section 8.

10.2 Update and amendment

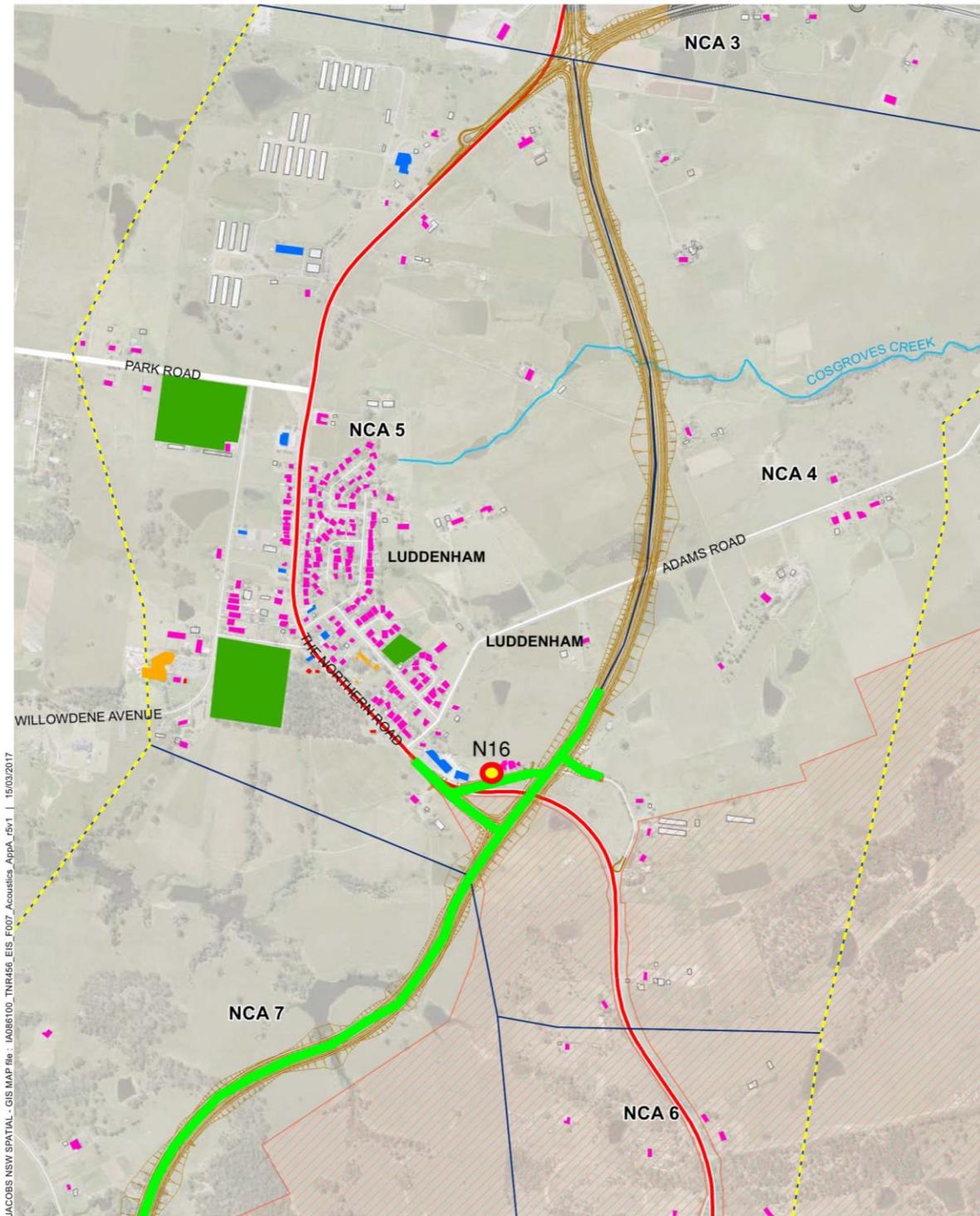
The processes described in Section 6.8 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

Any revisions to this CNVMP will be in accordance with the process outlined in Section 6.8 of the CEMP.

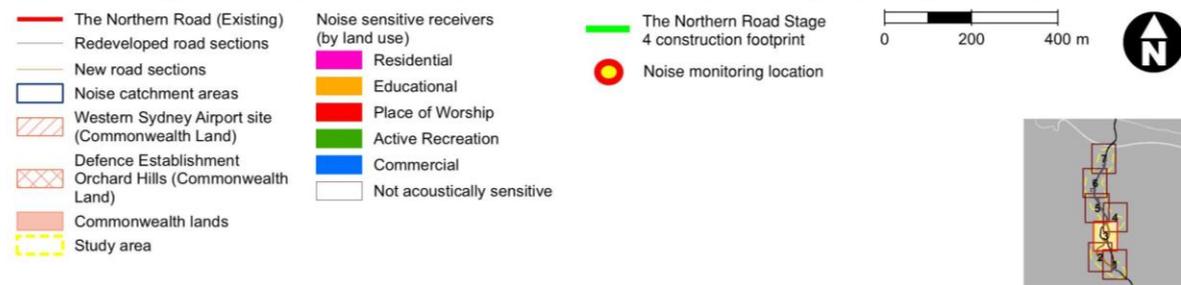
A copy of the updated Plan and changes will be distributed to all relevant stakeholders, including Liverpool City Council, in accordance with the approved document control procedure – refer to Section 6.7.2 of the CEMP.

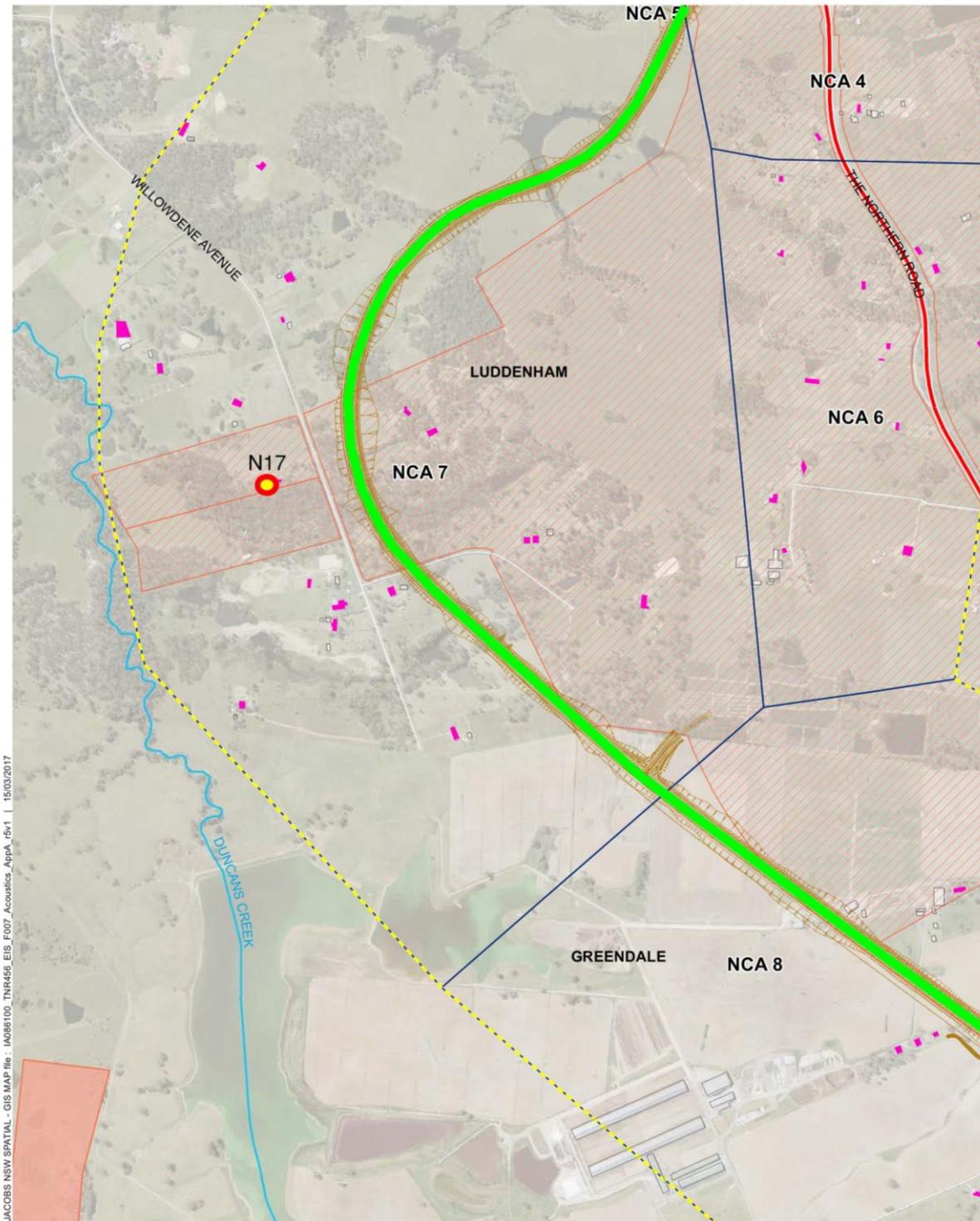
Annexure A

Sensitive receivers, noise monitoring locations and Noise Catchment Areas (NCA)



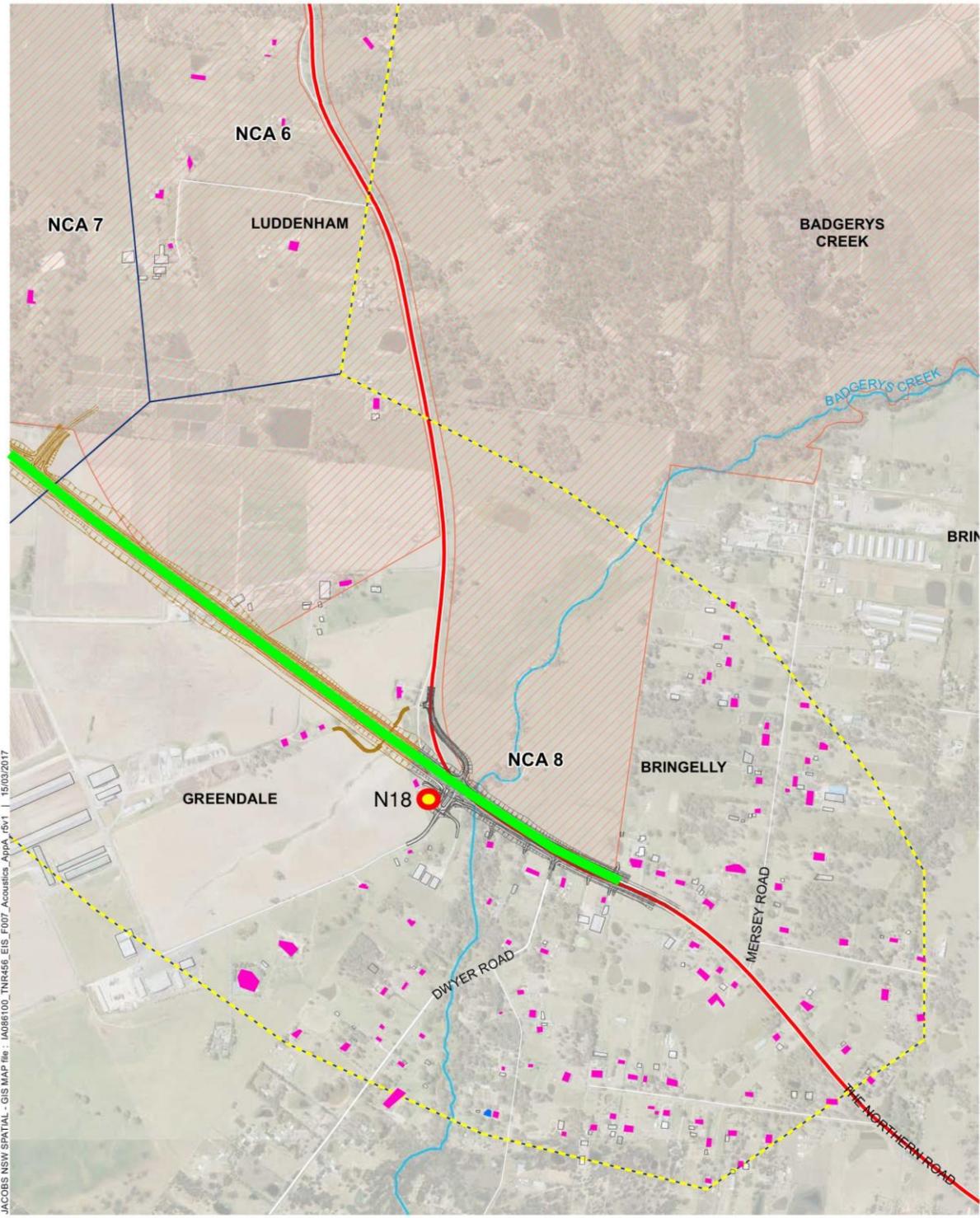
JACOBS NSW SPATIAL - GIS MAP file : IAC86100_TNR456_EIS_F007_Acoustics_AppA_rev1 | 16/03/2017





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Annexure B

Out of hours works procedure

Contents

- 1 Introduction
 - 2 Justification for OOHW
 - 3 OOHW noise and vibration assessment
 - 4 Additional mitigation measures
 - 5 Consultation and notification
 - 5.1 Community agreements for works outside of standard Construction hours
 - 6 Approval of OOHW
 7. Monitoring and auditing
 - 7.1 Monitoring for OOHW
 - 7.2 Complaints management
 - 7.3 Exceedances / non-conformances
 - 7.4 Records
- Attachment 1 - OOHW approval request form
- Attachment 2 – Application of OOHW mitigation measures

1 Introduction

This OOHW Procedure applies to any work associated with Construction of the Project to be carried out outside the standard hours of work in accordance with the requirements of NSW-CoA E26 and the EPL.

1.1 Induction / training

All site personnel (including sub-contractors) will be inducted on the control measures to be implemented to minimise impacts of OOHW on the community and environment and this OOHW Procedure. Training will include inductions, toolbox talks, pre-starts and targeted training as required.

1.2 Roles and responsibilities

The Environmental Site Representative will seek approval from Roads and Maritime for any works that need to occur outside the standard hours of work. OOHW approval requests will be reviewed by the Roads and Maritime Environmental Manager (or delegate) and approved by the Roads and Maritime Project Manager.

The CRM will be responsible for ensuring that notification and consultation has occurred with community stakeholders, in accordance with contractual requirements, on the likely impacts of OOHW activities.

The Environmental Site Representative and/or Acoustic Consultant will implement and oversee the noise monitoring program for OOHW to assess compliance with the CoA, the EPL and the OOHW Procedure.

The Environmental Site Representative is responsible for notifying the Roads and Maritime Project Manager and Roads and Maritime Environmental Manager (or delegate) of any noise exceedances or complaints during OOHW.

2 Justification for OOHW

Construction activities will be conducted within the approved standard Construction hours where reasonable and feasible. However, certain activities may need to be carried out outside of standard Construction hours. Where requirements of the CoA and EPL are satisfied Roads and Maritime may permit GEJV to carry out OOHW. GEJV will provide the Roads and Maritime Environmental Manager (or delegate) and Roads and Maritime Project Manager with details of the nature and need for activities to be conducted during the varied Construction hours.

GEJV will provide justification of the need for OOHW in accordance with the ICNG or where OOHW is required due to:

- for technical considerations (such as the need to meet particular quality specifications)
- to maintain the safety of road users or Construction personnel
- where a road occupancy license will not be provided during standard times
- for delivery of materials for safety reasons
- Where a utility service operator has advised that the works undertaken during standard hours will result in a high risk to the operation or integrity of the network.

Construction activities that may require scheduled OOHW include, but are not limited to:

- Paving works
- Asphaltting
- Concrete pours
- Ancillary facility operation
- Traffic management, traffic switches or road tie-in work
- Utility/service relocations

Construction activities that may be required or proposed to be undertaken outside of standard working hours will be assessed in accordance with the process outlined in this OOHW Procedure.

OOHW will only occur in accordance with the requirements of NSW-CoA E26 and the EPL. OOHW with predicted noise levels exceeding the requirements of NSW-CoA E26 will only occur if there is a community agreement in place in accordance with EPL Conditions L4.5, L4.6 and E1.1 to E1.8.

3 OOHW noise and vibration assessment

Prior to undertaking any OOHW, a noise and (if applicable) vibration assessment will be undertaken to assess the noise and vibration impacts for any activities proposed outside standard Construction hours. The assessment will include details of the work to be undertaken, plant and equipment required, scheduling and duration of the work, predicted impacts on sensitive receivers, their location and proposed mitigation measures.

The assessment will be prepared to take into account the risk factors listed in the *Construction Noise Strategy* (TfNSW, 2018) as shown in Table 3-1 below.

Table 3-1: OOHW risk factors

| Low risk factors: | Medium risk factors: | High risk factors: |
|--|---|--|
| <ul style="list-style-type: none"> • no sleep disturbance • 1800 – 2200 weekdays • 1300 – 2200 Saturdays • 0800 – 1800 Sunday and Public Holiday nights • one or two occurrences • no impulsive or tonal noise vibration | <ul style="list-style-type: none"> • Sleep disturbance risk • 2200 – 0700 weekday nights • 2200 – 0800 Saturday nights • 1800 – 0700 Sunday and Public Holiday nights | <ul style="list-style-type: none"> • Prolonged work (i.e. >1 week) • Sleep disturbance possible • Impulsive noise and vibration likely (e.g. vibratory rolling or rock breaking) |

OOHW applications with medium or high risk factors will be supported by a Construction noise and vibration impact statement. **Noise**

The assessment will determine the extent of noise impact the Construction activities will have on sensitive receivers. The assessment will identify the exceedances of Construction scenarios against the NMLs adopted for each Noise Catchment Area (NCA) or other sensitive land uses (refer Section 5.4 of the CNVMP).

3.1 Vibration

An assessment will be required for out of hours vibration intensive works within the safe working distances for human comfort (refer Section 7 of the CNVMP) for the nominated plant and equipment required for the OOHW. Prior to undertaking an assessment, all other feasible and reasonable options to use less vibration intensive equipment will be investigated and exhausted.

4 Additional mitigation measures

Prior to undertaking any OOHW, any additional mitigation measures will be identified, consistent with the Roads and Maritime CNVG, that are proposed to manage OOHW noise impacts from the Project. Additional mitigations measures will be implemented where reasonable and feasible and will relate directly to the risk factor (Table 3-1) of the proposed OOHW.

Attachment 2 to this OOHW Procedure outlines the approach for the application of standard and additional mitigation measures to minimise impacts of OOHW.

Where additional mitigation measures are proposed, the CRM will consult with affected sensitive receivers to ensure that their personal circumstances have been taken into account to identify the most appropriate mitigation measures.

In accordance with the requirements of NSW-CoA E29, GEJV will consult with potentially affected community, religious, educational institutions and noise and vibration-sensitive businesses to identify periods, including outside of standard hours, during which they would be adversely affected by noise generating works. GEJV will not schedule those works during the identified periods unless Roads and Maritime and the potentially affected institution or business have made other arrangements (at no cost to the affected receiver), or the Secretary has otherwise approved the works.

Further details of the range of possible additional mitigation measures are provided below.

Stakeholder Notifications

Stakeholder notifications will detail work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and a contact telephone number. Notifications will be issued a minimum of seven calendar days prior to the start of works.

Specific notifications will be letterbox dropped (or equivalent) to identified stakeholders no later than five working days ahead of Construction activities that are likely to exceed the noise objectives. The specific notification provides additional information to more highly affected receivers than covered in general letterbox drops.

Stakeholders will also be consulted to identify periods during which they would be adversely affected by noise generating works in accordance with NSW-CoA E29

Phone calls

Phone calls detailing relevant information will be made to identified/affected stakeholders within seven calendar days of proposed work. Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs. Where the resident cannot be telephoned then an alternative form of engagement will be used.

Individual briefings

Individual briefings will be used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. The CRM will visit identified stakeholders at least 48 hours ahead of potentially disturbing Construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the Project. Where the resident cannot be met with individually then an alternative form of engagement will be used

Respite Offers

Respite Offers will be considered where there are high noise and vibration generating activities near receivers to provide residents with respite from an ongoing impact.

Respite Periods

Out of hours Construction noise in out of hours Period 1 (defined in Attachment 2 of this Procedure) will be limited to no more than three consecutive evenings per week except where there is a Duration Respite. For night work these periods of work should be separated by not less than one week and no more than six evenings per month.

Night time Construction noise in out of hours Period 2 (defined in Attachment 2 of this Procedure) will be limited to two consecutive nights except for where there is a Duration Respite. For night work these periods of work will be separated by not less than one week and six nights per month. Where possible, high noise generating works will be completed before 11pm.

Duration Respite

Respite Offers and Respite Periods 1 and 2 may be counterproductive in reducing the impact on the community for longer duration Projects. In this instance and where it can be strongly justified it may be beneficial to increase the work duration, number of evenings or nights worked through Duration Respite so that the Project can be completed more quickly.

The CRM will engage with the community where noise levels are expected to exceed the NML to demonstrate support for Duration Respite.

Where there are few receivers above the NML each of these receivers will be visited to gain support for Duration Respite.

Alternative accommodation

Alternative accommodation options may be offered to residents living in close proximity to Construction works who that are likely to experience highly intrusive noise levels. Aspects for consideration include whether the highly intrusive activities occur throughout the night or before midnight.

5 Consultation and notification

Prior to undertaking OOHW, GEJV will consult with, as appropriate:

- Potentially affected sensitive receivers
- Roads and Maritime Project Manager
- Roads and Maritime Environmental Manager (or delegate)
- Penrith City Council and Liverpool City Council (as applicable)
- The ER
- EPA.

The CRM will notify the community of upcoming OOHW in accordance with the Community Communication Strategy (CCS). Notification will occur not less than seven calendar days and not more than 14 calendar days before commencement of any OOHW or activities.

GEJV will provide the Roads and Maritime Project Manager and Roads and Maritime Environmental Manager (or delegate) evidence of the consultation undertaken for the OOHW.

5.1 Community agreements for works outside of standard Construction hours

Works outside of standard Construction hours that do not meet the circumstances listed in NSW-CoA E26 may be undertaken if agreement between GEJV and a substantial majority of noise sensitive receivers has been reached in accordance with an EPL as described in Section 8.1 of the CNVMP.

6 Approval of OOHW

Agreement will be sought from Roads and Maritime for proposed OOHW that meet the circumstances outlined in NSW-CoA E26 and the EPL.

GEJV will provide Roads and Maritime with sufficient information to assess the likely impacts on sensitive receivers of the proposed OOHW (Section 3 of this Procedure) and specify the proposed mitigation measures (Section 4) as well as provide evidence of the consultation undertaken (Section 5).

The OOHW approval request form (Attachment 1 of this OOHW Procedure) will be completed and submitted to Roads and Maritime for review by the Environmental Manager (or delegate) and approval by the Roads and Maritime Project Manager.

Where the OOHW request is due to a requirement for emergency works, notification will be provided to the ER and EPA. GEJV will also use its best endeavours to notify all affected sensitive receivers of the likely impact and duration of those works

GEJV will comply with the approval requirements of the EPL for OOHW. Any community agreements between GEJV and noise sensitive receivers referred to in EPL Condition L4.5 must be submitted to the EPA for approval prior to any works that are the subject of the agreement being undertaken. A validation monitoring plan must be submitted to the EPA for approval as part of the community agreement documentation prior to any OOHW occurring

GEJV will not commence any OOHW until the written agreement of Roads and Maritime has been received.

7. Monitoring and auditing

7.1 Monitoring for OOHW

The Environmental Site Representatives will ensure the following noise and vibration monitoring is undertaken for all OOHW:

- Attended noise monitoring at representative sensitive receivers
- Attended vibration monitoring at representative sensitive receivers
- Additional noise and vibration monitoring and review if complaints about the activity are received.

All OOHW monitoring will be carried out by an appropriately trained person in the measurement and assessment of Construction noise and vibration.

Validation monitoring will be undertaken for any works that are the subject of a community agreement under the EPL and will be performed by a suitably qualified and experienced person on at least the first two nights where OOHW will be undertaken. If validation monitoring shows that noise levels are higher than those predicted by any noise modelling undertaken as part of the community agreement, work practices will be modified so that measured noise levels do not exceed predicted levels. The validation monitoring plan will be submitted to the EPA for approval as part of the community agreement documentation prior to any OOHW occurring.

7.2 Complaints management

Complaints received as a result of the OOHW will be managed in accordance with the Project Complaints Management Strategy and EPL condition M6.5. On receipt of any complaints, an investigation will be carried out in accordance with EPL conditions R4.2 and R4.3, and changes will be made to the works to address the source of the complaint if reasonable and feasible. Alternatively, monitoring will be undertaken to confirm compliance with the noise levels identified in NSW-CoA E26 and predicted vibration levels.

7.3 Exceedances / non-conformances

Where monitoring identifies any exceedances of the levels predicted in the OOHW assessments, a review of OOHW activities will be carried out to determine where noise or vibration levels can be further reduced. Where monitored noise or vibration levels are found to exceed the relevant criteria, the exceedance will be managed in accordance with the procedures outlined in Section 9.6 of the CNVMP.

7.4 Records

Accurate records will be maintained of all OOHW applications and noise and vibration monitoring undertaken during OOHW for the duration of the Project.

Attachment 1 - OOHW approval request form

| Out of hours work approval request form | | | |
|---|--|-----------------------|---------------------------|
| No: | Notification date: | Approval date: | Project: |
| | | | |
| A. Contact details | Name | Mobile number | Email |
| GEJV ESR | Peter Sheehan | 0437 397 005 | peter.sheehan@gejv.com.au |
| GEJV Construction Manager | Shane Cahill | 0418 408 334 | shane.cahill@gejv.com.au |
| GEJV Superintendent | Jamie Barry | | Jamie.barry@gejv.com.au |
| GEJV Project Engineer | Richard Kelly | 0427 802 387 | richard.kelly@gejv.com.au |
| B. Details of work: Include a map showing location of work extent and nearest sensitive receivers | Location (Chainage): | | |
| | NCA/s: | | |
| | Description of works: | | |
| | Machinery/ plant to be used | | |
| | Traffic control measures required: | | |
| | Lighting required: | | |
| | Proposed mitigation measures: | | |
| | Proposed dates: | | |
| | Proposed timings: | | |
| | Justification (Why does work need to occur outside of standard Construction hours?): | | |
| EPL condition satisfied: | | | |
| C. Risk factor category (low, medium, high): | Low Medium High | | |
| | Comments | | |
| D. Details of noise or vibration assessment completed: | Comments: | | |
| E. Review/ Endorsements | | | |

Out of hours work approval request form

| | | | |
|---|---|-----------------------|-----------------|
| No: | Notification date: | Approval date: | Project: |
| | | | |
| Roads and Maritime Environmental Manager (or delegate) | Agreed mitigation measures: | | |
| | Have the works been reviewed and endorsed? | | Yes / No |
| | Name: | Signature: | Date: |
| | | | |
| | Comments: | | |
| Community Relations Manager | Community notified | | Date: |
| | Additional consultation requirements: | | |
| | Have the works been reviewed and endorsed? | | Yes / No |
| | Name: | Signature: | Date: |
| | | | |
| | Comments: | | |
| F. Approvals EPA (if required) | EPA notification required? (emergency works only) | | Yes / No |
| | Date EPA notified: | | |
| Roads and Maritime Project Manager | Are the works approved? | | Yes / No |
| | Name: | Signature: | Date: |
| | | | |
| | Comments: | | |

Attachment 2 – Application of OOHW mitigation measures

note - exceedances greater than 15 dB(A) above the NML are only allowable if there is a community agreement in place in accordance with EPL conditions L4.5, L4.6 and E1.1 to E1.8 (refer Section 8.1.4 of the CNVMP)

| OOHW period | dB(A) | Mitigation measures |
|---|--------------------------|--|
| OOHW period 1 Monday–Friday: 6 pm – 10 pm Saturday: 7 am - 8 am and 1 pm – 10pm Sunday and Public Hol.: 8 am – 6 pm | 0-5 dB(A) above NML | Standard mitigation measures: <ul style="list-style-type: none"> • Behavioural practices on site • Equipment selection / Maintaining and monitoring plant • Use and siting of plant and hoardings • Site inductions • Use of non-tonal reversing alarms • Notification • Planning noisier work to be carried out earlier in the period |
| | 5-15 dB(A) above NML | Standard mitigation measures: <ul style="list-style-type: none"> • Standard measures as above. Additional mitigation measures: <ul style="list-style-type: none"> • Notification • Respite offer period 1 • Duration respite. |
| | 15-25 dB(A) above NML | Standard mitigation measures: <ul style="list-style-type: none"> • Standard measures as above. Additional mitigation measures: <ul style="list-style-type: none"> • Notification • Verification • Respite offer period 1 • Duration respite. |
| | >25 dB(A) above NML | Standard mitigation measures: <ul style="list-style-type: none"> • Standard measures as above. Additional mitigation measures: <ul style="list-style-type: none"> • Notification • Verification • Individual briefing • Respite offer period 1 • Duration respite • Phone calls • Specific notifications. |

| OOHW period | dB(A) | Mitigation measures |
|---|--------------------------|--|
| OOHW period 2 Monday– Friday: 10 pm – 7 am Saturday: 10 pm - 8 am Sunday and Public Hol. 6 pm – 7 am | 0-5 dB(A) above NML | Standard mitigation measures: <ul style="list-style-type: none"> • Behavioural practices on site • Equipment selection / maintaining and monitoring plant • Use and siting of plant and hoardings • Site inductions • Use of non-tonal reversing alarms • Notification • Planning noisier work to be carried out earlier in the period |
| | 5-15 dB(A) above NML | Standard mitigation measures: <ul style="list-style-type: none"> • Standard measures as above. Additional mitigation measures: <ul style="list-style-type: none"> • Notification • Verification • Respite offer period 2 • Duration respite. |
| | 15-25 dB(A) above NML | Standard mitigation measures: <ul style="list-style-type: none"> • Standard measures as above Additional mitigation measures: <ul style="list-style-type: none"> • Notification • Verification • Individual briefing • Respite offer period 2 • Duration respite • Phone calls • Specific notifications. |
| | >25 dB(A) above NML | Standard mitigation measures: <ul style="list-style-type: none"> • Standard measures as above. Additional mitigation measures: <ul style="list-style-type: none"> • Notification • Verification • Individual briefing • Respite offer period 2 • Duration respite • Phone calls • Specific notifications • Alternative accommodation. |

Annexure C - Construction Noise and Vibration Monitoring program

Construction Noise and Vibration Monitoring program

1 Introduction

1.1 Purpose and scope

This Construction Noise and Vibration Monitoring Program (MP) has been developed in accordance with NSW-CoA C9(b). It describes the environmental noise and vibration monitoring activities to be undertaken for the Project. The purpose of this MP is to:

- provide a procedure to monitor noise and vibration impacts during Construction of the Project
- meet the requirements of the conditions of approval for the Project
- meet any relevant legal and other requirements and any conditions of the Environment Protection Licence (EPL) for the Project.

1.2 Responsibilities

Site personnel or sub-contractors with suitable experience and qualifications will undertake the monitoring outlined in this MP.

1.3 EPL conditions

The EPL conditions relevant to the monitoring of noise and vibration are provided in Table 1.

Table 1: EPL requirements relevant to the monitoring of noise and vibration

| Ref. | Relevant requirement |
|-----------|--|
| M1 | Monitoring Records |
| M1.1 | The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition. |
| M1.2 | All records required to be kept by this licence must be: <ul style="list-style-type: none"> (a) in a legible form, or in a form that can readily be reduced to a legible form; (b) kept for at least 4 years after the monitoring or event to which they relate took place; and (c) produced in a legible form to any authorised officer of the EPA who asks to see them. |
| M1.3 | The following records must be kept in respect of any samples required to be collected for the purposes of this licence: <ul style="list-style-type: none"> (d) the date(s) on which the sample was taken; (e) the time(s) at which the sample was collected; (f) the point at which the sample was taken; and (g) the name of the person who collected the sample. |

| Ref. | Relevant requirement |
|-------------|---|
| M7 | Noise Monitoring |
| M7.1 | All noise monitoring must be undertaken in accordance with Australian Standard AS 2659.1 – 1998: "Guide to the use of sound measuring equipment – portable sound level meters", or any revisions of that standard which may be made by Standards Australia, and the compliance monitoring guidance provided in the "NSW Noise Policy for Industry" (EPA, 2017). |
| M7.2 | All vibration monitoring must be undertaken in accordance with the technical guidance provided in the "Environmental Noise Management - Assessing Vibration: a technical guideline" (DEC, 2006). All vibration monitoring results may be assessed and reported against the acceptable values of human exposure to vibration set out in Tables 2.2 and 2.4 of the guideline. |
| M7.3 | The licensee must undertake noise and vibration monitoring as directed by an authorised officer of the EPA. |
| R4 | Other reporting conditions |
| R4.2 | Noise and Vibration Reports |
| | <ul style="list-style-type: none"> (c) Upon request of an authorised officer of the EPA, the licensee must submit a Preliminary Investigation Report to the EPA in respect of any noise or vibration monitoring undertaken in accordance with the requirements of Condition M6.5. (d) The Preliminary Investigation Report must be submitted to the EPA by 4.30 pm of the afternoon of the next business day following any noise or vibration monitoring. (e) The Preliminary Investigation Report must: <ul style="list-style-type: none"> (i) include numerical and/or graphical representation of the noise and vibration monitoring results; and (ii) highlight any detected exceedance of noise goals or limits specified in: <ol style="list-style-type: none"> 1. this licence; 2. relevant noise guidelines; and 3. relevant noise modelling. |

| Ref. | Relevant requirement |
|------|--|
| R4.3 | <p>In the event of any exceedance of noise limits or noise management levels, the licensee must:</p> <ul style="list-style-type: none"> (f) Modify activities and implement all reasonable and feasible measures to prevent a recurrence of the exceedance; and (g) Submit a Follow-Up Investigation Report to the EPA within 5 business days of any noise or vibration monitoring having been undertaken (unless otherwise approved by the EPA). (h) The Follow-Up Investigation Report must include: <ul style="list-style-type: none"> 1. Confirmation of whether noise monitoring has been undertaken in accordance with AS2659 and the compliance monitoring guidance provided in the INP; and 2. Confirmation of whether vibration monitoring has been undertaken in accordance with the guidance provided in the "Environmental Noise Management - Assessing Vibration: a technical guideline" (DEC, 2006); and 3. Details of the prevailing meteorological conditions during the period when the monitoring was undertaken; and 4. A map of each noise and vibration monitoring location in relation to the noise source, including relevant distances; and 5. Numerical and graphical representation of the noise and vibration monitoring results; and 6. An analysis of the noise and vibration monitoring results; and 7. Details of any remedial action taken in relation to the matter; and 8. In cases not the subject of remedial action, detailed justification of the decision not to undertake remedial action. |

2 Baseline data

The noise and vibration assessment in the EIS and SPIR identified and considered potential noise and vibration impacts for each habitable dwelling or park along the Project alignment and within 600 m either side of the new or existing road centre line. Sensitive receivers are identified in Annexure A. The existing noise environment, including RBLs is described in Section 4 of this CNVMP.

3 Noise and vibration criteria

The noise criteria adopted for the Project are set out in Table 5-2 and Table 5-3 of this CNVMP.

Vibration criteria, including maximum and preferred values for continuous and impulsive vibration, acceptable vibration dose values for intermittent vibration, structural damage and heritage building vibration criteria and safe working distances for the Project are detailed in Sections 5.5 and 7.3.1 of this CNVMP.

4. Monitoring procedures

4.1 Noise monitoring

The noise monitoring program to be adopted for the Project is provided in Table 2 below.

All noise monitoring will be undertaken in accordance with Australian Standard AS 2659.1 – 1998: "Guide to the use of sound measuring equipment – portable sound level meters", or any revisions of that standard which may be made by Standards Australia, and the compliance monitoring guidance provided in the "NSW Noise Policy for Industry" (EPA, 2017). GEJV will undertake noise monitoring as directed by an authorised officer of the EPA.

Table 2: Noise monitoring program

| Monitoring details | Frequency | Test procedure |
|---|---|---|
| Noise monitoring at sensitive receivers identified in table 4-1 of the CNVMP | Monthly | The testing method includes: <ul style="list-style-type: none"> • sound level meter configured for "Fast" time weighting and "A" frequency weighting • The test environment will be free from reflecting objects where possible. Where the noise monitoring is conducted within 3.5 metres of large walls or a building facade, then a reflection correction of up to -2.5 dBA will be applied to remove the effect of increased noise due to sound reflections from such structures |
| OOHW noise monitoring at the nearest sensitive receivers to the works | As required during OOHW | <ul style="list-style-type: none"> • tests will not be carried out during rain or when the wind speed at the test site exceeds 5 m/s • Conditions such as wind velocity, wind direction, temperature, relative humidity and cloud cover will be recorded. These may be obtained from the nearest Bureau of Meteorology monitoring station or on-site weather station/observations • the monitoring period should be sufficient such that the measured noise levels are representative of the noise over a 15-minute period • at a minimum Leq, Lmax, L10 and L90 levels will be measured and reported <p>The observations of the person undertaking the measurements will be reported including audibility of Construction noise, other noise in the environment and any discernible Construction activities contributing to the noise at the receiver.</p> |
| Where a complaint is received and monitoring is considered an appropriate response to determine if noise levels exceed predicted 'worst case' Construction noise levels documented in the CNVMP | As required | |
| Monitoring to confirm noise levels are no more than 15 dB(A) above night time RBL levels using the $L_{Aeq(1min)}$ descriptor for works undertaken in accordance with NSW CoA E26(d) | During works undertaken in accordance with NSW-CoA E26(d) | In addition to the procedure outlined above, the monitoring period should be sufficient to ensure that the measured noise levels are representative of the noise over a 1-minute period. |

| Monitoring details | Frequency | Test procedure |
|--|---|--|
| Spot checks of noise intensive plant where it is required to check the noise emission from the plant against manufacturer's specifications | Monthly for Construction activities with predicted noise levels greater than 65 dBA at receiver locations | <p>The test procedure for construction plant will follow the stationary test procedures according to Australian Standard AS 2012.1.</p> <ul style="list-style-type: none"> • sound level meter configured for "Fast" time weighting and "A" frequency weighting • the test environment will be free from reflecting objects • tests will not be carried out during rain or when the wind speed at the test site exceeds 5 m/s |
| Where required for the purposes of refining Construction methods or techniques to reduce noise levels | As required | <ul style="list-style-type: none"> • in accordance with AS 2012.1, a minimum of 3 measurement points will be defined at locations on the hemispherical surface around the plant with the radius determined by the basic length (L) of the machine • the A-weighted Leq background noise at the measurement locations will be at least 6 dB and preferably 10 dB below the level with the plant operating • Leq and L10 levels will be measured and reported |

Where actual noise levels exceed the predicted worst case levels, the source of excessive noise generations will be identified, and any additional feasible and reasonable measures available will be implemented to either reduce noise emissions or reduce the impacts on receivers.

Details of site activity and equipment usage will be noted during Construction noise monitoring.

4.1.1 Noise monitoring equipment

Acoustic instrumentation employed in the noise monitoring surveys will carry current manufacturer conformance certificates and comply with *AS 2659.1 - 1998: Guide to the use of sound measuring equipment - Portable sound level meters*. All environmental monitoring equipment will be maintained and calibrated according to manufacturer's specifications and appropriate records kept. GEJV will maintain records of calibration on a calibration register in the DMS (document management system).

4.2 Vibration monitoring

The vibration monitoring program to be adopted for the Project is provided in Table 3. Vibration monitoring will be undertaken by the GEJV Environmental Site Representative or an environmental consultant. Building Dilapidation surveys will be conducted prior to commencement of Construction by an appropriately qualified and experienced building condition consultant.

All vibration monitoring will be undertaken in accordance with the technical guidance provided in the "Environmental Noise Management - Assessing Vibration: a technical guideline" (DEC, 2006). Vibration monitoring results may be assessed and reported against the acceptable values of human exposure to vibration set out in Tables 2.2 and 2.4 of the guideline.

GEJV will undertake vibration monitoring as required or as directed by an authorised officer of the EPA.

Table 3: Vibration monitoring program

| Monitoring details | Frequency | Test procedure |
|--|-------------|--|
| At the commencement of vibratory compaction work within 50 m of residential buildings | As required | <p>Attended vibration monitoring will be undertaken when checking the safe working distances from construction plant or in response to a complaint.</p> <p>The testing method includes:</p> <ul style="list-style-type: none"> transducer to be affixed to ground or building in general accordance with AS 2775- 2004 monitoring to be conducted for at least three distances from the plant, including a representative distance for the nearest sensitive structures and/or receivers the testing will be conducted at each location to obtain a suitable representation of the range of vibration levels that would occur from the tested plant |
| Where a complaint is received in relation to human exposure to vibration levels and monitoring is considered an appropriate response | As required | <ul style="list-style-type: none"> the plant will be tested in the settings in which it is expected to operate. For vibratory rollers this may include both “High” and “Low” settings peak (PPV) vibration levels and the dominant frequency of the vibration will be recorded for assessment against the structural and cosmetic damage criteria. In situations in which human comfort is also of concern then the rms vibration level should also be recorded |
| Where a complaint is received in relation to suspected property damage due to vibration impacts and monitoring is considered an appropriate response | As required | |
| Where an activity may occur within safe working distances for cosmetic damage for no more than one day continuously | As required | |
| Where required for the purposes of refining Construction methods to reduce vibration levels | As required | |

| Monitoring details | Frequency | Test procedure |
|---|---|--|
| Where an activity may occur within safe working distances for cosmetic damage for a period of more than one day continuously | As required | <p>Continuous vibration monitoring will be undertaken in situations where there is a risk that vibration from a particular Construction activity may exceed the cosmetic damage criteria at a sensitive structure. This will be where activities may occur within the safe working distances for cosmetic damage identified in table 5-7 of the CNVMP.</p> <p>The testing method includes:</p> <ul style="list-style-type: none"> • transducer to be affixed to ground or building in general accordance with AS 2775- 2004 • vibration logger to continuously measure vibration levels while the relevant works are occurring within the safe working distance for cosmetic damage • measurement to be conducted as close as possible to the sensitive structure. • a warning system will be implemented with the monitoring system including one or both of the following: <ul style="list-style-type: none"> ◦ audible and/or visual warning alarm ◦ SMS and/or email alerts to site personnel |
| Dilapidation surveys of buildings and structures where Construction works occurs within the safe working distance for cosmetic damage | Prior to that work being undertaken and post-Construction | <p>At a minimum, dilapidation surveys and reports will comprise:</p> <ul style="list-style-type: none"> • a visual inspection of the structure, including all internal and external walls, ground level floors and external pavements, all connections of other structures above ground level and their connection at ground level and any exposed foundations • full written building Condition Survey Report outlining the condition of the internal and external components of each property • a series of photographs of each identified defect/crack • a sketched floor plan showing the exact location of each defect and measurements of crack width/defect size • identification of any condition changes relative to Pre-Construction and the likely cause of the change (Post-Construction only) |

Where vibration is found to exceed safe levels, impacts will be reduced by changing work methods and / or equipment, or through the provision of building protection measures where possible. In the event that a complaint relating to property damage is received, an inspection of the property will be undertaken and an interim building condition survey prepared.

Attended vibration monitoring will be undertaken to determine site-specific minimum working distances for structural damage and human response. Site-specific minimum working distances will be determined whenever significant vibration generating plant will be working close to or within the recommended minimum working distances listed in Table 4 below.

Details of site activity and equipment usage will be noted during monitoring.

Table 4: Recommended minimum working distances for vibration intensive plant

| Activity / equipment | Rating description | Minimum working distance (m) | |
|-------------------------------|-----------------------------------|------------------------------|------------------------------|
| | | Cosmetic damage | Human response |
| Vibratory Roller ¹ | < 50 kN (Typically 1-2 tonnes) | 5 | 15 - 20 |
| | < 100 kN (Typically 2-4 tonnes) | 6 | 20 |
| | < 200 kN (Typically 4-6 tonnes) | 12 | 40 |
| | < 300 kN (Typically 7-13 tonnes) | 15 | 100 |
| | > 300 kN (Typically 13-18 tonnes) | 20 | 100 |
| | > 300 kN (Typically > 18 tonnes) | 25 | 100 |
| Jackhammer ¹ | Hand held | 1 (nominal) | Avoid contact with structure |
| Compactors ² | - | 15 | 100 |
| Grader ² | ≤ 20 tonne | 2 (nominal) | 10 |
| Excavators ² | ≤ 30 tonne (travelling/ digging) | 10 | 15 |
| Truck Movements ² | - | - | 10 |

Notes: ¹ TCA Construction Noise Strategy (Rail Projects) November 2011

² Renzo Tonin & Associates Project files, databases and library

4.2.1 Vibration monitoring equipment

Monitoring methods and instrumentation employed in the vibration monitoring surveys will comply with *AS2775.2004 Mechanical vibration and shock—Mechanical mounting of accelerometers* and *AS2670.1 Evaluation of human exposure to whole body vibration*. All environmental monitoring equipment will be maintained and calibrated according to manufacturer's specifications and appropriate records kept. GEJV will maintain records of calibration on a calibration register in the DMS (document management system).

4.3 Noise and vibration monitoring locations

The locations of noise and vibration sensitive receivers are shown in Annexure A of the CNVMP.

Noise monitoring locations will be consistent with the noise monitoring locations identified in Annexure A as a minimum, these locations are the same as those used to establish baseline noise levels during the EIS. Attended noise monitoring will also occur during any out of hours works at the nearest sensitive receiver location to ensure noise levels are within the predicated levels for the approved works. Attended Noise monitoring will also be undertaken for non-sensitive receivers predicted to be impacted by moderate exceedances of the NML from work in standard hours, including the Shell Service Station, IGA Luddenham and St James Anglican Church (refer Section 7.2.3 of the CNVMP.)

Continuous Vibration monitoring will be undertaken at vibration sensitive locations within the 'minimum working distances' established for each item of plant during the commencement of use of each plant on site.

Attended noise and vibration monitoring locations will include Construction sites where the commencement of operation for each new plant or activity on site has the potential to generate significant noise or vibration levels. This may also include specific attended noise and/or vibration monitoring of significant plant items, such as earthmoving plant.

5 Reporting

5.1 Monthly Environmental Report

The GEJV ESR will prepare Monthly Environmental Reports for the duration of the Project for incorporation in Project Monthly Reports and submission to the Roads and Maritime Environmental Manager (or delegate) and Roads and Maritime Project Manager for review. Information to be detailed in the reports includes:

- results summary and analysis of the environmental monitoring for noise and vibration
- performance of this MP
- Summary of complaints received that are related to noise and vibration.

5.2 Noise and Vibration Construction Monitoring Report

In accordance with NSW-CoA C15, GEJV will prepare Noise and Vibration Monitoring Reports detailing the results of the monitoring undertaken in accordance with this MP for inclusion in the six monthly construction compliance reporting required under NSW-CoA A32. Roads and Maritime will submit the reports to the Secretary and relevant regulatory agencies for information. Reports will be prepared six monthly for the duration of Construction of the Project. Reports will include, but not be limited to, the following information:

- the date(s) and time at which the monitoring was undertaken
- the locations and description of monitoring undertaken
- the name of the person who undertook the monitoring
- tabulations of monitoring data
- compliance monitoring results with the criteria identified in Section 3 of this MP
- identification of exceedances of the nominated criteria and descriptions of the causes of these exceedances
- details of any alteration to the MP
- summary of any complaints received regarding noise and vibration.

Monitoring records will be:

- kept in a legible form, or in a form that can readily be reduced to a legible form
- kept for at least four years after the monitoring or event to which they relate took place
- produced in a legible form to any authorised officer of the DP&E, DoEE or EPA upon request, within the timeframe nominated in the request.

Monitoring results may be made available on the EPA website.

5.3 Reporting on non-conformances and exceedances

In the event that the criteria identified in Section 5 of the CNVMP are exceeded, GEJV will report the exceedance to the Roads and Maritime Project Manager, Environmental Manager

(or delegate) and the ER within seven days of identification of the exceedance. Details of exceedances will be provided in the Monthly Environmental Reports.

Where an exceedance has caused, is causing or is likely to cause, material harm to the environment, the environmental incident notification and reporting procedures detailed in Section 5.6 of the CEMP and the Environmental Incident Classification and Reporting Procedure (refer to Appendix A7 of the CEMP) will apply. The Environmental Site Representative is responsible for reporting on incidents.

GEJV will immediately notify the Roads and Maritime Project Manager, Roads and Maritime Environmental Manager (or delegate) and the EPA (via the EPA environmental line) of any exceedance that has caused, is causing or is likely to cause, material harm to the environment. Roads and Maritime will notify the Secretary within 24 hours of notification of the event being provided to the EPA, as required by NSW-CoA A43. The notification will include the time, date and details of the incident and identify any non-compliance with the Infrastructure Approval.

GEJV will provide a written report of the event to the EPA within seven days of the date on which the event occurred. The report will identify:

- the cause, time and duration of the event
- the type, volume and concentration of every pollutant discharged as a result of the event
- the name, address and business hours telephone number of the GEJV personnel who witnessed the event
- the name, address and business hours telephone number of other witnesses to the event
- action taken by GEJV in relation to the event, including any follow-up contact with any complainants
- details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event and
- any other relevant matters.

The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by GEJV. GEJV will provide such further details to the EPA within the time specified in the request.

GEJV will also complete an incident form for submission to the Roads and Maritime Project Manager and Roads and Maritime Environmental Manager (or delegate) within three business days of the occurrence of the event.

Notification of incidents other than those relating to the POEO Act, will be provided to Secretary as soon as practicable and within 24 hours of the incident, in accordance with NSW-CoA A40.

Any notifications made under NSW-CoA 40 or 43 will also be provided to the Minister for DoEE.

5.4 EPL reporting

The GEJV Environmental Site Representative will prepare a summary of noise and vibration monitoring program results, including a statement of compliance with the relevant EPL conditions, and a summary of complaints received related to noise and vibration issues, for

inclusion in the annual EPL return. EPL annual returns will be submitted to the EPA within 60 days of the anniversary of the EPL for the duration of Construction.

5.4.1 Investigation reports

In addition to the annual reporting, noise and vibration reporting in response to any complaints in accordance with EPL Condition M6.5 comply with the following:

- upon request of an authorised officer of the EPA, GEJV will submit a Preliminary Investigation Report to the EPA in respect of any noise or vibration monitoring undertaken in accordance with the requirements of EPL Condition M6.5
- the Preliminary Investigation Report will be submitted to the EPA by 4.30 pm of the afternoon of the next business day following any noise or vibration monitoring
- the Preliminary Investigation Report will:
 - include numerical and/or graphical representation of the noise and vibration monitoring results and
 - highlight any detected exceedance of noise goals or limits specified in the EPL, relevant noise guidelines and relevant noise modelling

In the event of any exceedance of noise limits or noise management levels, GEJV will:

- modify activities and implement all reasonable and feasible measures to prevent a recurrence of the exceedance and
- submit a Follow-Up Investigation Report to the EPA within five business days of any noise or vibration monitoring having been undertaken (unless otherwise approved by the EPA).
- the Follow-Up Investigation Report will include:
 - confirmation of whether noise monitoring has been undertaken in accordance with AS2659 and the compliance monitoring guidance provided in the INP
 - confirmation of whether vibration monitoring has been undertaken in accordance with the guidance provided in the "Environmental Noise Management - Assessing Vibration: a technical guideline" (DEC, 2006)
 - details of the prevailing meteorological conditions during the period when the monitoring was undertaken
 - a map of each noise and vibration monitoring location in relation to the noise source, including relevant distances
 - numerical and graphical representation of the noise and vibration monitoring results
 - an analysis of the noise and vibration monitoring results
 - details of any remedial action taken in relation to the matter
 - in cases not the subject of remedial action, detailed justification of the decision not to undertake remedial action.

5.5 Building Condition Survey Reports

Prior to commencement of any works, a suitably qualified person will undertake building and structure condition surveys of all buildings and structures identified as being located where Construction works occur within the safe working distance for cosmetic damage. The results of the surveys will be documented in a Building Condition Survey Report for each building

and structure surveyed. Copies of Building Condition Survey Reports will be provided to the landowners of the buildings and structures surveyed and, if agreed by the landowner, Liverpool City Council within three weeks of completing the surveys, and no later than one month prior to the commencement of Construction.

5.6 Complaints management and reporting

Recording and reporting of complaints will be undertaken in accordance with the Complaints Management System (refer to Section 5.5.3 of the CEMP).

GEJV will submit a report to the EPA that provides details of all complaints received in relation to Construction activities regulated by GEJV on the telephone complaints line or through any other means by 2:00 pm each business day. The report will:

- be submitted to the email address nominated by the EPA
- include a unique identifier number for each complainant
- include date and time as reported by the complainant of the event that is the subject of the complaint
- include an outline of the work or activity that is the subject of the complaint
- any assessments required by EPL Conditions L4.2, L4.3, or L4.4, unless previously provided to the EPA, and details of how the requirements of these conditions have been met.

GEJV is not required to submit a report for any reporting period during which no complaints have been received.

6 Adaptive management

Should noise and vibration monitoring results directly attributable to the Project exceed the criteria set out in Section 5 of the CNVMP, the following steps will be undertaken:

- analysis of the results by the GEJV Environmental Site Representative in more detail with a view of determining possible causes for the exceedance, including identifying the Project stage (or stages) responsible for the issue
- site inspection by the GEJV Environmental Site Representative
- advising relevant personnel of the problem
- identifying and agreeing on actions and/or additional mitigation measures to resolve or mitigate the exceedance
- implementing actions to rectify or mitigate the exceedance, including stop work arrangements where necessary or if directed by the ER
- identifying and implementing additional mitigation measures.

Where actual noise levels are found to exceed the predicted worst case levels, the source of excessive noise generations will be identified, and any additional feasible and reasonable measures available will be implemented to either reduce noise emissions or reduce the impacts on receivers.

Where vibration is found to exceed safe levels, impacts will be reduced by changing work methods and / or equipment, or through the provision of building protection measures where possible. In the event a complaint relating to property damage is received, an inspection of the property will be undertaken and an interim building condition survey prepared.

Mitigation measures and preventative / corrective actions will be developed in accordance with Roads and Maritime specifications and the procedure for dealing with non-compliance with environmental management controls outlined in Section 5.6 of the CEMP. GEJV will verify and document the effectiveness of any management measures or preventative / corrective actions implemented to avoid further exceedances.

The timing for any improvement will be agreed between GEJV's Project Engineer/Superintendent and the Roads and Maritime Project Manager and Environmental Manager (or delegate) based on the level of risk or reoccurrence of the exceedance (e.g. a significant risk will require immediate action).

GEJV will communicate regularly with other high risk Construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and cumulative noise and vibration impacts are minimised.