

# APPENDIX



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## NSW construction noise and vibration management framework

NARROMINE TO NARRABRI ENVIRONMENTAL IMPACT STATEMENT

ARTC

The Australian Government is delivering  
Inland Rail through the Australian  
Rail Track Corporation (ARTC), in  
partnership with the private sector.

# NSW Construction Noise and Vibration Management Framework

0-9000-ENV-00-RP-0001 Rev 3



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## 1. INTRODUCTION

The Australian Government has committed to delivering the Inland Rail Programme (Inland Rail), which is a high performance and direct interstate freight rail corridor between Melbourne and Brisbane, via central-west New South Wales and Toowoomba in Queensland.

Inland Rail is a major nation-building programme of works that will enhance Australia's existing national rail network and serve the interstate freight market.

The Inland Rail route, which is about 1,700 kilometres long, involves:

- Using the existing interstate rail line through Victoria and southern NSW
- Upgrading about 400 kilometres of existing track, mainly in western NSW
- Providing about 600 kilometres of new track, mainly in northern NSW and south-east Queensland.

The Inland Rail consists of 13 proposals, seven of which are located within NSW. Each of these proposals (and, in some cases as appropriate, separate work sites within a proposal) will be subject to an assessment and, if required, approval under the statutory requirements of the relevant jurisdiction/s.

The NSW Inland Rail Construction Noise and Vibration Management Framework (the Framework) outlines the approach that ARTC will take to assessing and managing noise and vibration arising from the construction of the NSW components of Inland Rail. The Framework is identified in the Inland Rail Noise and Vibration Strategy (01-9000-PE-P11-ST-0003) and provides the necessary detail to allow practical application of relevant guidelines and standards at all project stages.

Terms and acronyms used in this Framework are defined in Table 1.

**Table 1 Definitions**

Term or Acronym	Definition
AA	Alternate accommodation. Refer to additional mitigation measures
ARTC	Australian Rail Track Corporation. Australian Government-owned corporation tasked with developing a 10 year programme to implement Inland Rail
CO	Communication. Refer to additional mitigation measures
CNVIS	Construction Noise and Vibration Impact Statement. Informs the development of the CNVMP (see Table 2)
CO1	Category 1: Communication to inform (newsletter, email, letterbox drop, advertisements, website and media). Refer to additional mitigation measures
CO2	Category 2: Personalised communication (door knock, meeting, telephone call). Refer to additional mitigation measures
CNVMP	Construction Noise and Vibration Management Plan. Details how construction noise and vibration impacts will be minimised and managed. The CNVMP is based on the Project Environmental Management Plan.

Term or Acronym	Definition
DECC	The former Department of Environment and Climate Change
EIS	An Environmental Impact Statement is a document prepared to describe the effect of proposed activities on the environment. An EIS is determined by NSW Planning and Environment, and is developed in response to the Secretary's Environmental Assessment Requirements (SEARs).
Enhancement Works	Enhancement works involve bridge works, and/ or track lowering, and may also include ancillary works such as gantry works, signalling and communications.
Environmental impact assessment	A broad term that covers a range of assessments required under the <i>Environmental Planning and Assessment Act 1979</i> (EP&A Act) and any related amendments to the Act.
Feasible	Relates to engineering considerations, what can practically be built (e.g. safety, access, and site constraints).
Greenfield	This involves construction within an entirely new corridor.
ICNG	Interim Construction Noise Guideline (DECC 2009)
Inland Rail Programme (Inland Rail)	The Inland Rail programme encompasses the design and construction of a new inland rail connection between Melbourne and Brisbane, via Wagga Wagga, Parkes, Moree, and Toowoomba. The route for Inland Rail is about 1,700 km in length. Inland Rail will involve a combination of track upgrades, enhancement of existing rail track and the provision of new track in greenfield areas.
Inland Rail Proposal	Specific works subject to an environmental impact assessment and confined to a particular geographic area within the Programme alignment, for example Parkes to Narromine.
NML	Noise Management Levels
OOHW	Out of hours work. Works conducted outside of the Standard Programme Construction Hours.
Preconstruction Activities	This includes enabling works such as geotechnical investigations, the movement of machinery, and other activities that may be undertaken prior to formal commencement of project construction.
Project Environmental Management Plan	Prepared by ARTC to guide the construction contractor in environmental management. This document will form the basis of the contractor's CNVMP.
Reasonable	Selecting reasonable measures from those that are feasible involves judging whether the overall noise benefits outweigh adverse social, economic and environmental effects including the cost of the measure. Further advice on determining reasonable measures can be found in the Interim Construction Noise Guideline.

Term or Acronym	Definition
Receiver	<p>A premise that is subject to construction noise or vibration.</p> <ul style="list-style-type: none"> <li>Noise sensitive receivers are properties where the occupants can be adversely impacted by noise or vibration including dwellings, hospitals, places of worship, childcare centres etc.</li> <li>Impacted receivers are those exposed to noise and vibration above the relevant management levels.</li> <li>Residential receivers are properties where people reside on a permanent basis.</li> </ul>
REF	Review of Environmental Factors is a document prepared to describe the effect of proposed activities on the environment. A REF will be prepared for projects where an EIS is not triggered. A REF is determined by ARTC.
RO	Respite Offer. Refer to additional mitigation measures.
SEARs	Secretary's Environmental Assessment Requirements are the requirements that must be addressed as part of the EIS.
SSI	State Significant Infrastructure
Standard Programme Construction Hours	Hours of work for construction activities undertaken as part of the Inland Rail Programme: 6am – 6pm Monday – Sunday (including public holidays)
Upgrade works	Can involve any or all of the following: upgrading the track, formation, culverts, curve easing, construction of passing loops and/ or ancillary works to level crossings, signalling and communications, signage, fencing, services and utilities.

### 1.1. Aim and Scope

The Framework is applicable to all NSW Inland Rail proposals and fulfils the recommendation in the *Interim Construction Noise Guideline, DECC 2009* (ICNG) for organisations to detail best practice, project-specific approaches to minimise noise impacts from pre-construction activities and construction and provide the public with transparency. The Framework also establishes the requirement for the management of construction vibration.

The Framework applies to all project stages, from the environmental impact assessment through to construction and is most relevant to:

- Project managers
- Acoustic consultants
- Environmental officers
- Construction contractors.

This Framework does not take precedence over proposal specific approval or licence conditions. The Framework will be reviewed as the Inland Rail Programme progresses to incorporate learning from Inland Rail proposals and in response to release or update of relevant guidelines, standards and policies.

Any reference to ‘construction noise’ in this Framework should also be taken to include noise generated by ‘pre-construction activities’. Similarly, a reference to vibration also includes vibration generated as part of pre-construction activities. Within NSW there are seven Inland Rail proposals, these are described in Table 2.

**Table 2 NSW Inland Rail Proposals**

PROPOSAL	DESCRIPTION	PROJECT TYPE	ASSESSMENT TYPE
Albury to Illabo	Providing double-stack capability for 185km of existing track.	Enhancement	REF
Illabo to Stockinbingal	New 37km standard gauge rail line that eliminates a twisty section of track known as the Bethungra Spiral.	Greenfield	SSI EIS
Stockinbingal to Parkes	Providing double-stack capability and passing loops on 173km of existing track.	Enhancement	REF
Parkes to Narromine	Upgrade of the existing 107km section of track, with passing loops, ancillary works and new 5.3km connection to the Broken Hill line.	Upgrade	SSI EIS underway
Narromine to Narrabri	307km of new track constructed between Narromine and Narrabri.	Greenfield	SSI EIS
Narrabri to North Star	188km of existing track upgraded to take heavier axle loads and double stacked trains	Upgrade	SSI EIS underway
North Star to NSW/Qld border	52 km of new track.	Greenfield	SSI EIS

## 1.2. Objectives

The objectives of this Framework are to:

- Ensure neighbours and people living in close proximity to places where work is being undertaken are not unduly affected and also address the requirements of relevant NSW guidelines, standards and policies.
- Provide a consistent approach to the evaluation, selection and delivery of feasible and reasonable noise and vibration controls during construction.
- Balance the needs of adjacent communities, rail commuters and train operators by facilitating efficient project delivery.



## 2. CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

The level of detail available on the construction methodology and project design increases as the planning and approval process progresses. Noise and vibration assessments are undertaken to quantify the impact of construction activities on receivers. The results of the assessment are then used to develop management measures to mitigate the impact of construction activities on receivers. Assessments should:

- Be based on the best information available at the time
- Assess a realistic, worst-case scenario
- Provide sufficient detail to identify project specific noise and vibration mitigation measures.

Assessments and plans incorporating different levels of detail will be required pre and post project approval. Table 3 identifies the document and information required at each stage.

Each aspect of construction noise and vibration is to be assessed in accordance with NSW state guidelines, Australian or international standards (Table 4), and the SEARs and relevant conditions of approval. Assessments should be quantitative and where possible estimate the duration of impact on receivers, noting that works will move along the alignment and are unlikely to affect a single receiver for the entire project construction period.

**Table 3 Construction Noise and Vibration Assessment Documents**

Project Stage	Document	Description	Content
Pre-approval	Environmental impact assessment (EIS or REF) – Noise and Vibration Study	Describes all noise and vibration effects of the project on the environment and advises how best to manage the impacts.	<ul style="list-style-type: none"> <li>• Description of works, duration and working hours and noise management levels</li> <li>• Identification of noise sensitive receivers including impacted commercial receivers</li> <li>• Identification of vibration sensitive structures including heritage buildings, and other vibration sensitive receivers (including sensitive scientific and medical equipment)</li> <li>• Assessment of likely noise impacts, including sleep disturbance</li> <li>• Assessment of construction methods with the potential to cause discomfort, cosmetic or structural damage</li> <li>• Conceptual description of feasible and reasonable work practices to minimise noise and vibration impacts</li> <li>• Changes made to the proposal in response to submissions</li> </ul>
Post-approval	Construction Environmental Management Plan –	Prepared by ARTC to collate the environmental	<ul style="list-style-type: none"> <li>• Description of works, duration, working hours and noise management levels</li> <li>• Assessment of likely noise impacts,</li> </ul>

Project Stage	Document	Description	Content
	Noise and Vibration	management requirements for each proposal and guide the development of the contractor's CNVMP. Based on detailed design incorporating a Construction Noise and Vibration Impact Statement (CNVIS).	<ul style="list-style-type: none"> <li>including sleep disturbance based on detailed design</li> <li>Assessment of construction methods with the potential to cause discomfort, cosmetic or structural damage, based on detailed design</li> <li>Defines the requirements for pre-construction dilapidation surveys</li> <li>Approval and licence conditions</li> <li>Feasible and reasonable work practices</li> <li>Monitoring, training and auditing requirements</li> </ul>
	Construction Noise and Vibration Management Plan (CNVMP)	Details how construction noise and vibration impacts will be minimised and managed. Incorporates project specific approval or licence conditions. Prepared prior to the commencement of construction, usually by the construction contractor.	<ul style="list-style-type: none"> <li>Description of works, duration and working hours and noise management levels</li> <li>Identification of noise sensitive receivers including impacted commercial receivers</li> <li>Identification of vibration sensitive structures and receivers, and requirements for dilapidation surveys and/ or monitoring during construction</li> <li>Details of construction including and indicative schedule for key construction scenarios</li> <li>Feasible and reasonable work practices to minimise noise and vibration impacts</li> <li>Monitoring and auditing procedures</li> <li>Blast Management Plan (if applicable) considering methods contained in AS2187.2-2006</li> </ul>

**Table 4 Construction Noise and Vibration Guidelines and Standards**

Aspect	Description	Framework
Airborne noise	Construction noise	Interim Construction Noise Guideline (Department of Environment and Climate Change, NSW, 2009)
	Construction traffic noise	NSW Road Noise Policy (NSW EPA, 2011)

Aspect	Description	Framework
	Sleep disturbance (for works extending over more than two consecutive nights)	Interim Construction Noise Guideline (Department of Environment and Climate Change, NSW, 2009) NSW Road Noise Policy (NSW EPA, 2011)
Ground-borne noise	Sound transmitted through the ground into a structure, for example by underground works such as tunnelling.	Interim Construction Noise Guideline (Department of Environment and Climate Change, NSW, 2009)
Vibration	Human responses to vibration.	Assessing Vibration: a technical guideline (Department of Environment and Conservation, NSW, 2006)
	Effect of vibration on structures (cosmetic and/ or structural damage)	German Standard DIN 4150-3: Structural Vibration – effects of vibration on structures.
Blasting	Overpressure and vibration from blasting, potential to cause annoyance/ discomfort, cosmetic or structural damage	Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (ANZECC 1990) or other limit set by conditions of consent <sup>1</sup> AS 2187: Part 2-2006 'Explosives - Storage and Use - Part 2: Use of Explosives'

## 2.1. Standard Programme Construction Hours

Assessment of noise and vibration should be undertaken with reference to the Standard Programme Construction Hours:

- 6am – 6pm Monday – Sunday

These working hours will apply to locations where there are impacted receivers. Extended working hours outside of the Standard Programme Construction Hours are permissible where impacts to receivers can be appropriately managed. Any changes to working hours must be supported by the results of a noise and vibration assessment (e.g. EIS or CNVIS).

The Standard Programme Construction Hours have been developed to:

- Accommodate the remote location of worksites and the efficient use of the workforce
- Reduce the duration of impact on individual receivers and minimise disruption to commuters and freight operators using existing operational rail lines
- Minimise the potential to cause sleep disturbance.

### 2.1.1. Standard Programme Blasting Hours

The Standard Programme Blasting Hours are below. These are consistent with the ICNG.

<sup>1</sup> Recent NSW infrastructure project approvals have recognised that levels presented in Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration are restrictive and have applied these upper limits: vibration (PPV): 25mm/s, overpressure: 125dBL at the nearest receiver. More conservative limits apply to heritage structures and buildings.

- Monday – Friday 9am – 5pm
- Saturday 9am -1pm
- No blasting on Sundays or public holidays.

## **2.2. Works outside of Standard Programme Construction Hours**

Works may be conducted outside of the Standard Programme Construction Hours if one or more of the following applies:

- The delivery of oversized plant or structures that police or other authorities have determined requires special arrangements to transport along public roads
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm
- Works that do not exceed the noise management level adopted in the Construction Noise and Vibration Management Plan (CNVMP) at the nearest receiver
- Works that do not exceed the 'preferred' human exposure vibration level adopted in the Construction Noise and Vibration Management Plan (CNVMP) at the nearest receiver
- Where agreement is reached between ARTC and potentially affected sensitive receivers. Agreements must be made in writing (refer to Section 7.2.2 of the ICNG for further guidance)
- Works to ensure construction personnel, road user or public safety
- Works that cannot be undertaken during the day due to ambient daytime temperatures that may be carried out during the night
- Rail tamping where the stress-free temperature of the rail cannot be achieved during the Standard Programme Working Hours
- Works required to be conducted during a track possession.

## **2.3. Track Possessions**

Track possessions will be required to undertake construction work on operational rail lines as part of the Inland Rail Programme. Track possessions are undertaken when safety or construction requirements mean that construction cannot be completed during Standard Programme Construction Hours.

Noise and vibration impacts from track possessions should be assessed in the environmental impact assessment, noting that the number of possessions required by a proposal or the scale of the possession may not be defined. A further detailed assessment should be undertaken as part of the CNVIS to inform site specific mitigation measures.

### 3. MANAGEMENT MEASURES

#### 3.1. Standard Management Measures

The measures below will be applied to all works conducted during Standard Programme Construction Hours to minimise potential noise and vibration impacts at surrounding noise sensitive receivers. It is considered that the measures in Table 5 are feasible and reasonable for all Inland Rail proposals in most circumstances.

**Table 5** Standard Management Measures

Standard Management Measures
<p>Site inductions for all employees and contractors will address:</p> <ul style="list-style-type: none"> <li>• Environmental aspects and impacts</li> <li>• Proposal specific and standard noise management measures</li> <li>• Licence and approval conditions</li> <li>• Hours of work</li> <li>• Environmental incident reporting and management procedures</li> <li>• Complaint management</li> </ul>
<p>Daily site-specific briefings for all employees and contractors will include:</p> <ul style="list-style-type: none"> <li>• Site specific noise management measures</li> <li>• Location of nearest noise sensitive receivers</li> <li>• Construction employee parking areas</li> <li>• Behavioural practices (e.g. avoid swearing, shouting, dropping materials from heights)</li> <li>• Designated loading/unloading areas and procedures</li> </ul>
<p>Work compounds, storage areas, parking areas, unloading/loading areas and other semi-permanent construction sites should be located away from noise sensitive receivers. Where this is not possible, the orientation and layout of the work site will consider noise impacts, and opportunities to shield receivers from noise through the use of site buildings and stockpiles should be considered.</p>
<p>When working adjacent to schools, medical centres, childcare centres or places of worship, particularly noisy activities will be scheduled outside of operating or service hours where possible.</p>
<p>Equipment that is used intermittently is to be shut down when not in use.</p>
<p>The off-set distance between noisy plant and noise sensitive receivers will be maximised.</p>
<p>The number of vehicle trips to and from site will be optimised.</p>
<p>Regularly inspect and maintain equipment to ensure it is operating correctly.</p>
<p>Avoid the simultaneous operation of noisy plant within discernible range of noise sensitive receivers where possible.</p>
<p>Use of non-tonal reversing alarms for all permanent mobile plant<sup>2</sup>.</p>

<sup>2</sup> Excludes light vehicles

Standard Management Measures
Where available, equipment selection will favour the use of quieter and less vibration emitting construction methods.
A telephone, email and web based community information service will be established to allow the community to obtain additional information on construction activities, provide feedback or make a complaint.
Regular communications on the activities and progress of the proposal will be provided to the community (e.g. via newsletter, email and/or website).
Noise or vibration monitoring in response to complaints will be undertaken where the results or the process assist in resolving or understanding the receiver's issue.
Where possible, construction compounds should be located a minimum of 1km from the nearest resident or noise sensitive receiver.
Where vibration levels are predicted to approach the criteria for cosmetic building damage or limits for critical or sensitive areas, attended vibration measurements should be undertaken at the commencement of vibration generating activities to confirm that vibration limits are within the acceptable range.
Where vibration and overpressure from blasting or construction activities are predicted to approach the relevant limits, dilapidation surveys on potentially affected buildings will be undertaken.

### 3.2. Additional Management Measures

Where works conducted outside of Standard Programme Construction Hours result in exceedance of noise or vibration management levels, the proposal will implement the measures described above as well as additional measures based on impact that are described below. Due to the number of proposals and variety of locations that make up the Inland Rail Programme in NSW, these measures may need to be adapted to suit individual proposals and community expectations.

#### 3.2.1. Communication (CO)

The level of noise and vibration impact and duration will guide communication with receivers. Accurate and timely communication is essential to manage and understand community expectations for out of hours works (OOHW).

Two categories of communication have been developed commensurate with the scale of the impact. The purpose of the communication is described below, but the method of communication will be at the discretion of the proposal and detailed in the Proposal's Community Engagement Plan. It is intended that this Framework will compliment, and be referred to, in all proposal Community Engagement Plans to achieve the engagement outcomes described below.

- Category 1 CO1: Communication to provide information on the proposal via letter box drop, email, newsletter, media advertisements and/or website a minimum of 5 days prior to the works commencing.
- Category 2 CO2: Communication should be personalised (e.g. door knock, meeting, telephone call). Contact with these residents should commence early to enable feedback to be considered by the proposal.

At minimum the information provided to stakeholders (CO1 or CO2) will include:

- The reason the work is required to be undertaken outside of the Standard Programme Construction Hours
- A diagram that identifies the location of the proposed works in relation to nearby cross streets and local landmarks



- The nature, scope and duration of the works, including start and finish times
- The expected noise impacts on receivers
- Information on how to obtain further information or make a complaint, including an after-hours number and Programme website.

### 3.2.2. Respite Offer (RO)

Residential receivers subject to lengthy periods of noise or vibration may be eligible for a respite offer in accordance with Tables 6, 7 and 8. The purpose of such an offer is to provide residents with respite from an ongoing impact and may comprise of pre-purchased movie tickets, dinner vouchers or similar.

Respite offers are not applicable to non-residential receivers.

Respite can also be provided by limiting high noise generating works and allowing at least a one-hour respite period between blocks of work. Where possible, the timing of this respite should be discussed with the impacted community.

### 3.2.3. Alternate Accommodation (AA)

Alternate accommodation options (i.e. accommodation in motels away from the worksite) may be provided for residents living in close proximity to construction sites in accordance with Tables 6 - 8.

Acceptable accommodation measures will be developed with the affected community and project team.

### 3.2.4. Assigning Additional Management Measures

Tables 6-8 identify appropriate additional management measures for noise sensitive receivers by matching the predicted exceedance of the relevant management level to the appropriate management measures which serve to counter or mitigate that exceedance. The management levels are derived from the assessment process outlined in the relevant guideline or standard (Table 4).

OOHW has been divided into two periods (rest and sleep) in Tables 6-8 to recognise the different impact that works can have at those times.

Management measures for works within the Standard Programme Construction Hours are listed in Table 5, and therefore only works outside of this period are considered in Tables 6-8.

**Table 6 Additional Management Measures – Airborne Noise**

Time Period		Exceedance of NML	Perception	Duration	Communication Category/ Management Measure
OOHW Rest Period Evenings	Monday – Sunday 6pm – 10pm (including public holidays)	<5	Noticeable	Any	CO1
		5-15	Clearly audible	Any	CO1
		15-25	Moderately intrusive	Any	CO1, CO2
		>25	Highly intrusive	Any	CO1, CO2

Time Period		Exceedance of NML	Perception	Duration	Communication Category/ Management Measure
				>2 consecutive rest periods	CO1, CO2, RO
OOHW Sleep Period Night	Monday – Sunday 10pm – 6am (including public holidays)	<5	Noticeable	Any	CO1
		5-15	Clearly audible	Any	CO1
		15	Moderately intrusive	Any	CO1, CO2
				>2 consecutive sleep periods	CO1, CO2, RO
		>25	Highly intrusive	Any	CO1, CO2, RO
				>2 consecutive sleep periods	CO1, CO2, RO, AA

Table 7 relates to exceedances of ground-borne construction noise at noise sensitive receivers.

**Table 7 Additional Management Measures – Ground- borne Noise**

Time Period		Exceedance of NML	Perception	Duration	Communication Category/ Management Measure
OOHW Rest Period Evenings	Monday – Sunday 6pm – 10pm (including public holidays)	<5	Noticeable	Any	CO1
		5-15	Clearly audible	Any	CO1
		15-25	Moderately intrusive	Any	CO1, CO2
		>25	Highly intrusive	Any	CO1, CO2
				>2 consecutive rest periods	CO1, CO2, RO
OOHW	Monday –	<5	Noticeable	Any	CO1

Time Period		Exceedance of NML	Perception	Duration	Communication Category/ Management Measure
Sleep Period Night	Sunday 10pm – 6am (including public holidays)	5-15	Clearly audible	Any	CO1
		15	Moderately intrusive	Any	CO1, CO2
				>2 consecutive sleep periods	CO1, CO2, RO, AA
		>25	Highly intrusive	Any	CO1, CO2, RO
				>2 consecutive sleep periods	CO1, CO2, RO, AA

Table 8 relates to exceedances of the human comfort vibration values for continuous, impulsive and intermittent vibration at noise sensitive receivers. Potential exceedances of the cosmetic or structural damage criteria are to be addressed via the Standard Management Measures in Table 5.

**Table 8 Additional Management Measures – Vibration**

Time Period		Duration	Exceedance of 'preferred' value	Exceedance of 'maximum' value
OOHW Rest Period Evenings	Monday – Sunday 6pm – 10pm (including public holidays)	Any	CO1, CO2	CO1, CO2, RO
OOHW Sleep Period Night	Monday – Sunday 10pm-6am (including public holidays)	Any	CO1, CO2, RO	CO1, CO2, RO, AA

#### 4. COMPLAINT HANDLING AND COMMUNITY ENGAGEMENT

Complaints will be handled in accordance with Inland Rail's complaints management system. Community engagement plans will be developed for each proposal incorporating the requirements of this Framework.

## **5. MONITORING AND AUDITING**

### **5.1. Noise and Vibration Monitoring**

Compliance noise and vibration monitoring will be undertaken as specified in this Framework, with the methodology and results documented. Noise measurements shall be undertaken consistent *AS1055.1-1997 Acoustics – Description and Measurement of Environmental Noise – General Procedures*. Vibration measurements shall be undertaken in accordance with *Assessing Vibration: a technical guideline* and *BS7385 Part 2-1993 Evaluation and measurement of vibration in buildings*, as recommended in *AS 2187: Part 2-2006 ‘Explosives - Storage and Use - Part 2: Use of Explosives’*.

#### **5.1.1. Track Possession Monitoring Programme**

If there is the potential to impact sensitive receivers, during a track possession, a monitoring programme should be initiated to confirm predicted noise and vibration levels and identify any additional feasible and reasonable measures to reduce impact on receivers. The monitoring programme (for either noise, vibration or both) should be risk based, and would not need to occur if there are no impacted receivers within the vicinity of the work. Design of the monitoring programme will be included in the proposal CNVMP.

#### **5.1.2. Dilapidation Surveys**

If construction activities have potential to cause cosmetic or structural damage through vibration or overpressure to public utilities, structures, buildings or their contents an existing condition report of buildings and structures will be undertaken in accordance with *AS 4349.0 Inspection of buildings – General requirements*. Where a heritage structure is assessed as potentially susceptible to vibration damage, a more conservative cosmetic damage criterion should be adopted.

### **5.2. Auditing**

Periodic audits will be undertaken of proposal construction activities and the implementation of the CNVMP to ensure that noise and vibration predictions are accurate and the required management measures are in place. The Proposal Environmental Management Plan and CNVMP will prescribe the auditing regime for each proposal.