

M1 Pacific Motorway Extension to Raymond Terrace – Stage 1 - Black Hill to Tomago

Appendix C - Noise and Vibration Management Sub-Plan

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Revisions and Distribution

Revisions

Draft issues of this document are identified as Revision A, B, C, etc. Upon initial issue (generally Contract Award) this will be changed to a sequential number commencing at Revision 0. Revision numbers will continue at Revision 1, 2, etc.

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Terms and Abbreviations

Term/Abbreviation	Definition/Expanded text
ABL	Assessment Background Level – A single-number figure used to characterise the background noise levels from a single day of a noise survey. ABL is derived from the measured noise levels for the day, evening, or night-time period of a single day of background measurements. The ABL is calculated to be the tenth percentile of the background LA90 noise levels, i.e. the measured background noise is above the ABL 90% of the time.
ABN	Airborne noise
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.
AMS	Activity Method Statements
AQMP	Air Quality Management Sub-Plan
Attenuation	The reduction in the level of sound or vibration.
At-property acoustic treatment	Includes courtyard walls and building treatments. Building treatments may include but are not limited to ventilation, acoustic blinds/curtains, glazing, window and door seals, sealing of vents or underfloor areas, shutters and secondary glazing.
AVTG	Assessing Vibration – A Technical Guideline
BH2T	Black Hill to Tomago, or the Project
BMP	Blast Management Plan
CS	Communications Strategy
CEMP	Construction Environmental Management Plan
CMP	Construction Monitoring Program
CNVG	Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services 2016b)
CoA	Conditions of Approval
Construction	Includes all activities required to construct the CSSI as defined in the Project Description described in the documents listed in Condition A1, including commissioning trials of equipment and temporary use of any part of the CSSI but excludes Low Impact Work which is carried out or completed prior to approval of the CEMP and works approved under a Site Establishment Management Plan.
Consultation	To provide information and actively engage with and obtain and consider feedback from stakeholders during development of post approval documents. How the feedback has been considered and whether any changes have been made in response to this feedback is then documented and communicated back to stakeholders. Consultation should not be limited to one-way notification about the project.
Continuously	Includes any period during which there is less than one hour between ceasing and recommencing any of the work.
CSSI	Critical State Significant Infrastructure
D&C	Design and Construct
dB(A)	Decibels using the A-weighted scale which is accepted as being representative of the frequency response of the human ear.
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DECCW	Department of Environment and Climate Change and Water
DPE	Former Department of Planning, Industry and Environment, now 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.

Term/Abbreviation	Definition/Expanded text
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 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.
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	Environment Protection Authority
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
EPL	Environment Protection Licence
ER	Environmental Representative
EWMS	Environmental Work Method Statement
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.
GBN	Ground-borne noise
Highly Noise Affected	As defined in the Interim Construction Noise Guideline (DECC, 2009)
Highly noise intensive works/ particularly annoying	Work which is defined as annoying under the ICNG including: use of power saws, such as used for cutting timber, rail lines, masonry, road pavement or steel work (a) grinding metal, concrete or masonry; (b) rock drilling; (c) line drilling; (d) vibratory rolling; (e) bitumen milling or profiling; (f) jackhammering, rock hammering or rock breaking; and (g) impact piling Note: when modelled, these activities/plant and equipment will incur a 5dB(A) penalty.
ICNG	Interim Construction Noise Guideline (DECC, 2009)
INP	Industrial Noise Policy
ISCA	Infrastructure Sustainability Council of Australia
JHGA JV	John Holland Gamuda Australia Joint Venture
L _{A(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.
L _{Aeq(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.
LA1	The A-weighted sound pressure level that is exceeded for 1 per cent of the time for which the given sound is measured.
LA90	The A-weighted sound pressure level that is exceeded for 10 per cent of the time for which the given sound is measured.
M12RT	M1 Pacific Motorway Extension to Raymond Terrace
NCA	Noise Catchment Area
NCG	Noise Criteria Guideline
NMG	Noise Mitigation Guideline
NML	Noise Management Level as defined in the Interim Construction Noise Guideline (DECC, 2009)

Term/Abbreviation	Definition/Expanded text
NPfI	Noise Policy for Industry
NVA	Noise and Vibration Assessment
NVIS	Noise and Vibration Impact Statement
NVMP	Noise and Vibration Management Sub-Plan
ONR	Operational Noise Review
OOHW	Out of Hours Works
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
PPV	Peak Particle Velocity – the highest velocity of a particle (such as part of a building structure) as it vibrates. Most sound level meters measure root mean squared (RMS) values; it is common to approximate the PPV based on an RMS measurement. PPV is commonly used as a vibration criterion, and is often interpreted as a PPV based on the L _{max} or L _{max,spec} index.
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 Measures
RMS	Root Mean Squared
RNP	Road Noise Policy
ROL	Road Occupancy Licence
Sensitive land use(s)	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), childcare centres, passive recreation areas (including outdoor grounds used for teaching). Receivers that may be considered sensitive include commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, and retail spaces), and industrial premises as identified by the Planning Secretary.
Submissions Report	The Proponent's response to issues raised in the submission received in relation to the application for approval of the CSSI under the EP&A Act.
SMART	Specific, Measurable, Achievable, Relevant and Time-Bound
SPL	Sound Pressure Level
Transport	Transport for New South Wales, or TfNSW
VMS	Variable Message Signs
Work	Any physical activity for the purposes of the CSSI including construction, Low Impact Work, enabling works, utility works and site establishment activities but not including operational maintenance works.
WRA	Work Risk Assessment

Noise and Vibration Management Sub-Plan

Plan Profile

Management System	The Project will use John Holland's Environmental Management System (EMS) and core Project plans to support Project delivery. Additional functional plans have been developed for the Project.
Name	Noise and Vibration Management Sub-Plan (NVMP)
Authorisation	All personnel employed on the Project will perform their duties in accordance with the requirements of this Plan and in compliance with Project system procedures and any specific Project instructions. This Plan is authorised by the Project Director.
Review and update	This Plan will be regularly reviewed, developed, and updated: • For changes in design or construction sequence, staging, methodology or resourcing • To consider progress of the Project Company's Work • For changes in access to the Project Site and Temporary Areas • To consider changes directed by Transport's Representative under the D&C Deed.

1. Introduction

1.1. Context

This Noise and Vibration Management Sub-Plan (NVMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the M1 Pacific Motorway Extension to Raymond Terrace (M12RT) Black Hill to Tomago (BH2T, or the Project).

This NVMP has been prepared to address the requirements of the Conditions of Approval (CoA), the measures listed in the M12RT Environmental Impact Statement (EIS) as amended by the Submissions Report (known as the Revised Environmental Management Measures (REMMs), and all applicable guidelines and legislation.

1.2. Background

M12RT is a 15 kilometre extension of the existing M1 Pacific Motorway at Black Hill to the existing Pacific Highway at Raymond Terrace within the City of Newcastle and Port Stephens Council local government areas. The M12RT will be delivered as follows:

- Stage 1 - Construction - Southern Package (BH2T), delivered by the John Holland Gamuda Australia Joint Venture (JHGA JV)
- Stage 2 - Construction - Northern Package (Heatherbrae Bypass), delivered by Seymour White.

The JHGA JV has been appointed by Transport for New South Wales (Transport) for the Design and Construct (D&C) contract for BH2T, which involves the design and construction of 10 kilometres of new dual carriageway motorway with two lanes in each direction, with interchanges at Black Hill, Tarro, and Tomago. For the full project description, see Section 3 of the CEMP.

The M12RT EIS (Chapter 8 and Appendix H), Submissions Report (Chapters 6.6 and 7.9, Appendix D Supplementary Report – Noise and Vibration and Appendix K – REMMs), and the Assessment Report (Chapter 6.6) identified the potential impacts associated with highly intrusive works such as demolition, utility, and piling works during the construction phase. However, the residual risks were identified as being able to be reduced to the extent that potential impacts can be managed.

It is noted that the EIS assessed noise and vibration impacts and residual risks based on worst-case scenarios with all equipment operating simultaneously, operating at their loudest (full load), in their worst-case orientation without consideration of directivity, and all plant operating in one location at the closest location to each receiver. In actual implementation, only some equipment will operate simultaneously, equipment will only operate at full load for short periods of time, plant will be spread around the work area, and noise levels will reduce as plant moves away from a receiver. Regardless, the Project will implement mitigation measures to further reduce potential noise and vibration impacts to the greatest extent possible.

1.3. Environmental Management Systems Overview

The Environmental Management System (EMS) overview is described in Section 1.5 of the CEMP. The EMS also incorporates the Project-specific CEMP and sub-plans, strategies, procedures, and environmental work method statement (EWMS). The EMS provides for overarching environmental management actions for implementation by Project personnel and contractors and will apply for the duration of construction and for any longer period set out in the Construction Monitoring Programs or specified by the Planning Secretary, whichever is the greater.

1.3.1. Relationship between this Plan and other Project documents

Other Project documents that interface with this Plan to ensure the Project CoA and REMMs are implemented include:

- CEMP and associated Sub-Plans
- Construction Management Plan
- Safety Management Plan
- Environmental management documents (e.g. plans, protocols, strategies, reports, and programs).

The key CEMP Sub-Plan interfaces that ensure Project CoA and REMMs are implemented are as follows:

- The Non-Aboriginal Heritage Management Sub-Plan, which includes mitigation measures relating to the impacts of architectural treatments for noise mitigation on heritage structures and vibration impacts on heritage structures.
- The Noise and Vibration Construction Monitoring Program (NVCMP), which details the noise and monitoring program to be undertaken to monitor the effectiveness of the controls outlined within this NVMP.

Section 1.6 of the CEMP provides a full list of plans, procedures and other documents that form the EMS.

1.4. Consultation for Preparation

In accordance with CoA A8, C5(b), and C12(a), this NVMP and the associated NVCMP (refer Appendix C) has been prepared as part of the CEMP in consultation with the following agencies and councils:

- City of Newcastle Council (NVMP and NVCMP)
- Port Stephens Council (NVMP and NVCMP)
- Maitland City Council (NVMP and NVCMP)
- Environmental Protection Authority (EPA) (NVCMP only).

This NVMP and associated NVCMP was provided to the above listed agencies and councils from 7 August 2023. No comments were made on either the NVMP or NVCMP.

Appendix A provides a summary of the consultation undertaken for the development of this NVMP and NVCMP. Table 1-1 provides a summary of consultation periods and outcomes.

Table 1-1 Consultation summary

Stakeholder	Total Review Period (Calendar days)	Outcome
City of Newcastle Council (NVMP and NVCMP)	14	No comments on NVMP or NVCMP
Port Stephens Council (NVMP and NVCMP)	17	No comments on NVMP or NVCMP
Maitland City Council (NVMP and NVCMP)	36	No comments on NVMP or NVCMP
Environmental Protection Authority (EPA) (NVCMP only)	16	No comments on NVCMP

Ongoing consultation with relevant stakeholders, including any unique local receivers (e.g. local residents, schools and asset owners), may be undertaken for particular issues, such as periods of excessive noise and vibration impacts or Out of Hours Works, pertaining to the Project's impact on ambient conditions. Community feedback and complaints relating to noise and vibration impacts will be dealt with in accordance with the Communication Strategy and the Complaints Management System (see Section 9.3 of this Plan)

In accordance with CoA C4 and C15, this NVMP and the associated NVCMP was endorsed by the Environmental Representative (ER) on 26 September 2023 prior to submission to the Planning Secretary for approval no later than one month before the commencement of construction. In accordance with CoA C10 and C16, construction may not commence until the CEMP and relevant CEMP Sub-Plans and Monitoring Programs applying to construction activities to be undertaken have been approved by the Planning Secretary and all relevant baseline data for the specific construction activity has been collected.

1.5. Operational noise

The potential impacts relating to operational noise will be assessed and documented in a separate Operational Noise Review (ONR) report developed as part of the design process. A program of post construction operational noise measurements will be conducted to confirm the outcomes of the project in accordance with E96 and will be documented in a separate Operational Noise Compliance Report in accordance with requirements of CoA E98.

2. Purpose and Objectives

2.1. Purpose

The purpose of this NVMP is to describe how potential noise and vibration impacts will be managed during construction of the Project.

2.2. Objectives

The key objective of the NVMP is to ensure all approval and contractual requirements relevant to noise and vibration are described, scheduled, and assigned responsibility as outlined in:

- M12RT EIS (Chapter 8 and Appendix H), Submissions Report (Chapter 6.6 and 7.9, Appendix D, and Appendix K – REMMS), Assessment Report (Chapter 6.6) and CoA
- Transport Specifications G36, G38 and G40
- Scope of Works and Technical Criteria (SWTC) Appendices.

To achieve compliance with the conditions and objectives of the Project documents above, the Project will undertake the following:

- Ensure measures (Section 8 of this NVMP) are implemented to address the relevant CoA outlined in Section 3.2 and the safeguards detailed in the REMMs in Section 3.3.
- Ensure best management practice controls and procedures are documented, communicated, and implemented during construction activities to avoid or minimise noise and vibration impacts.

2.3. Environmental Performance Outcomes and Targets

The following targets have been established for the management of noise and vibration impacts during Project construction:

- Ensure full compliance with the relevant legislative requirements, CoA and REMMs
- Implement 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)
- Implement feasible and reasonable vibration mitigation measures with the aim of achieving the vibration criteria established using the *Assessing vibration: a technical guidelines* (DEC, 2006) (for human exposure) and German Standard *DIN 4150-3: Structural Vibration- effects of vibration on structures* (for structural damage).
- If blasting activities are to occur, they are only undertaken at designated times and remain within established/agreed criteria. If blasting is to occur, a separate Blast Management Strategy will be prepared in accordance with CoA E82, E83, E84 and E85.
- Complaints from the community and stakeholders are minimised.

The performance outcomes listed in Table 2-1 have been established for the management of noise and vibration impacts during Project design and construction. These align with those established in the Revised Secretary Environmental Assessment Requirements (SEARS) and EIS Chapter 8 (Noise and Vibration) and Chapter 27 (Project Synthesis).

Table 2-1: Performance outcomes of NVMP

No.	Performance Outcomes	How it is achieved
Noise and Vibration - Amenity		
1	Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on acoustic amenity.	• Section 8, Table 8-1 • Noise and Vibration Impact Statements developed for each stage of the works
Noise and Vibration - Structural		
2	Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on the structural integrity of buildings and items including Aboriginal places and environmental heritage	• Section 8, Table 8-1 • Noise and Vibration Impact Statements developed for each stage of the works

2.4. SMART Principles

In accordance with the requirements of CoA C6(d) and CoA C13(j), this NVMP and the associated NVCMP have been developed with consideration of SMART principles. This is achieved as follows:

- **Specific:** The measures listed in Section 8 of this Plan are specific to noise and vibration management during construction. They include the development and implementation of plans and procedures tailored to address noise and vibration impacts, identification, and management of specific issues from construction noise and vibration, out-of-hours-work (OOHW), and other construction activities.
- **Measurable:** The document provides specific measures, requirements, and references that enable the evaluation and measurement of the effectiveness of each control measure. Monitoring programs and reporting requirements are outlined, allowing for the assessment of impacts from noise and vibration.
- **Achievable:** The control measures outlined in the document are practical and achievable within the construction context. They involve the implementation of plans, investigations, and management strategies that can be feasibly executed during the construction phase.
- **Relevant:** The measures are directly relevant to noise and vibration management during construction. They address potential impacts, such as those associated with construction noise and vibration and OOHW. These measures are designed to mitigate or prevent these impacts from noise and vibration.
- **Time-bound:** The document specifies when each measure should be implemented, such as prior to and during construction. It also assigns responsibilities to specific roles, indicating the timeline and accountability associated with each measure.

3. Environment Requirements

3.1. Relevant Legislation and Guidelines

Table 3-1 lists the principal legislation, regulation, plans, policies, guidelines, specifications, and Australian Standards that apply to noise and vibration management.

Table 3-1: Principal legislation and regulation relevant to noise and vibration

Legislation	• <i>Protection of the Environment Operations Act 1997 (POEO Act)</i> • Protection of the Environment Operations (Noise Control) Regulation 2008.
Standards	• British Standard BS 7385: Part 2-1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground-borne vibration (BSI 1993) • German Standard DIN 4150-3 (2016) Vibration in buildings – Part 3: Effects on structures (DIN2016) • Australian Standard AS 2187.2-2006 Explosives – Storage and use – Part 2 Use of explosives (Australian Standard 2006) • Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (ANZECC 1990).
Guidelines and Specifications	• Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services 2016b) • Interim Construction Noise Guideline (ICNG) (DECC 2009a) • Assessing Vibration: a technical guideline (DECC 2006) • NSW Road Noise Policy (RNP) (DECCW 2011) • Noise Criteria Guideline (NCG) (Roads and Maritime Services 2015c) • Noise Policy for Industry (NSW EPA 2017). • Interim Construction Noise Guideline (NSW EPA 2009)

Relevant provisions of the above legislation are explained in the Register of Legal and Other Requirements included in Appendix A1 of the CEMP.

3.2. Conditions of Approval – SSI-7319

The CoA relevant to this Plan are listed Table 3-2. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3-2: Condition of Approval relevant to the NVMP

CoA	Condition Requirements	Document Reference
A8	Where the terms of this approval require consultation to be undertaken, evidence of the consultation undertaken must be submitted to the Planning Secretary and ER (as relevant) with the corresponding documentation in accordance with the consultation procedures set out in the Communication Strategy required by Condition B1. The evidence must include: a) Documentation of the engagement with the identified party in the condition of approval that has occurred before submitting the document for approval; b) A log of the dates of engagement or attempted engagement with the identified party; c) Documentation of the follow-up with the identified party where engagement has not occurred to confirm that they do not wish to engage or have not attempted to engage after repeated invitations; d) Outline of the issues raised by the identified party and how they have been addressed; and e) A description of the outstanding issues raised by the identified party and the reasons why they have not been addressed. <i>Note: The Communication Strategy required by Condition B1 should be used in conjunction with Condition A8 to determine the level consultation and evidence required that is proportionate to the activity that will be undertaken.</i>	Section 1.4 Appendix A Communications Strategy
B7	A Complaints Management System must be prepared and implemented before the commencement of any Work and maintained for the duration of Work and for a minimum for 12 months following completion of construction of the CSSI. <i>Note: In the situation where there are different entities constructing and operating the CSSI, continuity of access to the Complaints Management System must be maintained.</i>	Section 9.3 Communications Strategy

CoA	Condition Requirements	Document Reference						
		Complaints Management System CEMP Section 4.8.4						
B8	The following information must be available to facilitate community enquiries and manage complaints one month before the commencement of Work and for 12 months following the completion of construction: a) A 24-hour telephone number for the registration of complaints and enquiries about the CSSI; b) A postal address to which written complaints and enquires may be sent; c) An email address to which electronic complaints and enquiries may be transmitted; and d) A mediation system for complaints unable to be resolved. This information must be accessible to all in the community regardless of age, ethnicity, disability or literacy level and must be provided on the website required under Condition B12.	Section 9.3 of this Plan Communications Strategy Complaints Management System CEMP Section 4.8.4						
C3	CEMP(s) (and relevant CEMP Sub-Plans) must be submitted to the Planning secretary for Approval.	Section 1.4						
C4	Where a CEMP (and relevant CEMP Sub-plans) requires Planning Secretary's approval, the CEMP (and relevant CEMP Sub-plans) must be endorsed by the ER. The endorsed CEMP (and relevant sub-plans) must be submitted to the Planning Secretary for approval no later than one month before the commencement of construction, or where construction is staged, no later than one month before the commencement of each stage.	Section 1.4						
C5	The following CEMP Sub-plans must be prepared in consultation with the relevant government agencies and councils identified for each CEMP Sub-plan. Details of all information requested by an agency during consultation must be provided to the Planning Secretary as part of any submission of the relevant CEMP Sub-plan, including copies of all correspondence from those agencies as required by Condition A8: <table border="1"> <thead> <tr> <th></th><th>Required CEMP Sub-Plan</th><th>Relevant government agencies to be consulted for each CEMP Sub-Plan</th></tr> </thead> <tbody> <tr> <td>(e)</td><td>Noise and Vibration</td><td>Relevant Council(s)</td></tr> </tbody> </table>		Required CEMP Sub-Plan	Relevant government agencies to be consulted for each CEMP Sub-Plan	(e)	Noise and Vibration	Relevant Council(s)	Section 1.4 and Appendix A Council Consultation Record provided with DPE Submission
	Required CEMP Sub-Plan	Relevant government agencies to be consulted for each CEMP Sub-Plan						
(e)	Noise and Vibration	Relevant Council(s)						
C6	The CEMP Sub-plans must state how: a) The environmental performance outcomes identified in the documents listed in Condition A1 will be achieved; b) The mitigation measures identified in the documents listed in Condition A1 will be implemented; c) The relevant terms of this approval will be complied with; and d) Issues requiring management during construction (including any trigger levels and cumulative impacts), as identified through ongoing environmental risk analysis, will be managed through SMART principles.	Section 2.3 Section 8 Sections 3 Section 2.4 (SMART Principles) Section 6 (risk /impact analysis) and Section 8 (control Measures)						
C8	The Noise and Vibration CEMP Sub-plan must include, but not be limited to: a) Details of all sensitive land use(s) (including noise and or vibration sensitive working areas such as operating theatres and precision laboratories) that are potentially exposed to construction noise and vibration; b) Noise Catchment Areas (NCAs) identified in the EIS – these must be reviewed (and refined where required) to ensure that each catchment represents a similar acoustic environment. Additional noise monitoring must be carried out to confirm rating background levels, NMLs and existing traffic noise levels for the NCAs. c) Construction noise and vibration performance criteria for the CSSI;	Sections 4, 6 and Appendix B Section 4.2, 4.4 and Appendix B and F Section 6						

CoA	Condition Requirements	Document Reference						
	d) Details of mitigation and management measures and procedures that will be implemented to manage construction noise and vibration impacts;	Section 8, 9.4 and Appendix C						
	e) Construction timetabling, in particular construction activities outside of standard hours; and	Sections 8.2 and 8.3						
	f) Measures to minimise cumulative construction impacts and the likelihood for construction fatigue from both concurrent activities and other projects in the area.	Section 7.3 and 8.3.1						
C10	Construction must not commence until the relevant CEMP(s) and CEMP Sub-plans applying to the construction activities to be undertaken have been approved by the Planning Secretary.	Section 1.4 Document Revisions Table						
C11	The CEMP(s) and CEMP Sub-plans as approved, including any minor amendments approved by the ER, must be implemented for the duration of construction.	Section 1.3 and 10.2						
C12	Construction Monitoring Program The following Construction Monitoring Programs (CMPs) must be prepared in consultation with the relevant government agencies and council(s) identified for each to compare actual performance of construction of the CSSI against the performance predicted in the documents listed in Condition A1 or in the CEMP: <table border="1"> <thead> <tr> <th></th><th>Required CEMP Sub-Plan</th><th>Relevant government agencies to be consulted for each CEMP Sub-Plan</th></tr> </thead> <tbody> <tr> <td>(a)</td><td>Noise and Vibration</td><td>EPA and Relevant Council(s)</td></tr> </tbody> </table>		Required CEMP Sub-Plan	Relevant government agencies to be consulted for each CEMP Sub-Plan	(a)	Noise and Vibration	EPA and Relevant Council(s)	Appendix C
	Required CEMP Sub-Plan	Relevant government agencies to be consulted for each CEMP Sub-Plan						
(a)	Noise and Vibration	EPA and Relevant Council(s)						
C13	Each CMP must provide:							
	a) Details of baseline data available;	Section 4 of Appendix C						
	b) Details of baseline data to be obtained and when;	Section 4 of Appendix C						
	c) Details of all monitoring of the project to be undertaken;	Section 5 and 6 of Appendix C						
	d) The parameters of the project to be monitored;	Section 5.4 and 6.4 of Appendix C						
	e) The frequency of monitoring to be undertaken;	Section 5.2 and 6.2 of Appendix C						
	f) The location of monitoring;	Section 5.1 and 6.1 of Appendix C						
	g) The reporting of monitoring results and analysis of results against relevant criteria;	Section 10 of Appendix C						
	h) Details of the methods that will be used to analyse the monitoring data;	Section 9 and 10 of Appendix C						
	i) Procedures to identify and implement additional mitigation measures where the results of the monitoring indicate unacceptable project impacts;	Section 9 of Appendix C						
	j) A consideration of SMART principles; and	Section 2.3 of Appendix C						
	k) Any consultation to be undertaken in relation to the monitoring programs.	Section 1.5 and 8.1 of Appendix C						
C15	The CMP must be endorsed by the ER. The endorsed CMP must be submitted to the Planning Secretary for approval no later than one month before the commencement of construction, or where construction is staged, no later than one month before the commencement of each stage.	Section 1.4 Appendix C, Section 1.5						
C16	Construction must not commence until the relevant CMPs have been approved by the Planning Secretary and all relevant baseline data for the specific construction activity has been collected.	Section 1.4 Appendix C, Section 1.5						
C17	The CMPs, as approved, including any minor amendments approved by the ER, must be implemented for the duration of construction and for any longer period set out in the Monitoring Program or specified by the Planning Secretary, whichever is the greater.	Section 1.3 and 10.2						

CoA	Condition Requirements	Document Reference
		Appendix C, Section 1.6
C18	The results of the CMPs must be submitted to the Planning Secretary, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant CMP. The Construction Monitoring Report(s) must include an analysis of the results including, but not limited to, exceedances of relevant criteria/targets/goals, reasons for any exceedances, trends in the data, and maximum, minimum and average data results for all monitored parameters. The report must also detail any management and mitigation measures that were implemented to address exceedances during the reporting period.	Table 10-1
E64	Construction Hours Work must only be undertaken during the following hours: a) 7:00 am to 6:00 pm Mondays to Fridays, inclusive; b) 8:00 am to 5:00 pm Saturdays; and c) At no time on Sundays or public holidays.	Section 5.2 Appendix D – Out of Hours Works Protocol
E65	Except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the same receiver must only be undertaken: (a) Between the hours of 8:00 am to 6:00 pm Monday to Friday; (b) Between the hours of 8:00 am to 1:00 pm Saturday; and (c) If continuously, then not exceeding three hours, with a minimum cessation of Work of not less than one hour. For the purposes of this condition, 'continuously' includes any period during which there is less than one hour between ceasing and recommencing any of the work.	Sections 5.2, & Table 8-1 (NMR36)
E66	Notwithstanding Conditions E64 and E65, Work may be undertaken outside the hours specified in any of the following circumstances: (a) Safety and Emergencies, including: i. For the delivery of materials required by the NSW Police Force or other authority for safety reasons; or ii. Where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm. On becoming aware of the need for emergency work in accordance with Condition E66 (a)(ii), the Proponent must notify, the ER, the Planning Secretary and the EPA of the reasons for such work. The Proponent must use best endeavours to notify all noise and/or vibration affected residents and owners/occupiers of properties identified as sensitive land use(s) of the likely impact and duration of the emergency works; or (b) Work that meets all of the following criteria: i. Work that causes LAeq(15 minute) noise levels: - No more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and - No more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land use(s); ii. Work that causes LAF max noise levels no more than 15 dBA above the RBL at any residence during the night-time; iii. Work that causes: - Continuous or impulsive vibration values, measured at the most affected residence no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), and - Intermittent vibration values measured at the most affected residence which are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006). (c) By Approval, including:	Section 5.2 & Table 8-1 (NMR37) Appendix D – Out of Hours Works Protocol Communications Strategy

CoA	Condition Requirements	Document Reference
	i. Where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or ii. Works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E67; or iii. Negotiated agreements with directly affected residents and sensitive land use(s).	
E67	An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of Work which is outside the hours defined in Condition E64, and is not subject to an EPL. The Protocol must be prepared in consultation with the ER. The Protocol must provide: (a) Identification of low, medium and high risk activities and an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where: i. The ER reviews all proposed out-of-hours activities and confirms their risk levels, ii. Low and medium risk activities can be approved by the ER, and iii. High risk activities are approved by the Planning Secretary; (b) A process for the consideration of out-of-hours work against the relevant NML and vibration criteria; (c) A process for selecting and implementing mitigation measures for residual impacts in consultation with the community at each affected location, including respite periods consistent with the requirements of Condition E77. The measures must take into account the predicted noise levels and the likely frequency and duration of the out-of-hours works that sensitive land use(s) would be exposed to, including the number of noise awakening events; (d) Procedures to facilitate the coordination of out-of-hours work including those approved by an EPL or undertaken by a third party, to ensure appropriate respite is provided; and (e) Notification arrangements for affected receivers for all approved out-of-hours work and notification to the Planning Secretary of approved low risk out-of-hours works. The Protocol must be submitted to and approved by the Planning Secretary before commencement of the out-of-hours work and implemented during Work which is outside the hours defined in Condition E64 and not subject to an EPL. Adherence to the Protocol does not apply if the requirements of Condition E66 (a) or (b) are met. Notes: 1. Conditions E78 and E79 provide additional parameters to be considered. 2. If the Work is subject to an EPL and the EPA does not endorse extended hours as part of the EPL, the extended hours cannot be considered under this Protocol.	Section 5.2, 7.2 and Table 8-1 (NMR05) Appendix D – Out of Hours Works Protocol
E68	Mitigation measures must be implemented with the aim of achieving the following noise management levels and vibration objectives: (a) Construction 'Noise affected' NMLs established using the Interim Construction Noise Guideline (DECC, 2009); (b) Vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure); (c) Australian Standard AS 2187.2 - 2006 "Explosives - Storage and Use - Use of Explosives"; (d) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and (e) The vibration limits set out in the German Standard DIN 4150-3: Structural Vibration-effects of vibration on structures (for structural damage). Work that exceeds the noise management levels and/or vibration criteria must be managed in accordance with the Ancillary Site Establishment Management Plan required by Condition A17 or Noise and Vibration CEMP Sub-plan required by Condition C5, as applicable. Note: The ICNG identifies 'particularly annoying' activities that require the addition of 5 dB(A) to the predicted level before comparing to the construction NML.	Section 8 and Table 8-1 Appendix D – Out of Hours Works Protocol

CoA	Condition Requirements	Document Reference
E69	Mitigation measures must be applied when either of the following residential ground-borne noise levels are exceeded:	Section 7.2 Appendix D – Out of Hours Works Protocol
	(a) Evening (6:00 pm to 10:00 pm) — internal LAeq(15 minute): 40 dB(A); and	
	(b) Night (10:00 pm to 7:00 am) — internal LAeq(15 minute): 35 dB(A).	
	The mitigation measures must be outlined in the Noise and Vibration CEMP Sub-plan, including in any Out-of-Hours Work Protocol as required by Condition E67.	
E70	Work that results in noise levels above the NMLs at community, religious, educational institutions, noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) must not be timetabled during sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	Sections 7, 8.3 and Table 8-1 (NMR11)
E71	Noise and Vibration Impact Statements (NVIS) must be prepared for any Work:	Section 7.1, 7.2 and Table 8-1 (NMR04)
	(a) That may exceed the noise management levels, vibration criteria and/or ground-borne noise levels specified in Condition E68 and Condition E69 at any residence outside work hours identified in Condition E64, or	
	(b) Where receivers will be highly noise affected.	
	The NVIS must include specific mitigation measures identified through consultation with affected receivers of the sensitive land use(s) and the mitigation measures must be implemented for the duration of the works. A copy of the NVIS must be provided to the ER prior to the commencement of the associated works. The Planning Secretary and the EPA may request a copy/ies of NVIS.	
E72	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before work that generates vibration commences in the vicinity of those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owners and occupiers are to be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier. These properties must be identified and considered in the Ancillary Site Establishment Management Plan required by Condition A17 and/or the Noise and Vibration CEMP Sub-plan required by Condition C5, and the owners and occupiers notified in accordance with the Communication Strategy required by Condition B1.	Sections 6.3.3, 6.3.4, 7.2 and Table 8-1 (NMR28) Communication Strategy
E73	The Proponent must conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures.	Section 5.9.2, 7, 8 and Table 8-1 (NMR26 and NMR28) Non-Aboriginal Heritage Management Plan Section 6 Appendix C – Noise and Vibration Monitoring Program
E74	Advice from a heritage specialist must be sought on the methods and locations for installing equipment used for vibration, movement and noise monitoring at heritage-listed structures. Note: The installation of noise and vibration equipment must not impact on the heritage value of the heritage items.	Table 8-1 (NMR32) Non-Aboriginal Heritage Management Plan Section 6
E75	Before conducting at-property architectural noise treatment at any heritage item identified in the documents listed in Condition A1, the advice of a suitably qualified and experienced built heritage expert must be obtained and implemented to ensure any such work does not have an adverse impact on the heritage significance of the item.	Table 8-1 (NMR32) Non-Aboriginal Heritage Management Plan Section 6 Communications Strategy

CoA	Condition Requirements	Document Reference
E76	All work undertaken for the delivery of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. The Proponent must:	Section 5.2, 7.2, Section 8.3.1 and Table 8-1 (NMR05)
	(a) Reschedule any work to provide respite to impacted noise sensitive land use(s) so that the respite is achieved in accordance with Condition E77; or	
	(b) Consider the provision of alternative respite or mitigation to impacted noise sensitive land use(s) where respite outlined in Condition E77 cannot be achieved; and	
	(c) Provide documentary evidence to the ER in support of any decision made by the Proponent in relation to respite or mitigation.	
E77	In order to undertake out-of-hours work outside the hours specified under Condition E64, the Proponent must identify appropriate respite periods for the out-of-hours work in consultation with the community at each affected location on a regular basis. This consultation must include (but not be limited to) providing the community with:	Section 5.2 and 8.3 Appendix D – Out of Hours Works Protocol Communications Strategy
	(a) A progressive schedule for periods no less than three months, of likely out-of-hours work;	
	(b) A description of the potential work, location and duration of the out-of-hours work;	
	(c) The noise characteristics and likely noise levels of the work; and	
	(d) Likely mitigation and management measures which aim to achieve the relevant noise management levels and vibration criteria under Condition E68 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers).	
	The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hours work must be provided to the ER, EPA and the Planning Secretary for information prior to undertaking the work scheduled for the subject period.	
	Notes:	
	1. <i>Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the rating background noise level at any residence.</i> 2. <i>Respite, relocation and other offers must be provided unconditionally.</i> 3. <i>Refer to Condition A8 in relation to consultation requirements and Table 1 - Terms and Definitions for the definition of 'consultation'.</i>	
E78	Work outside the hours specified in Condition E64 along the New England and Pacific Highway corridors which result in an exceedance of the relevant NML at the same sensitive land use(s) can only be undertaken in accordance with the following:	Section 5.2, 7.2 and Table 8-1 (NMR06)
	(a) Two consecutive evenings and/or nights per week; or	
	(b) Three non-consecutive evenings and/or nights per week; or	
	(c) 10 evenings and/or nights per month; or	
	(d) Except as identified by an EPL; or	
	(e) In accordance with an agreement with a potentially impacted receiver(s) as required by Condition E66(c)(iii).	
E79	Mitigation measures such as temporary alternative accommodation or other agreed mitigation measures, must be offered/ made available to residents affected by out-of-hours work (including where utility works are being undertaken for the CSSI or under a road occupancy licence) where the construction noise levels between:	Section 5.2 and Table 8-1 (NMR02.1) and (NMR02.2) Appendix D – Out of Hours Works Protocol Communications Strategy
	(a) 10:00 pm and 7:00 am, Monday to Friday;	
	(b) 10:00 pm Saturday to 8:00 am Sunday; and	
	(c) 6:00 pm Sunday and public holidays to 7:00 am the following day unless that day is Saturday then to 8:00 am,	
	are predicted to exceed the NML by 25 dB(A) or are greater than 75 dBA (LAeq(15 min)), whichever is the lesser and the impact is planned to occur for more than two (2) nights over a seven (7) day rolling period	
	The NML must be reduced by 5 dB where the noise contains annoying characteristics and may be increased by 10 dB if the property has received at-property acoustic treatment. The	

CoA	Condition Requirements	Document Reference
	noise levels and duration requirements identified in this condition may be changed through an EPL applying to the CSSI.	
E80	Crushing and grinding works must only be undertaken during the hours specified in Condition E64 unless otherwise approved by the Planning Secretary or through an EPL or if it meets the requirements of Condition E66.	Section 5.2 and 7 Table 8-1 (NMR03) Appendix D – Out of Hours Works Protocol Communications Strategy
E81	Blasting associated with the CSSI must only be undertaken during the following hours: (a) 9:00 am to 5:00 pm, Monday to Friday, inclusive; (b) 9:00 am to 1:00 pm on Saturday; and (c) At no time on Sunday or public holidays; or (d) As authorised through an EPL. This condition does not apply in the event of a direction from the NSW Police Force or other relevant authority for safety or emergency reasons to avoid loss of life, property loss and/or to prevent environmental harm.	Section 5.2 and 5.10 Table 8-1 (NMR30) Blast Management Strategy – to be prepared separately to this NVMP, if blasting is required
E82	A Blast Management Strategy must be prepared and must include: (a) Sequencing and review of trial blasting to inform blasting; (b) Regularity of blasting; (c) Intensity of blasting; (d) Periods of relief; and (e) Blasting program.	Section 5.10, 2.3 and Table 8-1 (NMR30) Blast Management Strategy – to be prepared separately to this NVMP, if blasting is required
E83	The Blast Management Strategy must be endorsed by a suitably qualified and experienced person.	Section 2.3, 5.10 and Table 8-1 (NMR30) Blast Management Strategy – to be prepared separately to this NVMP, if blasting is required
E84	The Blast Management Strategy must be prepared in accordance with relevant guidelines and in consultation with the EPA, to ensure that all blasting and associated activities are carried out so as not to generate unacceptable noise and vibration impacts or pose a significant risk to sensitive land use(s).	Section 2.3, 5.10 and Table 8-1 (NMR30) Blast Management Strategy – to be prepared separately to this NVMP, if blasting is required
E85	The Blast Management Strategy must be submitted to the Planning Secretary for information no later than one month before the commencement of blasting. The Strategy as submitted to the Planning Secretary, must be implemented for all blasting activities.	Section 2.3, 5.10 and Table 8-1 (NMR30) Blast Management Strategy – to be prepared separately to this NVMP, if blasting is required
E86	An independent and experienced noise specialist must be approved by the Planning Secretary to verify the validity (including being accurate and consistent with the requirements of this approval and the traffic noise model used to address the change of noise created by the CSSI) of the:	Section 4.4 and 5.8.1 Appendix F – Traffic Noise

CoA	Condition Requirements	Document Reference
	(a) Traffic Noise Monitoring Program required under Condition E87; The Planning Secretary's approval of the noise specialist must be sought no later than one month before undertaking traffic noise monitoring required under Condition E87. If Condition E88, applies, the approval of the noise specialist must be sought no later than one month before undertaking the ONR. Each verification must be submitted to the Planning Secretary for information along with a report that summarises and provides evidence to support the verification. The verification and report must be submitted to the Planning Secretary with the relevant operational noise documentation.	Monitoring Program and Monitoring Report
E87	Before the commencement of Work, a Traffic Noise Monitoring Program must be prepared to inform the calculation of operational road traffic noise impacts at sensitive land use(s). The program must: (a) Include monitoring at the noise monitoring locations used to inform the EIS; and (b) Identify additional locations at which monitoring will be undertaken to determine the change in operational traffic noise as a result of the CSSI. The additional monitoring locations must be located around elements of the CSSI that will create a change of noise (such as interchanges near residents and behind noise barriers) and be representative of the range of sound propagation conditions along the length of the CSSI corridor. The monitoring program must be submitted to the Planning Secretary for approval at least one month prior to undertaking any noise monitoring. Noise monitoring must not commence until the Planning Secretary has approved the Traffic Noise Monitoring Program. Noise monitoring must be undertaken prior to commencing Work in the vicinity of a noise monitoring location. <i>Note: The intent of this condition is to establish baseline noise levels for post construction compliance</i>	Section 4.4 and 5.8.1 Appendix F – Traffic Noise Monitoring Program and Monitoring Report
E88	Conditions E86(a) and E87 do not apply if it can be demonstrated to the satisfaction of the Planning Secretary that alternate monitoring addresses these condition requirements.	Traffic Noise Monitoring Program undertaken.
E91	Where the noise management level in Condition E68(a) is likely to be exceeded at residences during construction, operational noise mitigation measures identified in Condition E89, or in the absence of the final ONR the EIS, that will not be physically affected by construction must be implemented within 12 months of the commencement of construction at the residences where the NML is exceeded, unless another timeframe is agreed to by the Planning Secretary. All requests to the Planning Secretary for an extension to the timeframe must be accompanied by a report justifying why, along with details of temporary measures that would be implemented to reduce construction noise impacts, until such time that the operational noise mitigation measures are implemented. The report must be submitted to the Planning Secretary before the commencement of construction at the residences where the NML is exceeded. All temporary measures must be implemented within six months of the commencement of construction in the vicinity of the impacted residences. <i>Note: Not having finalised detailed design is not sufficient justification for not implementing the proposed operational noise mitigation measures.</i>	Table 8-1 (NMR24)
E92	The implementation of at-property acoustic treatment does not preclude the application of other noise and vibration mitigation and management measures, including temporary accommodation, to manage and mitigate construction noise.	Table 8-1 (NMR38)
E103	The Proponent must offer pre-construction surveys to the owners of surface and sub-surface structures and other relevant assets identified at risk from vibration, including all listed heritage items and buildings/structures of heritage significance as identified in the documents listed in Condition A1 . Where the offer is accepted, the survey must be undertaken by a suitably qualified and experienced engineer and/or building surveyor prior to the commencement of vibration generating works that could impact on the structure/asset. The results of each survey must be documented in a Pre-construction Condition Survey Report and the report must be provided to the owner of the item(s) surveyed no later than one month before the commencement of all other potentially impacting works.	Section 5.9.3 and Table 8-1 (NMR26)
E104	Where pre-construction surveys have been undertaken in accordance with Condition E103, subsequent post-construction surveys of the structure / asset must be undertaken by a suitably qualified and experienced engineer and/or building surveyor to assess damage that	Table 8-1 (NMR26)

CoA	Condition Requirements	Document Reference
	may have resulted from the vibration-generating works. The results of the post-construction surveys must be documented in a Post-Construction Condition Survey Report for each item surveyed. The Post-construction Condition Survey Reports must be provided to the owner of the structures/assets surveyed, and no later than four months following the completion of construction activities that have the potential to impact on the structure / asset.	
E105	Where damage has been determined to occur as a result of the CSSI, the Proponent must carry out rectification at its expense and to the reasonable requirements of the owner of the structure/asset within nine months of the completion of construction activities that have the potential to create damage unless another timeframe is agreed with the owner. Alternatively, the Proponent may pay compensation for the damage as agreed with the owner	Table 8-1 (NMR26, NMR41)

3.3. Revised Environmental Management Measures

Relevant REMMs are listed in Table 3-3. This includes reference to required outcomes, the timing of when the commitment applies and cross reference to indicate where the requirement is addressed in this Plan or other Project management documents.

Table 3-3: Revised environmental management measures relevant to this NVMP

Ref #	Outcome	Commitment	Timing	NVMP Reference
NV01	Construction noise and vibration management	A Construction Noise and Vibration Management Plan (CNVMP) would be prepared for the project to mitigate and manage noise and vibration impacts. The CNVMP would include:	Construction	This plan
		All potential significant noise and vibration generating activities associated with the activity	Construction	Sections 6.3 and 7
		Measures to be implemented during construction to minimise noise and vibration impacts, such as restrictions on working hours, respite periods, staging, placement and operation of ancillary facilities, temporary noise barriers, haul road maintenance, and controlling the location and use of vibration generating equipment	Construction	Table 5-1 and Section 8 Appendix D – Out of Hours Works Protocol
		Description of the approach that will be adopted for carrying out location and activity specific construction noise and vibration mitigation, to assist with designing and selecting of appropriate location-specific mitigation measures	Construction	Sections 7 and Table 8-1 Appendix D – Out of Hours Works Protocol
		A monitoring program to assess performance against relevant noise and vibration criteria	Construction	Section 9.4 Appendix C – Construction Noise and Vibration Monitoring Program
		Process for the implementation of respite periods to provide residents with respite from ongoing impact	Construction	Sections 5.2, 7, Table 8-1 (NMR05) and 8.2 Appendix D – Out of Hours Works Protocol
		Arrangements for consultation with affected receivers, including notification and complaint handling procedures	Construction	Sections 8.3 and 9.3 Table 8-1 (NMR02 and NMR04) Appendix C – Construction Noise and

Ref #	Outcome	Commitment	Timing	NVMP Reference
		Contingency measures to be implemented in the event of noncompliance with noise and vibration criteria.	Construction	Vibration Monitoring Program Communications Strategy Table 8-1 & 9.7 Appendix C – Construction Noise and Vibration Monitoring Program
NV02	Construction noise and vibration impacts	Where reasonable and feasible, implementation of recommended operational noise mitigation would be carried out within 12 months of construction activities commencing. If the mitigation cannot be implemented within 12 months of construction activities commencing, a request to the Planning Secretary for an extension to the timeframe must be accompanied by a report justifying why, along with details of temporary measures that would be implemented to reduce construction noise impacts, until such time that the operational noise mitigation measures are implemented. The report will be submitted to the Planning Secretary before the commencement of construction at the residences where the NML is exceeded. All temporary measures will be implemented within six months of the commencement of construction in the vicinity of the impacted residences.	Prior to Construction	Table 8-1 (NMR24)
NV03	Vibration impacts to residential and commercial structures	Where vibration generating activities will be carried out within minimum working distances for cosmetic damage as defined and/or developed in accordance with Transport's Construction Noise and Vibration Guideline, vibration monitoring will be carried out. Where monitoring indicates cosmetic damage criteria are exceeded, alternative low vibration work practices will be investigated and implemented.	Prior to Construction	Sections 6.3.2 and 7 Table 8-1 (NMR05, NMR26-NMR29 and NMR35)
NV04	Vibration impacts to utilities	Where works are within 25m of utilities and are predicted to generate vibration within minimum safe working distances consultation will be carried out with the relevant utility authorities to establish site specific mitigation measures to manage potential vibration impacts.	During Construction	Section 5.9.3 Table 8-1 (NMR39) Appendix C – Construction Noise and Vibration Monitoring Program
NV05	Vibration impacts to heritage structures	Heritage items within 100m of vibration intensive work are to be considered on a case-by-case basis and further investigation would be carried out during detailed design to confirm the structural integrity (i.e. structurally sound or unsound) of all potentially affected structures. Where items are considered sensitive to vibration, appropriate vibration criteria would be determined after detailed inspections have been completed.	Prior to Construction	Section 5.9.2 Table 8-1 (NMR29 and NMR32) Non-Aboriginal Heritage Management Plan Section 6
NV06	Blasting	If blasting is to be included as part of the construction work, the NVMP would include a Blast Management Plan (BMP). The BMP would be prepared in consultation with the EPA, demonstrating that all blasting and associated activities would be carried out in a manner that would not generate unacceptable noise and vibration impacts or pose a substantial risk of impact to residences and sensitive receivers.	During Construction	Sections 2.3 and 5.10 Table 8-1 (NMR30) Blast Management Strategy – to be prepared

Ref #	Outcome	Commitment	Timing	NVMP Reference
				separately to this NVMP, if blasting is required
NV09	Impacts from Out of Hours Works	An Out of Hours Work Procedure will be included as part of the NVMP. The procedure will follow the approach in Roads and Maritime Services' Construction Noise and Vibration Guideline (Roads and Maritime Services 2016b) and include, but not be limited to: • Details of works required outside standard construction hours and justifications of why the works are required outside standard construction hours • The noise and vibration impact assessment processes that will be followed to identify potentially affected receivers and clarify potential level of impacts • Details of the approval process (internal and external) for works proposed outside standard construction hours • Scheduling of noise intensive or high noise impact work to evening periods where feasible • Use of alternative plant and equipment and/or construction techniques to minimise noise • Notification and consultation requirements including preparation of a 'look ahead' program for likely out of hours work • Use of temporary noise barriers • Respite periods • Representative noise monitoring • Offers of reasonable and temporary alternative accommodation or an act of good will • Use of negotiated agreements • Community information sessions at regular intervals for residents or groups around the • Tarro interchange affected by longer periods of OOHW.	During construction	Section 5.2 Appendix D – Out of Hours Works Protocol
NV10	Construction noise impacts	Prior to construction, additional noise monitoring will be carried out to validate the Rating Background Levels adopted for the Project during construction.	During construction	Sections 4.4 and 5.8.1 Appendix F – Traffic Noise Monitoring Program and Monitoring Report
NA02	Hannell Family Vault	• A dilapidation survey will be carried out. • Barrier fencing will be erected between the construction project activities and vault structure.	Prior to construction	Table 8-1 (NMR26)
NA03	Glenrowan Homestead	• Archival photographic recording of Site 2 will be carried out prior to demolition. • Archaeological salvage excavation at Site 3 under the supervision of an Excavation Director, who meets the NSW Heritage Council criteria will be carried out prior to works proceeding. • A dilapidation survey will be carried out. • Architectural noise treatment at the main house at Site 1 would be sympathetic to the heritage values of the item.	Prior to construction	Table 8-1 (NMR26)
NA04	Residence, 29 Eastern Avenue, Tarro	• A dilapidation survey will be carried out. • Architectural noise treatment at the heritage residence would be sympathetic to the heritage values of the item.	Prior to construction	Table 8-1 (NMR26)
NA06	Tarro Substation and	• A dilapidation survey will be carried out for the Tarro Substation and Pumping Station.	Detailed design/ prior to	Table 8-1 (NMR26)

Ref #	Outcome	Commitment	Timing	NVMP Reference
	Pumping Station		construction/ construction	

3.4. Environment Protection License (EPL)

An EPL will be obtained for Project construction. On issue, the requirements of the EPL will be integrated into this Plan in accordance with change management process outlined in Section 4.13 of the CEMP.

4. Existing Environment

The following sections summarise what is known about factors influencing noise and vibration impacts and management associated with the Project, within and adjacent to the Project corridor.

4.1. Key Reference Documents

The key reference documents are detailed below:

- EIS Chapter 8
- EIS Appendix H – Noise and Vibration
- Submissions Report, Appendix D – Noise and Vibration Supplementary Report
- Submissions Report, Section 6.2 and 7.9
- Assessment Report, Section 6.6
- Relevant guidelines, specifications, and policy documents (Section 3.1 of this Plan).

4.2. Sensitive Receivers

Residential, non-residential, and commercial/industrial receivers have been identified in the study area and grouped into noise catchment areas (NCA) representing areas with similar acoustic environments. Fourteen NCAs have been identified and are described in Table 4-1 and shown on Figure 4-1. Appendix B shows further detail on the location of receivers in each of the NCAs.

Table 4-1: Noise catchment areas

Noise Catchment Area	Description
NCA01A	Located in Black Hill, directly to the west and east of the M1 Pacific Motorway and the Project. Rural residential receivers and a single non-residential receiver are located within this NCA. The noise environment is typically dominated by traffic noise from the M1 Pacific Motorway
NCA01B	Located in Black Hill, east of the M1 Pacific Motorway and south of the Project. Rural residential receivers are located within this NCA. The noise environment includes distant traffic noise from the M1 Pacific Motorway.
NCA02	Located in Beresfield, north of John Renshaw Drive and the Project. Commercial and industrial receivers and a single non-residential receiver are located within this NCA. The noise environment includes general industrial noise and traffic noise from John Renshaw Drive.
NCA03	Located in Beresfield, north of John Renshaw Drive and the Project. Commercial and industrial receivers are located within this NCA. The noise environment includes general industrial noise and traffic noise from the New England Highway.
NCA04A	Located in Beresfield and Tarro, directly to the north of the New England Highway and the Project. Suburban residential receivers and two non-residential receivers are located within this NCA. The noise environment is typically dominated by traffic noise from the New England Highway.
NCA04B	Located in Beresfield and Tarro, north of the New England Highway and the Project. Suburban residential receivers and two non-residential receivers are located within this NCA. The noise environment includes distant traffic noise from the New England Highway.
NCA5A	Located in Tarro, directly to the north of the New England Highway and the Project. Suburban residential receivers and some industrial receivers are located within this NCA. The noise environment includes traffic noise from the New England Highway.
NCA5B	Located in Beresfield and Tarro, north of the New England Highway and the Project. Suburban residential receivers and seven non-residential receivers are located within this NCA. The noise environment includes distant traffic noise from the New England Highway.
NCA06	Located in Woodberry, north and west of the New England Highway and the Project. Suburban residential receivers and two non-residential receivers are located within this NCA. The noise environment includes distant traffic noise from the New England Highway.
NCA07	Located in Black Hill and Tarro, directly south of the New England Highway and the Project. Two rural residential receivers and some industrial receivers are located within this NCA. The noise environment is dominated by traffic noise from the New England Highway.
NCA08	Located in Hexham, directly west of the New England Highway, east of the Pacific Highway and south of the Project. Four residential receivers and numerous commercial and industrial receivers are located within this NCA. The noise environment is dominated by general industrial noise and traffic noise from the New England Highway and Pacific Highway

Noise Catchment Area	Description
NCA09	Located in Tomago, directly south of the Pacific Highway and the Project. One residential receiver and a caravan park are located within this NCA. The noise environment is dominated by nearby industrial noise and traffic noise from the Pacific Highway.
NCA10	Located in Tomago, southeast of the Pacific Highway and the Project. Commercial and industrial receivers are located within this NCA. The noise environment includes general industrial noise and traffic noise from the Pacific Highway.
NCA11	Located in Tomago, east of the Pacific Highway and the Project. One non-residential receiver is located within this NCA. The noise environment is typically dominated by traffic noise from the Pacific Highway.
NCA14A	Located in Tarro, west of the Pacific Highway and the Project. Commercial and industrial receivers are located within this NCA. The noise environment dominated by traffic noise from the Pacific Highway.

Noise and vibration sensitive receivers within each NCA are generally separated into the following major categories:

- Residential receivers including caravan parks
- Other sensitive (non-residential) receivers including schools, places of worship, childcare centres, active recreations, and passive recreation areas
- Commercial premises including offices and retail outlets
- Industrial premises
- Utilities and services.

Sensitive receiver locations and figures showing their location can be found in Appendix B. Sensitive receivers will be reviewed during each revision of this Plan to determine if any new sensitive receivers have moved in during the period or if new properties are developed within 100m of construction boundary for potential noise or vibration impacts.

4.3. Existing Heritage Structures

Heritage within or near the construction footprint comprises Aboriginal and non-Aboriginal heritage. Non-Aboriginal heritage within or adjacent the construction footprint comprises above ground structures and below ground archaeological sites (Table 4-2), while Aboriginal heritage within the construction footprint comprises surface and subsurface (below ground) artefacts.

Table 4-2: Existing heritage structures within the construction footprint

NCA	Heritage item name	Location
NCA08	Hannell Family Vault (I179)	398B Maitland Road, Hexham
NCA04A	Residence (I548)	29 Eastern Avenue, Tarro
NCA04A	Tarro Substation (I546)	6A Anderson Drive, Tarro
NCA05A	Pumping Station (I550)	3 Woodberry Road, Tarro
NCA04B	Newcastle Crematorium (I34)	176 Anderson Drive, Beresfield
NCA04A	Our Lady of Lourdes Church (I547)	42 Anderson Drive, Tarro
NCA07	Glenrowan Homestead	51 New England Highway, Black Hill

Black Hill to Tomago

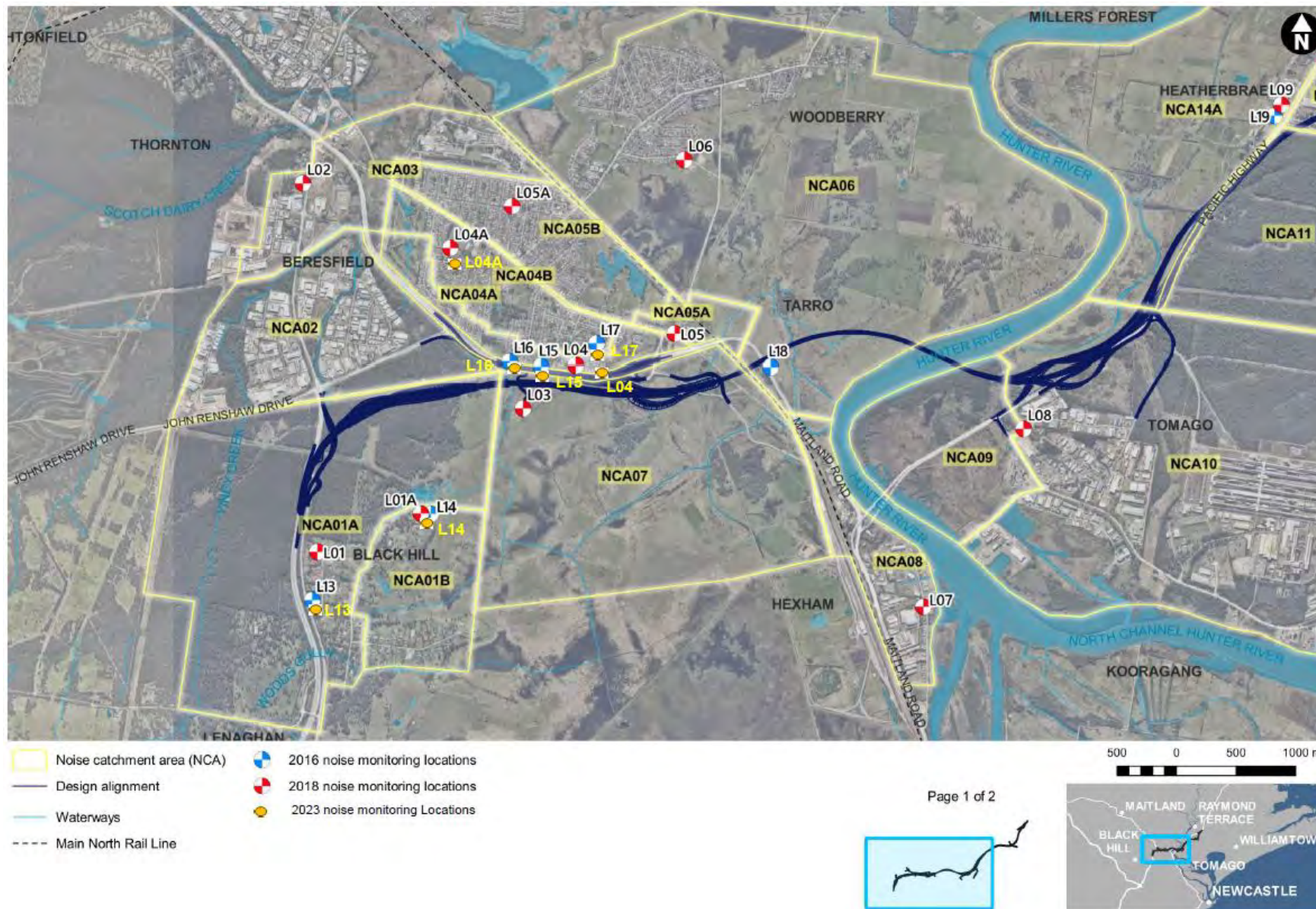


Figure 4-1: Noise catchment areas and monitoring locations

4.4. Ambient Noise

Noise monitoring was carried out by an independent and experienced noise specialist in areas where receivers may potentially be affected by construction noise from the Project. Noise monitoring was also carried out to determine the existing levels of road traffic noise along the Project corridor.

Long-term noise monitoring was carried out between June and July 2018 at nine locations (L01 to L09 with short-term noise measurements at three locations (L01A, L04A and L05A). The derived Rating Background Levels (RBL) were re-established in the Submissions Report from the levels presented in the EIS.

A peer review of background noise monitoring was also undertaken during the Planning Approval phase which reaffirmed the RBLs. The additional monitoring was undertaken as part of the overall Traffic Noise Monitoring Program (Appendix F) required under CoA E87. The results of the additional monitoring identified and recommended changes to RBLs at some locations due to the previous data being more than 5 years old. The adjusted levels are provided in Table 4-3.

Table 4-3: Ambient noise monitoring results and derived RBL

ID	NCA	Address	Measured RBL, dB (A) ¹		
			Day	Evening	Night
L01	NCA01A	23 Cahill Close, Black Hill	51	49	46
L01A	NCA01B	24 Walter Parade, Black Hill ²	37	38	36
L02	NCA03	54 Weakleys Drive, Beresfield	66	60	47
L04	NCA04A	1/15 Quarter Sessions Road, Tarro	51	49	41
L04A	NCA04B	22 Lenox Street, Beresfield ⁴	45	45	39
L05	NCA05A	11 Anderson Drive, Tarro	55	51	45
L05A	NCA05B	49 Beresford Avenue, Beresfield ⁴	41	38	35
L06	NCA06	61 Redbill Drive, Woodberry	38	36	34
L03	NCA07	51 New England Highway, Tarro	43	46	43
L07	NCA08	179 Old Maitland Road, Hexham	41	40	37
L08	NCA09	838 Tomago Road, Tomago	52	47	45
L09	NCA14A	2213 Pacific Highway, Heatherbrae	54	49	42

Notes:

1. Day (7am – 6pm), evening (6pm - 10pm) and night (10pm – 7am) periods as defined in the Traffic Noise Monitoring Program and Monitoring Report provided in Appendix F per (NPfI) (EPA 2017).

2. Background noise levels for locations L01A, L04A, L05A, L10A and L12 based on correlation with nominated long term monitoring locations with similar noise environments.

5. Project Noise and Vibration Criteria

5.1. Noise and vibration guidelines

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

- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- Assessing Vibration – A Technical Guideline (AVTG), Department of Environment and Conservation 2006
- The ANZECC, Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration.
- German Standard DIN4150-1999 Structural vibration Part 3: Effects of vibration on Structures (Deutsches Institute fur Normung, 1999)
- British Standard 7385: Part 2-1993 'Evaluation and measurement of vibration in buildings Part 2 (BSI, 1993).

Relevant elements of these documents are summarised and discussed in the following sections.

5.2. Construction work hours

Standard working hours for the Project are defined by CoA E64, E65 and E66. CoA E67 and E76 to E79 define when works may be conducted outside standard working hours. Table 5-1 below summarises the information that the CoA requires regarding construction working hours for the Project.

Table 5-1: Approved construction work hours

CoA	Construction Activity	Working hours applicable to Condition		
		Monday to Friday	Saturday	Sunday/ Public holiday
Work Hours				
E64	Works must be undertaken during the following hours:	7:00am to 6:00pm	8:00am to 5:00pm	No work
Highly Noise Intensive Work				
E65	Except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the same receiver must only be undertaken: (a) Between the hours of 8:00 am to 6:00 pm Monday to Friday (b) Between the hours of 8:00 am to 1:00 pm Saturday (c) If continuously, then not exceeding three hours, with a minimum cessation of work of not less than one hour. For the purposes of this condition, 'continuously' includes any period during which there is less than one hour between ceasing and recommencing any of the work.	8:00am to 6:00pm (plus respite)	8:00am to 1:00pm (plus respite)	No work
Variation to Work Hours				
E66	Notwithstanding Conditions E64 and E65 work may be undertaken outside the hours specified in any of the following circumstances (Refer Section 9.4 and Appendix D): (a) Safety and Emergencies, including: i. For the delivery of materials required by the NSW Police Force or other authority for safety reasons	6.00pm to 7.00am the following day	7.00am to 8.00am and 5.00pm Saturday to 8.00am Sunday	8.00am Sunday to 7.00am Monday (8.00am on public holidays until 7.00am on the following working day)

CoA	Construction Activity	Working hours applicable to Condition		
		Monday to Friday	Saturday	Sunday/ Public holiday
	ii. Where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm On becoming aware of the need for emergency work in accordance with Condition E66 (a)(ii), the Proponent must notify the ER, the Planning Secretary and the EPA of the reasons for such work. The Proponent must use best endeavours to notify all noise and/or vibration affected sensitive land user(s) of the likely impact and duration of those work. (b) Work that meets all of the following criteria: i. Construction that causes $L_{Aeq}(15 \text{ minute})$ noise levels: - No more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, or - No more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s); or ii. Construction that causes $L_{AFmax}(15 \text{ minute})$ noise levels no more than 15 dB(A) above the rating background level at any residence during the night-time; or iii. Work that causes: - Continuous or impulsive vibration values, measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), or - Intermittent vibration values measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006). (c) By Approval, including: i. Where different construction hours are permitted or required under an EPL in force in the CSSI; or ii. Works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E67; or iii. Negotiated agreements with directly affected residents and sensitive land user(s).			

Out-Of-Hours Work Protocol

E67	An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of Work which is outside the hours defined in Condition E64, and is not subject to an EPL. The Protocol must be prepared in consultation with the ER. The Protocol must provide: (a) Identification of low, medium and high risk activities and an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where:	6.00pm to 7.00am the following day	5.00pm Saturday to 8.00am Sunday	8.00am Sunday to 7.00am Monday (8.00am on public holidays)
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CoA	Construction Activity	Working hours applicable to Condition		
		Monday to Friday	Saturday	Sunday/ Public holiday
	i. The ER reviews all proposed out-of-hours activities and confirms their risk levels, ii. Low and medium risk activities can be approved by the ER, and iii. High risk activities are approved by the Planning Secretary; (b) A process for the consideration of out-of-hours work against the relevant NML and vibration criteria; (c) A process for selecting and implementing mitigation measures for residual impacts in consultation with the community at each affected location, including respite periods consistent with the requirements of Condition E77. The measures must take into account the predicted noise levels and the likely frequency and duration of the out-of-hours works that sensitive land use(s) would be exposed to, including the number of noise awakening events; (d) Procedures to facilitate the coordination of out-of-hours work including those approved by an EPL or undertaken by a third party, to ensure appropriate respite is provided; and (e) Notification arrangements for affected receivers for all approved out-of-hours work and notification to the Planning Secretary of approved low risk out-of-hours works. The Protocol must be submitted to and approved by the Planning Secretary before commencement of the out-of-hours work and implemented during Work which is outside the hours defined in Condition E64 and not subject to an EPL. Adherence to the Protocol does not apply if the requirements of Condition E66 (a) or (b) are met. Notes: 1. <i>Conditions E78 and E79 provide additional parameters to be considered.</i> 2. <i>If the Work is subject to an EPL and the EPA does not endorse extended hours as part of the EPL, the extended hours cannot be considered under this Protocol.</i> Refer to Appendix D.			
E76	All work undertaken for the delivery of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. The Proponent must: (a) reschedule any work to provide respite to impacted noise sensitive land use(s) so that the respite is achieved in accordance with Condition E77; or (b) consider the provision of alternative respite or mitigation to impacted noise sensitive land use(s) where respite outlined in Condition E77 cannot be achieved; and (c) provide documentary evidence to the ER in support of any decision made by the Proponent in relation to respite or mitigation. (c) The consideration of respite must also include all other CSSI, SSI and SSD projects which may	6.00pm to 7.00am the following day	5.00pm Saturday to 8.00am Sunday	8.00am Sunday to 7.00am Monday (8.00am on public holidays)

CoA	Construction Activity	Working hours applicable to Condition		
		Monday to Friday	Saturday	Sunday/ Public holiday
	cause cumulative and/or consecutive impacts at receivers affected by the delivery of the CSSI.			
E77	In order to undertake out-of-hours work outside the hours specified under Condition E64, the Proponent must identify appropriate respite periods for the out-of-hours work in consultation with the community at each affected location on a regular basis. This consultation must include (but not be limited to) providing the community with: (a) A progressive schedule for periods no less than three months, of likely out-of-hours work; (b) A description of the potential work, location and duration of the out-of-hours work; (c) The noise characteristics and likely noise levels of the work; and (d) Likely mitigation and management measures which aim to achieve the relevant noise management levels and vibration criteria under Condition E68 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers). The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hours work must be provided to the ER, EPA and the Planning Secretary for information prior to undertaking the work scheduled for the subject period. Notes: 1. <i>Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the rating background noise level at any residence.</i> 2. <i>Respite, relocation and other offers must be provided unconditionally.</i> 3. <i>Refer to Condition A8 in relation to consultation requirements and Table 1 - Terms and Definitions for the definition of 'consultation'.</i>	6.00pm to 7.00am the following day	5.00pm Saturday to 8.00am Sunday	8.00am Sunday to 7.00am Monday (8.00am on public holidays)
E78	Work outside the hours specified in Condition E64 along the New England and Pacific Highway corridors which result in an exceedance of the relevant NML at the same sensitive land use(s) can only be undertaken in accordance with the following: (a) Two consecutive evenings and/or nights per week; or (b) Three non-consecutive evenings and/or nights per week; or (c) 10 evenings and/or nights per month; or (d) Except as identified by an EPL; or (e) In accordance with an agreement with a potentially impacted receiver(s) as required by Condition E66(c)(iii).	-	-	-
E79	Mitigation measures such as temporary alternative accommodation or other agreed mitigation measures, must be offered/ made available to residents affected by out-of-hours work (including where utility works are being undertaken for the CSSI or under a road	10:00pm to 7:00am the following day	10:00pm Saturday to 8:00am Sunday	6:00pm Sunday and public holidays to 7:00am the following day unless that day is

CoA	Construction Activity	Working hours applicable to Condition		
		Monday to Friday	Saturday	Sunday/ Public holiday
	occupancy licence) where the construction noise levels between: (a) 10:00 pm and 7:00 am, Monday to Friday; (b) 10:00 pm Saturday to 8:00 am Sunday; and (c) 6:00 pm Sunday and public holidays to 7:00 am the following day unless that day is Saturday then to 8:00 am, Are predicted to exceed the NML by 25 dB(A) or are greater than 75 dBA (LAeq(15 min)), whichever is the lesser and the impact is planned to occur for more than two (2) nights over a seven (7) day rolling period. The NML must be reduced by 5 dB where the noise contains annoying characteristics and may be increased by 10 dB if the property has received at-property acoustic treatment. The noise levels and duration requirements identified in this condition may be changed through an EPL applying to the CSSI.			a Saturday, then it is to 8:00am
Utility Coordination and Respite				
E76	All work undertaken for the delivery of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. The Proponent must: (a) Reschedule any work to provide respite to impacted noise sensitive land use(s) so that the respite is achieved in accordance with Condition E77; or (b) Consider the provision of alternative respite or mitigation to impacted noise sensitive land use(s) where respite outlined in Condition E77 cannot be achieved; and (c) Provide documentary evidence to the ER in support of any decision made by the Proponent in relation to respite or mitigation. The consideration of respite must also include all other CSSI, SSI and SSD projects which may cause cumulative and/or consecutive impacts at receivers affected by the delivery of the CSSI.	-	-	-
Blasting				
E81	Blasting associated with the CSSI must only be undertaken during the following hours: (a) 9:00 am to 5:00 pm, Monday to Friday, inclusive; (b) 9:00 am to 1:00 pm on Saturday; and (c) At no time on Sunday or public holidays; or (d) As authorised through an EPL. This condition does not apply in the event of a direction from the NSW Police Force or other relevant authority for safety or emergency reasons to avoid loss of life, property loss and/or to prevent environmental harm.	9:00am to 5:00pm	9:00am to 1:00pm	At no time on Sunday or public holidays

5.3. Construction noise and assessment objectives

The DECC Interim Construction Noise Guideline (ICNG, July 2009) 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.

5.4. Quantitative noise assessment criteria

The ICNG provides an approach for determining the construction NMLs for residential receivers and other sensitive land uses based on the measured Rating Background Level (RBL).

The ICNG establishes "Noise affected" and a "Highly noise affected" construction NMLs to determine the noise management requirements necessary to minimise the construction noise impacts upon noise sensitive residential receivers and other sensitive land uses across the respective noise periods.

Table 5-2 summarises the approach for development of construction NMLs for residential receivers for the respective periods relating to approved construction hours.

Table 5-2: Development of construction NMLs for residential receivers

Time of day	Construction NMLs ¹ LAeq(15 min)	How to apply
Recommended standard hours: • Monday to Friday 7am to 6pm • Saturday 8am to 1pm • No work on Sundays or public holidays	Noise affected RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq(15 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.
Standard construction hours and outside of standard construction hours	Highly noise affected 75dB(A)	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: • 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 + 5dB	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 5dB(A) above the noise affected level, the proponent should negotiate with the community. The process for justification, assessment, and approval for out-of-hours-work (OOHW) is detailed in the OOHW Protocol, for additional guidance on negotiating agreements see Section 7.2.2 of the ICNG.

¹ Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m 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.

Table 5-3 and Table 5-4 set out the NMLs for other noise-sensitive receiver locations located within the construction study area. These NMLs are absolute levels and are independent of the existing background and ambient noise environment.

Table 5-3: Construction noise management level at non-residential sensitive receivers

Receiver / Land Use	Management level, LAeq(15min) (applies when properties are in use or occupied)
Classrooms at schools and other educational institutions	Internal noise level – 45 dB(A)
Hospital wards and operating theatres	Internal noise level – 45 dB(A)
Places of worship	Internal noise level – 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level – 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level – 65 dB(A)

Table 5-4: Construction Noise Management level at commercial/industrial receivers

Receiver / Land Use	Management level, LAeq(15min) (applies when properties are in use or occupied)
Industrial premises	External noise level – 75 dB(A)
Commercial premises	External noise level – 70 dB(A)

5.5. Ground-borne noise

Ground-borne or regenerated noise as a result of construction activities is usually associated with vibration generating equipment, such as rock hammers, operating near buildings / structures. Table 5-5 summarises the CNVG ground-borne construction noise objectives for residential receptors during the evening and night periods, which are consistent with the ICNG.

Table 5-5: Ground-borne noise objectives at residential premises

Period	Time	Internal LAeq(15min) ground-borne noise management level
Evening	6:00pm to 10:00pm	40 dB(A)
Night	10:00pm to 7:00am	35 dB(A)

5.6. Sleep disturbance

The ICNG (DECC 2009) states that where construction work is planned to extend over more than two consecutive nights, assessment of the maximum noise levels and the extent and number of times the maximum noise level exceeds the rating background levels should be carried out.

The Noise Policy for Industry (NPfI) (EPA 2017) recommends that where the subject development/premises night-time noise levels at a residential location exceed:

- LAeq(15min) 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- LA(max) 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,

a more detailed analysis is required.

The NPfI recommends that for a residence, the project noise trigger level and maximum noise levels are to be assessed at the reasonably most-affected point on or within the residential property boundary or, if that is more than 30 metres from the residence, at the reasonably most affected point within 30 metres of the residence, but not closer than 3 metres to a reflective surface and at a height of between 1.2–1.5 metres above ground level.

The ICNG (DECC 2009 and CNVG 2019) also refers to the Environmental Criteria for Road Traffic Noise (EPA, 1999) for more guidance on sleep disturbance from maximum noise level events. This guideline has since been superseded by the RNP (DECCW 2011). Both guidelines discuss research into the effects of maximum noise level events on sleep disturbance and conclude that the LAmax or LA1(1min) should not exceed the ambient LA90(15min) noise level by more than 15 dB(A). This considers the emergence of noise events but does not directly limit the number of such events or their highest level, which are also found to affect sleep disturbance.

The RNP (DECCW 2011) provides further guidance as follows:

- Maximum internal noise levels below 50–55 dB(A) are unlikely to cause awakening reactions.
- One or two noise events per night with maximum internal noise levels of 65 to 70 dB(A) are not likely to significantly affect health and wellbeing.

Accordingly, the background level plus 15 dB(A) has been applied as the screening level trigger for sleep disturbance.

5.7. Construction traffic noise

The RNP (DECCW 2011) provides traffic noise target levels for receivers near existing roads (refer Table 5-6). These levels are applied to construction work to identify potential construction traffic impacts and the subsequent need for reasonable and feasible mitigation measures.

The Application Notes for the RNP state that ‘for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.’

If road traffic noise during construction is within 2 dB(A) of current levels, then the objectives of the RNP (DECCW 2011) are met and no specific mitigation measures are required.

Table 5-6: Construction traffic noise criteria, LAeq(period) dBA

Type of development	Day 7:00 am to 10:00 pm	Night 10:00 pm to 7:00 am
Existing residence affected by additional traffic on arterial roads generated by land use developments	60 LAeq(15hr)	55 LAeq(9hr)
Existing residence affected by additional traffic on local roads generated by land use developments	55 LAeq(1hr)	50 LAeq(1hr)
1. School classrooms	LAeq,1hour 40 (internal) when in use	-
2. Hospital wards	LAeq,1hour 35 (internal) when in use	LAeq,1hour 35 (internal) when in use
3. Places of worship	LAeq,1hour 40 (internal) when in use	LAeq,1hour 40 (internal) when in use
4. Open space (active use)	LAeq,15hour 60 (external) when in use	-
5. Open space (passive use)	LAeq,15hour 55 (external) when in use	-
6. Child Care Facilities	Sleeping rooms LAeq,1hour 35 (internal) Indoor play areas LAeq,1hour 40 (internal) Outdoor play areas LAeq,1hour 55 (external)	-
7. Aged care facilities	Assessed as residential receivers	Assessed as residential receivers

5.8. Adopted project noise management levels

5.8.1. Construction noise management levels

The Project-specific construction noise management levels (NMLs) and sleep disturbance screening levels for each NCA have been determined in accordance with the results of the noise monitoring and the CNVG criteria.

The Project undertook additional noise monitoring by an independent noise specialist in accordance with NV10, as part of the wider Traffic Noise Monitoring Program (Appendix F). The re-established NMLs from the Traffic Noise Monitoring Program for each NCA are presented in Table 5-7 and will be applied for construction.

Residential receivers are considered 'noise affected' where construction noise levels are greater than the NMLs. The noise affected level represents the point above which there may be some community reaction to noise. If construction noise is equal to or above LAeq(15 minute) 75 dB(A) at any residence

at any time, that residential receiver is considered to be highly noise affected. Where predicted and/or measured construction noise levels exceed NMLs, feasible and reasonable noise mitigation and/or management measures, as presented in the CNVG, would be considered in order to meet the NMLs.

Table 5-7: Noise management levels for residential sensitive receivers

NCA ¹	Monitoring Location	LAeq(15 minute) NML, dB(A)				Sleep disturbance screening level (RBL + 15dB) ⁶
		Standard hours (RBL + 10dB) Day ²	Extended / out of hours (RBL + 5dB)			
			Day ³	Evening ⁴	Night ⁵	
NCA01A	L01	61	56	54	51	61
NCA01B	L01A	47	42	43	41	51
NCA03	L02	76	65	65	52	62
NCA04A	L04	61	56	54	46	56
NCA04B	L04A	55	50	50	44	54
NCA05A	L05	65	60	56	50	60
NCA05B	L05A	51	46	43	40	50
NCA06	L06	48	43	41	39	49
NCA07	L03	53	48	51	48	58
NCA08	L07	51	46	45 ⁷	42 ⁷	52
NCA09	L08	62	57	52	50	60
NCA14A	L09	64	59	54	47	57

Notes:

1. NCA02, NCA10 and NCA11 comprise of commercial and industrial type receivers and are not presented in this table
2. Day standard construction hours: 7.00am to 6.00pm Monday to Friday and 8.00am to 5.00pm Saturday
3. Day out-of-hours: 5.00pm to 6.00pm on Saturday and 8.00am to 6.00pm on Sundays and public holidays
4. Evening: 6.00pm to 10.00pm Monday to Saturday.
5. Night: 10.00pm to 7.00am Monday to Friday, 10.00pm Friday to 8.00am Saturday, 6.00pm to 8.00am Sundays, and Public Holidays.
6. Sleep disturbance assessed for night time period only
7. Where the evening RBL is higher than the day RBL, the day RBL is adopted. Where the night RBL is higher than the evening RBL, the evening RBL is adopted
8. Caravan parks assessed as residential type receivers.

5.9. Vibration criteria

5.9.1. Human comfort

Vibration limits to minimise impacts on human comfort are presented in the Noise and Vibration Assessment (NVA) in accordance with Assessing Vibration – A Technical Guideline (DEC, 2006) (AVTG). AVTG presents limits (vibration dose values), above which there is considered to be a risk that the amenity and comfort of people occupying buildings would be adversely affected by construction work.

The applicable criteria for intermittent vibration are shown in Table 5-8 as vibration dose value ($\text{m/s}^{1.75}$). The vibration guideline also specifies limits for continuous and impulsive vibration. These vibration limits are expressed in acceleration (m/s^2) and peak particle velocity (mm/s) as presented in Appendix C of the AVTG and reproduced in Table 5-9.

Table 5-8: Vibration limits for human exposure from intermittent vibration

Location	Assessment Period ¹	Vibration Dose Value ($\text{m/s}^{1.75}$) ²	
		Preferred value	Maximum value
Residences	Daytime ¹	0.2	0.4
	Night-time	0.13	0.26

Location	Assessment Period ¹	Vibration Dose Value (m/s ^{1.75}) ²	
		Preferred value	Maximum value
Offices, schools, educational institutions, and places of worship	Anytime	0.4	0.8
Workshops	Anytime	0.8	1.6

¹ Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am

² Preferred and maximum levels for human comfort (intermittent vibration) (Metres per second)

Table 5-9: Preferred and maximum values for continuous and impulsive vibration

Location	Assessment Period ¹	² RMS Acceleration m/s ³				³ Peak Particle Velocity mm/s	
		Preferred values		Maximum values		Preferred values	Preferred values
		Z axis	X & Y axes	Z axis	X & Y axes		

Continuous Vibration

Critical areas	Daytime or night-time	0.0050	0.0036	0.010	0.0072	0.14	0.28
Residences	Daytime ⁴	0.010	0.0071	0.020	0.014	0.28	0.56
	Night-time	0.007	0.005	0.014	0.010	0.20	0.40
Offices, schools, educational institutions, and places of worship ⁴	Daytime or night-time	0.020	0.014	0.040	0.028	0.56	1.1
Workshops	Day or night-time	0.04	0.29	0.080	0.0058	1.1	2.2

Impulsive vibration

Critical areas	Day or night-time	0.0050	0.0036	0.010	0.0072	0.14	0.28
Residences	Daytime ⁴	0.3	0.21	0.60	0.42	8.6	17.0
	Night-time	0.10	0.071	0.20	0.14	2.8	5.6
Offices, schools, educational institutions, and places of worship ⁴	Daytime or night-time	0.64	0.46	1.28	0.92	18.0	36.0
Workshops	Daytime or night-time	0.64	0.46	1.28	0.92	18.0	36.0

¹ Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am

² Values derived from z-axis critical frequency range

³ Values given for the most critical frequency range >8 Hz assuming sinusoidal motion. Where required, a more detailed analysis can be conducted as per AS 2670.2-1990.

⁴ Sufficient justification should accompany the use of a peak velocity approach if used in an assessment.

⁵ Specific values depend on social and cultural factors, psychological attitudes and expected degree of intrusion.

5.9.2. Cosmetic and structural building damage

Vibration from construction has the potential to lead to cosmetic and structural building damage. Cosmetic damage is regarded as minor in nature, as it is readily repairable and does not affect a building's structural integrity. Damage of this nature is typically described as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks, and separation of partitions or intermediate walls from load bearing walls.

If the relevant threshold for cosmetic damage is unlikely to be exceeded, then structural damage is not considered a significant risk and is not further assessed.

Heritage items are considered on a case-by-case basis, and care should be taken as these structures can be difficult to repair in the case of damage. Where a structure is found to have defects, or is

structurally unsound following an inspection, maximum vibration criteria are to be established for that specific structure for construction work to not further damage the structure.

Where vibration causing activities are identified to have the potential to impact on heritage item vibration testing will be undertaken before and during vibration generating activities in accordance with British Standard BS 7385: Part 2-1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground-borne vibration (BSI 1993) to confirm that the safe working distances determined following a structural assessment are adequate. If vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the construction methodology will be reviewed and, if necessary, additional mitigation measures will be implemented.

Vibration limits for cosmetic and structural damage caused by vibration is outlined in the NVA in line with German Standard DIN 4150 (1999) Part 3: Structural Vibration in Buildings: Effects on Structures. These limits are summarised in Table 5-10 and Table 5-11.

Table 5-10: Recommended vibration limits for cosmetic damage

Type of Structure	Guideline values for velocity, v_i , in mm/s, of vibration in horizontal plane of highest floor, at all frequencies ¹
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	10
Dwellings and buildings of similar design and/or occupancy	5
Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order)	2.5

¹ If a building is subjected to harmonic vibration, then the maximum values can also occur in floors other than the top floor, or in the foundation. The values given in the table also apply in these cases.

Table 5-11: Recommended vibration limits for short-term vibration on structures

Type of structure	Guideline values for velocity, v_i , in mm/s		
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz ¹
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50
Dwellings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20
Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order)	3	3 to 8	8 to 10

¹ At frequencies above 100 Hz, the values given in this column may be used as a minimum value.

5.9.3. Other vibration sensitive structures and utilities

Vibration impacts from construction has the potential to affect services and utilities such as tunnels, buried pipelines, and fibre optic cables. Specific vibration criteria would be determined on a case-by-case basis. Where these utilities are encountered, the structure or utility's owner will be consulted to determine acceptable vibration levels in accordance with REMM NV04. In lieu of specific criteria, the NVA provides limits for short term vibration on these structures/utilities based on guidance in *German Standard DIN 4150 (1999) Part 3: Structural Vibration in Buildings: Effects on Structures*. These limits are reproduced in Table 5-12.

Table 5-12: Guideline values for vibration velocity to be used when evaluating the effects of vibration on buried pipework

Pipe Material	Guideline values for velocity measured on the pipe, v_i , in mm/s
Steel (including welded pipes)	100
Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80
Masonry, plastic	50

5.10. Blast criteria

If blasting is proposed, the relevant blast criteria will be outlined in a Blast Management Strategy, which will be finalised and submitted to the DPE for information no later than one month prior to the commencement of blasting as required by E81, E82, E83, E84 and E85. Upon approval of the Blast Management Strategy, this Plan will be updated accordingly.

6. Environmental Aspects and Impacts

6.1. Construction Activities

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.

6.2. Key Construction Activities

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.

6.3. 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
- Characteristics and intrusiveness of sound
- The number of equipment simultaneously in use
- Ground condition
- Topography and other physical barriers
- Proximity to sensitive receivers
- The physical condition of sensitive receiver structure
- Hours/duration of construction works
- Existing background noise.

Relevant aspects and the potential for related impacts have been considered in a risk assessment in Appendix A2 of the CEMP.

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

6.3.1. Construction Noise

Key aspects of the Project that could result in noise and vibration emissions have been characterised by peak impact and intrusiveness at the nearest sensitive receiver. The intrusiveness of an activity is determined using the criteria identified in Appendix C of the CNVG. These are detailed in Table 6-1. The key findings of the Project noise assessment are as per the below sections. The list of plant and equipment and their SWLs input into the model to produce the below noise predictions are contained in Appendix E.

Table 6-1: Level of impact of key construction activities

Clearly audible, low vibration	Moderately noise and vibration intrusive	Highly noise and vibration intrusive
• Ancillary facility – operation • Bulk earthwork – cuttings in soft soils • Concrete pavement (including pavement drainage) • Traffic management and control	• Ancillary facility and site establishment • Bridge work (excluding piling) • Roadside furniture and finishing work • Traffic management and control • Cross drainage • Piling for bridges and bridge approaches • Utility relocations and installations	• Clearing, grubbing, and demolition • Utility work • Piling for bridges and bridge approaches • Bulk earthwork – cuttings hard soil/rock • Intersection realignment

6.3.1.1. Impacts during standard construction hours – residential receivers

Seventeen representative construction scenarios were developed for the EIS as summarised in Table 6-2. Construction scenarios for the assessment of noise impacts were based on a 'realistic worst-case' scenario to determine the impacts from the noisiest 15-minute period that is likely to occur for each scenario, in accordance with the ICNG. The scenarios have been assessed as 'peak impact' or 'typical impact' work, where 'peak impact' work includes the use of noise intensive equipment like rock-breakers or concrete saws, and 'typical impact' work represents typical noise emissions from the Project when noise intensive equipment is not in use. Appendix E of this Plan provides a list of typical

plant and equipment, extracted from Appendix C1 of the Appendix H – Noise and Vibration (Part 2) of the EIS, required for the Project and correlating sound power levels. When undertaking subsequent noise assessments sound power level (SWLs) and their associated references will be detailed within the noise modelling report.

Table 6-2: Construction scenarios and associated plant and equipment

ID	Scenario	Indicative duration (months)	Comments
1	Pre-construction and site establishment	20	Carried out during the day period and evening and night out of hours. Out of hours work includes infrequent Road Occupancy Licence (ROL) work for road connections.
2	Ancillary facility (establishment)	13	As above.
3	Ancillary facility (operation)	50	The operation of some ancillary facilities would be carried out during the day period and would also include evening and night out of hours work.
4	Batch plant operation	7	As above.
5	Clearing, grubbing and demolition	21	Typically carried out during day period*, however some infrequent evening and night out of hours work would be required for work associated with the existing road network.
6	Utility work	40	Carried out during the day period with evening and night out of hours work limited to utility work associated with the existing road network and shutdowns for work on operational assets
7	Bulk earthwork (cuttings)	10	Typically carried out during day period.
8	Blasting	10	Carried out during day period.
9	Bulk earthwork (fill)	40	Typically carried out during day period.
10	Concrete pavement (including pavement drainage)	24	Carried out during the day period with evening and night out of hours work limited to tie-in to existing road network or infrequent out of hours work periods for extended concrete pours.
11	Asphalt pavement (including pavement drainage)	28	Carried out during the day period with evening and night out of hours work limited to widening and tie-in to existing road network or infrequent out of hours work periods for extended asphalt laying.
12	Bridge work (excluding piling)	26	Carried out during the day period with evening and night out of hours work required for extended concrete pours, work near existing road and rail network, and where the work does not cause noise emissions to be audible at sensitive receivers.
13	Piling for bridges and bridge approaches	23	Carried out during the day period with evening and night out of hours work limited to work on existing road network.
14	Roadside furniture and finishing work	28	Carried out during the day period with evening and night out of hours work limited to where works are required to be carried out on existing road network.
15	Traffic management and control	26	Traffic management and control for all day period and out of hours work on existing road network.
16	Landscaping	11	Typically carried out during day period.
17	Cross drainage	17	Carried out during the day period with evening and night out of hours work limited to installation of cross drainage beneath the existing road network.

The highest impacts are during ‘peak impact’ activities, which is due to all plant and equipment assessed as operating concurrently, including noise intensive equipment such as rock hammers or concrete saws. For most scenarios, the ‘peak impact’ activities would only occur for a relatively short period. Noise levels during the ‘typical impact’ activities would be lower, impact fewer receivers, and are more indicative of the typical construction noise impacts experienced by receivers.

The highest impacts at residential receivers are generally in catchments where receivers are located close to the construction footprint. This includes NCA04A and NCA08, which are directly to the north and west of the construction footprint, respectively. Receivers in NCA04A are within suburban areas and are densely distributed, resulting in a relatively large number of receivers being impacted by construction noise in this NCA.

'Highly intrusive' noise levels (i.e. greater than 20 dB exceedance) are predicted in NCA04A during clearing, grubbing and demolition work, utility work and bridge piling work during 'peak impact' activities. This is due to residential receivers in NCA04A being close to the construction footprint at the Tarro Interchange.

Noise impacts from batch plant operations (concrete and asphalt), bulk earthwork (fill) and asphalt pavement work are not predicted to exceed the NMLs at any residential receiver during peak or typical impact activities.

Noise impacts from bulk earthwork (cuttings) and concrete pavement work are not predicted to exceed the NMLs at any residential receivers during typical activities.

Clearing, grubbing and demolition work, and utility work generally impact the highest amount of residential receivers and have the highest exceedances. This is because this work would be carried out over the entire length of the Project.

Construction noise impacts are predicted to be 'Noticeable' (i.e. no exceedance of NML) at all residential receivers in NCA01A, NCA03, NCA05B and NCA06 for all construction work scenarios during standard construction work hours.

Table 6-3 shows the maximum predicted construction noise impacts during standard daytime hours at residential receivers and Table 6-4 shows the likely subjective perception from receivers.

Table 6-3: Predicted maximum LAeq(15 minute) construction noise levels - standard daytime (7:00am to 6:00pm Mondays to Fridays, inclusive and 8:00am to 5:00pm Saturdays) – residential receivers

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
1	Pre-construction and site establishment	Peak impact	59	46	37	87	61	58	49	36	64	55	68	63
		Typical impact	51	39	30	79	53	50	41	<30	56	47	60	56
2	Ancillary facility – establishment	Peak impact	44	46	38	80	63	61	46	37	72	71	57	61
		Typical impact	36	38	30	72	55	54	38	30	64	63	50	53
3	Ancillary facility – operation	Peak impact	37	40	32	74	56	55	40	31	65	65	51	54
		Typical impact	34	37	<30	71	53	52	37	<30	62	62	48	51
4A	Batch plant operation (concrete batch plant)	Peak impact	34	42	30	51	47	49	40	35	54	45	51	45
		Typical impact	31	38	<30	48	44	46	37	32	50	42	48	41
4B	Batch plant operation (asphalt batch plant)	Peak impact	36	43	31	53	49	51	41	36	55	46	52	46
		Typical impact	<30	36	<30	46	42	44	34	<30	48	40	46	39
5	Clearing, grubbing, and demolition	Peak impact	61	48	39	89	62	60	51	38	66	57	70	65
		Typical impact	59	46	37	87	60	58	49	36	64	55	68	63

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
6	Utility work	Peak impact	60	47	38	88	61	59	50	37	65	56	69	64
		Typical impact	59	46	37	87	60	58	49	36	64	55	68	63
7	Bulk earthwork – cuttings	Peak impact	61	48	39	64	59	51	48	36	50	42	58	65
		Typical impact	56	44	35	60	54	47	44	32	45	38	53	61
9	Bulk earthwork – fill	Peak impact	57	45	36	60	55	52	46	33	54	38	54	62
		Typical impact	54	42	33	58	52	49	43	31	52	36	52	59
10	Concrete pavement (including pavement drainage)	Peak impact	45	44	37	63	56	54	47	36	65	45	58	65
		Typical impact	41	39	33	59	52	49	43	31	61	40	54	61
11	Asphalt pavement (including pavement drainage)	Peak impact	41	39	33	66	55	50	45	33	53	41	58	42
		Typical impact	39	37	31	64	53	48	43	31	51	39	56	40
12	Bridge work (excluding piling)	Peak impact	56	43	34	84	57	55	46	33	53	52	65	51
		Typical impact	53	41	32	81	55	52	43	30	51	50	63	48
13	Piling for bridges and bridge approaches	Peak impact	61	48	39	89	62	60	51	38	58	57	70	56
		Typical impact	55	42	33	82	56	54	45	32	52	51	64	49
14	Roadside furniture and finishing work	Peak impact	55	43	34	83	57	54	45	32	60	52	65	60
		Typical impact	50	37	<30	78	51	49	40	<30	55	46	59	54
15	Traffic management and control	Peak impact	44	31	<30	72	45	43	34	<30	49	40	53	48
		Typical impact	44	31	<30	72	45	43	34	<30	49	40	53	48
16	Landscaping	Peak impact	55	42	33	83	56	54	45	32	60	51	64	59
		Typical impact	49	37	<30	77	51	48	39	<30	54	46	59	54
17	Cross drainage	Peak impact	54	42	33	82	56	53	44	31	59	50	63	59
		Typical impact	53	40	31	81	54	52	43	30	58	49	62	57

* NCA02, NCA10 and NCA11 comprise of commercial and industrial receivers and hence, are not included this table

Table 6-4: Predicted construction noise perception - standard daytime (7:00am to 6:00pm Mondays to Fridays, inclusive and 8:00am to 5:00pm Saturdays) – residential receivers

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
0 Noticeable (no exceedance)			● Clearly audible (1 dB to 10 dB)			◆ Moderately intrusive (11 dB to 20 dB)			■ Highly intrusive (> 20 dB)					
1	Pre-construction and site establishment	Peak impact	○	○	○	◆	●	○	○	○	●	●	●	●
		Typical impact	○	○	○	◆	○	○	○	○	○	○	○	○
2	Ancillary facility – establishment	Peak impact	○	○	○	◆	●	○	○	○	○	◆	○	○
		Typical impact	○	○	○	●	○	○	○	○	○	◆	○	○
3	Ancillary facility – operation	Peak impact	○	○	○	●	○	○	○	○	○	◆	○	○
		Typical impact	○	○	○	●	○	○	○	○	○	◆	○	○
4A	Batch plant operation (concrete batch plant)	Peak impact	○	○	○	○	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
4B	Batch plant operation (asphalt batch plant)	Peak impact	○	○	○	○	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
5	Clearing, grubbing, and demolition	Peak impact	○	○	○	■	●	○	○	○	●	●	●	●
		Typical impact	○	○	○	◆	●	○	○	○	●	●	●	●
6	Utility work	Peak impact	○	○	○	■	●	○	○	○	●	●	●	●
		Typical impact	○	○	○	◆	●	○	○	○	●	●	●	●
7	Bulk earthwork – cuttings	Peak impact	○	○	○	○	●	○	○	○	○	○	○	●
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
9	Bulk earthwork – fill	Peak impact	○	○	○	○	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
10	Concrete pavement (including pavement drainage)	Peak impact	○	○	○	○	○	○	○	○	●	○	○	●
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
11	Asphalt pavement (including pavement drainage)	Peak impact	○	○	○	○	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
12	Bridge work (excluding piling)	Peak impact	○	○	○	◆	●	○	○	○	○	●	●	○
		Typical impact	○	○	○	◆	○	○	○	○	○	○	○	○
13	Piling for bridges and bridge approaches	Peak impact	○	○	○	■	●	○	○	○	○	●	●	○
		Typical impact	○	○	○	◆	○	○	○	○	○	○	●	○
14	Roadside furniture and finishing work	Peak impact	○	○	○	◆	●	○	○	○	○	○	●	○
		Typical impact	○	○	○	◆	○	○	○	○	○	○	○	○
15	Traffic management and control	Peak impact	○	○	○	●	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	●	○	○	○	○	○	○	○	○
16	Landscaping	Peak impact	○	○	○	◆	○	○	○	○	○	○	●	○
		Typical impact	○	○	○	●	○	○	○	○	○	○	○	○
17	Cross drainage	Peak impact	○	○	○	◆	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	◆	○	○	○	○	○	○	○	○

* NCA02, NCA10 and NCA11 comprise of commercial and industrial receivers and hence, are not included this table

6.3.1.2. Impacts during out of hours work – residential receivers

Similar to impacts during ‘standard working hours’ and ‘extended hours’, the highest impacts are during the ‘peak impact’ activities, however for most scenarios, the ‘peak impact’ activities would only occur for a relatively short period. Noise levels during the ‘typical impact’ activities would be lower, impact fewer receivers, and are more indicative of the typical construction noise impacts experiences by receivers.

The highest impacts at residential receivers are generally in catchments where receivers are located close to the construction footprint. This includes NCA04A and NCA04B, which are directly to the north of the New England Highway at Tarro. This includes ‘highly intrusive’ noise levels.

Table 6-5 and Table 6-6 show the predicted construction noise impacts during daytime out of hours and the likely subjective perception from receivers. Table 6-5 and Table 6-8 show the predicted construction noise impacts during the evening period and the likely subjective perception from receivers. Table 6-9 and Table 6-10 show the predicted construction noise impacts during the night time period and the likely subjective perception from receivers.

Table 6-5: Predicted maximum LAeq(15 minute) construction noise levels *daytime out of hours (8:00am – 5:00pm Sundays and public holidays)* – residential receivers

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
1	Pre-construction and site establishment	Peak impact	59	46	37	87	61	58	49	36	64	55	68	63
		Typical impact	51	39	30	79	53	50	41	<30	56	47	60	56

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
2	Ancillary facility – establishment	Peak impact	44	46	38	80	63	61	46	37	72	71	57	61
		Typical impact	36	38	30	72	55	54	38	30	64	63	50	53
3	Ancillary facility – operation	Peak impact	37	40	32	74	56	55	40	31	65	65	51	54
		Typical impact	34	37	<30	71	53	52	37	<30	62	62	48	51
4A	Batch plant operation (concrete batch plant)	Peak impact	34	42	30	51	47	49	40	35	54	45	51	45
		Typical impact	31	38	<30	48	44	46	37	32	50	42	48	41
4B	Batch plant operation (asphalt batch plant)	Peak impact	36	43	31	53	49	51	41	36	55	46	52	46
		Typical impact	<30	36	<30	46	42	44	34	<30	48	40	46	39
5	Clearing, grubbing, and demolition	Peak impact	61	48	39	89	62	60	51	38	66	57	70	65
		Typical impact	59	46	37	87	60	58	49	36	64	55	68	63
6	Utility work	Peak impact	60	47	38	88	61	59	50	37	65	56	69	64
		Typical impact	59	46	37	87	60	58	49	36	64	55	68	63
7	Bulk earthwork – cuttings	Peak impact	61	48	39	64	59	51	48	36	50	42	58	65
		Typical impact	56	44	35	60	54	47	44	32	45	38	53	61
9	Bulk earthwork – fill	Peak impact	57	45	36	60	55	52	46	33	54	38	54	62
		Typical impact	54	42	33	58	52	49	43	31	52	36	52	59
10	Concrete pavement (including pavement drainage)	Peak impact	45	44	37	63	56	54	47	36	65	45	58	65
		Typical impact	41	39	33	59	52	49	43	31	61	40	54	61
11	Asphalt pavement (including pavement drainage)	Peak impact	41	39	33	66	55	50	45	33	53	41	58	42
		Typical impact	39	37	31	64	53	48	43	31	51	39	56	40
12	Bridge work (excluding piling)	Peak impact	56	43	34	84	57	55	46	33	53	52	65	51
		Typical impact	53	41	32	81	55	52	43	30	51	50	63	48
13	Piling for bridges and bridge approaches	Peak impact	61	48	39	89	62	60	51	38	58	57	70	56
		Typical impact	55	42	33	82	56	54	45	32	52	51	64	49

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
14	Roadside furniture and finishing work	Peak impact	55	43	34	83	57	54	45	32	60	52	65	60
		Typical impact	50	37	<30	78	51	49	40	<30	55	46	59	54
15	Traffic management and control	Peak impact	44	31	<30	72	45	43	34	<30	49	40	53	48
		Typical impact	44	31	<30	72	45	43	34	<30	49	40	53	48
16	Landscaping	Peak impact	55	42	33	83	56	54	45	32	60	51	64	59
		Typical impact	49	37	<30	77	51	48	39	<30	54	46	59	54
17	Cross drainage	Peak impact	54	42	33	82	56	53	44	31	59	50	63	59
		Typical impact	53	40	31	81	54	52	43	30	58	49	62	57

* NCA02, NCA10 and NCA11 comprise of commercial and industrial receivers and hence, are not included this table

Table 6-6: Predicted construction noise perception daytime out of hours (8:00am – 5:00pm Sundays and public holidays) – residential receivers

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
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0 Noticeable (no exceedance)

● Clearly audible (1 dB to 10 dB)

◆ Moderately intrusive (11 dB to 20 dB)

■ Highly intrusive (> 20 dB)

1	Pre-construction and site establishment	Peak impact	○	○	○	◆	●	○	○	○	●	●	●	●
		Typical impact	○	○	○	◆	○	○	○	○	○	○	○	○
2	Ancillary facility – establishment	Peak impact	○	○	○	◆	●	○	○	○	○	◆	○	○
		Typical impact	○	○	○	●	○	○	○	○	○	◆	○	○
3	Ancillary facility – operation	Peak impact	○	○	○	●	●	○	○	○	○	◆	○	○
		Typical impact	○	○	○	●	○	○	○	○	○	◆	○	○
4A	Batch plant operation (concrete batch plant)	Peak impact	○	○	○	○	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
4B	Batch plant operation (asphalt batch plant)	Peak impact	○	○	○	○	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
5	Clearing, grubbing, and demolition	Peak impact	○	○	○	■	●	●	○	○	●	●	●	●
		Typical impact	○	○	○	◆	●	○	○	○	●	●	●	●

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
6	Utility work	Peak impact	○	○	○	■	●	○	○	○	●	●	●	●
		Typical impact	○	○	○	◆	●	○	○	○	●	●	●	●
7	Bulk earthwork – cuttings	Peak impact	○	○	○	○	●	○	○	○	○	○	○	●
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
9	Bulk earthwork – fill	Peak impact	○	○	○	○	○	○	○	○	○	○	○	●
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
10	Concrete pavement (including pavement drainage)	Peak impact	○	○	○	○	●	○	○	○	●	○	○	●
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
11	Asphalt pavement (including pavement drainage)	Peak impact	○	○	○	○	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
12	Bridge work (excluding piling)	Peak impact	○	○	○	◆	●	○	○	○	○	●	●	○
		Typical impact	○	○	○	◆	○	○	○	○	○	○	●	○
13	Piling for bridges and bridge approaches	Peak impact	○	○	○	■	●	●	○	○	○	●	●	○
		Typical impact	○	○	○	◆	●	○	○	○	○	●	●	○
14	Roadside furniture and finishing work	Peak impact	○	○	○	◆	●	○	○	○	○	●	●	○
		Typical impact	○	○	○	◆	○	○	○	○	○	○	○	○
15	Traffic management and control	Peak impact	○	○	○	●	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	●	○	○	○	○	○	○	○	○
16	Landscaping	Peak impact	○	○	○	◆	●	○	○	○	○	●	●	○
		Typical impact	○	○	○	●	○	○	○	○	○	○	○	○
17	Cross drainage	Peak impact	○	○	○	◆	●	○	○	○	○	○	●	○
		Typical impact	○	○	○	◆	○	○	○	○	○	○	○	○

Table 6-7: Predicted maximum LAeq(15 minute) construction noise levels – evening (7pm-10pm) – residential receivers

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
1	Pre-construction and site establishment	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
2	Ancillary facility – establishment	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
3	Ancillary facility – operation	Peak impact	37	40	32	74	56	55	40	31	65	65	51	54
		Typical impact	34	37	<30	71	53	52	37	<30	62	62	48	51
4A	Batch plant operation (concrete batch plant)	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
4B	Batch plant operation (asphalt batch plant)	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
5	Clearing, grubbing, and demolition	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
6	Utility work	Peak impact	60	47	38	88	61	59	50	37	65	56	69	64
		Typical impact	59	46	37	87	60	58	49	36	64	55	68	63
7	Bulk earthwork – cuttings	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
9	Bulk earthwork – fill	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
10	Concrete pavement (including pavement drainage)	Peak impact	45	44	37	63	56	54	47	36	65	45	58	65
		Typical impact	41	39	33	59	52	49	43	31	61	40	54	61
11	Asphalt pavement (including pavement drainage)	Peak impact	41	39	33	66	55	50	45	33	53	41	58	42
		Typical impact	39	37	31	64	53	48	43	31	51	39	56	40
12	Bridge work (excluding piling)	Peak impact	56	43	34	84	57	55	46	33	53	52	65	51
		Typical impact	53	41	32	81	55	52	43	30	51	50	63	48

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
13	Piling for bridges and bridge approaches	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
14	Roadside furniture and finishing work	Peak impact	55	43	34	83	57	54	45	32	60	52	65	60
		Typical impact	50	37	<30	78	51	49	40	<30	55	46	59	54
15	Traffic management and control	Peak impact	44	31	<30	72	45	43	34	<30	49	40	53	48
		Typical impact	44	31	<30	72	45	43	34	<30	49	40	53	48
16	Landscaping	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
17	Cross drainage	Peak impact	54	42	33	82	56	53	44	31	59	50	63	59
		Typical impact	53	40	31	81	54	52	43	30	58	49	62	57

* NCA02, NCA10 and NCA11 comprise of commercial and industrial receivers and hence, are not included this table

Table 6-8: Predicted construction noise perception evening (7pm-10pm) – residential receivers

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
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0 Noticeable (no exceedance) ● Clearly audible (1 dB to 10 dB) ◆ Moderately intrusive (11 dB to 20 dB) ■ Highly intrusive (> 20 dB)

1	Pre-construction and site establishment	Peak impact	○	○	○	■	●	●	○	○	●	●	●	●
		Typical impact	○	○	○	◆	○	○	○	○	○	○	○	○
2	Ancillary facility – establishment	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
3	Ancillary facility – operation	Peak impact	○	○	○	●	●	○	○	○	○	◆	○	○
		Typical impact	○	○	○	●	○	○	○	○	○	●	○	○
4A	Batch plant operation (concrete batch plant)	Peak impact	○	○	○	○	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
4B	Batch plant operation (asphalt batch plant)	Peak impact	○	○	○	○	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
5	Clearing, grubbing, and demolition	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
6	Utility work	Peak impact	○	○	○	■	●	●	○	○	●	●	●	●
		Typical impact	○	○	○	■	●	●	○	○	●	●	●	●
7	Bulk earthwork – cuttings	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
9	Bulk earthwork – fill	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
10	Concrete pavement (including pavement drainage)	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
11	Asphalt pavement (including pavement drainage)	Peak impact	○	○	○	●	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	●	○	○	○	○	○	○	○	○
12	Bridge work (excluding piling)	Peak impact	○	○	○	◆	●	●	○	○	○	○	●	○
		Typical impact	○	○	○	◆	○	○	○	○	○	○	●	○
13	Piling for bridges and bridge approaches	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
14	Roadside furniture and finishing work	Peak impact	○	○	○	◆	●	●	○	○	●	○	●	●
		Typical impact	○	○	○	◆	○	○	○	○	○	○	○	○
15	Traffic management and control	Peak impact	○	○	○	●	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	●	○	○	○	○	○	○	○	○
16	Landscaping	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
17	Cross drainage	Peak impact	○	○	○	◆	●	○	○	○	●	○	●	●
		Typical impact	○	○	○	◆	○	○	○	○	○	○	○	○

* NCA02, NCA10 and NCA11 comprise of commercial and industrial receivers and hence, are not included this table

Table 6-9: Predicted maximum LAeq(15 minute) construction noise levels - night time (10pm-6am) – residential receivers

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
1	Pre-construction and site establishment	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
2	Ancillary facility – establishment	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
3	Ancillary facility – operation	Peak impact	37	40	32	74	56	55	40	31	65	65	51	54
		Typical impact	34	37	<30	71	53	52	37	<30	62	62	48	51
4A	Batch plant operation (concrete batch plant)	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
4B	Batch plant operation (asphalt batch plant)	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
5	Clearing, grubbing, and demolition	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
6	Utility work	Peak impact	60	47	38	88	61	59	50	37	65	56	69	64
		Typical impact	59	46	37	87	60	58	49	36	64	55	68	63
7	Bulk earthwork – cuttings	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
9	Bulk earthwork – fill	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
10	Concrete pavement (including pavement drainage)	Peak impact	45	44	37	63	56	54	47	36	65	45	58	65
		Typical impact	41	39	33	59	52	49	43	31	61	40	54	61
11	Asphalt pavement (including pavement drainage)	Peak impact	41	39	33	66	55	50	45	33	53	41	58	42
		Typical impact	39	37	31	64	53	48	43	31	51	39	56	40
12	Bridge work (excluding piling)	Peak impact	56	43	34	84	57	55	46	33	53	52	65	51
		Typical impact	53	41	32	81	55	52	43	30	51	50	63	48

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
13	Piling for bridges and bridge approaches	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
14	Roadside furniture and finishing work	Peak impact	55	43	34	83	57	54	45	32	60	52	65	60
		Typical impact	50	37	<30	78	51	49	40	<30	55	46	59	54
15	Traffic management and control	Peak impact	44	31	<30	72	45	43	34	<30	49	40	53	48
		Typical impact	44	31	<30	72	45	43	34	<30	49	40	53	48
16	Landscaping	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
17	Cross drainage	Peak impact	54	42	33	82	56	53	44	31	59	50	63	59
		Typical impact	53	40	31	81	54	52	43	30	58	49	62	57

Notes: NCA02, NCA10 and NCA11 comprise of commercial and industrial receivers and hence, are not included this table Predicted construction noise levels only presented for scenarios where work would be carried out during the night period.

Table 6-10: Predicted construction noise perception night time (10pm-6am) – residential receivers

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
0 Noticeable (no exceedance)			● Clearly audible (1 dB to 10 dB)			◆ Moderately intrusive (11 dB to 20 dB)			■ Highly intrusive (> 20 dB) (> 20 dB)					
1	Pre-construction and site establishment	Peak impact	●	○	○	■	●	◆	○	○	●	●	◆	◆
		Typical impact	○	○	○	■	○	●	○	○	●	○	●	●
2	Ancillary facility – establishment	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
3	Ancillary facility – operation	Peak impact	○	○	○	◆	●	●	○	○	○	◆	○	●
		Typical impact	○	○	○	◆	○	●	○	○	○	●	○	●
4A	Batch plant operation (concrete batch plant)	Peak impact	○	○	○	○	○	●	○	○	○	○	○	○
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○
4B	Batch plant operation (asphalt batch plant)	Peak impact	○	○	○	○	○	●	○	○	●	○	○	○
		Typical impact	○	○	○	○	○	○	○	○	○	○	○	○

ID	Scenario	Activity	NCA01A	NCA01B	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA07	NCA08	NCA09	NCA14A
5	Clearing, grubbing, and demolition	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
6	Utility work	Peak impact	●	●	○	■	●	◆	○	○	●	●	◆	◆
		Typical impact	●	○	○	■	●	◆	○	○	●	●	◆	◆
7	Bulk earthwork – cuttings	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
9	Bulk earthwork – fill	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
10	Concrete pavement (including concrete pavement drainage)	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
11	Asphalt pavement (including pavement drainage)	Peak impact	○	○	○	●	●	●	○	○	○	○	●	○
		Typical impact	○	○	○	●	○	●	○	○	○	○	●	○
12	Bridge work (excluding piling)	Peak impact	○	○	○	■	●	●	○	○	○	○	●	●
		Typical impact	○	○	○	■	●	●	○	○	○	○	●	○
13	Piling for bridges and bridge approaches	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
14	Roadside furniture and finishing work	Peak impact	○	○	○	■	●	●	○	○	●	○	●	●
		Typical impact	○	○	○	■	○	●	○	○	●	○	●	●
15	Traffic management and control	Peak impact	○	○	○	◆	○	○	○	○	○	○	○	○
		Typical impact	○	○	○	◆	○	○	○	○	○	○	○	○
16	Landscaping	Peak impact	-	-	-	-	-	-	-	-	-	-	-	-
		Typical impact	-	-	-	-	-	-	-	-	-	-	-	-
17	Cross drainage	Peak impact	○	○	○	■	●	●	○	○	●	○	●	●
		Typical impact	○	○	○	■	●	●	○	○	●	○	●	●

* NCA02 comprises of commercial and industrial receivers and hence, are not included this table

6.3.1.3. Highly noise affected residential receivers

All highly noise affected residential receivers (up to 24 in total) are located within NCA04A, in Tarro, where construction work is closest to receivers.

6.3.1.4. Other sensitive receivers

Twenty-one other sensitive receivers and associated buildings (such as classrooms, places of worship, childcare centres, and recreation area) would potentially be affected by construction noise.

The receivers identified as exceeding the NML are Tarro Public School (educational receiver), which consists of eight receiver buildings, Pasadena Crescent Reserve Soccer Fields (active recreation receiver) and Hunter Region Botanic Gardens (passive recreation receiver).

Table 6-11 shows the maximum predicted construction noise levels at other sensitive receivers.

Table 6-11: Predicted maximum LAeq(15 minute) construction noise levels at other sensitive receivers

ID	Scenario	Activity	NCA01A	NCA02	NCA04A	NCA04B	NCA05B	NCA06	NCA11	NCA14A
1	Pre-construction and site establishment	Peak impact	45	51	68	51	48	37	72	64
		Typical impact	37	43	60	43	40	29	64	56
2	Ancillary facility – establishment	Peak impact	50	50	54	54	47	36	40	54
		Typical impact	43	43	46	46	39	29	32	46
3	Ancillary facility – operation	Peak impact	44	44	48	47	41	30	33	48
		Typical impact	41	41	45	44	38	27	30	45
4A	Batch plant operation (concrete batch plant)	Peak impact	41	34	47	41	38	32	28	42
		Typical impact	38	31	43	38	35	29	25	39
4B	Batch plant operation (asphalt batch plant)	Peak impact	43	36	48	43	40	33	30	44
		Typical impact	36	29	41	36	33	26	23	37
5	Clearing, grubbing, and demolition	Peak impact	46	52	70	53	50	38	74	66
		Typical impact	44	50	68	51	48	36	72	64
6	Utility work	Peak impact	45	51	69	52	49	37	73	65
		Typical impact	44	50	68	51	48	36	72	64
7	Bulk earthwork – cuttings	Peak impact	46	52	55	49	45	38	74	66
		Typical impact	42	48	50	44	41	33	70	61
9	Bulk earthwork – fill	Peak impact	43	49	55	45	44	34	70	62
		Typical impact	40	46	53	42	42	31	68	59

ID	Scenario	Activity	NCA01A	NCA02	NCA04A	NCA04B	NCA05B	NCA06	NCA11	NCA14A
10	Concrete pavement (including pavement drainage)	Peak impact	46	48	53	50	44	37	88	66
		Typical impact	42	43	49	45	40	32	84	61
11	Asphalt pavement (including pavement drainage)	Peak impact	41	44	66	49	45	33	78	43
		Typical impact	39	42	64	47	44	31	76	41
12	Bridge work (excluding piling)	Peak impact	40	48	57	45	42	33	65	50
		Typical impact	37	45	55	43	39	31	62	47
13	Piling for bridges and bridge approaches	Peak impact	45	52	62	50	47	38	70	55
		Typical impact	38	46	56	44	40	32	64	48
14	Roadside furniture and finishing work	Peak impact	41	47	64	47	44	33	69	60
		Typical impact	35	41	59	42	39	27	63	55
15	Traffic management and control	Peak impact	29	35	53	36	33	21	57	49
		Typical impact	29	35	53	36	33	21	57	49
16	Landscaping	Peak impact	40	46	64	47	44	32	68	60
		Typical impact	35	41	59	41	38	27	63	54
17	Cross drainage	Peak impact	40	46	63	46	43	32	67	59
		Typical impact	38	44	62	45	42	30	66	58

Note: No other sensitive receivers are located within NCA01B, NCA03, NCA05A, NCA07, NCA08, NCA09, NCA10, NCA11, NCA12 and NCA13

6.3.1.5. Commercial and industrial receivers

Construction noise impacts in NCA04A are predicted to be 'Clearly audible' (i.e. 1 dB to 10 dB exceedance of NML) during pre-construction and site establishment work, clearing, grubbing and demolition work, utility work, bridge, and viaduct superstructure work (including bridge piling work) and roadside furniture and finishing work.

Other NCAs either have no commercial or industrial receivers, or the receivers are of sufficient distance from the construction footprint to prevent exceedances.

The predicted maximum construction noise levels at commercial and/or industrial receivers are shown in Table 6-12.

Table 6-12: Predicted maximum LAeq(15 minute) construction noise levels at commercial and/or industrial receivers

ID	Scenario	Activity	NCA01A	NCA02	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA08	NCA09	NCA10	NCA11	NCA12	NCA13	NCA14A
1	Pre-construction and site establishment	Peak impact	44	72	40	79	48	60	43	36	41	55	98	64	85	50	84
		Typical impact	36	64	32	71	40	52	35	28	33	47	90	57	77	42	76
2	Ancillary facility – establishment	Peak impact	35	68	39	70	42	63	43	36	66	48	66	41	102	48	57
		Typical impact	27	60	32	62	35	55	36	28	58	40	59	34	94	40	49
3	Ancillary facility – operation	Peak impact	28	62	33	64	36	56	37	29	60	41	60	35	96	41	51
		Typical impact	25	59	30	61	33	53	34	26	57	38	57	32	93	38	48
4A	Batch plant operation (concrete batch plant)	Peak impact	-	45	32	46	38	46	35	32	40	45	64	28	82	33	42
		Typical impact	-	42	28	43	35	43	32	29	36	42	60	25	79	30	39
4B	Batch plant operation (asphalt batch plant)	Peak impact	-	47	33	47	40	48	36	34	41	46	65	29	84	34	44
		Typical impact	-	40	26	41	33	41	30	27	34	40	58	23	77	28	37
5	Clearing, grubbing, and demolition	Peak impact	46	74	42	81	50	61	45	38	43	57	100	66	87	52	85
		Typical impact	44	72	40	79	48	59	43	36	41	55	98	64	85	49	83
6	Utility work	Peak impact	45	73	41	80	49	60	44	37	42	56	99	65	86	50	84
		Typical impact	44	72	40	79	48	59	43	36	41	55	98	64	85	50	83
7	Bulk earthwork – cuttings	Peak impact	46	74	41	55	43	50	42	37	36	42	62	66	87	52	85
		Typical impact	41	69	37	50	39	45	38	32	31	38	58	62	82	47	81
9	Bulk earthwork – fill	Peak impact	42	70	37	52	39	52	39	34	39	38	59	63	83	48	82

Black Hill to Tomago

ID	Scenario	Activity	NCA01A	NCA02	NCA03	NCA04A	NCA04B	NCA05A	NCA05B	NCA06	NCA08	NCA09	NCA10	NCA11	NCA12	NCA13	NCA14A
		Typical impact	40	68	35	50	37	49	36	31	37	36	56	60	80	45	79
10	Concrete pavement (including pavement drainage)	Peak impact	36	74	39	63	43	53	43	36	41	45	69	66	86	51	74
		Typical impact	32	69	34	59	39	49	39	31	37	40	64	61	82	47	70
11	Asphalt pavement (including pavement drainage)	Peak impact	32	49	34	50	39	49	38	33	38	41	88	58	53	46	46
		Typical impact	30	47	32	48	37	47	36	31	36	39	86	56	51	44	44
12	Bridge work (excluding piling)	Peak impact	41	60	37	76	45	57	40	33	38	52	92	54	54	47	81
		Typical impact	38	58	35	74	42	54	38	30	36	50	90	52	52	44	78
13	Piling for bridges and bridge approaches	Peak impact	46	65	42	81	50	61	45	38	43	57	97	59	59	52	86
		Typical impact	40	59	36	75	44	55	39	32	37	51	91	53	53	45	79
14	Roadside furniture and finishing work	Peak impact	40	68	36	76	44	56	40	32	37	52	94	61	81	46	80
		Typical impact	35	63	31	70	39	50	34	27	32	46	89	55	76	40	74
15	Traffic management and control	Peak impact	29	57	25	64	33	44	28	21	26	40	82	49	69	34	68
		Typical impact	29	57	25	64	33	44	28	21	26	40	82	49	69	34	68
16	Landscaping	Peak impact	40	68	36	75	44	55	39	32	37	51	94	60	81	45	79
		Typical impact	35	63	31	70	39	50	34	26	32	46	88	55	75	40	74
17	Cross drainage	Peak impact	39	67	35	74	43	55	38	31	36	50	93	60	80	45	79
		Typical impact	38	66	34	73	42	53	37	30	35	49	92	58	79	44	77

Note: No commercial or industrial receivers are located within NCA01B and NCA07

6.3.1.6. Sleep disturbance if construction activities occur during the night-time period:

NCA04A and NCA04B have the highest number of residential receivers that would exceed the sleep disturbance screening level. This is because NCA04A and NCA04B have the highest number of residential receivers located close to the construction footprint.

Residential receivers located within NCA05A and NCA05B are predicted to exceed the sleep disturbance screening level, however, fewer exceedances are expected due to the distance between the NCAs and construction activities.

NCA01A, NCA01B, NCA07, NCA08 and NCA09 show low numbers of residential receivers exceeding the sleep disturbance screening level.

Utility work causes highest number of exceedances of the sleep disturbance screening level.

6.3.1.7. Construction ground-borne noise

Most receivers are sufficiently distant from the work for ground-borne noise impacts to be minimal. Where residential receivers are located near construction work, airborne noise levels would typically be dominant over the ground-borne noise component. Any specific ground-borne noise impacts that have the potential to impact properties will be identified during the noise and vibration impact assessment process.

6.3.1.8. Construction road traffic noise

Construction traffic associated with the Project is not expected to increase traffic noise levels by more than 2 dB(A) in areas where sensitive receivers are located. It is noted in Chapter 8 of the EIS that increases of more than 2dB are predicted in Heatherbrae, however these increases would not affect sensitive receivers.

6.3.2. Construction Vibration

The key findings of the construction vibration assessment for the Project are:

- With consideration to structural damage risk, construction is expected to generally present a very low risk of structure damage with potential for medium risk to nearest residential building in NCA04A with approximate distance of 10 to 15 metres from work
- With consideration to human disturbance, the Project is expected to present very low to high risk (at NCA04A) for adverse comment
- Heritage listed structures are unlikely to be impacted by vibration from the construction activities. However, heritage listed structures that are within 100 metres from vibration intensive work would be considered on a case-by-case basis and further investigation to be carried out to confirm the structural integrity.

6.3.3. Vibration assessment – residential and commercial/industrial structures

The CNVG provides recommended minimum working distances for typical vibration intensive plant and equipment, presented in Table 6-13. The minimum working distances are indicative only and potential vibration experienced by receivers would be dependent on separation distances, the intervening soil and rock strata, dominant frequencies of vibration and the receiver structure.

Table 6-13: Recommended minimum working distances for vibration intensive plant and equipment

Plant item	Rating/activity description	Recommended minimum working distances		
		Cosmetic damage		Human response ³
		Structurally sound ¹ (e.g. residential & light commercial)	Structurally unsound ² (e.g. unsound heritage structures)	
Vibratory roller	< 50kN (typically 1-2t)	5m	11m	15m to 20m

Plant item	Rating/activity description	Recommended minimum working distances		
		Cosmetic damage		Human response ³
		Structurally sound ¹ (e.g. residential & light commercial)	Structurally unsound ² (e.g. unsound heritage structures)	
	< 100kN (typically 2-4t)	6m	13m	20m
	<200kN (typically 4-6t)	12m	15m	40m
	< 300kN (typically 7-13t)	15m	31m	100m
	>300kN (typically 13-18t)	20m	40m	100m
	> 300kN (typically > 18t)	25m	50m	100m
	300kg – 5 to 12t excavator	2m	5m	7m
Medium hydraulic hammer	900kg – 12 to 18t excavator	7m	15m	23m
Large hydraulic hammer	1600kg – 18 to 34t excavator	22m	30m ⁴	73m
Vibratory pile driver	Sheet piles	2m to 20m	5m to 30m	20m to 50m
Pile boring	≤ 800mm	2m	5m	5m
Jackhammer	Handheld	1m	3m	5m

1. Referenced from either the CNVG or against the criteria in the British Standard BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2

2. Criteria referenced from DIN 4150-3:2016 Vibration in buildings – Effects on structures (including heritage items)

3. Referenced from either the CNVG or the criteria referenced in the EPA's Assessing Vibration: a technical guideline (December 2006)

An assessment of potential vibration levels was carried out for all residential and commercial / industrial use buildings, and other similar type structures in the vicinity of construction during the EIS. Table 6-14, shows a summary of the potential for vibration impacts when the predicted levels are analysed against the minimum working distances, for both structural damage risk and human disturbance.

Table 6-14: Potential vibration impacts for residential and commercial / industrial structures

NCA	Approx. distance to nearest buildings from work (metres)	Type of nearest sensitive buildings	Assessment of potential vibration impacts		
			Structural damage risk	Human disturbance	Vibration monitoring
NCA01A	160m – 180m	Residential	Very low risk of structural damage	Very low risk of adverse comment	Not required
NCA01B	590m – 610m	Residential	Very low risk of structural damage	Very low risk of adverse comment	Not required
NCA02	70m – 80m	Commercial / Industrial	Very low risk of structural damage	Very low risk of adverse comment	Not required

NCA	Approx. distance to nearest buildings from work (metres)	Type of nearest sensitive buildings	Assessment of potential vibration impacts		
			Structural damage risk	Human disturbance	Vibration monitoring
NCA03	1150m – 1200m	Commercial / Industrial	Very low risk of structural damage	Very low risk of adverse comment	Not required
NCA04A	10m – 15m	Residential	Medium risk of structural damage	High risk of adverse comment	Vibration monitoring may be considered
NCA04B	80m – 90m	Residential	Very low risk of structural damage	Low risk of adverse comment	Vibration monitoring may be considered
NCA05A	100m – 110m	Residential / Commercial / Industrial	Very low risk of structural damage	Very low risk of adverse comment	Not required
NCA05B	300m – 310m	Residential	Very low risk of structural damage	Very low risk of adverse comment	Not required
NCA06	1350m – 1400m	Residential	Very low risk of structural damage	Very low risk of adverse comment	Not required
NCA07	35m – 40m	Residential	Low risk of structural damage	Medium risk of adverse comment	Vibration monitoring may be considered
NCA08	40m – 45m	Residential	Low risk of structural damage	Medium risk of adverse comment	Vibration monitoring may be considered
NCA09	55m – 60m	Residential	Very low risk of structural damage	Low risk of adverse comment	Vibration monitoring may be considered

6.3.4. Vibration assessment – heritage structures

Below ground archaeological sites (non-Aboriginal heritage) and both surface and subsurface artefacts (Aboriginal heritage) are not subject to potential vibration impacts. Heritage items with the potential to be impacted by construction vibration are identified in Table 6-15. All identified heritage items are typically located outside of the minimum working distances provided in Table 6-15.

Table 6-15: Heritage items with the potential to be impacted by construction vibration

NCA	Heritage item name	Location	Approx. distance to vibration intensive work
NCA08	Hannell Family Vault (I179)	398B Maitland Road, Hexham	Greater than 100m
NCA04A	Residence (I548)	29 Eastern Avenue, Tarro	75m
NCA04A	Tarro Substation (I546)	6A Anderson Drive, Tarro	100m
NCA05A	Pumping Station (I550)	3 Woodberry Road, Tarro	Greater than 100m
NCA04B	Newcastle Crematorium (I34)	176 Anderson Drive, Beresfield	Greater than 500m
NCA04A	Our Lady of Lourdes Church (I547)	42 Anderson Drive, Tarro	Greater than 250m
NCA07	Glenrowan Homestead	51 New England Highway, Black Hill	85m

6.3.5. Utilities sensitive to vibration

Works within 25 metres of utilities that may be subject to vibration include:

- Hunter Water Corporations Water mains and sewer mains (Black Hill, Tomago, Heatherbrae)
- AGL pipeline (Tomago)
- Jemena (Pacific Highway between Tomago and Heatherbrae)
- Telstra (various locations across construction footprint)
- Optus (various locations across construction footprint)

- NBN (various locations across construction footprint)
- Nextgen (various locations across construction footprint)
- Ausgrid overhead and underground high and low voltage lines (Pacific Highway between Tomago Road and Heatherbrae, Black Hill between Weakleys Drive and Lenaghans Drive, Black Hill South of Weakleys Drive, Beresfield/Tarro)
- Transgrid major overhead high voltage transmission lines (Black Hill, across floodplain west of the Hunter River and Tomago interchange)
- Vocus (Pacific Highway Tomago).

Prior to undertaking any vibration causing activities, consultation will be carried out with the appropriate asset, utility owner to establish site specific mitigation measures to manage potential vibration impacts in accordance with REMM NV04.

6.3.6. Cumulative impacts

Cumulative noise and vibration impacts may arise from the interaction of construction and operation activities of the project, and other approved or proposed projects in the area including M12RT Heatherbrae Bypass Package and Hexham Straight Widening. When considered in isolation, specific project impacts may be considered minor. These minor impacts may; however, be more substantial, when the impact of multiple projects on the same receivers is considered.

The contribution of the project to cumulative impacts on noise and vibration in the area is generally minor, given the distances to the impacted receivers and the type of receivers potentially impacted.

7. Construction Noise and Vibration Assessment

7.1. Method for evaluation and assessment of impacts

The adopted process of assessment of construction noise and vibration impacts for the Project is detailed in Figure 7-1. This process will form the basis of the assessments that will be prepared prior to construction works commencement. Where significant new/additional activities and/or significant changes to site layout or construction methodology are proposed, additional assessment as per this section will be undertaken. Site-specific or activity-specific noise assessments will be prepared to assess all construction activities and ancillary facilities for the Project. Noise and vibration monitoring data will be collected throughout the delivery of the Project in accordance with the Construction Noise and Vibration Monitoring Program (refer to Appendix C).

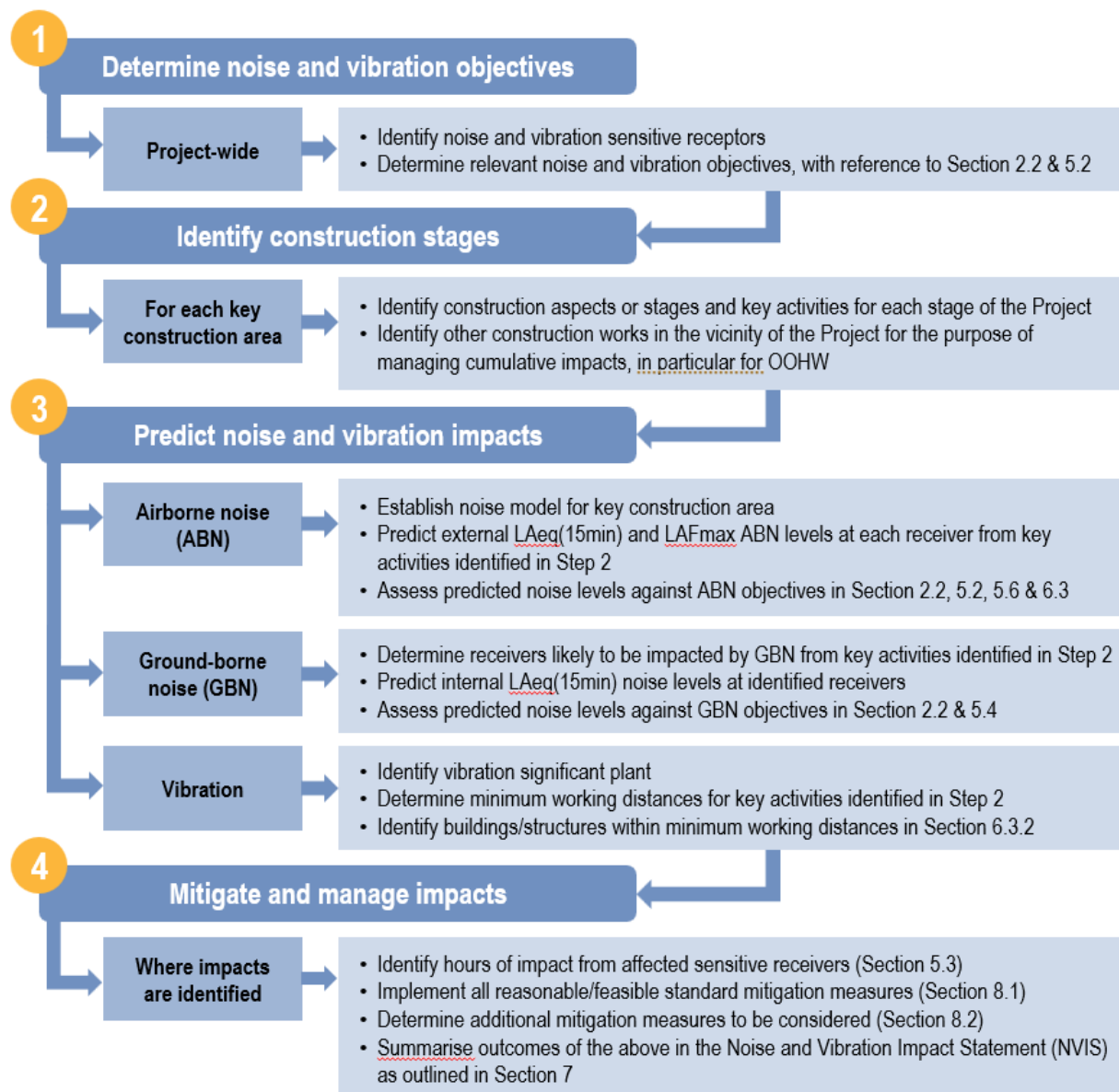


Figure 7-1: Construction noise and vibration impact assessment process

7.2. Noise and Vibration Impact Statements

In accordance with CoA 71, any construction work identified as potentially exceeding the noise management levels and/or vibration criteria established in Section 4 outside of standard work hours or where receivers will be highly noise affected must be included in a Noise and Vibration Impact Statement (NVIS). The NVIS's will be a key site management tool providing clear instructions for managing each construction worksite. Each NVIS will be prepared before any works that result in noise and vibration impacts commence at the relevant construction worksite. The NVIS will be progressively prepared for the construction phase to identify noise and vibration impact predictions and applicable management measures.

In accordance with CoA E69, mitigation measures must be applied when residential ground-borne noise levels exceed 40dB(A) during the evening hours (6:00pm to 10:00pm) or 35 dB(A) during night time hours (10:00pm to 7:00am).

All NVIS will be prepared by an appropriately qualified and experienced acoustic consultant. Each NVIS would set out the mitigation and management measures required for the construction stage, through consultation with affected sensitive receivers. They will address:

- Scope of works covered by NVIS
- Justification for OOHW (where required)
- Nearest noise and vibration sensitive receivers,
- Construction noise and vibration objectives
- Construction noise and vibration impact assessment
- Mitigation options, preferred management measures and ongoing risk management
- Noise and vibration monitoring requirements and auditing process.

Noise model assumptions will be consistent with the updated model in the approved Submissions Report, including the SWLs used which are included in Appendix E. Modelling will be carried out using SoundPLAN software to calculate noise impacts in accordance with ISO9613. The model will include the following assumptions:

- Topography – 1 metre DEM based on LPI Lidar data.
- Individual buildings for façade calculations and to account for shielding and reflections. Building heights are also taken from Lidar data.
- Individual sensitive receivers – One receiver location representing each residential dwelling and located 1.5 metres above most affected floor level (e.g. level 2) and most-affected façade at up to around 500 metres radius.
- Construction noise sources – Activities and equipment included in the noise model as area sources. SoundPlan takes the worst-case point within each area to perform its calculations, a conservative approach. Sound power levels in Appendix E. Source is modelled at 1.5 metres above ground.
- Meteorology –worst-case conditions: gentle breeze (3-5 m/s) source to receiver and stable conditions (conductive of temperature inversion).
- Ground absorption and transmission in accordance with ISO9613
- Estimated noise source duration of 15 minutes.

Construction noise and vibration impacts associated with a construction worksite would be assessed by identifying the construction activities for each worksite and stage of the Project, including likely plant and equipment. Construction noise and vibration from the identified activities would be predicted and assessed against the relevant noise and vibration objectives to identify the risk of impact. Where there is a risk of impact, all reasonable and feasible noise and vibration management measures would be recommended to reduce or manage the impacts as much as practicable.

Monitored noise and vibration levels will be analysed against the predictions made in the relevant NVIS. This will allow for ongoing review and verification of the predictive model, and a feedback mechanism to construction planning to ensure ongoing noise and vibration risks are identified and managed appropriately. Physical noise mitigation measures such as noise barriers and acoustic enclosures around fixed plant will be outlined in the NVIS. Furthermore, specific management measures such as a staging of works, respite periods (CoA E65, E68, E76, E78 and E79) and community notification and consultation (CoA B2 and E77) will also be summarised and implemented.

The NVIS will identify the sensitive receivers that the Project is required to notify regarding upcoming works to ensure ongoing noise and vibration risks are managed throughout the Project.

This notification will include the likely noise and vibration impacts during the assessed works, the duration of impact and any additional mitigation (e.g. respite periods) that may be required to manage noise and vibration impacts.

In accordance with CoA E71, A copy of the NVIS must be provided to the ER prior to the commencement of the associated works. The Planning Secretary and the EPA may also request copies of the NVIS.

The key NVIS that are anticipated to be prepared under the NVMP are summarised in Table 7-1 and shown in Figure 7-2. The Project has been divided into four zones based on the Project program and the key construction activities occurring in each of the zones. Further to this, the Project noise and vibration management tool (see Section 7.3) will be used to manage ongoing noise and vibration risks as works progress.

Table 7-1: Indicative NVIS prepared under this NVMP

Construction worksite/ stage	Construction activity
Zone 1	Ancillary facility operation, site clearing, access road construction, bulk earthworks, utilities and drainage, pavements, finishing works, landscaping
Zone 2	Ancillary facility operation, site clearing, bulk earthworks, piling, bridge construction, utilities and drainage, pavements, finishing works, landscaping
Zone 3	Ancillary facility operation, site clearing, access road construction, piling, bridge construction, utilities and drainage, pavements, finishing works, landscaping
Zone 4	Ancillary facility operation, site clearing, access road construction, piling, bulk earthworks, utilities and drainage, pavements, finishing works, landscaping



Figure 7-2: Construction zones for NVIS development

7.3. Noise Management Tool

A construction noise and vibration management tool, KnowNoise will be developed specifically for the Project to allow specific work areas and activities to be planned, assessed, and managed as construction works progress in accordance with CoA E66, E76, E77 and E78. It would also allow cumulative noise impact from other aspects of the Project or, where relevant, noise from other construction projects, to be assessed and managed in accordance with this NVMP.

8. Environment Control Measures

8.1. Noise and vibration mitigation and management measures

In accordance with the CoA mitigation measures will be implemented with the aim of achieving the construction noise management levels and vibration criteria detailed in Section 4. Specific measures and requirements to address contract specifications, CoA and REMMs in relation to impacts from noise and vibration are outlined in Table 8-1.

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

ID	Measure / Requirement	Timing / Frequency	Responsibility	Reference	Relevant Management Document or Process
NMR01	Noise and vibration mitigation must be implemented with the aim of achieving the construction noise management levels and vibration assessment criteria detailed in Section 5.1 of the NVMP.	Pre-construction/ Construction	Environment and Sustainability Manager (or delegate)	REMM NV01 Good Practice	NVMP, EWMS and WRA/AMS
NMR02.1	Community consultation or notification measures are to be undertaken in accordance with the Community Communication Strategy detailing work activities, dates and hours, expected noise levels, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the works (where applicable) and contact telephone numbers. If residents are deemed to be impacted by any OOHW where the construction noise levels are predicted to exceed the NML by 25 dB(A) or are greater than 75 dBA (LAeq(15 min)), whichever is the lesser and the impact is planned to occur for more than two (2) nights over a seven (7) day rolling period, mitigation measures that are agreed upon such as temporary alternative accommodation will be provided (except as permitted by an EPL in accordance with E79).	Pre-construction/ Construction	Community Team	CS, EIS, CNVG CoA E79 D&C G36 Clause 4.6(m)	Section 8.3 Section 9.3 Communications Strategy OOHW Protocol Consultation records NVIS Community agreements
NMR02.2	Where the noise contains annoying characteristics, the NML will be reduced by 5 dB and may be increased by 10 dB if the property has received at-property acoustic treatment. Note: Only one correction can be applied to either increase the predicted noise level or reduce the NML by 5dB(A)	Pre-construction/ Construction	Community Team	CS, EIS, CNVG CoA E79	Communications Strategy OOHW Protocol Consultation records NVIS Community agreements
NMR03	All construction activities are to be undertaken during approved construction hours such as crushing and grinding works and impact piling, unless otherwise approved under the EPL, OOHW Protocol, following the completion of an OOHW Permit or if it meets the requirements of condition E66	Construction	Environment and Sustainability Manager (or delegate) Foreperson	CoA C8(e), CoA E80 D&C G36 Clause 4.6(u)	NVMP and associated EWMS and WRA/AMS

ID	Measure / Requirement	Timing / Frequency	Responsibility	Reference	Relevant Management Document or Process
NMR04	Noise and Vibration Impact Statements (NVIS) must be prepared for any Work: that may exceed the noise management levels, vibration criteria and/or ground-borne noise levels specified in Condition E68 and Condition E69 at any residence outside work hours identified in Condition E64, or and where receivers will be highly noise affected. The NVIS must include specific mitigation measures identified through consultation with affected receivers of the sensitive land use(s) and the mitigation measures must be implemented for the duration of the works. .	Construction	Environment and Sustainability Manager (or delegate)	CoA E71	Section 7 and associated NVIS
NMR05	Respite periods are to be applied as a reasonable and feasible mitigation measure to reduce noise and vibration impacts to sensitive receivers in accordance with the following processes: - During OOHV, in accordance with OOHV Protocol (Appendix D of this NVMP) and the CNVG standard and additional mitigation measures (Section 8.1 and 1.1). - In accordance with the criteria detailed in Section 5.4 of this NVMP relating to circumstances where construction noise exceeds the “Highly noise affected” 75dB(A) construction noise management level criteria. - For Highly Noise Intensive Work - In circumstances where there is potential for exceedance of the vibration screening criteria for cosmetic damage may occur and no alternative processes can be implemented, and as a result of consultation and agreement with sensitive receivers, respite periods have been proposed a mitigation measure. - For work undertaken by third parties (such as utility relocations).	Construction	Environment and Sustainability Manager (or delegate) Community Team Area Manager	C8(f), E67, E76, E77, B2, REMM NV01, NV03 and NV09	OOHV Protocol EWMS and WRA/AMS Consultation records Monitoring and inspection records Environmental Inspection Checklists
NMR06	Work outside the hours along the New England and Pacific Highway corridors which result in an exceedance of the relevant NML at the same sensitive land use(s) can only be undertaken in accordance with the following: - Two consecutive evenings and/or nights per week; or - Three non-consecutive evenings and/or nights per week; or 10 evenings and/or nights per month; or - Except as identified by an EPL; or - In accordance with an agreement with a potentially impacted receiver(s)	Construction	Environment and Sustainability Manager (or delegate) Area Manager Foreperson	CoA E78 REMM NV09	OOHV Protocol
NMR07	Training must be undertaken for all workers as described in this document. Training will be aimed to reduce potential noise impacts to receivers and will include topics on good behavioural practices, including: No unnecessary shouting or loud stereos/radios onsite.	Pre-construction/ Construction	Environment and Sustainability Manager (or delegate) Area Manager	Good Practice, Submissions Report	Training and briefing content EWMS and WRA/AMS

ID	Measure / Requirement	Timing / Frequency	Responsibility	Reference	Relevant Management Document or Process
	No dropping of materials from height, throwing of metal items and slamming of doors.		Foreperson		
NMR08	Work compounds, loading/unloading areas, parking areas, equipment and material stockpile sites, toolbox locations will be positioned as far as practicable away from noise-sensitive receivers.	Pre-construction/Construction	Environment and Sustainability Manager (or delegate) Area Manager Foreperson	Good Practice	Construction Environmental Management Plan NVIS
NMR09	Ancillary facilities will be designed to ensure that primary noise sources are at a maximum distance from residences (where reasonable and feasible), with solid structures (sheds, containers, etc.) placed between residences and noise sources (and as close to the noise sources as is practical).	Construction	Area Manager Foreperson	REMM NV01	Construction Environmental Management Plan NVIS
NMR10	Site entry and exit points will be located as far as possible from sensitive receivers, taking into account the importance of safe access.	Pre-construction/Construction	Area Manager Foreperson	Good Practice	Construction Environmental Management Plan NVIS EWMS and WRA/AMS
NMR11	Timetabling work that exceeds the noise limits set for community areas, religious establishments, educational institutions, noise and vibration-sensitive businesses, as well as critical spaces like theatres, laboratories, and operating theatres, should be avoided during sensitive periods. However, alternative mutually agreed arrangements that do not impose any costs on the affected institutions can be made.	Construction	Area Manager Foreperson	CoA C8(f), E70	NVIS EWMS and WRA/AMS Communications Strategy Consultation Records – including notifications, emails and meeting minutes
NMR12	Haulage routes will be located as far away as possible from residential receivers, where this is reasonable and feasible.	Construction	Area Manager Foreperson	CoA E89, Traffic, Transport and Access Management Sub-Plan	Traffic and Transport Management Plan Heavy Vehicle Route Maps EWMS and WRA/AMS
NMR13	Noise levels of plant and equipment will have operating Sound Power or Sound Pressure Levels compliant with the criteria listed in Table 2 of the Transport for NSW, Construction Noise Strategy (7TP-ST-157/2.0). Equipment will be operated in the correct manner, maintained in efficient working order, fitted with appropriate silencers and suppression devices that are in accordance with manufacturer's specifications, and turned off when not in use. Any equipment found to be producing excessive noise	Construction	Area Manager Foreperson	Good Practice D&C G36 Clause 4.6 (p), (q), (x), (z) and (aa)	EWMS and WRA/AMS Plant inspection records Site inspection records Inspection records Observations/diary entries

ID	Measure / Requirement	Timing / Frequency	Responsibility	Reference	Relevant Management Document or Process
	compared to normal industry expectations will either be removed from site, repaired or modified				
NMR14	Quieter construction methods will be used, where there are sensitive receivers potentially affected and where this is considered reasonable and feasible. These may include grinding, rock splitting or terrain levelling instead of hydraulic rock breaking.	Construction	Area Manager Foreperson	Good Practice	EWMS, NVIS and WRA/AMS
NMR15	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used onsite and for any out-of-hours work. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level. Limit reversing movements by planning traffic flow, parking and unloading areas	Construction	Area Manager Foreperson	EIS, Good Practice	OOHW Protocol, EWMS and WRA/AMS Plant onboarding/assessment process/documents
NMR16	Truck movements will be restricted to identified haulage routes and the routes outlined in the Traffic and Transport Management Plan.	Construction	Area Manager	Submissions Report	Traffic and Transport Management Plan
NMR17	The use of temporary noise shielding will be used at locations where reasonable and feasible	Construction	Foreperson	Submissions Report	NVIS EWMS and WRA/AMS
NMR18	Static noise sources, such as generators, pumps and lighting towers, will be located as far as possible from sensitive receivers. Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436: 2010 lists materials suitable for shielding	Construction	Area Manager	Good Practice Submissions Report	NVIS EWMS and WRA/AMS
NMR19	The selection of plant and equipment will consider noise emission levels. This equipment will be operated and maintained so that noise emissions are minimised.	Construction	Foreperson	Submissions Report	NVIS EWMS and WRA/AMS
NMR20	Truck movements will be kept to a minimum, i.e. trucks will be sufficiently utilised for each trip.	Construction	Area Manager	Good practice	Traffic and Transport Management Plan EWMS and WRA/AMS
NMR21	Trucks will not queue outside residential properties. No trucks will arrive on site or be permitted to queue near sensitive receivers outside of standard construction hours unless required by road safety considerations.	Construction	Foreperson	Good practice	Heavy Vehicle Toolbox Traffic and Transport Management Plan EWMS and WRA/AMS
NMR22	Noisy plant working simultaneously close together will be avoided to the greatest extent practical adjacent to noise affected sensitive receivers.	Construction	Area Manager	Good practice	NVIS EWMS and WRA/AMS

ID	Measure / Requirement	Timing / Frequency	Responsibility	Reference	Relevant Management Document or Process
NMR23	Whenever practical, at the end of shifts, excavation and/or ripping plant will be taken from their work areas and left overnight away from the immediate vicinity of sensitive receivers. Warming up of the plant will then be conducted away from such receivers.	Construction	Foreperson	Good practice	AMS EWMS and WRA/AMS
NMR24	At-property operational noise mitigation measures will be implemented within 12 months of construction activities commencing. This will be done during the pre-construction phase and early construction phases of the Project, where reasonable and feasible, to assist in reducing noise impacts associated with construction (including out of hours work). Possible measures to be determined in the detailed design process undertaken by the Contractor would likely include noise walls, in corridor barriers/mounds and at-property treatments, the implementation of these measures will be detailed in a delivery program. At-property treatments will be prioritised for those properties likely to be most affected by construction noise impacts. These mitigation measures are to be detailed in the NVMP in accordance with CoA E89 If the mitigation cannot be implemented within 12 months of construction activities commencing, a request to the Planning Secretary for an extension to the timeframe must be accompanied by a report justifying why, along with details of temporary measures that would be implemented to reduce construction noise impacts, until such time that the operational noise mitigation measures are implemented. The report will be submitted to the Planning Secretary before the commencement of construction at the residences where the NML is exceeded. All temporary measures will be implemented within six months of the commencement of construction in the vicinity of the impacted residences.	Pre-construction	Transport/ Design/ Environment Team	CoA E89, CoA E91, REMM NV02	Records of at-property treatment Operational Noise Review – Section 1.5
NMR25	Unless required for technical reasons, the project shall undertake high noise generating work (such as use of concrete saws or hydraulic hammers) during the day, or early in the evening if required to be undertaken at night; avoiding short sharp sounds from impacts during night work to minimise sleep disturbance to neighbouring residents.	Construction	Area Manager Foreperson	Good practice	EWMS and WRA/AMS OOHW Protocol NVIS
NMR26	Building condition surveys will be undertaken for buildings and other structures/assets within the minimum working distances from the main vibration generating activities as well as all other items/assets identified in the EIS/Submissions report requiring dilapidation surveys (Table 6-14) in accordance with CoA E103 and E73. The survey must be undertaken by a suitably qualified and experienced engineer and/or building surveyor prior to the commencement of vibration generating works that could impact on the structure/asset.	Pre-construction/ Construction	Area Manager Environment and Sustainability Manager (or delegate)	CoA E103, E104, and E73: REMM NV03, NV04 and NV06	NVMP Blast Management Strategy Building Condition Survey Reports

ID	Measure / Requirement	Timing / Frequency	Responsibility	Reference	Relevant Management Document or Process
	A copy of the building condition survey report will be provided to the owner of the item/s no later than one month before commencement of all other potentially impacting works.				
NMR27	Where vibration generating activities will be carried out within minimum working distances for cosmetic damage, vibration levels are to be predicted using safe working distance criteria and risk assessment mapping. Where predictions indicate cosmetic damage criteria are likely to be exceeded, alternative low-vibration work practices will be investigated and implemented.	Construction	Area Manager Environment and Sustainability Manager (or delegate)	REMM NV03 Good practice	EWMS and WRA/AMS Construction Noise and Vibration Monitoring Program NVIS
NMR28	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before work that generate vibration commences in the vicinity of those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owners and occupiers are to be provided a schedule of potential exceedances monthly for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier.	Pre-construction / Construction	Area Manager Environment and Sustainability Manager (or delegate)	CoA E72, REMM NV03	Communications Strategy EWMS and WRA/AMS Consultation and notification records
NMR29	Vibration testing must be conducted before and during vibration generating activities that have the potential to impact on property/assets to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, additional mitigation measures will be implemented.	Pre-construction / Construction	Environment and Sustainability Manager (or delegate)	CoA E73, REMM NV03 and NV05	Construction Noise and Vibration Monitoring Program
NMR30	If blasting is to be included as part of the construction work, the NVMP would include a Blast Management Plan (BMP). The BMP would be prepared in consultation with the EPA, demonstrating that all blasting and associated activities would be carried out in a manner that would not generate unacceptable noise and vibration impacts or pose a substantial risk of impact to residences and sensitive receivers.	Pre-construction	Environment and Sustainability Manager (or delegate)	CoA E81, E82, E83, E84, & E85 REMM NV06	NVMP Blast Management Strategy
NMR31	Appropriately sized equipment will be selected to minimise vibration emissions, where required.	Construction	Area Manager Foreperson Environment and Sustainability Manager (or delegate)	Good Practice	EWMS NVIS WRA and AMS
NMR32	Advice from a heritage specialist will be sought on the methods and locations for installing equipment used for vibration, movement and noise monitoring at heritage-listed structures.	Construction	Area Manager Foreperson	CoA E74 & E75 REMM NV05, NA04	NVMP

ID	Measure / Requirement	Timing / Frequency	Responsibility	Reference	Relevant Management Document or Process
	Note: The installation of noise and vibration equipment must not impact on the heritage value of the heritage items. Prior to any conducting any at-property architectural noise treatment at any heritage-listed property, advice of a suitably qualified and experienced built heritage expert will be obtained and implemented to ensure any such work does not have an adverse impact on the heritage significance of the item.		Environment and Sustainability Manager (or delegate)		
NMR33	Ongoing communication with Northern Package Contractor, Council and other Projects (including utility projects) within the area to determine whether there may be cumulative impacts associated with noisy works and OOHW	Construction	Construction Team Communications Team Environment and Sustainability Manager (or delegate)	CoA C8	NVMP
NMR34	Airborne noise monitoring will be undertaken in the following instances: - At the commencement of any activity where a specific noise and vibration assessment has been prepared - At the commencement of activities in an acoustic shed confirming predicted performance of the shed - Where there are any changes to methodology, plant or equipment which may result in increased noise impacts - In response to complaint(s) - When directed by EPA - When required by the NVIS, Out of Hours Works (OOHW) Protocol or EPL, - Following implementation of mitigation measures or noise attenuation resulting from exceedance of predicted noise levels - Ongoing spot checks as required. Monitoring locations will vary on a case-by-case basis and be determined by a NVIS, Project predictive noise and vibration tool or in response to complaints	Construction	Area Manager Foreperson Environment and Sustainability Manager (or delegate)	REMM NV01 and NV09 CoA C13	NVMP Noise and Vibration Monitoring Program
NMR35	Attended vibration monitoring will be undertaken in the following instances: - Prior to the commencement of operations for any plant or activity on site that could generate significant vibration levels - Before initiating vibration-generating activities that could impact heritage items - Following the start of tunnelling and dive excavation	Construction	Area Manager Foreperson Environment and Sustainability Manager (or delegate)	REMM NV03 and NV04 CoA C13	NVMP Noise and Vibration Monitoring Program

ID	Measure / Requirement	Timing / Frequency	Responsibility	Reference	Relevant Management Document or Process
	- If vibration-sensitive locations are found to be within the established minimum working distances for each plant - When deemed appropriate based on a case-by-case evaluation of a vibration-related complaint - When instructed by an authorized officer from the EPA - To fulfill any additional requirements stipulated by the NVIS, OOHW Protocol, or the EPL.				
NMR36	Unless authorized by an Environmental Protection License (EPL), activities that produce high levels of noise resulting in a violation of the specified Noise Management Level (NML) at the same receiving point can only be conducted during the following time frames: - Weekdays, from 8:00 am to 6:00 pm. - Saturdays, from 8:00 am to 1:00 pm. - If performed continuously, the duration must not exceed three hours, with a minimum break of at least one hour between the work periods. For the purpose of this requirement, 'continuously' encompasses any period where there is less than one hour between the cessation and resumption of any work	Construction	Area Manager Foreperson Environment and Sustainability Manager (or delegate)	CoA E65	NVIS
NMR37	Except for Conditions E64 and E65, work will be conducted outside of the specified hours under the following circumstances: - Safety and Emergencies, which include: - Delivering materials required by the NSW Police Force or another authority for safety reasons; or - When it is necessary in an emergency to prevent injury, loss of life, property damage, or environmental harm. When the need for emergency work arises according to Condition E66: (a)(ii) the Proponent will inform the ER, the Planning Secretary, and the EPA about the reasons for such work. The Proponent will make every effort to notify all residents and property owners/occupiers who may be affected by noise and/or vibrations, especially those residing in properties designated as sensitive land use areas, about the anticipated impact and duration of the emergency works. - Work that fulfills all of the following requirements: - Work that results in LAeq(15 minute) noise levels: - no more than 5 dB(A) above the background level measured at any residence in accordance with the ICNG, and	Construction	Area Manager Foreperson	CoA E66	OOHW Protocol

ID	Measure / Requirement	Timing / Frequency	Responsibility	Reference	Relevant Management Document or Process
	- no higher than the 'Noise affected' NMLs (Noise Management Levels) specified in Table 3 of the ICNG for other sensitive land use areas. ii. Work that causes LAF max noise levels no more than 15 dBA above the RBL (Rated Background Level) at any residence during nighttime. iii. Work that causes: - continuous or impulsive vibration values, measured at the most affected residence, not exceeding the recommended values for human exposure to vibration specified in Table 2.2 of the technical guideline "Assessing Vibration" (DEC, 2006), and - intermittent vibration values measured at the most affected residence that are within the preferred values for human exposure to vibration specified in Table 2.4 of the technical guideline "Assessing Vibration" (DEC, 2006). c) With Approval, including: i. situations where different construction hours are allowed or required under an EPL in effect for the CSSI; or ii. works that are not subject to an EPL but are approved under an Out-of-Hours Work Protocol as mandated by Condition E67; or iii. negotiated agreements with directly affected residents and sensitive land use areas.				
NMR38	Installation of at-property acoustic treatments will not remove the need for other noise and vibration mitigations and management measures including but not limited to temporary accommodation to reduce the impact of noise and vibration impacts	Construction	Environment and Sustainability Manager (or delegate)	CoA E92	Construction Noise and Vibration Monitoring Program Communications strategy
NMR39	Where construction activities are planned within a 25-meter radius of utilities and are expected to generate vibrations that could affect the safe working distances, consultation will be conducted with the appropriate utility authorities to establish specific mitigation measures at the site to remove potential vibration impacts effectively	Construction	Area Manager Foreperson Environment and Sustainability Manager (or delegate)	REMM NV04	Construction Noise and Vibration Monitoring Program NVIS
NMR40	Establish a regular inspection and maintenance schedule for the haul roads including regular checks for any potholes, cracks, or uneven surfaces. Undertake repairs as soon as any issues are identified. Maintenance of haul roads will reduce noise and vibration impacts caused by transportation activities during the construction process.	Construction	Area Manager Foreperson	REMM NV01	Inspection records Maintenance records

ID	Measure / Requirement	Timing / Frequency	Responsibility	Reference	Relevant Management Document or Process
NMR41	Any damage that been determined to occur as a result of activities undertaken by the Project, the Project will carry out rectification at the Project's expense and to the reasonable requirements of the owner of the structure/asset within nine months of the completion of construction activities that have the potential to create damage unless another timeframe is agreed with the owner. Alternatively, compensation may be paid for the damage as agreed with the owner.	Construction	Project Director Construction Manager	CoA E105	Records of repair / payment Consultation manager Complaints management system
NMR42	Post-construction surveys of the structure / asset must be undertaken by a suitably qualified and experienced engineer and/or building surveyor to assess any damage that may have resulted from the works. Surveys will be documented in a Post-Construction Condition Survey Report and provided to the owner of the structure/asset no later than four months after the completion of construction that had potential to cause impacts to the structure/asset	Completion of works	Construction/ Comms / Enviro	CoA E104	NVMP Blast Management Strategy Building Condition Survey Reports Post-Construction Condition Survey Report

8.2. Additional noise and vibration mitigation measures

In instances where noise levels are still predicted to exceed the NML at receivers, after the application of noise mitigation and management measures (refer to Section 8.1), the CNVG directs that the Project should consider implementing the additional mitigation measures such as (refer to Appendix C of the CNVG for more detail):

- Notification (letterbox drop or equivalent) detailing work activities, time periods of which these will occur, impacts and mitigation measures
- Specific notifications, which provide additional information when relevant and informative to more highly affected receivers than covered in general letterbox drops
- Phone calls, which detail relevant information to identified/affected stakeholders and provide personalised contact, tailored advice and the opportunity to comment on the proposed work
- Individual briefings, which inform stakeholders about the impacts of high noise activities and mitigation measures, and provide personalised contact, tailored advice and the opportunity to comment on the proposed work
- Respite offers, to provide residents with respite from an ongoing impact
- Respite period 1, where out-of-hours construction noise in OOHW Period 1 is generally limited to no more than three consecutive evenings per week
- Respite period 2, where night-time construction noise in OOHW Period 2 is generally limited to two consecutive nights
- Duration respite, which is where the work duration, number of evenings and/or nights is increased so that the Project can be completed more quickly
- Alternative accommodation, and/or
- Verification, including measurement of the background noise level and construction noise.

The standard hours and OOHW periods are depicted in Section 5.2. The OOHW periods are further defined as OOHW Period 1 and 2, based on the Roads and Maritime Construction Noise and Vibration Guideline (CNVG).

Error! Reference source not found. and Figure 8-2 detail the additional mitigation measures for airborne noise and ground-borne noise respectively. Figure 8-3 details the additional mitigation measures for vibration.

OOHW period	Perception	dB(A) above RBL	dB(A) above NML	Additional mitigation measures	Noise levels at which additional mitigation measures are applicable
OOHW period 1	Noticeable	5 to 10	0	-	NML
Monday– Friday: 6 pm – 10 pm	Clearly audible	10 to 20	5-15	- Notification - Duration respite - Respite offer period 1	NML+5
Saturday: 7 am - 8 am and 5 pm – 10 pm	Moderately intrusive	20 to 30	15-25	- Notification - Respite offer period 1 - Verification - Duration respite	NML+15
Sunday and Public Hol.: 8 am – 6 pm	Highly Intrusive	>30	>25	- Notification - Respite offer period 1 - Phone calls - Verification - Duration respite - Individual briefings - Specific notifications	NML+25
OOHW period 2	Noticeable	5 to 10	<5	Notification	NML
Monday– Friday: 10 pm – 7 am	Clearly audible	10 to 20	5-15	- Notification - Respite offer period 2 - Verification - Duration respite	NML+5
Saturday: 10 pm - 8 am	Moderately intrusive	20 to 30	15-25	- Notification - Individual briefing - Duration respite - Specific notifications - Verification - Respite offer period 2	NML+15
Sunday and Public Hol. 8 pm – 7 am (8am if the following day is a Saturday)	Highly Intrusive	>30	>25	- Phone calls - Notifications - Individual briefing - Duration respite - Specific notifications - Verification - Respite offer period 2 - Phone calls - Alternative accommodation	NML+25

Figure 8-1: Hierarchy for application of additional mitigation for air-borne noise

OOHW period	dB(A) above ground-borne NML	Additional mitigation measures	
OOHW period 1	10-20 above NML	• Verification • Specific notification • Duration respite	• Notification • Respite offer period 1
Monday–Friday: 6 pm – 10 pm			
Saturday: 7 am – 8 am and 5 pm – 10 pm	>20 above NML	• Verification • Individual briefing • Duration respite • Specific notifications	• Notification • Respite offer period 1 • Phone calls
Sunday and Public Hol.: 8 am – 6 pm			
OOHW period 2	10-20 above NML	• Notifications • Individual briefing • Duration respite • Specific notifications	• Verification • Respite offer period 2 • Phone calls • Alternative accommodation
Monday– Friday: 10 pm – 7 am			
Saturday: 10 pm – 8 am			
Sunday and Public Hol. 6 pm – 7 am (8am if the following day is a Saturday)	>20 above NML	• Notifications • Individual briefing • Duration respite • Specific notifications	• Verification • Respite offer period 2 • Phone calls • Alternative accommodation

Figure 8-2: Hierarchy for application of additional mitigation for ground-borne noise

Predicted vibration level receiver	Additional mitigation measures type	
Perception	Type ¹	Apply to ²
Standard hours: Mon-Fri (7am-6pm), Sat (8am-5pm), Sun/Public Holiday (Nil)		
Predicted vibration exceeds maximum levels for human comfort	V, N, RP	All
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am and 5pm – 10pm), Sun/Public Holiday (8am – 6pm)		
Predicted vibration exceeds maximum levels for human comfort	V, IB, N, RO, PC, RP, SN	All
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Public Holiday 6pm to 7am		

Notes:

1. The additional mitigation measures have used the following abbreviations: AA = Alternative Accommodation, V = Validation of predicted level, PC = Phone calls, IB = Individual briefings, SN = Specific notifications, N = Notification drops, RP = Respite Period

2. All affected receivers

3. Table from Appendix C# of the Roads and Maritime CNVG

Figure 8-3: Triggers for additional vibration measures

8.3. Consultation and notification

Throughout delivery, the Project will continue to work with the Stakeholder and Community Team to consult with relevant councils and community stakeholders, including any other noise sensitive receivers such as schools, medical facilities, and places of worship.

Notification providing progress on construction and updates of any out of hours works will be provided to the local community in accordance with the Communications Strategy.

The consultation would involve consideration of appropriate mitigation and management options to be implemented where feasible and reasonable to minimise impacts. In accordance with Condition E70, noise generating work in the vicinity of potentially affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise levels above the NMLs will be timetabled so as to avoid sensitive periods, unless other reasonable arrangements have been made with the affected institutions.

In accordance with Condition E72, owners and occupiers of properties identified in the NVIS as at risk of exceeding the screening criteria for cosmetic damage will be notified before commencement of vibration generating works in the vicinity of that property. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owners and occupiers will be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier.

For out-of-hours work, appropriate respite periods would be identified in consultation with the community at each affected location on a regular basis in accordance with Condition E77. Consultation would include (but not be limited to) providing the community with:

- A progressive schedule for periods no less than three (3) months, of likely out-of-hours work
- A description of the potential work, location, and duration of the out-of-hours work
- The noise characteristics and likely noise levels of the work; and
- Likely mitigation and management measures which aim to achieve the relevant NMLs under Condition E68 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers).

The outcomes of the community consultation identified respite periods and scheduling of the likely out-of-hour work will be provided to the ER, EPA, and the Planning Secretary prior to undertaking the work scheduled for the subject period.

Community feedback and complaints relating to noise and/or vibration impacts will be dealt with in accordance with the Communication Strategy and the Complaints Management System (see Section 9.3 of this Plan).

8.3.1. Cumulative impact management

The Project will manage the potential for cumulative impacts via coordination and engagement with key stakeholders and other SSI stages and projects. In accordance with Condition E76 out-of-hours work undertaken by third parties for the delivery of the CSSI (such as utility relocations), will be coordinated to the greatest extent possible to ensure respite periods are provided, this includes:

- Reschedule any work to provide respite to impacted noise sensitive receivers so that the respite is achieved in accordance with Condition E77 (refer to Section 8.3), or
- Consider the provision of alternative respite or mitigation to impacted noise sensitive receivers.

9. Compliance Management

9.1. Roles and Responsibilities

The Project Team's organisational structure and overall roles and responsibilities are outlined in Section 4.3 of the CEMP. Specific roles not mentioned in the CEMP but are required for the implementation of noise and vibration management controls are detailed in Table 9-1.

Table 9-1: Roles and responsibilities specific to this Plan

Role	Responsibilities
Acoustic consultant	• Prepare all noise and vibration impacts statements • Provide professional acoustic advice

9.2. Training

All project personnel, including contractors working on site will undergo site induction training and pre-start briefings relating to noise and vibration management issues. The induction training and pre-start briefings will address elements related to noise and vibration management including:

- Existence and requirements of this sub-plan
- Applicable and relevant legislative requirements
- EPL conditions (e.g. specifically noise and vibration management competency and maintenance of plant and equipment conditions)
- Roles and responsibilities for noise and vibration management
- Typical construction activities that may impact noise and vibration, and associated environmental impacts
- Procedure to be implemented in the event of an incident or exceedance in monitored exceedance limits
- Noise and Vibration mitigation and management measures
- Out of Hours Work Protocol.

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. See Table 9-2 for details specific to this Plan.

Table 9-2: Training responsibilities relevant to this Plan

Training	Delivery
Potential sources of noise and vibration emissions	Project Induction, Toolbox talks
Impacts to the environment and surrounding community	Project Induction, Toolbox talks
Planning and preparedness for Out of Hours Working	Project Induction, Toolbox talks

Further details regarding staff induction and training are outlined in Section 4.6 of the CEMP.

9.3. Complaints Management

In accordance with CoA Part B, all community feedback, enquiries, and complaints will be managed via the Communication Strategy and Complaints Management System. Further details on the processes are outlined in Section 4.8.4 of the CEMP.

- A variety of communication tools will be used throughout construction to consult and inform stakeholders and the local community of impacts, including but not limited to:
- Tailored messaging regarding increased traffic volumes on detour routes and expected delays
- Geotargeted social posts during peak periods to remind people as they prepare to move around work areas
- Meetings/briefing with MPs, local councils, local businesses, and other community organisations
- Information sessions and pop-up displays
- Functional advertising through print, radio, television, and digital channels
- Signage including VMS and other dynamic signage
- Project website updates.

The Environment and Sustainability Manager (or delegate) will complete a site inspection and record observations and weather conditions in response to any community complaints associated with noise and vibration. Actions or rectification (if required) will be undertaken by the construction team as soon as reasonably practicable.

9.4. Monitoring and Inspection

Inspections of sensitive areas, mitigation measures, and activities which have the potential to generate noise and vibration impacts will occur for the duration of the Project. Requirements and responsibilities in relation to monitoring and inspections are documented in Section 4.10 of the CEMP.

Noise and vibration monitoring will also occur routinely for the duration of the Project, in accordance with the Project's NVCMP (Appendix C). Monitored noise and vibration levels will be analysed against the predictions made in the relevant noise and vibration assessment or using the Project's predictive tools. Where monitored noise levels are found to be above modelling predictions or vibration goals are exceeded, the following actions will be undertaken:

- Cease the noise generating source which causes the exceeded predictions
- Confirm the monitored levels are not being impacted by other noise or vibration sources
- Confirm if the exceedance is due to an uncharacteristically loud piece of equipment
- Identify if the equipment can be swapped out for another piece of equipment or alternative, equipment or plant, or if additional mitigation can be included in the site design
- Confirm if the exceedance is due to an uncharacteristically vibratory piece of equipment
- Confirm that the modelling reflects the actual activity being undertaken
- Implement additional feasible and reasonable measures which may include reducing plant size, modifying time of works, changing operational settings (such as turning off the vibratory function of the machine), and utilising alternative construction methodology or a combination of these
- Review work practices to ensure compliance with the management levels set out in this NVMP
- Ensure that the learnings from the above are fed back into the noise modelling assessment process for fine-tuning
- Continue work where impacts can be reduced
- Communicate lessons learnt to relevant personnel.

The Project will review the work or activity or combination of simultaneous works or activities as soon as practicable and where possible, modify the work or activity to prevent any recurrence. In the case of above prediction monitoring results, the need for modelling to be reviewed will also be considered. Lessons learnt will be communicated to relevant personnel in toolbox talks.

All environmental monitoring equipment (if required) will be maintained and calibrated according to the manufacturer's specifications, and appropriate records will be kept. Non-conformance reporting protocols are outlined in Section 9.7 of this Plan and Section 4.11 of the CEMP.

9.5. Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub plan, CoA and other relevant approvals, licenses, and guidelines. These audits will be undertaken at planned intervals to provide information on whether the Project:

- Is meeting its compliance obligations
- Conforms to this sub-plan
- Determines if this Sub-plan is effectively implemented and maintained.

The approach to internal and independent audits, including audit requirements and the auditing schedule, are detailed in Section 4.10.6 of the CEMP. Management of environmental incidents is detailed in Section 4.9 of the CEMP.

9.6. Reporting

Specific reports prepared in response to noise and vibration monitoring will capture detail including, but not limited, to:

- The locations and description of monitoring undertaken

- A tabulation of results (e.g. for noise including LA (MAX), LA10 (15min), LA90 (15min) and LAeq (15min) noise levels) together with notes identifying the principle sources and operations
- Summary of any measurements exceeding the nominated criteria, and descriptions of the plant or operations causing these exceedances.

Detail of any corrective actions and confirmation of their successful implementation.

Table 9-3 presents the reporting requirements specific to noise and vibration management. The full list of reporting requirements and responsibilities are documented in Section 4.10.7 of the CEMP

Table 9-3: Reporting requirements specific to noise and vibration management

Report	Requirement	Timing	Responsibility	Recipient
Monthly environmental and sustainability report	For incorporation in Project Monthly Reports including environmental statistics (i.e., incidents, regulatory action, complaints on environmental issues), regulatory and authority considerations, monitoring program performance and key environmental issues.	Within 10 working days of the end of each calendar month	Project Environment and Sustainability Manager Project Environmental Advisor	Transport
Monitoring program reporting	Reports to include analysis of the results including, but not limited to, exceedances of relevant criteria/targets/goals, reasons for any exceedances, trends in the data, and maximum, minimum and average data results for all monitored parameters. The report will also detail any management and mitigation measures that were implemented to address exceedances during the reporting period.	6 monthly	Project Environment and Sustainability Manager Project Environmental Advisor	Transport, DPE, EPA, City of Newcastle Council, Port Stephens Council, Maitland City Council Planning Secretary, and relevant regulatory agencies (as per CoA C18)
Incident reporting	Environmental incident classification, notification, and reporting in accordance with the Transport Environmental Incident Classification and Reporting Procedure Refer CEMP Section 4.9.	As specified in the CEMP Section 4.9 and Transport Environmental Incident Classification and Reporting Procedure	Environment and Sustainability Manager (or delegate)	Transport Relevant Regulatory Agencies
	Environmental incident notification to the Planning Secretary that causes or threatens to cause material harm as defined within the CoA. Refer CEMP Section 4.9 and CoA A39 and A40	As soon as possible and no later than 24 hours after becoming aware. Refer CEMP Section 4.9 and CoA A39 and A40.	Environment and Sustainability Manager (or delegate)	Transport DPE
Complaint Reporting	Complaint management and reporting in accordance with the Communication Strategy. Refer Section 4.8.4 of the CEMP and COA B7 through B11.	As specified within Section 4.8.4 of the CEMP and the Communication Strategy.	Environment and Sustainability Manager (or delegate) Community and Stakeholder Manager	Transport

9.7. Non-compliance and Non-conformance

Section 4.11 of the CEMP defines non-compliance and non-conformance and their associated reporting requirements. Generally, a non-compliance refers to a breach of the CoA or failure to implement the CEMP and CEMP sub-plans, requiring notification to the Planning Secretary, while a non-conformance is a failure to comply with environmental requirements, standards or procedure established by the Project EMS in addition to the CoA.

Environmental non-compliance or non-conformances will be communicated to the Project Environment Team. This will then be recorded in the Project database. An environmental action list will be developed and issued to the relevant the Project Team personnel for implementation and closeout. Actions will be assigned an implementation priority in a collaborative way by the Project Environment Team based on the environmental risk. Timeframes will be set to ensure any damage incurred is rectified and any chance of recurrence is eliminated as soon as practicable. Following corrective action, the Project Environment Team will close out the non-compliance/non-conformance, noting that additional obligations may be required for non-compliance following notification to the Planning Secretary.

Where a non-compliance/non-conformance is detected or monitoring indicates risks directly attributable to the Project (i.e. are influenced by factors under the direct control of the Project, e.g. exceedance of the predicted noise level due use of non-modelled plan), the process will typically include:

- An analysis of the results by the Project Environment and Sustainability Manager or delegate in more detail, with the aim of determining possible causes
- A site inspection by the Project Environment and Sustainability Manager or delegate
- Advising relevant personnel of the problem
- Identifying and agreeing on actions to resolve or mitigate the risk
- Implementing actions to rectify or mitigate the risk.

A Non-compliance/Non-conformance Report may be issued by the Project Environment and Sustainability Manager if it is found to be related to construction. The nature of the non-compliance/non-conformance will also be assessed against the criteria detailed in the Project and Transport Incident Classification, Notification and Reporting requirements (refer to Section 4.9 of the CEMP).

The timing for any improvement will be agreed between the relevant Area Managers/Forepersons and Project Environment and Sustainability Manager based on the level of risk (e.g. a significant risk will require immediate action).

For further information regarding environmental non-compliance and non-conformances, see Section 4.11 of the CEMP.

9.8. Notifications

In accordance with CoA E66, the Project will use best endeavours to notify all noise and/or vibration affected residents and owners/occupiers of properties identified as sensitive land use(s) of the likely impact and duration of the emergency works.

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
- 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.

10.2. NVMP Version Control

The processes described in Section 4.10 to 4.14 of the CEMP may result in the need to update or revise this Plan. This will occur as needed.

Only the Environment and Sustainability Manager (or delegate) has the authority to approve changes to the requirements of this Plan. Minor amendments to the Plan may be approved by the ER in accordance with Section 4.13.2 of the CEMP and are to be implemented for the duration of construction and for any longer period set out in the monitoring programs or specified by the Planning Secretary, whichever is the greater. Amendments not considered minor by the ER need to be approved by the Planning Secretary.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure. For details, refer to Section 4.12 of the CEMP.

Appendix A – Consultation Responses

City of Newcastle Engagement Log per CoA A8 (a), (b) and (c) and Comment Register per CoA A8 (d) and (e)

Date	Details of Engagement / Attempted Engagement
15/08/2023	JHGA email to City of Newcastle (CoN) providing copy of the NVMP and NVCMP.
30/08/2023	PSC email to JHGA confirming there are no comments on the NVMP or NVCMP.

Comment Raised	Project Response	Where addressed	Status
No comment. Refer Email dated 30 August 2023.			N/A

Port Stephens Council Engagement Log per CoA A8 (a), (b) and (c) and Comment Register per CoA A8 (d) and (e)

Date	Details of Engagement / Attempted Engagement
15/08/2023	JHGA email to Port Stephens Council (PSC) providing copy of the NVMP and NVCMP.
1/09/2023	PSC email to JHGA confirming there are no comments on the NVMP or NVCMP.

Comment Raised	Project Response	Where addressed	Status
No comment. Refer Email dated 1 September 2023.			N/A

Maitland City Council Engagement Log per CoA A8 (a), (b) and (c) and Comment Register per CoA A8 (d) and (e)

Date	Details of Engagement / Attempted Engagement
14/08/2023	Phone call to Maitland City Council (MCC) to arrange briefing session via Teams to discuss status of upcoming plans for consultation
15/08/2023	JHGA briefing session with MCC via Teams to discuss status of upcoming plans for consultation. JHGA email to MCC providing copy of the NVMP and NVCMP. Request for feedback by 30 August 2023. Offer of in-person meeting / Teams session made.
31/08/2023	Phone call to MCC to discuss status of CEMP Sub-Plans with MCC for consultation. JHGA email to MCC requesting update on CEMP Sub-Plans with MCC for consultation.
6/09/2023	Phone call from MCC to discuss status of CEMP Sub-Plans with MCC for consultation.
11/09/2023	JHGA email to MCC requesting update on CEMP Sub-Plans with MCC for consultation.
12/09/2023	MCC email to JHGA providing feedback on CEMP Sub-Plans and indicating NVMP comments will be provided by 20 September 2023.
13/09/2023	JHGA email to MCC offering further meetings with relevant MCC personnel to address and specific queries / questions on the NVMP and NVCMP.
14/09/2023	Phone call to MCC to discuss status of CEMP Sub-Plans with MCC for consultation. No response, voicemail left.
19/09/2023	JHGA email to MCC requesting confirmation from MCC that comments will be provided by 20 September 2023.
20/09/2023	Phone call to MCC to discuss status of CEMP Sub-Plans with MCC for consultation. No response, voicemail left. MCC email to JHGA confirming there are no comments on the NVMP or NVCMP.

Comment Raised	Project Response	Where addressed	Status
No comment. Refer Email dated 20 September 2023.			N/A

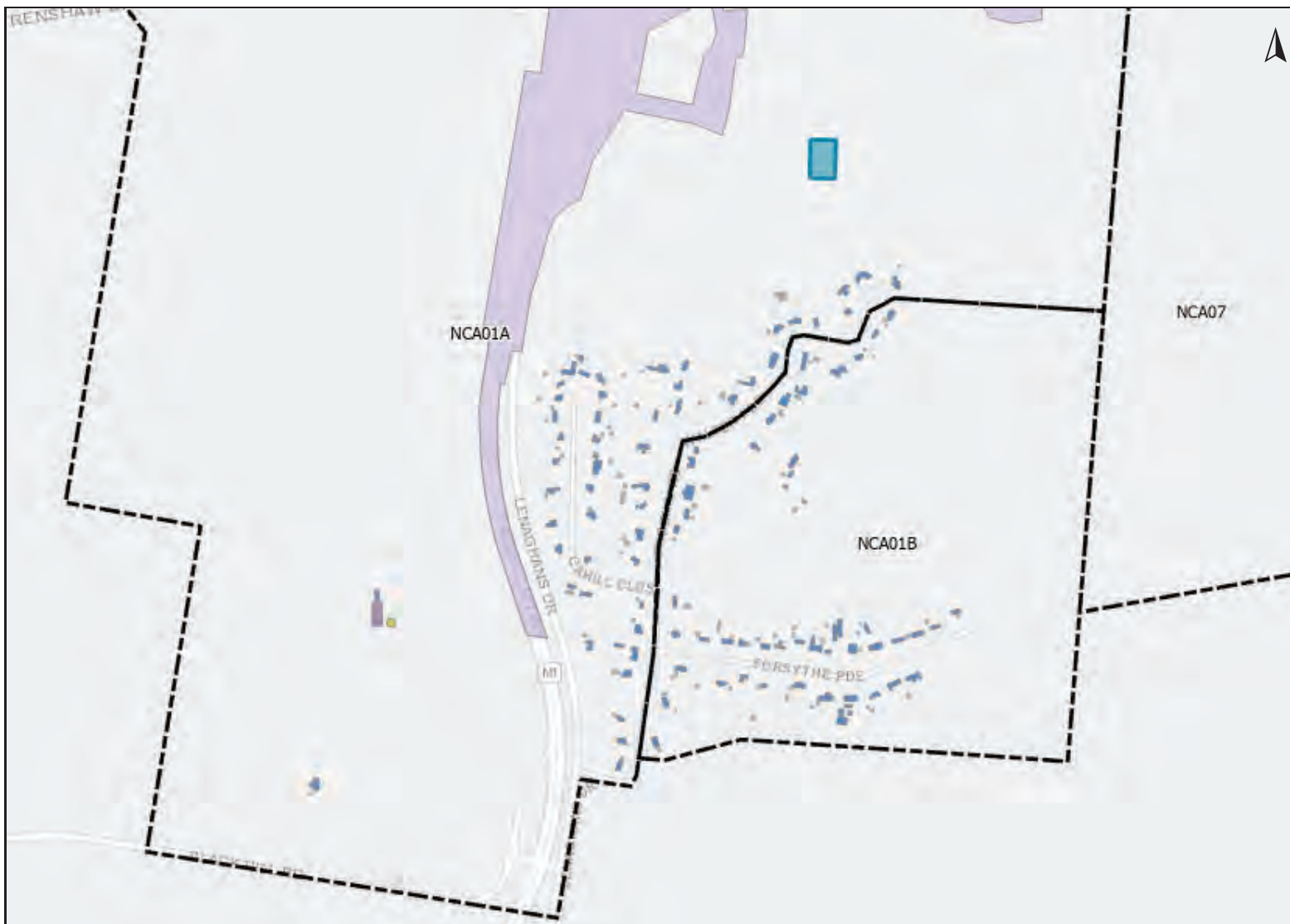
EPA Engagement Log per CoA A8 (a), (b) and (c) and Comment Register per CoA A8 (d) and (e)

Date	Details of Engagement / Attempted Engagement
15/08/2023	JHGA email to EPA providing copy of the NVMP and NVCMP.
31/08/2023	EPA email to JHGA confirming there are no comments on the NVMP or NVCMP.

Comment Raised	Project Response	Where addressed	Status
No comment. Refer Email dated 21 August 2023.			N/A

Appendix B – Land Use/Sensitive Receivers Maps

Noise & Vibration Sensitive Receiver Locations



LEGEND

- BH2T Site Works Area
- Sensitive Receivers - Additional Active Recreation
- Sensitive Receivers - Residential
- Sensitive Receivers - Commercial
- Sensitive Receivers - Garage
- Sensitive Receivers - Active Recreation
- Noise Catchment Area Bound

Latest Map (04/07/2023)

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 m

Scale: 1 20000

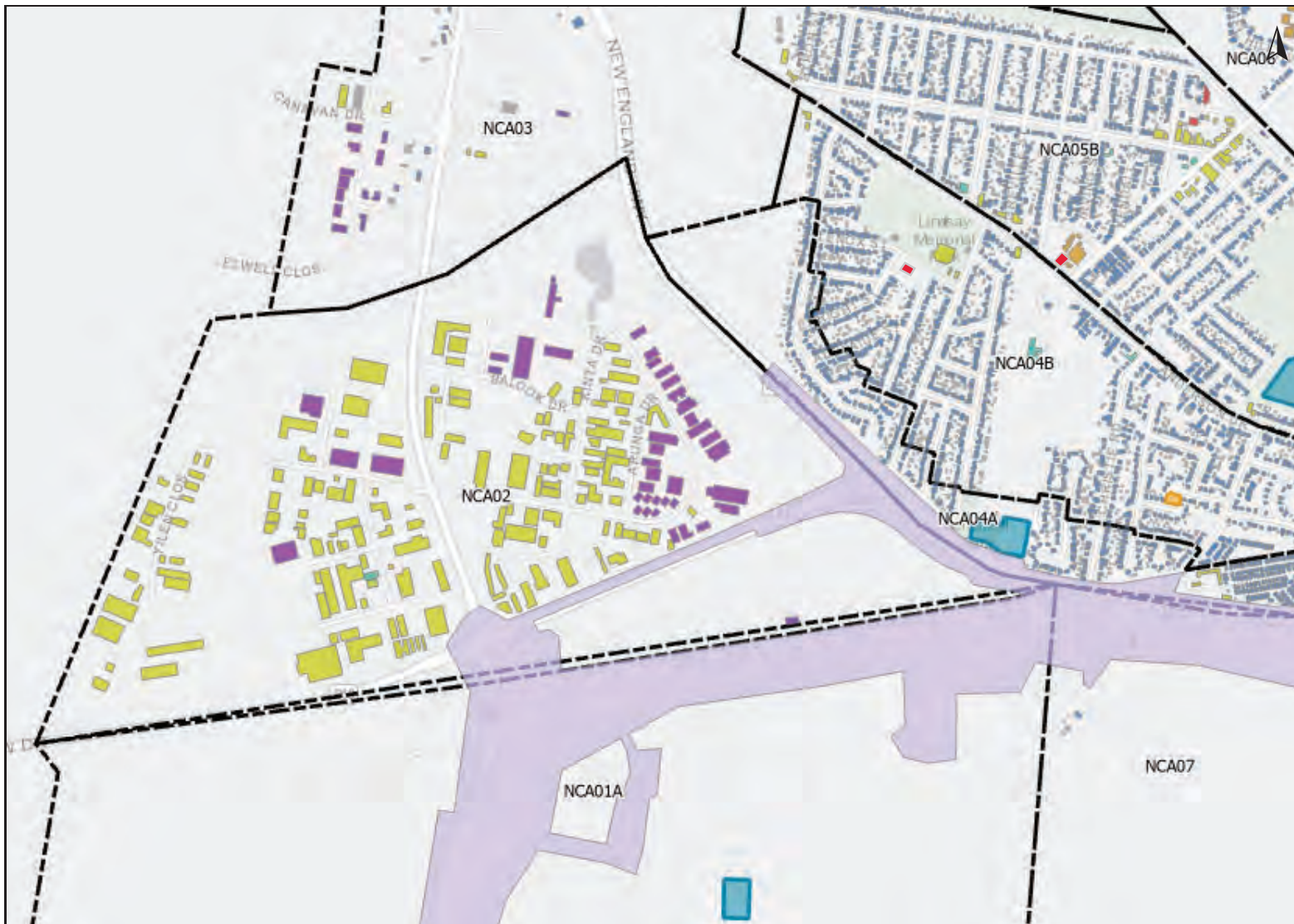
This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. Plotted as A4 Landscape Sheet.

THIS MAP IS NOT TO BE USED FOR CONSTRUCTION

Plotted: 07/04/2023 13:17:53



Noise & Vibration Sensitive Receiver Locations



LEGEND

- BH2T Site Works Area
- Sensitive Receivers - Additional Passive Recreation
- Sensitive Receivers Additional Active
- Sensitive Receivers - Residential
- Sensitive Receivers - Commercial
- Sensitive Receivers - Industrial
- Sensitive Receivers - Childcare
- Sensitive Receivers - Educational
- Sensitive Receivers - Place Of Worship
- Sensitive Receivers - Garage
- Sensitive Receivers - Library
- Noise Catchment Area Boundary
- Latest Map (04/07/2323)

0 150 300
m

Scale: 1 20000

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Plotted: 07/04/2023 13:26:51



Noise & Vibration Sensitive Receiver Locations

LEGEND

- BH2T Site Works Area
 - Sensitive Receivers - Additional Active Recreation
 - Sensitive Receivers - Residential
 - Sensitive Receivers - Commercial
 - Sensitive Receivers - Industrial
 - Sensitive Receivers - Childcare
 - Sensitive Receivers - Educational
 - Sensitive Receivers - Place Of Worship
 - Sensitive Receivers - Garage
 - Sensitive Receivers - Library
 - Noise Catchment Area Boundary
- Latest Map (04/07/2023)



0 150 300
 m

Scale: 1:20000

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Plotted: 07/04/2023 13:36:53



Noise & Vibration Sensitive Receiver Locations

LEGEND

BH2T Site Works Area



Sensitive Receivers - Additional Active



Sensitive Receivers - Residential



Sensitive Receivers - Commercial



Sensitive Receivers - Industrial



Sensitive Receivers - Childcare



Sensitive Receivers - Educational



Sensitive Receivers - Place Of Worship



Sensitive Receivers - Garage



Noise Catchment Area Boundary



Latest Map (04/07/2023)



0 150 300
m

Scale: 1 25000

Plotted: 07/04/2023 13:50:51

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Noise & Vibration Sensitive Receiver Locations



LEGEND

- BH2T Site Works Area
- Sensitive Receivers - Residential
- Sensitive Receivers - Commercial
- Sensitive Receivers - Industrial
- Sensitive Receivers - Garage
- Noise Catchment Area Boundary

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Scale: 1 30000

Plotted: 07/04/2023 13:59:19

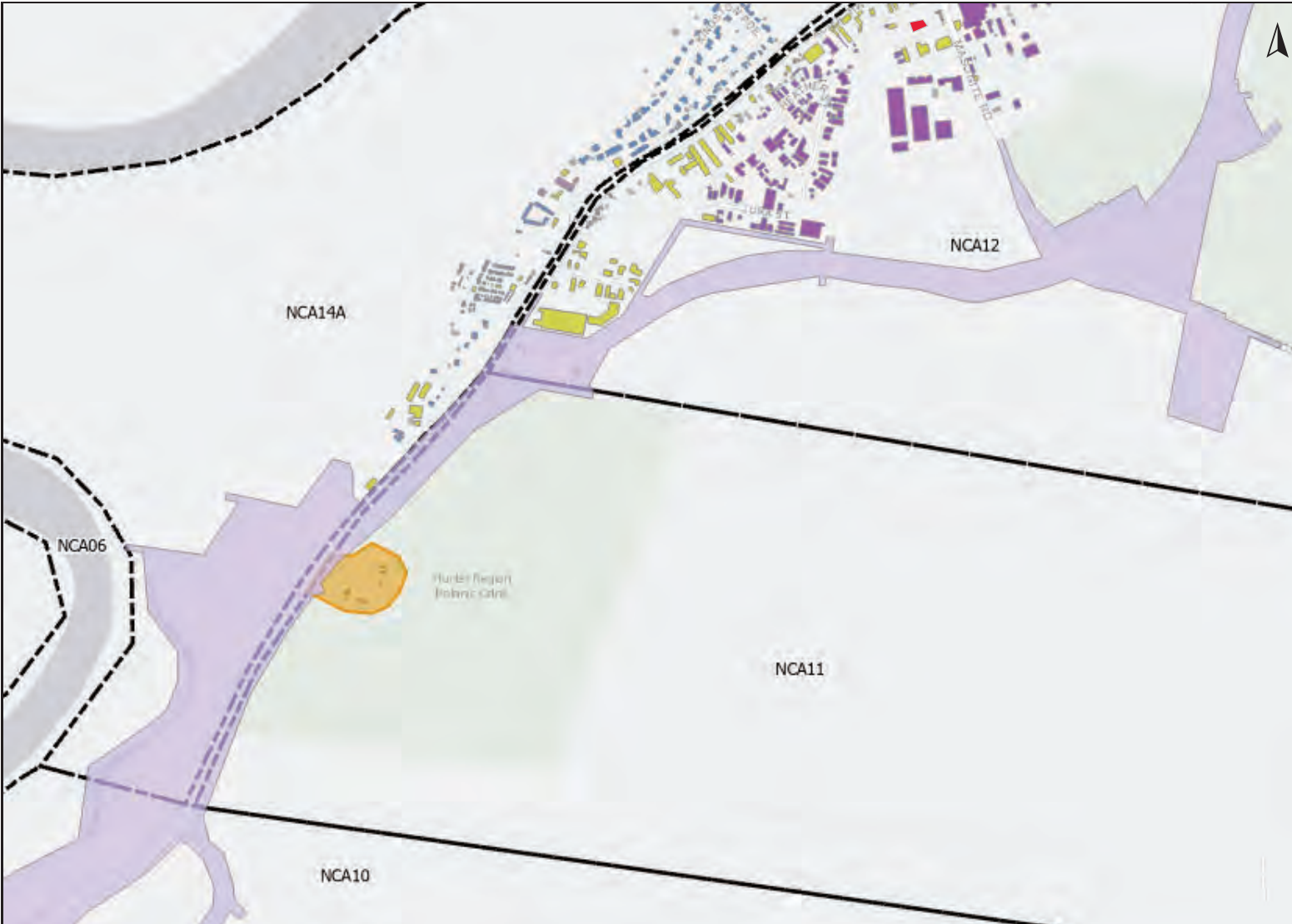
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Latest Map (04/07/2023)



Noise & Vibration Sensitive Receiver Locations



LEGEND

BH2T Site Works Area



Sensitive Receivers - Additional Passive Recreation



Sensitive Receivers - Residential



Sensitive Receivers - Commercial



Sensitive Receivers - Industrial



Sensitive Receivers - Educational



Sensitive Receivers - Garage



Sensitive Receivers - Passive Recreation



Sensitive Receivers - Active Recreation



Noise Catchment Area Boundary



Latest Map (04/07/2023)

0 150 300
m

Scale: 1:25000

Plotted: 07/04/2023 14:08:42

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Noise & Vibration Sensitive Receiver Locations

LEGEND

BH2T Site Works Area



Sensitive Receivers - Residential



Sensitive Receivers - Commercial



Sensitive Receivers - Industrial



Sensitive Receivers - Educational



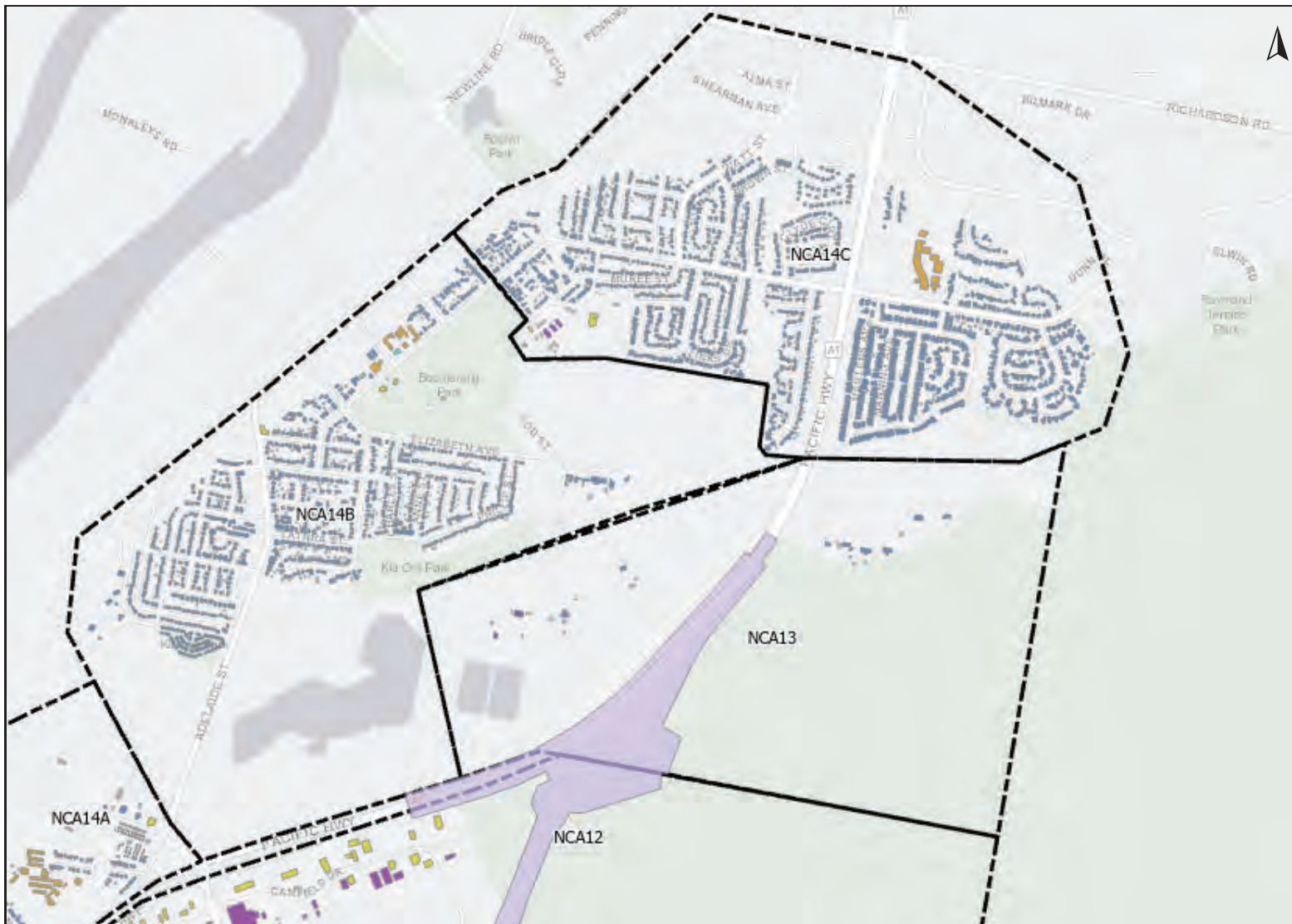
Sensitive Receivers - Place Of Worship



Sensitive Receivers - Garage



Noise Catchment Area Boundary



0 150 300
m

Scale: 1:25000

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Latest map (04/07/2023)



Appendix C – Construction Noise and Vibration Monitoring Program

M1 Motorway Extension to Raymond Terrace – Stage 1 Black Hill to Tomago

NWMP Appendix C –Noise and Vibration Construction Monitoring Program

Document Number: M1RTBH2T-JHGM-6003-NV-PRG-200001

Revision Number: F

Issue Date: 30/10/2023

Revisions and Distribution

Revisions

Draft issues of this document are identified as Revision A, B, C, etc. Upon initial issue (generally Contract Award) this will be changed to a sequential number commencing at Revision 0. Revision numbers will continue at Revision 1, 2, etc.

R ev	Date	Prepared By [Name]	[Signature]	Reviewed By [Name]	[Signature]	Approved By [Name]	[Signature]	Remarks
A	22/05/23	D. Price	DP	K. Kerr K. Lloyd B. O'Leary	KK KL BO	R. Petaccia	RP	Initial Transport / ER Submission
B	4/07/23	K. Lloyd D. Price	KL DP	K. Kerr	KK	R. Petaccia	RP	Transport / ER Re- submission
C	31/07/23	K. Lloyd D. Price	KL DP	K. Lloyd	KL	R. Petaccia	RP	For external consultation
D	20/09/23	K. Lloyd D. Price K. Kerr	KL DP KK	K. Lloyd K. Kerr	KL KK	R. Petaccia	RP	For ER endorsement
E	25/09/23	K. Kerr	KK	K. Kerr	KK	R. Petaccia	RP	Document number correction.
F	30/10/2023	K. Lloyd	KK	K. Lloyd	KK	R. Petaccia	RP	For DPE Resubmissio n

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Terms and Abbreviations

Term/Abbreviation	Definition/Expanded text
ABL	Assessment Background Level – A single-number figure used to characterise the background noise levels from a single day of a noise survey. ABL is derived from the measured noise levels for the day, evening or night-time period of a single day of background measurements. The ABL is calculated to be the tenth percentile of the background LA90 noise levels, i.e. the measured background noise is above the ABL 90% of the time.
ABN	Airborne noise
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.
AQMP	Air Quality Management Sub-Plan
Attenuation	The reduction in the level of sound or vibration.
At-property acoustic treatment	Includes courtyard walls and building treatments. Building treatments may include but are not limited to ventilation, acoustic blinds/curtains, glazing, window and door seals, sealing of vents or underfloor areas, shutters and secondary glazing.
AVTG	Assessing Vibration – A Technical Guideline
BH2T	Black Hill to Tomago, or the Project
BMP	Blast Management Plan
CS	Communications Strategy
CEMP	Construction Environmental Management Plan
CMP	Construction Monitoring Program
CNVG	Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime Services 2016b)
CoA	Conditions of Approval
Construction	Includes all activities required to construct the CSSI as defined in the Project Description described in the documents listed in Condition A1, including commissioning trials of equipment and temporary use of any part of the CSSI but excludes Low Impact Work which is carried out or completed prior to approval of the CEMP and works approved under a Site Establishment Management Plan.
Consultation	To provide information and actively engage with and obtain and consider feedback from stakeholders during development of post approval documents. How the feedback has been considered and whether any changes have been made in response to this feedback is then documented and communicated back to stakeholders. Consultation should not be limited to one-way notification about the project.
Continuously	Includes any period during which there is less than one hour between ceasing and recommencing any of the work.
CSSI	Critical State Significant Infrastructure
D&C	Design and Construct
dB(A)	Decibels using the A-weighted scale which is accepted as being representative of the frequency response of the human ear.
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DECCW	Department of Environment and Climate Change and Water
DPE	Former Department of Planning and Environment, now Department of Planning, Industry 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.

Term/Abbreviation	Definition/Expanded text
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 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.
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	Environment Protection Authority
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
EPL	Environment Protection Licence
ER	Environmental Representative
EWMS	Environmental Work Method Statement
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.
GBN	Ground-borne noise
Highly Noise Affected	As defined in the Interim Construction Noise Guideline (DECC, 2009)
Highly noise intensive works/ particularly annoying	Work which is defined as annoying under the ICNG including: use of power saws, such as used for cutting timber, rail lines, masonry, road pavement or steel work a. grinding metal, concrete or masonry; b. rock drilling; c. line drilling; d. vibratory rolling; e. bitumen milling or profiling; f. jackhammering, rock hammering or rock breaking; and g. impact piling
ICNG	Interim Construction Noise Guideline (DECC, 2009)
ISCA	Infrastructure Sustainability Council of Australia
JHGA JV	John Holland Gamuda Australia Joint Venture
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.
LAeq(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.
M12RT	M1 Pacific Motorway Extension to Raymond Terrace
NCA	Noise Catchment Area
NCG	Noise Criteria Guideline
NMG	Noise Mitigation Guideline
NML	Noise Management Level as defined in the Interim Construction Noise Guideline (DECC, 2009)
NVA	Noise and Vibration Assessment
NVIS	Noise and Vibration Impact Statement
NVMP	Noise and Vibration Management Sub-Plan
ONR	Operational Noise Review
OOHW	Out of Hours Works
POEO Act	<i>Protection of the Environment Operations Act 1997</i>
PPV	Peak Particle Velocity – the highest velocity of a particle (such as part of a building structure) as it vibrates. Most sound level meters measure root mean squared (RMS) values; it is common to

Term/Abbreviation	Definition/Expanded text
	approximate the PPV based on an RMS measurement. PPV is commonly used as a vibration criterion, and is often interpreted as a PPV based on the L _{max} or L _{max,spec} index.
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 Measures
RMS	Root Mean Squared
RNP	Road Noise Policy
ROL	Road Occupancy Licence
Sensitive land use(s)	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), childcare centres, passive recreation areas (including outdoor grounds used for teaching). Receivers that may be considered sensitive include commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, and retail spaces), and industrial premises as identified by the Planning Secretary.
Standard construction hours	Hours during which construction work is permitted by the CoA. Further defined in Section 5.1 in the NVMP.
Submissions Report	The Proponent's response to issues raised in the submission received in relation to the application for approval of the CSSI under the EP&A Act.
SMART	Specific, Measurable, Achievable, Relevant and Time-Bound
SPL	Sound Pressure Level
Transport	Transport for New South Wales, or TfNSW
VMS	Variable Message Signs
Work	Any physical activity for the purposes of the CSSI including construction, Low Impact Work, enabling works, utility works and site establishment activities but not including operational maintenance works.

Noise and Vibration Construction Monitoring Program

Program Profile

Management System	The Project will use John Holland's Environmental Management System (EMS) and core Project plans to support Project delivery. Additional functional plans have been developed for the Project.
Name	Noise and Vibration Construction Monitoring Program
Authorisation	All personnel employed on the Project will perform their duties in accordance with the requirements of this Monitoring Program and in compliance with Project system procedures and any specific Project instructions. This Monitoring Program is authorised by the Project Director.
Review and update	This Monitoring Program will be regularly reviewed, developed, and updated: • For changes in design or construction sequence, staging, methodology or resourcing • To consider progress of the Project Company's Work • For changes in access to the Project Site and Temporary Areas • To consider changes directed by Transport's Representative under the D&C Deed.

1. Introduction

1.1. Context

This Noise and Vibration Construction Monitoring Program (NVCMP or Monitoring Program) forms part of the Construction Environmental Management Plan (CEMP) for the M1 Pacific Motorway Extension to Raymond Terrace (M12RT) Black Hill to Tomago (BH2T, or the Project).

This monitoring Program has been prepared to address the requirements of the Minister's Condition of Approval (CoA) C12(a), the measures listed in the M1 Pacific Motorway Extension to Raymond Terrace Environmental Impact Statement (EIS), as amended by the Submissions Report (known as the Revised Environmental Management Measures (REMMs)), and all applicable guidance and legislation.

1.2. Background

The M1 Pacific Motorway Extension to Raymond Terrace Environmental Impact Statement (EIS) assessed noise and vibration impacts on sensitive receivers and structures during construction and operation of the Project, within Chapter 8 and Appendix H.

The EIS identified the potential for noise and vibration impacts during construction which are dependent on the types of construction activity in progress and the proximity of works to sensitive receivers. However, it concluded any potential impacts could be managed by tailored mitigation and management measures, including construction noise and vibration monitoring.

Please refer to Section 1.3 of the Construction Environmental Management Plan (CEMP) for Project description.

1.3. Scope of the monitoring program

The scope of this monitoring Program is to describe how John Holland Gamuda Joint Venture (JHGA) proposes to carry out noise and vibration monitoring during the construction of the Project. Monitoring will be undertaken for modelling verification at sensitive receivers, to assess compliance in response to complaints, for equipment spot checks and verification of construction traffic. For further information refer to Sections 5 and 6.

This Monitoring Program forms part of the Project's Noise and Vibration Management Plan.

Operational noise and vibration monitoring does not fall within the scope of this monitoring Program and therefore is not included within the processes contained within this monitoring Program.

1.4. Environment Management Systems Overview

The Environmental Management System (EMS) overview is described in Section 1.5 of the CEMP. The EMS also incorporates the Project-specific CEMP and sub-plans, strategies, procedures, and Environmental Work Method Statement (EWMS). The EMS provides management guides that clearly identify required environmental management actions for implementation by Project personnel and contractors and will apply for the duration of construction.

1.5. Consultation for Preparation

In accordance with CoA A8, C5(b), and C12(a), this NVCMP and the associated NVMP (to which the NVCMP is an Appendix) has been prepared as part of the CEMP in consultation with the following agencies and councils:

- City of Newcastle Council (NVMP and NVCMP)
- Port Stephens Council (NVMP and NVCMP)
- Maitland City Council (NVMP and NVCMP)
- Environmental Protection Authority (EPA) (NVCMP only).

This NVCMP and the NVMP were provided to the above listed agencies and councils from 7 August 2023. No comments were made on either the NVCMP or NVMP.

Appendix A of the NVMP provides a summary of the consultation undertaken for the development of this NVCMP and the NVMP. Table 1-1 provides a summary of consultation periods and outcomes.

Table 1-1 Consultation summary

Stakeholder	Total Review Period (Calendar days)	Outcome
City of Newcastle Council (NVMP and NVCMP)	14	No comments on NVMP or NVCMP
Port Stephens Council (NVMP and NVCMP)	17	No comments on NVMP or NVCMP
Maitland City Council (NVMP and NVCMP)	36	No comments on NVMP or NVCMP
Environmental Protection Authority (EPA) (NVCMP only)	16	No comments on NVCMP

Ongoing consultation with relevant stakeholders, including any unique local receivers (e.g. local residents, schools and asset owners), may be undertaken for particular issues, such as periods of excessive noise and vibration impacts or Out of Hours Works, pertaining to the Project's impact on ambient conditions. Community feedback and complaints relating to Noise and Vibration impacts will be dealt with in accordance with the Communication Strategy and the Complaints Management System (see Section 8.1 of this Plan).

In accordance with CoA C4 and C15, this NVCMP and the associated NVMP was endorsed by the Environmental Representative (ER) on 26 September 2023 prior to submission to the Planning Secretary for approval no later than one month before the commencement of construction. In accordance with CoA C10 and C16, construction may not commence until the CEMP and relevant CEMP Sub-Plans and Monitoring Programs applying to construction activities to be undertaken have been approved by the Planning Secretary and all relevant baseline data for the specific construction activity has been collected.

1.6. Monitoring Program Implementation

In accordance with CoA C17, this NVCMP, as approved, including any minor amendments approved by the ER, will be implemented for the duration of construction and for any longer period set out in this NVCMP, or as otherwise specified by the Planning Secretary, (whichever is the greater).

2. Purpose and Objectives

2.1. Purpose

The purpose of this monitoring Program is to describe how the Project proposes to conduct noise and vibration monitoring during construction of the Project.

This monitoring Program will apply for the duration of the Project's construction works unless a longer period is specified by the Secretary of the Department of Planning and Environment (DPE).

2.2. Objectives

The key objective of this NVCMP is to ensure all approval and contractual requirements relevant to noise and vibration monitoring are describe, schedule, and assigned responsibility as outlined in:

- M12RT EIS (Chapter 8 and Appendix H), Submissions Report (Chapter 6.6 and 7.9, Appendix D and Appendix K – REMMs), Assessment Report (Chapter 6.2), and CoA
- TfNSW Specifications G36, G38 and G40
- Scope of Works and Technical Criteria (SWTC) Appendices.

To achieve compliance with the conditions and objectives of the Project documents above, the Project will undertake the following:

- Establish the monitoring program including parameters, frequency, and location and ensure its implementation for the duration of the program
- Establish the reporting requirements including monitoring results and analysis of results against relevant criteria
- Established the methods that will be applied to analyse the monitoring data
- Establish procedures to identify and implement additional mitigation measures where the result of monitoring indicates unacceptable Project impacts
- Consider SMART principles in development of the monitoring program.

2.3. Smart Principles

In accordance with the requirements of CoA C13(j), the NVMP is to be developed with consideration of SMART principles. This is achieved as follows:

- (S) Specific, the monitoring program clearly defines the objectives and targets related to noise and vibration monitoring. It focuses on identifying and assessing potential impacts of construction activities on local receivers, ensuring that the monitoring efforts are specific to these risks.
- (M) Measurable, the monitoring program utilises quantifiable parameters and standardised sampling methods to measure and monitor noise and vibration. Parameters are measured using appropriate instruments and laboratory analysis. This allows for consistent and comparable data collection throughout the monitoring process.
- (A) Achievable, monitoring activities are consummate to environmental risk and are designed within the Project's available resources and timeframes. Sufficient staff, equipment, and expertise are allocated to ensure the successful implementation of the monitoring program. Adequate training and support are provided to personnel involved in data collection and analysis.
- (R) Realistic, the selected parameters and monitoring locations are realistic and relevant to the construction activities and potential risk. The program focuses on areas with potential to be impacted by construction and ensures that the collected data is directly applicable to assessing the impact of construction on noise and vibration levels.
- (T) Time-bound, the monitoring program has defined timeframes and intervals for data collection. It includes pre-construction, construction, and post-construction phases, allowing for a comprehensive assessment of noise and vibration throughout the project lifecycle. Regular monitoring activities are conducted at specific intervals, including routine sampling and where there are any changes to methodology, plant or equipment which may result in increased noise impacts, to capture any temporal variations in water quality.

3. Environment Requirements

3.1. Relevant Legislation and Guidelines

3.2. Legislation

All legislation relevant to this monitoring Program is included in Section 3.1.1 of the NVMP.

3.3. Guidelines and Standards

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

- Transport for NSW Specification D&C G36 – Environmental Protection (Management System).
- RMS Construction Noise and Vibration Guidelines (Roads and Maritime 2016)
- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- NSW Road Noise Policy, Dept. of Environment, Climate Change and Water 2011
- Approved Methods for Measurement and Analysis of Environmental Noise in NSW 2022
- Noise Policy for Industry (NPfI), Environment Protection Authority 2017
- NSW Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- Australian Standard 1055 Acoustics – Description and Measurement of Environmental Noise
- AS 2012.1 Acoustics - Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors - Stationary test condition - Determination of compliance with limits for exterior noise
- Australian Standard AS/NZS 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors
- Australian Standard AS 2187.2 Explosives - Storage and use - Part 2 Use of explosives
- Australian Standard AS2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites Australian Standard 2659.1 – 1998 Guide to the use of sound measuring equipment – portable sound level meters
- Australian Standard 2775 Mechanical Mounting of Accelerometers
- Australian Standard 2834-1995 Computer Accommodation, Chapter 2.9 Vibration
- Australian Standard IEC 61672.1 Electroacoustic – Sound Level Meters – Specifications
- British Standard BS 6472-2008, 'Evaluation of human exposure to vibration in buildings (1- 80Hz)
- British Standard 7385: Part 2-1993 'Evaluation and measurement of vibration in buildings'
- German Standard DIN4150-3:2016 Vibration in buildings – Part 3: Effects on structures
- ISO 3744 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane
- ISO 3746 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane
- ISO 6393 Earth-moving machinery - Determination of sound power level - Stationary test conditions
- ISO 6395 Earth-moving machinery - Determination of sound power level - Dynamic test conditions.

3.4. Environment Protection Licenses

All applicable requirements from the EPL will be incorporated into this Program following receipt of the EPL.

4. Baseline monitoring data

4.1. Baseline Noise Monitoring

Noise monitoring was carried out in areas where receivers may potentially be affected by construction noise from the Project. Noise monitoring was also carried out to determine the existing levels of road traffic noise along the Project corridor. The baseline noise monitoring locations were selected to be representative of the appropriate Noise Catchment Areas (NCAs) within and around the Project, across a mix of existing land uses including residential, commercial, industrial, and open space.

The objectives of the monitoring were to:

- Determine the existing ambient and background noise levels across each noise catchment area.
- Derive construction noise management levels and operational road traffic noise criteria to be applied to the assessment of the project.
- Validate noise models used in the assessment of the project.

Long-term noise monitoring was carried out between June and July 2018 at eight locations (L01 to L08) with short-term noise measurements at three locations (L01A, L04A and L05A). Baseline logger location considerations included land topography and contributions from other noise activities, such as road noise. The logger locations were considered representative of the existing background and ambient noise environment in the study area.

In accordance with REMM NV10, additional monitoring was undertaken between November and December 2022 at 30 locations. The monitoring was both for baseline and validation. The results of the additional monitoring identified and recommended changes to RBLs at some locations due to the previous data being more than 5 years old. The adjusted levels are provided in Table 4-1. The results of the additional noise monitoring is included in Appendix C6 of the NVMP. For further information regarding existing environment refer to Section 4 of the NVMP and EIS Section 8 and Appendix H (Noise and Vibration).

4.2. Baseline Noise Data Summary

The Noise Management Levels (NMLs) derived from the baseline noise monitoring undertaken during the EIS and additional baseline noise monitoring undertaken as part of the Traffic Noise Monitoring Program is provided in Table 4-1.

Table 4-1: Noise management levels for residential sensitive receivers

NCA	Monitoring Location	LAeq (15 minute) NML, dB(A)				Sleep disturbance screening level (RBL + 15dB)
		Standard hours (RBL + 10dB) Day ¹	Extended / out of hours (RBL + 5dB)			
			Day ²	Evening ³	Night ⁴	
NCA01A	L01	61	56	54	51	61
NCA01B	L01A	47	42	43	41	51
NCA03	L02	76	65	65	52	62
NCA04A	L04	61	56	54	46	56
NCA04B	L04A	55	50	50	44	54
NCA05A	L05	65	60	56	50	60
NCA05B	L05A	51	46	43	40	50
NCA06	L06	48	43	41	39	49
NCA07	L03	53	48	51	48	58
NCA08	L07	51	46	45	42	52
NCA09	L08	62	57	52	50	60
NCA14A	L09	64	59	54	47	57

Notes:

1. Day: 7.00am to 6.00pm Monday to Friday and 8.00am to 5.00pm Saturdays
2. 8.00am to 6.00pm Sundays & Public Holidays
3. Evening: 6.00pm to 10.00pm Monday to Sunday and Public Holidays
4. Night: 10.00pm to 7.00am Monday to Saturday and 10.00pm to 8.00am Sundays and Public Holidays

Table 4-2: Noise management levels for non-residential sensitive receivers details the NMLs for other noise sensitive receivers located within the construction study area. These NMLs are absolute levels and are independent of the existing background and ambient noise environment, in accordance with the ICNG.

Table 4-2: Noise management levels for non-residential sensitive receivers

Land use	NML
Classrooms at schools, and other educational institutions	Internal noise level 45 dB(A) ^{2 and 1}
Places of worship	Internal noise level 45 dB(A) ²
Childcare centre	External noise level 50 dB(A) ⁶
Active recreation areas (e.g. sports fields/activities which generate their own noise and are generally less sensitive to external noise)	External noise level 65 dB(A)
Passive recreation areas (e.g. area used for low intensity and low noise producing activities which could be impacted by external noise such as reading or meditation)	External noise level 60 dB(A) ⁴
Commercial premises (including offices and retail outlets)	External noise level 70 dB(A) ^{3 and 5}
Industrial premises	External noise level 75 dB(A) ⁵

1. NMLs apply when receiver areas are in use only
2. As per the ICNG and NPfI, it has been assumed that the difference between an internal noise level and the external noise level is 10 dB(A), assuming windows are open for adequate ventilation. An external NML would be defined on this basis.
3. Medical centres and similar are classified as commercial premises
4. Community centres have been assessed to an external noise level of 60 dB(A). Depending on the intended use of the centre, the noise management level may vary
5. The NML applies at the most affected occupied point on the premises
6. Specific criteria for childcare centres are not provided in the ICNG. The NML for childcare centres has been developed with consideration of Association of Australian Acoustical Consultants Guideline for Child Care Centre Acoustics Assessment (2013) and a conservative 10 dB(A) reduction from external to internal noise levels

4.3. Baseline Vibration Monitoring

Baseline vibration monitoring was not undertaken during the EIS or following the EIS. The impacts of vibration experienced by receivers would be dependent on separation distances, the intervening soil and rock strata, dominant frequencies of vibration and the receiver structure. Where construction activities involving vibration intensive plant are carried out within the minimum working distances presented in Table 4-3, vibration monitoring should be conducted at the impacted receivers to confirm vibration levels are within acceptable limits during the work.

Table 4-3: Recommended minimum working distances for vibration intensive plant and equipment

Plant item	Rating/activity description	Recommended minimum working distance		
		Cosmetic damage		Human response ³
		Structurally sound ¹ (e.g. residential & light commercial)	Structurally unsound ² (e.g. unsound heritage structures)	
Vibratory roller	< 50 kN (typically 1-2 t)	5m	11m	15m to 20m
	< 100 kN (typically 2-4 t)	6m	13m	20m
	< 200 kN (typically 4-6 t)	12m	15m	40m
	< 300 kN (typically 7-13 t)	15m	31m	100m

Plant item	Rating/activity description	Recommended minimum working distance		
		Cosmetic damage		Human response ³
		Structurally sound ¹ (e.g. residential & light commercial)	Structurally unsound ² (e.g. unsound heritage structures)	
	> 300 kN (typically 13-18 t)	20m	40m	100m
	> 300 kN (typically > 18 t)	25m	50m	100m
Small hydraulic hammer	300 kg – 5 to 12 t excavator	2m	5m	7m
Medium hydraulic hammer	900 kg – 12 to 18 t excavator	7m	15m	23m
Large hydraulic hammer	1600 kg – 18 to 34 t excavator	22m	30m ⁴	73m
Vibratory pile driver	Sheet piles	2 m to 20 m	5 m to 30 m	20 m to 50 m
Pile boring	≤ 800 mm	2m	5m	5m
Jackhammer	Handheld	1m	3m	5m
Blasting operations ⁴		Based on charge size – see Note ⁴		

Notes:

1. Referenced from either the CNVG or against the criteria in the British Standard BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2
2. Criteria referenced from DIN 4150-3:2016 Vibration in buildings – Effects on structures (including heritage items)
3. Referenced from either the CNVG or the criteria referenced in the EPA's Assessing Vibration: a technical guideline (December 2006)
4. To be determined during test blasts to establish appropriate propagation characteristics for the site and increase the accuracy of blasting predictions and confirmed

5. Noise Monitoring

5.1. Frequency and location of airborne noise monitoring

The frequency and location of airborne monitoring would be dependent on the purpose of monitoring and is likely to change for each event, as described further below.

Where possible, monitoring will be undertaken at the most affected noise sensitive receiver's location in proximity to the construction activities. Noise monitoring locations will consider factors including:

- The location of previous monitoring sites
- The proximity of the receiver to a Project worksite
- Availability of power and security
- The sensitivity of the receiver to noise
- Background and baseline noise levels prior to the commencement of works
- The expected duration of the impact.

Some locations may be the boundary of construction sites while others may be within the property of sensitive receivers, where access is granted.

In accordance with the ICNG the duration and amount of noise monitoring will depend on the scale of the construction activities and extent of expected noise impacts. Noise monitoring will cover a representative period of the construction activity.

5.2. Attended airborne noise monitoring

Attended monitoring of construction noise levels will be undertaken as follows:

- Monitoring will be carried out at the commencement of activities for which a location and activity specific noise and vibration impact assessment has been prepared which identifies that validation monitoring is required (Section 9.4 of the NVMP) to confirm that actual noise levels are consistent with noise impact predictions and that the management measures that have been implemented are appropriate,
- Prior to any changes in methodology, plant or equipment which may result in a significant increase in construction noise impact that may require implementation of additional mitigation measures,
- Where appropriate in response to a noise related complaint(s) (determined on a case-by-case basis) and in accordance with EPL Condition,
- As directed by an authorised officer of the EPA,
- As otherwise required by the NVIS, Out of Hours Works (OOHW) Protocol or EPL,
- Following the implementation of mitigation measures or noise attenuation as a result of exceedance of predicted noise levels, and
- Ongoing spot checks for noise intensive plant and equipment will be undertaken throughout construction to ensure compliance with the maximum noise level goals for construction equipment. Spot checks would be carried out as required on a case-by-case basis, such as in response to a plant/equipment specific noise related complaint and during noise and vibration assessment validation monitoring when it is possible to isolate the noise from one piece of plant or equipment.

Attended noise monitoring locations will vary and be determined on a case-by-case basis by a NVIS, the Project's predictive noise and vibration tool or in response to complaints.

In accordance with the ICNG the duration and amount of noise monitoring will depend on the scale of the construction activities and extent of expected noise impacts. Noise monitoring will cover a representative period of the construction activity. A representative period is the stage of a construction activity where all the plant and equipment operating is consistent with the full range of plant and equipment modelled in the noise and vibration assessment, i.e. noise monitoring is not to be undertaken when the key noise contributing plant and equipment are turned off. The NVIS identifies the representative periods.

Where possible, monitoring will be undertaken at the most affected noise sensitive receiver's location in proximity to the Project's construction activities. Noise monitoring locations will consider factors including:

- The location of previous monitoring sites,
- The proximity of the receiver to a Project worksite,
- The sensitivity of the receiver to noise,
- Background noise levels and
- The expected duration of the impact.

Monitored noise levels will then be analysed against the predictions made in the relevant NVIS or using the Project's predictive tools. For where monitored construction noise levels are found to be above modelling predictions are exceeded, refer to Section 8 for further information.

5.3. Unattended airborne noise monitoring

Unattended noise monitoring may be used to provide real-time monitoring throughout construction works or may be used in place of attended noise monitoring, where it is deemed appropriate.

When unattended noise monitoring is completed, monitoring results will be compared against a log of activities recorded during the monitoring period. This can be used to determine whether project activities are influencing noise levels at the monitoring location.

During unattended monitoring, noise loggers will record audio (triggered by noisy events) to allow for the identification of construction noise contribution and the presence of any extraneous noise, if privacy concerns can be overcome.

5.4. Parameters to be monitored

All environmental noise monitoring will be taken with the following meter settings:

- Time Constant: Fast (i.e. 125 milliseconds),
- Frequency Weightings: A-weighting, and
- Sample period: 15 minutes.

Environmental noise monitoring (excluding spot checks of plant and equipment) will be recorded over 15-minute sample intervals, excluding periods of extraneous noise until a representative sample has been obtained. A representative sample will be determined by operator, who will be competent, suitability trained and experienced in undertaking noise measurements and familiar with the relevant Australian Standards (as detailed in Section 5 of the NVMP). The minimum range of noise metrics to be stored in the memory for later retrieval include the following A-weighted noise levels: L_{A90} , L_{Aeq} , L_{A10} , $L_{A(min)}$ and $L_{A(max)}$.

For spot checks of noise intensive plant and equipment, duration of monitoring will depend on the source of noise being monitored. Sources of continuous noise (such as generators), measurements will be monitored over one-to-two-minute intervals. For dynamic plant, such as front-end loaders, spot checks will capture a representative activity, such as one truck-and-dog load cycle.

Monitoring will be undertaken in line with applicable standards including:

- AS2012–1990 Acoustics – Measurement of Airborne Noise Emitted by Earthmoving Machinery and Agricultural Tractors – Stationary Test Condition Part 1: Determination of Compliance with Limits for Exterior Noise
- International Standard ISO 3740:2019 Acoustics – Determination of sound power levels of noise sources – Guidelines for the use of basic standards
- AS1055 - Acoustics - Description and measurement of environmental noise

Note: monitoring results may undergo corrections in accordance with AS1055

5.5. Out-of-hours Protocol noise monitoring requirements

The Out-of-Hours Works Protocol enables out-of-hours works (for works that are not subject to an EPL) under certain circumstances and prescribes requirements that must be complied with to undertake the works.

Typically, OOHW that is not subject to an EPL will involve service investigations, relocations and other works items that are not scheduled activities under the Protection of the Environment Operations Act 1997 (POEO Act) (and associated regulations) and are outside the EPL premise boundary.

In accordance with the Protocol, noise monitoring must be undertaken in accordance with the requirements of the work specific OOHW permit to validate predicted noise impacts. Section 7.1 of the Out-of-Hours Works Protocol identifies that noise verification monitoring would be undertaken in the following circumstances:

- Attended noise monitoring at representative directly affected residents and sensitive land use(s) in the first instance of an activity predicted to be moderately intrusive or worse during OOHW Period 1 or clearly audible or worse during OOHW Period 2
- Additional noise monitoring and review if complaints about the activity are received
- Attended noise monitoring at appropriate representative stages of OOHW that has been determined by the ER to be low or medium risk to verify predictions.

5.6. Calibration, QA and competency

All monitoring will be undertaken by competent personnel, appropriately qualified, suitability trained and experienced in undertaking noise measurements.

Noise monitoring equipment used will be at least Type 2 instruments and calibrated in accordance with manufacturer specifications or relevant Australian Standards. The calibration of the monitoring equipment will be checked in the field before the noise measurement period. Records of monitoring equipment calibration will be maintained by JHGA throughout the delivery of the Project.

All monitoring records will be retained throughout the delivery of the Project by JHGA. Noise monitoring records will be completed to record:

- Date and time of measurement,
- Name of person undertaking the measurement,
- Type and model number of monitoring instrumentation,
- Results of field calibration checks,
- Time of day, length of measurement and any measurement time intervals,
- Monitoring location (including a sketched map/photo of area),
- Measurement location details and number of measurements at each location,
- Weather conditions during measurements,
- Operation and activities of the noise sources under investigation,
- Estimated contribution of the Project's activities, and
- Noise due to other extraneous and environmental sources (e.g. traffic, aircraft, trains, dogs barking, insects).

Noise monitoring will be undertaken and recorded in accordance with the relevant noise measurement requirements in the reference standards and documents in Section 3.1.

All outdoor noise measurements will be undertaken with a windscreen over the microphone and measurements of noise will be disregarded when it is raining and/or the wind speed is greater than 5 m/s (18 km/h).

Where high background noise levels obscure construction noise contribution during attended noise measurements, operators will either: measure closer to the source and calculate back to the required position, or measure with the source noise off and then on (where possible) and calculate the difference or use the 'pause and cut' feature on the sound level meter to try to exclude as much of the extraneous noise as possible.

Where possible, noise monitoring is to be carried out at least 3.5 m from any reflective surface other than the ground and the preferred microphone/measurement height is 1.2-1.5 m above the ground.

Measurements taken inside buildings should be at least one metre from walls or other reflective surface, and about 1.5 metres from windows, where such instrument siting is possible.

6. Vibration monitoring

6.1. Frequency and location of Vibration Monitoring

Where possible, monitoring will be undertaken at the most affected vibration sensitive receiver's location in proximity to the construction activities. Vibration monitoring locations will consider factors including:

- The location of previous monitoring sites
- The proximity of the receiver to a Project worksite and consideration of safe working distances
- Availability of power and security
- The sensitivity of the receiver to vibration
- The expected duration of the impact
- Background and baseline vibration prior to commencement of works

Some locations may be the boundary of construction sites while others may be within the property of sensitive receivers, where access is granted.

6.2. Attended vibration monitoring

Attended vibration monitoring is to be undertaken as follows:

- At the commencement of operation for each plant or activity on site, which has the potential to generate significant vibration levels, where the vibration screening criteria is likely to be exceeded or as determined by a vibration assessment,
- At the commencement of vibration generating activities that have the potential to impact on property/assets to confirm/identify the minimum working distances to prevent cosmetic damage,
- Where vibration sensitive locations are determined to fall within the 'minimum working distances' established for each item of plant, so to refine the indicative minimum working distances,
- Where appropriate in response to a vibration related complaint(s) (determined on a case-by-case basis) and in accordance with the EPL,
- As directed by an authorised officer of the EPA, and
- As otherwise required by the NVIS, OOHV Protocol (Section 7) or EPL (i.e. as directed by authorised officer of the EPA).

Where works are within 25m of utilities and are predicted to generate vibration within minimum safe working distances consultation will be carried out with the relevant utility authorities to establish site specific mitigation measures to manage potential vibration impacts.

6.2.1 Vibration Assessment Procedure

Vibration monitoring for human comfort, structural damage and heritage structures will be undertaken in accordance with the guidelines and associated vibration reference levels set out in Table 4-3 of this Program.

The procedure to be followed when undertaking vibration assessments will ensure:

- Vibration monitoring equipment is placed outside at the footings or foundations of the building of interest, closest to the vibrating plant,
- The surface will be solid and rigid to best represent the vibration entering the structure of the building under investigation,
- The vibration sensor or transducer will not be mounted on loose tiles, loose gravel or other resilient surfaces,
- The vibration sensor or transducer will be directly mounted to the vibrating surface using either bees wax or a magnetic mounting plate onto a steel washer, plate or bracket which shall be either fastened or glued to the surface of interest, and
- Where a suitable mounting surface is unavailable, then a metal stake of at least 300mm in length will be driven into solid ground adjacent to the building of interest and the vibration sensor or transducer shall be mounted on that.

Where vibration monitoring is undertaken to measure tactile vibration levels, vibration monitoring results shall be assessed and reported against the acceptable values of human exposure to vibration set out in Table 4-3.

For each monitoring event, a Noise and Vibration Monitoring Form (Appendix C) will be completed which include the following information to be recorded:

- Date and time of measurements,
- Name of person undertaking the measurements,
- Type and model number of instrumentation,
- Description of the time aspects of each measurement (i.e. sample times, measurement time intervals and time of day),
- Sketch/photo map of area and measurement location,
- Measurement location details and number of measurements at each location,
- Operation and load conditions of the vibrating plant under investigation, and
- Possible vibration influences from other sources (e.g. domestic vibrations, other mechanical plant, traffic, etc.).

6.3. Unattended vibration monitoring

Where attended vibration monitoring is not feasible, due to extended periods of vibration intensive works, an unattended vibration monitoring system will be installed where initial monitoring to establish safe buffer zones is insufficient to ensure goal levels are met, due to changing plant or unknown ground conditions. Unattended monitors will warn plant operators (e.g. via flashing light, SMS, etc.) that vibration is approaching levels where there is potential for cosmetic damage to buildings and structures.

Where unattended vibration monitors are left in place on a private property they will be picked up at a mutually agreed time with the resident.

Monitored vibration levels will be analysed against the predictions made in the relevant NVIS or using the Project's predictive tools. For where monitored construction noise levels are found to be above modelling predictions or vibration goals are exceeded, refer to Section 8 for further information.

6.4. Parameters to be monitored

Vibration data will be processed statistically and stored in memory. The minimum range of vibration metrics to be stored in memory for later retrieval is the following:

- Root-Mean-Square acceleration (RMS), or
- Vector-sum peak-particle velocity (PPV).

All short term attended vibration monitoring will be recorded over a representative sampling interval where the worst-case vibration levels can be captured. Where unattended vibration monitoring is proposed, monitoring will be undertaken continuously whilst the vibrating plant is operational to capture the worst-case vibration levels within the pre-determined 'minimum working distance' from the potentially affected building. Typical 'minimum working distances' for construction equipment are presented in Table 6-10 in the NVMP.

6.5. Out-of-hours Protocol vibration monitoring requirements

The Out-of-Hours Works Protocol enables out-of-hours works (for works that are not subject to an EPL) under certain circumstances and prescribes requirements that must be complied with to undertake the works.

Typically, OOHW that is not subject to an EPL will involve service investigations, relocations and other works items that are not scheduled activities under the Protection of the Environment Operations Act 1997 (POEO Act) (and associated regulations) and are outside the EPL premise boundary.

In accordance with the Protocol, noise monitoring must be undertaken in accordance with the requirements of the work specific OOHW permit to validate predicted noise impacts. Section 7 of the Out-of-Hours Works Protocol identifies that noise verification monitoring would be undertaken in the following circumstances:

- Attended vibration monitoring at representative directly affected residents and sensitive land use(s) in the first instance of work where vibration levels are predicted to exceed maximum levels
- Additional vibration monitoring and review if complaints about the activity are received

Attended noise or vibration monitoring at appropriate representative stages of OOHW that has been determined by the ER to be low or medium risk to verify predictions.

6.6. Calibration and QA

All monitoring will be undertaken by competent personnel, appropriately qualified, suitability trained and experienced in undertaking vibration measurements.

All vibration instruments will be calibrated in accordance with manufacturers specifications or relevant Australian Standards. Records of monitoring equipment calibration will be maintained by JHGA throughout the delivery of the Project.

All monitoring records will be retained throughout the delivery of the Project by JHGA. Vibration monitoring records will be completed to record:

- Date and time of measurements,
- Name of person undertaking the measurements,
- Calibration dates of monitoring equipment,
- Type and model number of instrumentation,
- Time of day, length of measurement and measurement time intervals,
- Monitoring location (including a sketched map/photo of area),
- Measurement location details and number of measurements at each location,
- Operation and load conditions of the vibrating plant under investigation, and
- Possible vibration influences from other sources (e.g. domestic vibrations, other mechanical plant, traffic etc.).

7. Heritage-listed structures

In accordance with CoA E73, JHGA will conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items, to identify minimum working distances to prevent cosmetic damage. Should vibration testing and monitoring show that the preferred values for vibration are likely to be exceeded, JHGA will follow the process in Section 8.

Heritage items which have the potential to be impacted by vibration are identified in the Non- Aboriginal Heritage Management Plan. Sections 6.3.3, 6.3.4 and 8.1 of the NVMP also provides further detail on the approach to managing potential vibration impacts on heritage structures.

Vibration assessments prepared for the Project will also identify where monitoring should be conducted at heritage items.

JHGA will seek the advice of the Project's heritage and noise and vibration specialists, on methods and locations for installing equipment used for vibration, movement, and noise monitoring of heritage-listed structures.

8. Compliance Management

8.1. Complaints Management

In accordance with CoA Part B, all community feedback, enquiries, and complaints will be managed via the Communication Strategy and Complaints Management System. Further details of this processes are outlined in Section 4.8.4 of the CEMP.

A variety of communication tools will be used throughout construction to consult and inform stakeholders and the local community of impacts, including but not limited to:

- Tailored messaging regarding increased traffic volumes on detour routes and expected delays
- Geotargeted social posts during peak periods to remind people as they prepare to move around work areas
- Meetings/briefing with MPs, local councils, local businesses, and other community organisations
- Information sessions and pop-up displays
- Functional advertising through print, radio, television, and digital channels
- Signage including VMS and other dynamic signage
- Project website updates.

The Environment and Sustainability Manager (or delegate) will complete a site inspection and record observations and noise and vibration levels in response to any community complaints associated with noise and vibration. Actions or rectification (if required) will be undertaken by the construction team as soon as reasonably practicable.

9. Continual improvement and corrective action

Monitored noise and vibration levels will be analysed by personnel who are appropriately qualified, suitability trained and experienced in noise and vibration assessments against the predictions made in the relevant NVIS or using the Project's predictive tools. Where monitored construction noise levels are found to be above modelling predictions or vibration goals are exceeded, the following actions will be undertaken:

Cease the noise and/or vibration generating activity which causes the exceeded predictions,

- Confirm the monitored levels are not being impacted by other noise or vibration sources,
- Confirm if the exceedance is due to an uncharacteristically loud piece of equipment,
- Identify if the equipment can be swapped out for another piece of equipment or alternative equipment or plant,
- Confirm if the exceedance is due to an uncharacteristically vibratory piece of equipment,
- Confirm that the modelling reflects the actual activity being undertaken,
- Implement other feasible and reasonable mitigation measures which may include reducing plant size, modifying time of works, changing operational settings (such as turning off the vibratory function of the machine), and utilising alternative construction methodology or a combination of these,
- Review work practices to ensure compliance with the ICNG,
- Ensure that the learnings from the above are fed back into the noise modelling assessment process for fine-tuning,
- Continue work where impacts can be reduced, and
- Communicate lessons learnt to relevant personnel.

The Project will review the work or activity or combination of simultaneous works or activities and where possible, modify the work or activity to prevent any recurrence. Lessons learnt will be communicated to relevant personnel in toolbox talks.

Where a complaint relating to human comfort is received, the Project will review the noise and vibration model. If it is determined from the review that there is insufficient local monitoring to validate the noise and vibration model, the Project will offer additional monitoring following the process defined in Sections 5.1 and 6.1.

10. Reporting of monitoring results

During construction, real time noise and vibration monitoring data will be collected, tabulated, and assessed against baseline conditions and performance criteria. Monitoring reports will be submitted to DPE and the ER within 60 days of the reporting period unless otherwise agreed with DPE.

Reporting requirements associated with the Program for the construction phase of the Project are presented in Table 10-1.

Table 10-1: Reporting Requirements

Report	Requirement	Timing	Responsibility	Recipient
Monthly environmental and sustainability report	For incorporation in Project Monthly Reports including environmental statistics (i.e., incidents, regulatory action, complaints on environmental issues), regulatory and authority considerations, monitoring program performance and key environmental issues.	Within 10 working days of the end of each calendar month	Project Environment and Sustainability Manager Project Environmental Advisor	Transport
Monitoring program reporting	Reports to include analysis of the results including, but not limited to, exceedances of relevant criteria/targets/goals, reasons for any exceedances, trends in the data, and maximum, minimum and average data results for all monitored parameters. The report will also detail any management and mitigation measures that were implemented to address exceedances during the reporting period.	6 monthly as specified in Noise and Vibration Management Sub-Plan	Project Environment and Sustainability Manager Project Environmental Advisor	Transport, DPE, EPA, City of Newcastle Council, Port Stephens Council, Maitland City Council Planning Secretary, and relevant regulatory agencies (as per CoA C18)

Separate from the Construction Monitoring Report, Validation Report and Preliminary Investigation Reports, additional records relating to noise and vibration training, toolbox talks, monitoring results and audit results are described in Section 4 of the CEMP. The complaints management and reporting procedure is described in Section 4.8.4 of the CEMP and NVMP Section 9.3.

Appendix A – Environmental Requirements of this Monitoring Program

CoA	Detail	Document Reference						
Conditions of Approval – SSI-7319								
C12	The following Construction Monitoring Programs (CMPs) must be prepared in consultation with the relevant government agencies and council(s) identified for each to compare actual performance of construction of the CSSI against the performance predicted in the documents listed in Condition A1 or in the CEMP: <table> <tr> <th>Item</th><th>Required Construction Monitoring Programs</th><th>Relevant Government agencies and councils to be consulted for each Construction Monitoring Program</th></tr> <tr> <td>(a)</td><td>Noise and Vibration</td><td>EPA and relevant council(s)</td></tr> </table>	Item	Required Construction Monitoring Programs	Relevant Government agencies and councils to be consulted for each Construction Monitoring Program	(a)	Noise and Vibration	EPA and relevant council(s)	This NVCMP
Item	Required Construction Monitoring Programs	Relevant Government agencies and councils to be consulted for each Construction Monitoring Program						
(a)	Noise and Vibration	EPA and relevant council(s)						
C13	Each CMP must provide: a) Details of baseline data available; b) Details of baseline data to be obtained and when; c) Details of all monitoring of the project to be undertaken; d) The parameters of the project to be monitored; e) The frequency of monitoring to be undertaken; f) The location of monitoring; g) The reporting of monitoring results and analysis of results against relevant criteria; h) Details of the methods that will be used to analyse the monitoring data; i) Procedures to identify and implement additional mitigation measures where the results of the monitoring indicate unacceptable project impacts; j) A consideration of SMART principles; and k) Any consultation to be undertaken in relation to the Monitoring Programs.	Section 4.2 and Section 4.3 Section 5 and Section 6 Section 5.2 and Section 6.2 Section 9 Section 2.3 Section 1.5, Section 8.1 and Appendix A						
C15	The CMP must be endorsed by the ER. The endorsed CMP must be submitted to the Planning Secretary for approval no later than one month before the commencement of construction, or where construction is staged, no later than one month before the commencement of each stage.	Section 1.5						
C16	Construction must not commence until the relevant CMPs have been approved by the Planning Secretary and all relevant baseline data for the specific construction activity has been collected.	Section 1.5						
C17	The CMPs, as approved, including any minor amendments approved by the ER, must be implemented for the duration of construction and for any longer period set out in the Monitoring Program or specified by the Planning Secretary, whichever is the greater.	Section 1.6						
C18	The results of the CMPs must be submitted to the Planning Secretary, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant CMP. The Construction Monitoring Report(s) must include an analysis of the results including, but not limited to, exceedances of relevant criteria/targets/goals, reasons for any exceedances, trends in the data, and	Table 10-1						

CoA	Detail	Document Reference
	maximum, minimum and average data results for all monitored parameters. The report must also detail any management and mitigation measures that were implemented to address exceedances during the reporting period.	
E73	The Proponent must conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures.	Section 7
REMMs		
NV10	Prior to construction, additional noise monitoring will be carried out to validate the Rating Background Levels adopted for the project during construction.	Section 4.1

Appendix B – Noise and Vibration Monitoring Form

[illegible]

Job Name / No:			Client:			Name:		
Monitoring location details:								
Date:			Time (24hr):			File Name/#		
Noted sources and contribution level from source(s) of interest:								
Level dB(A)	Time	Duration	Event/Comments					
Measured noise levels and duration of monitoring								
LAeq	L Amin	LA90	LA10	LA1	L Amax			
Site contribution								
LAeq	LC-A	LFN band	Adj LAeq	L Amax				
Wind speed (m/s)		Wind direction (deg)			Cloud cover (eights)			

Appendix D – TfNSW Out of Hours Works Protocol

M1 Pacific Motorway Extension to Raymond Terrace

Out of Hours Work Protocol-Works
not subject to an EPL

June 2023





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Acknowledgement of Country

Transport for NSW acknowledges the traditional custodians of the land on which we work and live.

We pay our respects to Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the lands, waters and seas and their rich contribution to society.

Document controls

File name	Out of Hours Work Protocol- Works not subject to an EPL A48797683
Report name	M12RT OOHW Protocol

Approval and authorisation

Prepared by:	Reviewed by:	Reviewed by:

Revision history

Revision	Date	Description
1	16/03/2023	Draft for Environmental Representative review
2	04/04/2023	Updated to address ER consultation
3	04/04/2023	For approval
4	8/05/2023	Updated to address DPE comments
5	21/06/2023	Updated to address DPE comments

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Attachments

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Attachment 2	Mitigation measure definitions
Attachment 3	

Terms and Definitions

Term	Expanded text
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
CCLP	(Contractor's) Construction Community Liaison Plan
CEMP, sub plan- noise and vibration	Construction environmental management plan, sub plan – noise and vibration
Communication Strategy	Communication Strategy provides an overarching strategy for design and delivery of the M1 Pacific Motorway extension to Raymond Terrace. The Communication Strategy describes how Transport and its contractors will manage community and stakeholder engagement and consultation through all phases of the project
CSSI	Critical State Significant Infrastructure project
CoA	Conditions of Approval (issued for the project by the Department of Planning and Environment)
Construction (as defined by CoA Table 1)	Includes all activities required to construct the CSSI as defined in the Project Description described in the documents listed in Condition A1 , including commissioning trials of equipment and temporary use of any part of the CSSI, but excludes Low Impact Work which is carried out or completed prior to approval of the CEMP and works approved under a Site Establishment Management Plan .
CNVG	<i>Construction Noise and Vibration Guideline</i> (Roads and Maritime, 2016)
CRM	Community Relations Manager
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear
DPE	Department of Planning and Environment
REMM	Revised Environmental Management Measures (for the project)
EPL	Environmental Protection Licence
ER	Independent Environmental Representative (for the project)
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.
Highly noise affected	As defined in the <i>Interim Construction Noise Guideline</i> (DECC, 2009)
Highly noise intensive work	Works which are defined as annoying under the <i>Interim Construction Noise Guideline</i> (DECC, 2009) including: (a) use of power saws, such as used for cutting timber, rail lines, masonry, road pavement or steel work (b) grinding metal, concrete or masonry (c) rock drilling (d) line drilling (e) vibratory rolling (f) bitumen milling or profiling (g) jackhammering, rock hammering or rock breaking (h) impact piling
ICNG	<i>Interim Construction Noise Guideline</i> (DECC, 2009)

Term	Expanded text
$LA_{eq(15min)}$	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
Low Impact Works (as defined by CoA Table 1)	Includes: (a) surveys including carrying out general alignment surveys, installing survey controls (including installation of global positioning systems (GPS)), installing repeater stations, carrying out surveys of existing and future utilities, and building and road dilapidation surveys; (b) investigations including investigative drilling, contamination investigations and excavation; (c) use of minor ancillary facilities established under Condition A20 or if the ER has determined the operational activities will have minimal impact on the environment and community; (d) minor clearing and relocation of native vegetation, as identified in the documents listed in Condition A1; (e) installation of mitigation measures including erosion and sediment controls, temporary exclusion fencing for sensitive areas and at-property treatments, but excluding noise barriers; (f) property acquisition adjustment work including installation of property fencing, (g) relocation and connection of utilities where the relocation or connection has been determined by the ER to have a minor impact to the environment and the community; (h) archaeological testing under the Code of practice for archaeological investigation of Aboriginal objects in NSW (DECCW, 2010) or archaeological monitoring undertaken in association with (a) - (g) above to ensure that there is no impact on heritage items; (i) archaeological and cultural salvage undertaken in accordance with a strategy or salvage operation as detailed in the documents listed in Condition A1; (j) maintenance of existing buildings and structures required to facilitate the carrying out of the CSSI; (k) installation of temporary project information signage; and (l) other activities determined by the ER to have minor impact on the environment and the community, which may include but not be limited to construction of minor access roads, temporary relocation of pedestrian and cycle paths and bus stops, and the provision of property access. Notwithstanding the following works are not Low Impact Work: (m) where heritage items (excluding those impacted by activities in (h) and (i) above), or threatened species or threatened ecological communities (within the meaning of the Biodiversity Conservation Act 2016 or Environment Protection and Biodiversity Conservation Act 1999) are affected or potentially affected by any low impact work, that work is construction, unless otherwise determined by the Planning Secretary, following consultation by the Proponent with Heritage NSW, BCD or DPI Fisheries (in the case of impact upon fish, aquatic invertebrates or marine vegetation) as relevant; and (n) any Work undertaken outside the hours defined in Condition E64 that exceeds noise management and vibration levels as identified in Condition E66(b). The low impact work described in this definition becomes construction when the Construction Environmental Management Plan is approved. This also applies to low impact work that has already commenced. Notes: 1. Early stages of Work are not necessarily low impact work. 2. Low Impact work is not construction as defined by this approval.

Term	Expanded text
M12RT	M1 Pacific Motorway Extension to Raymond Terrace
NCA	Noise Catchment Area
NML	Noise Management Level as defined in the <i>Interim Construction Noise Guideline</i> (DECC, 2009)
NVMP	Noise and Vibration Management Plan
OOHW	Out of hours work
RBL	The Rating Background Level for each period is the medium value of the RBL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
RNP	NSW Road Noise Policy
Sensitive land use(s)	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), child care centres, passive recreation areas (including outdoor grounds used for teaching). Receivers that may be considered to be sensitive include, commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, and retail spaces), and industrial premises as identified by the Planning Secretary
SPL	Sound Pressure Level
SWL	Sound Power Level
Works (as defined by CoA Table 1)	Any physical activity for the purpose of the CSSI including construction, Low Impact Work, enabling works, utility works and site establishment activities but not including operational maintenance works.

1. Introduction

1.1 Purpose and scope

M1 Pacific Motorway Extension to Raymond Terrace (the M12RT Project) was approved by the Minister for Planning under Section 5.19 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on 8 November 2022 subject to a number of Conditions of Approval (CoA).

The Out of Hours Work Protocol is developed to identify a process for the consideration, management and approval of Work which is outside the hours defined in Condition E64 and E65 and is not subject to an EPL. This is particularly relevant to works occurring prior to Construction (i.e. Low Impact Works), noting that Construction would require an EPL (or licences) to be obtained under Schedule 1 of the POEO Act 1997.

This protocol has been developed to provide a process for the approval of OOHW including:

- a) identified of low, medium and high risk activities and an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where:
 - i. the ER reviews all proposed out-of-hours activities and confirms their risk levels,
 - ii. low and medium risk activities can be approved by the ER, and
 - iii. high risk activities are approved by the Planning Secretary;
- b) a process for the consideration of out-of-hours work against the relevant NML and vibration criteria;
- c) a process for selecting and implementing mitigation measures for residual impacts in consultation with the community at each affected location, including respite periods consistent with the requirements of condition E77. The measures must take into account the predicted noise levels and the likely frequency and duration of the out-of-hours works that sensitive land use(s) would be exposed to, including the number of noise awakening events;
- d) procedures to facilitate the coordination of out-of-hours work including those approved by an EPL or undertaken by a third party, to ensure appropriate respite is provided; and
- e) notification arrangements for affected receivers for all approved out-of-hours work and notification to the Planning Secretary of approved low risk out-of-hours works.

1.2 Adopted guidelines and standards

CoA E68 lists the guidelines and standards for establishing project-specific noise and vibration criteria to guide the application of mitigation measures. The guidelines and standards adopted for the M12RT Project include (but are not limited to):

- a) construction 'Noise affected' NMLs established using the Interim Construction Noise Guideline (DECC, 2009);
- b) vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure);
- c) Australian Standard AS 2187.2 - 2006 "Explosives - Storage and Use - Use of Explosives"; NSW Government 44 Department of Planning and Environment Conditions of Approval for M1 Pacific Motorway Extension to Raymond Terrace (SSI 7319)
- d) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and
- e) the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage).

1.3 Conditions of Approval and mitigation measures

CoA and Revised Environmental Management Measures (REMMs) relevant to OOHW and where they are addressed in this OOHW protocol are identified in Table 1-1.

Table 1-1: CoA and REMMs relevant to OOHW

CoA/ REMM	Condition requirements	OOHW Protocol Reference
E64	Work Hours Work must only be undertaken during the following hours: (a) 7:00 am to 6:00 pm Mondays to Fridays, inclusive; (b) 8:00 am to 5:00 pm Saturdays; and (c) at no time on Sundays or public holidays.	Section 3
E65	Highly Noise Intensive Work Except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable NML at the same receiver must only be undertaken: (a) between the hours of 8:00 am to 6:00 pm Monday to Friday; (b) between the hours of 8:00 am to 1:00 pm Saturday; and (c) if continuously, then not exceeding three hours, with a minimum cessation of Work of not less than one hour. For the purposes of this condition, 'continuously' includes any period during which there is less than one hour between ceasing and recommencing any of the work.	Section 3
E66	Variation to Work Hours Notwithstanding Conditions E64 and E65, Work may be undertaken outside the hours specified in any of the following circumstances: (a) Safety and Emergencies, including: (i) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or (ii) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm. On becoming aware of the need for emergency work in accordance with Condition E66(a)(ii), the Proponent must notify, the ER, the Planning Secretary and the EPA of the reasons for such work. The Proponent must use best endeavours to notify all noise and/or vibration	Section 3

CoA/ REMM	Condition requirements	OOHW Protocol Reference
	affected residents and owners/occupiers of properties identified as sensitive land use(s) of the likely impact and duration of the emergency works; or (b) Work that meets all of the following criteria: (i) Work that causes $L_{Aeq}(15 \text{ minute})$ noise levels: • no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and • no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land use(s); (ii) Work that causes LAF max noise levels no more than 15 dBA above the RBL at any residence during the night-time; (iii) Work that causes: • continuous or impulsive vibration values, measured at the most affected residence no more than the preferred values for human exposure to vibration, specified in Table 2.2 of <i>Assessing Vibration: a technical guideline</i> (DEC, 2006), and • intermittent vibration values measured at the most affected residence which are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of <i>Assessing Vibration: a technical guideline</i> (DEC, 2006). (c) By Approval, including: (i) where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or (ii) works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E67; or (iii) negotiated agreements with directly affected residents and sensitive land use(s).	
E67	Out of Hours Work Protocol – Works not Subject to an EPL An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of Work which is outside the hours defined in Condition E64, and is not subject to an EPL. The Protocol must be prepared in consultation with the ER. The Protocol must provide: (a) identification of low, medium and high risk activities and an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where: (i) the ER reviews all proposed out-of-hours activities and confirms their risk levels, (ii) low and medium risk activities can be approved by the ER, and (iii) high risk activities are approved by the Planning Secretary; (b) a process for the consideration of out-of-hours work against the relevant NML and vibration criteria; (c) a process for selecting and implementing mitigation measures for residual impacts in consultation with the community at each affected location, including respite periods consistent with the requirements of Condition E77. The measures must take into account the predicted noise levels and the likely frequency and duration of the out-of-hours works that sensitive land use(s) would be exposed to, including the number of noise awakening events;	This Protocol (a) Section 4.3 (b) Section 4 (c) Section 5

CoA/ REMM	Condition requirements	OOHW Protocol Reference
	(d) procedures to facilitate the coordination of out-of-hours work including those approved by an EPL or undertaken by a third party, to ensure appropriate respite is provided; and (e) notification arrangements for affected receivers for all approved out-of-hours work and notification to the Planning Secretary of approved low risk out-of-hours works. The Protocol must be submitted to and approved by the Planning Secretary before commencement of the out-of-hours work and implemented during Work which is outside the hours defined in Condition E64 and not subject to an EPL. Adherence to the Protocol does not apply if the requirements of Condition E66 (a) or (b) are met. Notes: 1. Conditions E78 and E79 provide additional parameters to be considered. 2. If the Work is subject to an EPL and the EPA does not endorse extended hours as part of the EPL, the extended hours cannot be considered under this Protocol.	(d) Section 5.4 and 5.5 (e) Section 6
E68	Noise Levels and Vibration Criteria Mitigation measures must be implemented with the aim of achieving the following noise management levels and vibration objectives: (a) construction 'Noise affected' NMLs established using the <i>Interim Construction Noise Guideline</i> (DECC, 2009); (b) vibration criteria established using the <i>Assessing vibration: a technical guideline</i> (DEC, 2006) (for human exposure); (c) Australian Standard AS 2187.2 - 2006 "<i>Explosives - Storage and Use - Use of Explosives</i>"; (d) BS 7385 Part 2-1993 "<i>Evaluation and measurement for vibration in buildings Part 2</i>" as they are "applicable to Australian conditions"; and (e) the vibration limits set out in the <i>German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures</i> (for structural damage). Work that exceeds the noise management levels and/or vibration criteria must be managed in accordance with the Ancillary Site Establishment Management Plan required by Condition A17 or Noise and Vibration CEMP Sub-plan required by Condition C5, as applicable. Note: The ICNG identifies 'particularly annoying' activities that require the addition of 5 dB(A) to the predicted level before comparing to the construction NML.	Section 4.1
E69	Mitigation measures must be applied when either of the following residential ground-borne noise levels are exceeded: (a) evening (6:00 pm to 10:00 pm) — internal $L_{Aeq}(15 \text{ minute})$: 40 dB(A); and (b) night (10:00 pm to 7:00 am) — internal $L_{Aeq}(15 \text{ minute})$: 35 dB(A). The mitigation measures must be outlined in the Noise and Vibration CEMP Sub-plan, including in any Out-of-Hours Work Protocol as required by Condition E67.	Section 4.1
E70	Work that results in noise levels above the NMLs at community, religious, educational institutions, noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) must not be timetabled during sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	Section 5.3

CoA/ REMM	Condition requirements	OOHW Protocol Reference
E71	Noise and Vibration Mitigation and Management Noise and Vibration Impact Statements (NVIS) must be prepared for any Work: (a) that may exceed the noise management levels, vibration criteria and/or ground-borne noise levels specified in Condition E68 and Condition E69 at any residence outside work hours identified in Condition E64, or (b) where receivers will be highly noise affected. The NVIS must include specific mitigation measures identified through consultation with affected receivers of the sensitive land use(s) and the mitigation measures must be implemented for the duration of the works. A copy of the NVIS must be provided to the ER prior to the commencement	Section 4.2
E72	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before work that generates vibration commences in the vicinity of those properties. If potential exceedance is to occur more than once or extend over a period of 24 hour, owners and occupiers are to be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier. These properties must be identified and considered in the Ancillary Site Establishment Management Plan required by Condition A17 and/or the Noise and Vibration CEMP Sub-Plan required by Condition C5 and owners and occupiers notified in accordance with the Communications Strategy required by Condition B1.	Section 4.2 and 4.3
E73	The Property must conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary implement additional mitigation measures.	Section 4.2 and 4.3
E76	Utility Coordination and Respite All work undertaken for the delivery of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. The Proponent must: (a) reschedule any work to provide respite to impacted noise sensitive land use(s) so that the respite is achieved in accordance with Condition E77; or (b) consider the provision of alternative respite or mitigation to impacted noise sensitive land use(s) where respite outlined in Condition E77 cannot be achieved; and (c) provide documentary evidence to the ER in support of any decision made by the Proponent in relation to respite or mitigation. The consideration of respite must also include all other CSSI, SSI and SSD projects which may cause cumulative and/or consecutive impacts at receivers affected by the delivery of the CSSI.	Section 5.5
E77	Out-of-Hours Works – Community Consultation on Respite In order to undertake out-of-hours work outside the hours specified under Condition E64, the Proponent must identify appropriate respite periods for the out-of-hours work in consultation with the community at each affected location on a regular basis. This consultation must include (but not be limited to) providing the community with: (a) a progressive schedule for periods no less than three months, of likely out-of-hours work; (b) a description of the potential work, location and duration of the out-of-hours work; (c) the noise characteristics and likely noise levels of the work; and	Section 6

CoA/ REMM	Condition requirements	OOHW Protocol Reference
	(d) likely mitigation and management measures which aim to achieve the relevant noise management levels and vibration criteria under Condition E68 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers). The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hours work must be provided to the ER, EPA and the Planning Secretary for information prior to undertaking the work scheduled for the subject period. Notes: 1. Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the rating background noise level at any residence. 2. Respite, relocation and other offers must be provided unconditionally. 3. Refer to Condition A8 in relation to consultation requirements and Table 1 - Terms and Definitions for the definition of 'consultation'.	
E78	New England and Pacific Highway – Out-of-Hours Work periods Work outside the hours specified in Condition E64 along the New England and Pacific Highway corridors which result in an exceedance of the relevant NML at the same sensitive land use(s) can only be undertaken in accordance with the following: (a) two consecutive evenings and/or nights per week; or (b) three non-consecutive evenings and/or nights per week; or (c) 10 evenings and/or nights per month; or (d) except as identified by an EPL; or (e) in accordance with an agreement with a potentially impacted receiver(s) as required by Condition E66(c)(iii).	Section 3
E79	Out-of-Hours Works – Mitigation Mitigation measures such as temporary alternative accommodation or other agreed mitigation measures, must be offered/ made available to residents affected by out-of-hours work (including where utility works are being undertaken for the CSSI or under a road occupancy licence) where the construction noise levels between: (a) 10:00 pm and 7:00 am, Monday to Friday; (b) 10:00 pm Saturday to 8:00 am Sunday; and (c) 6:00 pm Sunday and public holidays to 7:00 am the following day unless that day is Saturday then to 8:00 am, are predicted to exceed the NML by 25 dB(A) or are greater than 75 dBA (L_{Aeq}(15 min)), whichever is the lesser and the impact is planned to occur for more than two (2) nights over a seven (7) day rolling period. The NML must be reduced by 5 dB where the noise contains annoying characteristics and may be increased by 10 dB if the property has received at-property acoustic treatment. The noise levels and duration requirements identified in this condition may be changed through an EPL applying to the CSSI.	Section 3 Section 5 Section 6

CoA/ REMM	Condition requirements	OOHW Protocol Reference
REMM NV09	Impacts from Out of Hours Works An Out of Hours Work Procedure will be included as part of the CNVMP. The procedure will follow the approach in Roads and Maritime Services' Construction Noise and Vibration Guideline (Roads and Maritime Services 2016b) and include, but not be limited to: • <i>Details of works required outside standard construction hours and justifications of why the works are required outside standard construction hours</i> • <i>The noise and vibration impact assessment processes that will be followed to identify potentially affected receivers and clarify potential level of impacts</i> • <i>Details of the approval process (internal and external) for works proposed outside standard construction hours</i> • Scheduling of noise intensive or high noise impact work to evening periods where feasible • Use of alternative plant and equipment and/or construction techniques to minimise noise • Notification and consultation requirements including preparation of a 'look ahead' program for likely out of hours work • Use of temporary noise barriers • Respite periods • Representative noise monitoring • Offers of reasonable and temporary alternative accommodation or an act of good will • Use of negotiated agreements • <i>Community information sessions at regular intervals for residents or groups around the Tarro interchange affected by longer periods of OOHW.</i>	Section 3 Section 2 and 4 Section 5 Section 5 Section 5 Section 5 and 6 Section 5 Section 5 Section 5 Section 5 Section 5 Section 6

2. The OOHW process

Figure 2-1 illustrates the step-by-step process from justification to approval and provides a cross-reference to sections of the protocol where a detailed explanation or further information can be found.

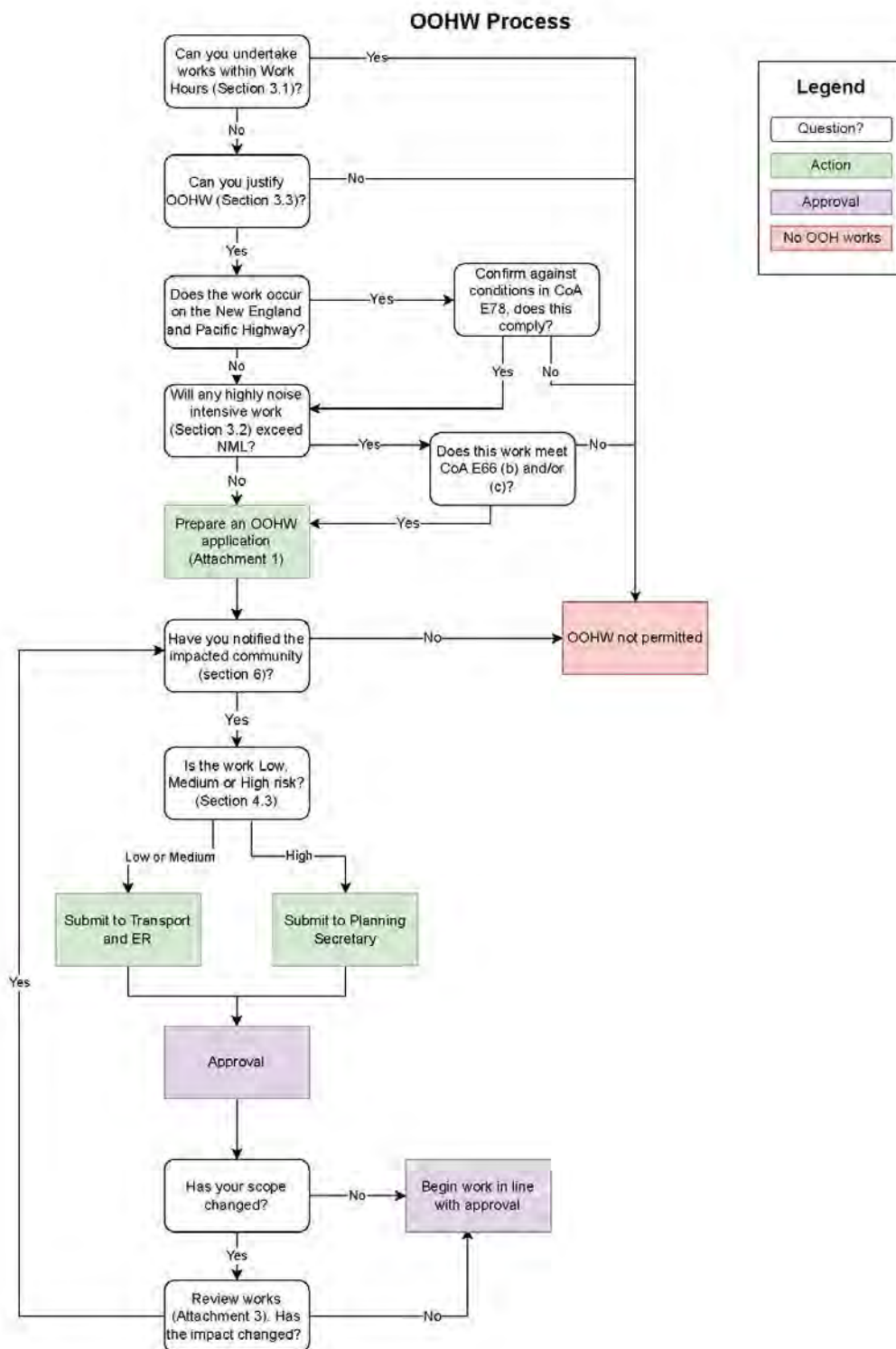


Figure 2-1 OOHW approval process flow chart

3. Application of Approval Conditions and Justification for OOHW

3.1 Working Hours

Standard construction hours defined by CoA E64 and adopted for the OOHW protocol are:

- 7:00 am to 6:00 pm Mondays to Fridays, inclusive
- 8:00 am to 5:00 pm Saturdays
- at no time on Sundays or public holidays.

Certain activities may need to be carried out outside of standard hours. There are two periods of OOHW assessed in the EIS, including:

1. OOHW Period 1
 - a. Monday to Friday: 6pm to 10pm
 - b. Saturday: 7am to 8am and 5pm to 10pm; and
 - c. Sunday and Public Holidays: 8am to 6pm.
2. OOHW Period 2:
 - a. Monday to Friday: 10pm to 7am
 - b. Saturday: 10pm to 8am; and
 - c. Sunday and Public Holidays: 6pm to 7am the following day (unless that day is Saturday then to 8:00am).

Table 3-1 identifies the OOHW permissible under the relevant conditions of approval under this protocol.

Table 3-1 Work hours in accordance with the CoA

	Monday to Friday	Saturday	Sunday and Public holidays
Work hours (E64)	7:00 am to 6:00 pm	8:00 am to 5:00 pm	at no time
OOHW Period 1	6pm to 10pm	7am to 8am and 5pm to 10pm	8am to 6pm
OOHW Period 2	10pm to 7am	10pm to 8am	6pm to 7am the following day (unless that day is Saturday then to 8:00am)
Highly noise intensive work (E65) (an exceedance of the applicable NML at the same receiver)	8:00 am to 6:00 pm	(b) between the hours of 8:00 am to 1:00 pm Saturday; and	at no time
	if continuously, then not exceeding three hours, with a minimum cessation of Work of not less than one hour.		

	Monday to Friday	Saturday	Sunday and Public holidays
Residential ground borne noise exceedance (E69)	(a) evening (6:00 pm to 10:00 pm) — internal $L_{Aeq}(15 \text{ minute})$: 40 dB(A); and (b) night (10:00 pm to 7:00 am) — internal $L_{Aeq}(15 \text{ minute})$: 35 dB(A).		
Work on New England and Pacific Highway corridors (E78)	(a) two consecutive evenings and/or nights per week; or (b) three non-consecutive evenings and/or nights per week; or (c) 10 evenings and/or nights per month; (d) in accordance with an agreement with a potentially impacted receiver(s) as required by Condition E66(c)(iii)		

3.2 Highly Noise Intensive Activities

In accordance with NSW CoA E65, highly noise intensive activities that result in the exceedance of an applicable noise management level (NML) at the same receiver must only be undertaken between:

- Monday to Friday: 8:00 am to 6:00 pm
- Saturday: 8:00 am to 1:00 pm
- If continuously, then not exceeding three hours, with a minimum cessation of work of not less than one hours

3.3 Justification

Work associated with the M12RT Project will be undertaken generally in accordance with the assessment and management approach outlined in the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) and within the limitations imposed by the Conditions of Approval. The ICNG recommends standard construction hours and requires that OOHW has a strong justification. Where it is considered possible (safe, reasonable and not prevented by a road occupancy licence) for works to be undertaken during standard hours, OOHW proposals will not be considered justified and will not be considered further. Works that have no justification to occur outside of standard construction hours would be undertaken during standard construction hours.

Valid reasons for work to be undertaken out of hours to include, but not be limited to:

- Carrying on those works and activities during standard construction hours would result in a high risk to construction personnel or public safety
- Minimising disruption to the existing road network and the network level of service
- Following directions by Traffic Management Centre and/or relevant roads authority (e.g. where a Road Occupancy Licence will not be provided for standard construction hours)

- d) Where works are required in a rail corridor during a rail possession or similar restriction
- e) Minimising disruptions to essential services and utilities for surrounding businesses and adjoining residential receivers
- f) 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
- g) To undertake critical works that have a demonstrated technical or critical justification that the works need to be undertaken outside of standard hours

Work 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 OOWH Protocol

3.4 Variation to Work Hours

Notwithstanding conditions E64 and E65, work may be undertaken outside the hours specific in any of the following circumstances:

- (a) Safety and emergencies including
 - i. for the delivery of materials required by the NSW Police Force or other authority for safety reasons
 - ii. where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm

On becoming aware of the need for emergency work in accordance with CoA E66(a)(ii), the Proponent must notify, the ER, the Planning Secretary and the EPA of the reasons for such work. The Proponent must use best endeavours to notify all noise and/or vibration affected residents and owners/occupiers of properties identified as sensitive land use(s) of the likely impact and duration of the emergency works;

- (b) Work that meets all of the following criteria:
 - i. Work that causes LAeq(15 minute) noise levels:
 - no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and
 - no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land use(s);
 - ii. Work that causes LAF max noise levels no more than 15 dBA above the RBL at any residence during the night-time;
 - iii. Work that causes:
 - continuous or impulsive vibration values, measured at the most affected residence, no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), and
 - intermittent vibration values measured at the most affected residence which are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).
- (c) By approval, including:
 - i. where different construction hours are permitted or required under an EPL are in force in respect of the CSSI; or
 - ii. works which are not subject to an EPL that are approved under an **Out-of-Hours Work Protocol** as required by **Condition E67**; or
 - iii. negotiated agreements with directly affected residents and sensitive land use(s).

4. OOHW noise and vibration assessment

4.1 OOHW Permit

Works which has been appropriately justified can only proceed outside of standard working hours where a comprehensive OOHW application has been prepared and approved in accordance with the approval pathway outlined in Figure 2.1. Attachment 1 of this OOHW Protocol provides the application template to capture all necessary information for this process including:

- Relevant personnel details
- Detailed work description including location, activity, equipment required, duration etc
- Valid justification
- Noise and vibration assessment against M12RT Project specific criteria
- Determination of an activity risk category based on criteria in section 4.3
- Standard mitigation measures to be adopted
- Details of community consultation including relevant feedback and how it has been addressed, and the status of any agreements.

This information will be reviewed by the relevant approval delegate when considering whether proposed OOHW can proceed as documented, proceed on a conditional basis, or not proceed at all.

The subsequent sections provide further detail of the above (where relevant) or cross-reference to where further detail can be found.

4.2 Noise and vibration assessment criteria

4.2.1 Noise management levels

Project-specific noise management levels (NMLs) and sleep disturbance criteria for each Noise Catchment Area (NCA) within the M12RT Project area will be used during any noise assessment. Construction NML criteria for non-residential, commercial and industrial receivers will also be applied as required.

Mitigation measures will be applied with regard to relevant thresholds as described in section 5.

4.2.2 Ground-borne noise criteria

Ground-borne noise is noise generated by vibration transmitted through the ground into a structure. CoA E69 recognises that ground-borne noise in some instances can be more noticeable than air-borne noise and specifies the following criteria for the application of mitigation measures for affected residential receivers. These include:

- Evening (6:00 pm to 10:00 pm) - internal $L_{Aeq(15 \text{ minute})}$: 40 dB(A)
- Night (10:00 pm to 7:00 am) - internal $L_{Aeq(15 \text{ minute})}$: 35 dB(A).

Section 5.3 outlines mitigation measures to be applied when ground-borne noise exceeds the thresholds outlined above.

4.2.3 Vibration criteria

Vibration criteria has been adopted directly from the standards outlined in section 1.2 as applicable to Australian conditions. An adaptive approach to mitigation will be applied to vibration from OOHW including timing of works, duration of works, plant selection, plant substitution and consultation with affected receivers. The criteria include consideration to potential cosmetic damage to properties (CoA E72) and heritage structures (CoA E73).

4.3 Noise and vibration assessment

In accordance with CoA E71, Noise and Vibration Impact Statements (NVIS) must be prepared for any Work:

- a) that may exceed the noise management levels, vibration criteria and/or ground-borne noise levels specified in Condition E68 and Condition E69 at any residence outside work hours identified in Condition E64, or
- b) where receivers will be highly noise affected.

The NVIS must include specific mitigation measures identified through consultation with affected receivers of the sensitive land use(s) and the mitigation measures must be implemented for the duration of the works. A copy of the NVIS must be provided to the ER prior to the commencement of the associated works. The Planning Secretary and the EPA may request a copy/ies of NVIS.

4.3.1 Noise assessment

A noise assessment to determine the noise impacts of the proposed OOHW will be undertaken for each activity, including individual work locations and the impacted NCA's. The assessment will predict the level and extent of noise impact that OOHW activities will have on potentially affected sensitive receivers under a worst case scenario.

Quantitative noise assessments for all OOHW will predict the potential exceedances of the OOHW scenario against the relevant NMLs and sleep disturbance screening criteria identified for potentially affected sensitive receivers. The assessment will include:

- Details of the nature and scope of each activity, including details of times, duration, vehicles, plant and equipment to be used
- Justification of the selected construction and work methods, plant and equipment compared to alternatives taking into consideration noise and vibration impacts
- An evaluation of the worst case scenario for each affected NCA including:
 - the addresses of the most affected noise sensitive receivers
 - the relevant Rating Background Level for each NCA
 - NMLs for the NCA
 - the predicted $L_{Aeq} (15 \text{ min})$ noise level, incorporating any 5 dB correction for particularly annoying activities as listed in the ICNG and CoA
 - an assessment of sleep disturbance
- Mitigation measures to be applied.

Noise mitigation measures to be adopted based on the predicted noise levels, including respite periods to minimise noise and vibration impacts on surrounding noise sensitive receivers in each locality, and are detailed further in section 5.

Where changes to the scope and potential impact of the approved OOHW occur, the Contractor must follow the change management process outlined in section 7.5.

4.3.2 Vibration assessment

An assessment of vibration intensive activities that may impact sensitive receivers or structures will be required for out of hours vibration intensive works. The proposed OOHW activities will be assessed for compliance with safe working distances for:

- Cosmetic and/or structural impacts (including safe working distances) including owners and occupiers of properties and heritage structures
- Human comfort impacts due to vibration and ground borne noise.

Assessments will be undertaken in accordance with Table 8-7 “Recommended minimum working distances for vibration intensive plant and equipment” Chapter 8 of the EIS, noting that the safe working distances provided in this table are indicative and actual vibration levels will vary depending on the item of plant (particularly its power rating) and local geotechnical conditions. Consideration of these factors will be considered in the assessment of all vibration generating OOHW. Where a particular piece of plant or equipment is not included in Table 8-7 of the EIS, safe working distances from the plant or equipment’s Operation Manual may be used. Otherwise, values supplied from a noise and vibration consultant may be used upon ER review.

Prior to undertaking an assessment, all other feasible and reasonable options to use less vibration intensive equipment will be investigated and exhausted.

4.4 OOHW risk determination and approval

The approval process for justified OOHW will be determined on a risk-based case-by-case basis to ensure that OOHW is approved by the appropriate delegate in accordance with CoA E67(a). Justified OOHW will be approved as per Table 4-1.

Table 4-1: OOHW approval delegate

Approval delegate	OOHW risk category
M12RT Project Environmental Representative	Justified OOHW where the ER has confirmed the OOHW is low or medium risk
Planning Secretary	Justified OOHW where the ER has confirmed the OOHW is high risk

The risk factors in determining low, medium and high risk are outlined in Table 4-2 and are generally in accordance with the Construction Noise and Vibration Guide (Roads and Maritime, 2016).

Table 4-2: OOHW risk factors*

	Low risk factors	Medium risk factors	High risk factors
OOHW Period	Period 1	Period 1 & 2	Period 1 & 2
Air-borne Noise	Work predicted to generate air-borne noise levels 15dBA or less above the NML	Work predicted to generate air-borne noise levels between 15dBA and 25dBA above the NML	Work predicted to generate air-borne noise levels more than 25dBA above the NML
Impulsive/tonal noise or intensive vibratory activities	No impulsive or tonal noise vibration activities between 1800-2200 weekdays, 1300-2200 Saturdays, 0800-1800 Sundays and public holidays	Impulsive noise and/or intensive vibration activities between 2200-0700 weekday nights, 2200-0800 Saturday nights, 1800-0700 Sunday and public holiday nights	Impulsive noise and vibration likely after 2200hrs (e.g., vibratory rolling or rock breaking)
Sleep Disturbance	Not predicted	Sleep disturbance risk	Predicted
Consultation	N/A	Activities predicted to generate noise that is more than 25dBA above the NML for the period and where 100 per cent of directly affected residents and sensitive land uses have agreed to the proposed negotiated agreement.	Activities predicted to generate noise that is more than 25dBA above the NML for the period and where less than 100 per cent of directly affected residents and sensitive land uses have agreed to the proposed negotiated agreement.

* Low, medium and high-risk factors taken from Figure 2 of the Transport's Construction Noise and vibration guideline

4.4.1 Low risk activities

These activities generate noise at levels that is considered “noticeable” and “clearly audible” as defined within Transport’s Construction Noise and Vibration Guideline (i.e. up to 15dBA above the NML). Low risk activities would not include any impulsive noise and vibration events outside of standard construction hours. These activities may be assessed and approved by the ER as low risk activities.

Criteria considered by the ER in determining low risk would include:

- The efficacy of mitigation measures in minimising the magnitude of impacts on affected receivers
- Whether plant or equipment is likely to generate impulsive noise and vibration events

4.4.2 Medium risk activities

These activities generate noise at levels that are considered “moderately intrusive” as defined within Transport’s Construction Noise and Vibration Guideline (i.e., more than 15dBA above the NML but no more than 25dBA above the NML). They may include impulsive noise and vibration events between the hours 2200-0700 weekday nights, 2200-0800 Saturday nights, and 1800-0700 Sunday and public holidays. They may also include activities that are highly intrusive but requires 100 per cent of directly affected residents and sensitive land uses to agree to the activities and application of appropriate mitigation measures. These

activities may be assessed and approved by the ER as medium risk activities. Criteria considered by the ER in determining medium risk would include:

- The efficacy of mitigation measures in minimising the magnitude of impacts on affected receivers; or
- Where written agreement has been obtained with 100 per cent of directly affected residents and sensitive land uses who are predicted to experience noise levels more than 25dBA above the NML. Further detail on the collection and application of written agreements is provided in section 6.3.

4.4.3 High risk activities

These activities generate noise levels that are predicted to exceed the NML at a sensitive receiver by more than 25dBA. These activities are defined as ‘highly intrusive’ within Transport’s Construction Noise and Vibration Guideline. These activities also include impulsive or vibratory impacts after 2200hrs.

These activities are to be assessed and approved by the Planning Secretary prior to the commencement of the OOHV works.

5. Application of mitigation measures

5.1 Standard mitigation measures

Reasonable and feasible standard mitigation measures will be proposed and implemented for all OOHW in consultation with directly affected residents and sensitive land use(s), Transport and approved by the relevant approval delegate, where there is predicted to be impacts on directly affected residents and sensitive land use(s). These measures include, but are not limited to:

- Modifying 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
- Stakeholder notification
- Planning noisier work to be carried out earlier in the period.

5.2 CoA E79 Mitigation Measures

Mitigation measures such as temporary alternative accommodation or other agreed mitigation measures, must be offered/ made available to residents affected by OOHW (including as outlined in Section 5.5 where utility works are being undertaken for the CSSI or under a road occupancy licence) where the construction noise levels between:

- a) 10:00 pm and 7:00 am, Monday to Friday;
- b) 10:00 pm Saturday to 8:00 am Sunday; and
- c) 6:00 pm Sunday and public holidays to 7:00 am the following day unless that day is Saturday then to 8:00 am;

are predicted to exceed the NML by 25 dB(A) or are greater than 75 dBA (LAeq(15 min)), whichever is the lesser and the impact is planned to occur for more than two (2) nights over a seven (7) day rolling period.

The NML must be reduced by 5 dB where the noise contains annoying characteristics and may be increased by 10 dB if the property has received at-property acoustic treatment.

5.3 Additional mitigation measures

Where construction noise and vibration levels are still predicted to exceed the noise or vibration objectives after the application of the standard mitigation measures, additional mitigation measures will be implemented in consultation with directly affected residents and sensitive land use(s). Table 5-1 and Table 5-2 outline the approach for the application of additional mitigation measures to minimise impacts of OOHW generated air-borne and ground-borne noise.

Table 5-1: Hierarchy for application additional mitigation for air-borne noise

OOHW period	Perception	dB(A) above RBL	dB(A) above NML	Additional mitigation measures	Noise levels at which additional mitigation measures are applicable
OOHW period 1	Noticeable	5 to 10	0	-	NML
Monday– Friday: 6 pm – 10 pm	Clearly audible	10 to 20	5-15	• Notification • Duration respite • Respite offer period 1	NML+5
Saturday: 7 am - 8 am and 5 pm – 10 pm	Moderately intrusive	20 to 30	15-25	• Notification • Respite offer period 1 • Verification • Duration respite	NML+15
Sunday and Public Hol.: 8 am – 6 pm	Highly Intrusive	>30	>25	• Notification • Respite offer period 1 • Phone calls • Verification • Duration respite • Individual briefings • Specific notifications	NML+25
OOHW period 2	Noticeable	5 to 10	<5	• Notification	NML
Monday– Friday: 10 pm – 7 am	Clearly audible	10 to 20	5-15	• Notification • Respite offer period 2 • Verification • Duration respite	NML+5
Saturday: 10 pm - 8 am Sunday and Public Hol. 6 pm – 7 am (8am if the following day is a Saturday)	Moderately intrusive	20 to 30	15-25	• Notification • Individual briefing • Duration respite • Specific notifications • Verification • Respite offer period 2 • Phone calls	NML+15
	Highly Intrusive	>30	>25	• Notifications • Individual briefing • Duration respite • Specific notifications • Verification • Respite offer period 2 • Phone calls • Alternative accommodation	NML+25

Table 5-2: Hierarchy for application additional mitigation for ground-borne noise

OOHW period	dB(A) above ground-borne NML	Additional mitigation measures	
OOHW period 1 Monday–Friday: 6 pm – 10 pm Saturday: 7 am - 8 am and 5 pm – 10 pm Sunday and Public Hol.: 8 am – 6 pm	10-20 above NML	• Verification • Specific notification • Duration respite	• Notification • Respite offer period 1
	>20 above NML	• Verification • Individual briefing • Duration respite • Specific notifications	• Notification • Respite offer period 1 • Phone calls
OOHW period 2 Monday– Friday: 10 pm – 7 am Saturday: 10 pm - 8 am Sunday and Public Hol. 6 pm – 7 am (8am if the following day is a Saturday)	10-20 above NML	• Notifications • Individual briefing • Duration respite • Specific notifications	• Verification • Respite offer period 2 • Phone calls • Alternative accommodation
	>20 above NML	• Notifications • Individual briefing • Duration respite • Specific notifications	• Verification • Respite offer period 2 • Phone calls • Alternative accommodation

The definitions of the additional mitigation measures referred to in section 5.1 and section 5.2 is provided in Attachment 2.

5.4 Mitigation measures for other sensitive periods

Work that results in noise levels above the NMLs at community, religious, educational institutions, noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) will not be timetabled during sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.

The mitigation measures will include consultation with directly affected residents and sensitive land use(s), Transport and approved by the relevant approval delegate.

5.5 Utility coordination and respite

As required by CoA E76, all OOH utility works carried out for the project (including those undertaken by third parties) will be coordinated to ensure respite periods are provided at noise affected locations, in accordance with the additional mitigation measures outlined in Section 5.2 and the CNVG. The Contractor will:

- reschedule any work to provide respite to impacted noise sensitive land use(s) so that the respite is achieved in accordance with Condition E77 (refer to Section 6.2); or
- consider the provision of alternative respite or mitigation to impacted noise sensitive land use(s) where respite outlined in Condition E77 (refer to Section 6.2) cannot be achieved; and
- provide documentary evidence to the ER in support of any decision made by the Proponent in relation to respite or mitigation.

The consideration of respite must also include all other CSSI, SSI and SSD projects in the NCA which may cause cumulative and/or consecutive impacts at receivers affected by the delivery of the project.

All work undertaken on behalf of Transport will be assessed and approved, where appropriate, in accordance with the processes documented in this protocol.

6. Consultation

6.1 Community consultation

Prior to undertaking all OOHW, the Contractor will consult with, as appropriate:

- Potentially affected sensitive receivers
- Transport Principal Representative (or delegate)
- Transport Environmental Manager (or delegate)

As required by the M12RT Communication Strategy and CoA E77, the Proponent must identify appropriate respite periods for the out-of-hours work in consultation with the community at each affected location on a regular basis. The consultation will include, (but not be limited to) providing the community with:

- a progressive schedule for periods no less than three months, of likely out-of-hours work;
- a description of the potential work, location and duration of the out-of-hours work;
- the noise characteristics and likely noise levels of the work; and
- likely mitigation and management measures which aim to achieve the relevant noise management levels and vibration criteria under CoA-E68, refer Section 4.1.1, (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers).

The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hours works must be provided to the ER, EPA and the Planning Secretary for information prior to undertaking the work scheduled for the subject period.

Consultation will occur in accordance with the requirements of CoA A8.

It is noted that in accordance with REMM NV09 community information sessions will be held at regular intervals for residents or groups around the Tarro interchange affected by longer periods of OOHW.

6.2 Negotiated agreements

Where noise or vibration modelling for proposed OOHW shows that high risk factors and/or screening criteria is predicted to be exceeded, the Contractor (or Transport as necessary) may pursue negotiated agreements to downgrade OOHW from high to medium risk. These negotiated agreements would be made with directly affected residents and sensitive land use(s) in accordance with CoA-E66c)(iii). Once the negotiated agreements are finalised, the ER may then consider and approve the OOHW application as a medium risk activity subject to the following.

- The finalised negotiated agreements must include all relevant information required for a community notification (refer section 6.3), but also:
- Acknowledge that the OOHW in the absence of an agreement would be categorised as high risk (refer Table 4-2)
- Identify any unique measures or requirements agreed to by both parties (eg regular advice on the status of the OOHW by text message)
- Consider the potential of cumulative impacts and schedule OOHW from each package (southern and northern) on affected residents and sensitive land use(s)
- Document the period in which the agreement remains in effect

- Provide a mechanism to review / revise the agreement where circumstances might have changed.

The ER can only consider an application for OOHW to be downgraded from a high to medium activity if agreement with 100 per cent of directly affected residents and sensitive land use(s) is reached. Although the ER will endorse high risk activity before submission to Planning Secretary for approval, see Section 4.4.3.

The ER would consider a number of circumstances in making a determination. Considerations might include, but not be limited to:

- Whether a directly affected residents and sensitive land use(s) has not responded to multiple attempts and methods of engagement
- Whether a directly affected residents and sensitive land use(s) does not want to sign a written agreement but has provided verbal agreement to the OOHW.

In circumstances where agreement with 100 per cent of directly affected residents and sensitive land use(s) is unable to be obtained due to non-responding parties, the ER can consider an agreement has been reached where three genuine attempts at consultation have been made and documented. This would include, but not be limited to, all or a combination of doorknock and one, of the following methods:

- A personalised stakeholder notification (letter, email, text message)
- Telephone call
- Doorknock, including leaving a “sorry I missed you” card explaining the reason for the visit and requesting a return phone call.

In circumstances where a directly affected residents and sensitive land use(s) has no objections to the OOHW, but has indicated they do not wish to sign a written agreement, the ER can consider a communication record (or file note) of the verbal agreement. The record must include the date, time and place of the conversation and those in attendance. It must also include any special circumstances under which the receiver has advised that they are in agreement with the OOHW. The record must be signed by the M12RT Project representative in attendance and an electronic copy retained.

All agreements would be recorded in accordance with the processes outlined in the M12RT Project Communication Strategy and captured in the Consultation Manager database. All negotiated agreements made for the purposes of undertaking OOHW that might otherwise be categorised as a high risk activity will be attached to the OOHW application provided to the ER and/or Planning Secretary. This application will also be provided to Transport for approval, prior to submission to the ER and/or Planning Secretary. Transport's review of the application will include a consideration of consistency between each package as well as any potential cumulative impacts.

6.3 Community notification

Community notifications will be used as a mitigation measure for receivers of potential noise and vibration impacts from OOHW.

Where OOHW have been scheduled, the Contractor's Community Liaison Representative will notify the directly affected residents and sensitive land use(s) of upcoming OOHW in accordance with the procedures in the approved Communication Strategy.

Specific notifications of OOHW events will be issued to directly affected residents and sensitive land use(s) at least five days, and not more than 14 working days, prior to the OOHW commencing.

OOHW notifications will be prepared generally in accordance with the CNVG. The notifications will:

- Be undertaken by letterbox drop or email (or equivalent)

- Clearly outline the reason that the work is required to be undertaken outside standard construction hours specified
- 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, type of work, scope and days and dates and hours of the proposed works
- Detail the expected noise impact of the works on directly affected residents and sensitive land use(s)
- Detail mitigation and management measures and proposed respite periods
- Clearly state how complaints may be made and additional information obtained
- Include the number of the 24-hour telephone complaints line, site contact (where available and the M12RT Project website address.

In accordance with CoA E72, the Contractor's Community Liaison Representative will notify the landowners and occupiers of properties at risk of experiencing vibration that exceeds the screening criteria limits for cosmetic damage prior to the commencement of OOHV that may generate vibration near those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, the Contractor will provide the landowners and occupiers a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the landowner and occupier.

7. Monitoring and auditing

7.1 Monitoring of OOHW

The Contractor's Environmental Site Representative will ensure the following OOHW noise and vibration monitoring is undertaken:

- Attended noise monitoring at representative directly affected residents and sensitive land use(s) in the first instance of an activity predicted to be moderately intrusive or worse during OOHW Period 1 or clearly audible or worse during OOHW Period 2
- Attended vibration monitoring at representative directly affected residents and sensitive land use(s) in the first instance of work where vibration levels are predicted to exceed maximum levels
- Additional noise and vibration monitoring and review if complaints about the activity are received
- Attended noise or vibration monitoring at appropriate representative stages of OOHW that has been determined by the ER to be low or medium risk to verify predictions.

All OOHW monitoring will be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration in accordance with the approved Noise and Vibration Monitoring program and validation monitoring for negotiated agreements in accordance with section 6.3.

7.2 Complaints management

Complaints received as a result of the OOHW will be managed in accordance with the M12RT Project Communication Strategy and be recorded in the Complaints Register. On receipt of any complaints, the Contractor will carry out an investigation and where feasible and reasonable, make changes to the works to address the issue of concern. Where relevant to the detail of the complaint, monitoring will be undertaken to confirm compliance with the noise levels identified in the noise modelling and predicted vibration levels.

7.3 Exceedances / non-compliances

Where monitoring identifies any exceedances of the levels predicted in the OOHW assessment, a review of OOHW activities will be carried out to determine whether noise or vibration levels can be further reduced via additional feasible and reasonable measures.

Where the processes and systems outlined in this protocol are not followed or where work isn't in accordance with the approved OOHW application form, the event will be considered a noncompliance with this protocol. The noncompliance will be managed in accordance with Transport Environmental Incident Procedure and the requirements of CoA A41.

7.4 Records

The Contractor will maintain accurate records of all OOHW applications and noise and vibration monitoring undertaken during OOHW for the duration of the works.

8. Document Revision

In accordance with CoA E67, the OOHW Protocol has been developed in consultation with the ER, and will be endorsed via a letter by the ER and approved by the Planning Secretary prior to the commencement of Out of Hours Work.

The ER will be consulted with any proposed amendments to this Protocol before submission to the Planning Secretary for approval.

Attachment 1 Project OOHW application form

M12RT Project OOHW application form

Out of Hours Application			
Application number:	Notification date:	Commencement of work date:	M12RT Stage:
Contact Details			
	Name	Mobile Number	Email
Contractor Environmental Site Representative			
Contractor Construction Manager			
Contractor Communications Manager			
Contractor Super Intendant/ Supervisor			
Out of hours works category (CoA E66)			
Select ☐	Safety and Emergencies, including: i. for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or ii. where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm.		
☐	Work that meets all of the following criteria: i. Work that causes LAeq(15 minute) noise levels: • no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and • no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land use(s); ii. Work that causes LAF max noise levels no more than 15 dBA above the RBL at any residence during the night-time; iii. Work that causes: • continuous or impulsive vibration values, measured at the most affected residence no more than the preferred values for human exposure to vibration, specified in Table 2.2 of <i>Assessing Vibration: a technical guideline</i> (DEC, 2006), and • intermittent vibration values measured at the most affected residence which are no more than the preferred values for human		

	exposure to vibration, specified in Table 2.4 of <i>Assessing Vibration: a technical guideline</i> (DEC, 2006).		
N.A	By Approval, including:		
	i. where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or		
☐	ii. works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E67; or		
☐	iii. negotiated agreements with directly affected residents and sensitive land use(s).		
Details of Work			
Location <i>Include a figure with boundary of OOH works, project boundary and directly affected residents and sensitive land use(s)</i>			
Description of work and sequence if multiple activities			
Justification why does the work need to occur outside of standard working hours			
Plant and Equipment Guidance (delete on final document): This plant and equipment list will form the basis of the noise assessment for the work. Include reference to "stand-by" equipment that may be present on site but would only be used in the event of a breakdown. If plant and equipment is changed or substituted following approval of the OOHW Application Form the Environmental Site Representative must undertake a consistency review as per Attachment 3. Where noise impacts are predicted to be greater than those outlined in the initial noise assessment,	Plant	Quantity	SWL

appropriateness of environmental management measures are to be considered and an updated OOHW Application Form approval must be sought			
Proposed dates for work			
Start date	End Date	Number of Working Days	Contingency dates
Time of works <i>As per ROL</i>			
NCA/s and NML/s	NCA	NML	
Have any other out of hours applications been approved or submitted for these dates and NCA/s?	☐ Yes, identify any cumulative impacts and respite periods ☐ No		
Risk Factor (section 4.3)	☐ Below NML ☐ Low ☐ Medium ☐ High		
Has a noise assessment been completed which identifies directly affected residents or land use(s)?	☐ Yes, complete Attachment 1 ☐ No, complete noise assessment		
Do you need a vibration assessment? (Section 4.2.2)	☐ Yes, complete and attach as Attachment 3 ☐ No, disregard Attachment 3		
Proposed mitigation measures (Section 5) <i>Identify any respite required</i>			

Community Consultation			
Outline consultation undertaken for the proposed OOHW (date, distribution, method and outcome)			
Has respite periods for OOHW been identified with the affected community on a monthly basis and a three-month schedule of likely OOHW provided (refer CoA E39)?			
Approvals			
	Name	Date	Signature
Contractor Community Liaison Representative			
Contractor Environmental manager (or delegate)			
Transport Environment and Sustainability Manager (or delegate)			
ER approval <i>low or medium risk activities</i>			
Planning Secretary approval <i>high risk activities</i>			

Attachment 1 – Noise assessment

Step 1. Complete noise assessment

Step 2. Fill in Table 1

Table 1 – Noise assessment Summary

Activity	Location/ receiver	NCA	NML	dBA above NML

Step 2. Insert figure/s below with predicted noise impact for work and showing directly affected residents or land use(s).

Step 3. Insert noise assessments

Attachment 2 - Consultation evidence (including copies of negotiated agreements)

Attachment 3 - Vibration assessment (if required)

Attachment 2 Mitigation measure definitions

Mitigation measure definitions

Standard notification for OOHW

Standard notifications of OOHW will be issued to potentially affected sensitive receivers at least five days, and not more than 14 working days, prior to the OOHW commencing. The notification will include:

- potential work, location and duration
- proposed respite periods
- noise characteristics and likely noise and vibration levels
- likely mitigation and management measures
- the name and contact telephone number of the Contractor's representative to enable potentially affected sensitive receivers to lodge any concerns about extended working hours.

OOHW notifications will be prepared in accordance with the CNVG (Roads and Maritime, 2016).

Specific notifications

Specific notifications will be provided in the form of letterbox drops (or equivalent) to identified stakeholders no later than seven calendar days ahead of OOHW that are predicted likely to exceed the noise objectives. The specific notification provides additional information when relevant and is informative to more highly affected receivers than what is covered by a standard notification.

Phone calls

Phone calls to potentially affected sensitive receivers detailing relevant information will be made within five working days of the proposed OOHW. Phone calls provide potentially affected sensitive receivers with personalised contact and tailored advice, with the opportunity to provide comments on the proposed OOHW and specific needs. The responses of sensitive receivers will be addressed to ensure an optimum outcome is achieved regarding mitigation of OOHW impacts. Where the resident cannot be telephoned then an alternative form of engagement will be used.

Individual briefings

Where required, individual briefings will be used to inform affected sensitive receivers about the impacts of OOHW and mitigation measures that will be implemented. Where required, the Contractor's Community Liaison Representative will visit potentially affected sensitive receivers at least 48 hours ahead of the proposed OOHW. Individual briefings provide potentially affected sensitive receivers with personalised contact and tailored advice. Contact with sensitive receivers will be documented and concerns addressed where feasible and reasonable.

Where there are many sensitive receivers predicted to be above the NML and it is not practical to discuss the proposed OOHW with every resident, or the resident cannot be met with individually, then an alternative form of engagement will be used.

Respite Offers

Respite Offers will be considered where noise and/or vibration levels are predicted to be moderately or highly intrusive, or exceed maximum vibration levels, respectively, at affected sensitive receivers to provide residents with respite from an ongoing impact. As suggested in the CNVG (Roads and Maritime, 2016), work will be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The actual duration of each block of work and respite will be flexible to accommodate the usage of and amenity at nearby receivers. The purpose is to provide residents

with respite from an ongoing impact. This measure will be evaluated on an event-by-event basis, and may not be applicable to all OOHW events.

Respite Periods

The Contractor will identify appropriate respite periods for the OOHW in consultation with the community at each affected location. Scheduled respite periods determined in consultation with potentially affected sensitive receivers will be implemented to mitigate the impacts of ongoing periods of noise criteria exceedances at nearby receivers. Where reasonable and feasible, proposed OOHW will be coordinated to avoid the same sensitive receiver being affected over consecutive nights and OOHW will be staggered in order to maximise the respite period between OOHW. The Contractor will modify the scheduled construction activities to accommodate respite periods where necessary.

Respite periods will be flexible and determined on a case-by-case basis, taking into account predicted maximum exceedance levels, duration and timing of exceedances, surrounding land uses and community feedback. Indicative respite periods for OOHW, to be discussed during consultation are summarised below.

OOHW Period 1 Monday–Friday: 6 pm – 10 pm Saturday: 7 am - 8 am & 5 pm – 10 pm Sunday and Public Hol: 8 am – 6 pm	• Construction noise 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. • With the exception for works along the New England and Pacific Highway corridors (CoA E78), which limits to no more than two consecutive evenings and/or nights per week; or three non-consecutive evenings and/or nights per week; or 10 nights and/or nights per month or expect as identified by an EPL or in accordance with an agreement with to potentially impacted receiver(s) as required by Condition E66(c)(iii).
OOHW Period 2 Monday– Friday 10 pm – 7 am Saturday: 10 pm - 8 am Sunday and Public Hol. 6 pm – 7 am	• Night time construction noise 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 / particularly annoying activities will be completed before 11 pm. • In accordance with CoA E78(a)-(c), work outside the hours specified in CoA E64 along the New England and Pacific Highway corridors which result in an exceedance of the relevant NML at the same sensitive land use(s) can only be undertaken in accordance with the following: a) two consecutive evenings and/or nights per week; or b) three non-consecutive evenings and/or nights per week; or c) 10 evenings and/or nights per month. e) in accordance with an agreement with a potentially impacted receiver(s) as required by Condition E66(c)(iii)

Duration Respite

Respite Offers and the implementation of Respite Periods 1 and 2 may be counterproductive in reducing the impact on the community for longer duration activities. 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 Respites so that the project can be completed more quickly.

The Contractor's Community Liaison Representative will engage with the directly affected residents and sensitive land use(s) where noise levels are expected to exceed the NML to demonstrate support for Duration Respite. This would be documented via the negotiated agreements process detailed in section 6.2. Consultation will be undertaken in accordance with the M12RT Communication Strategy.

Utility coordination and respite

As required by CoA E76, all OOH utility works carried out for the project, (including those undertaken by third parties), will be coordinated to ensure respite periods are provided at noise affected locations, in accordance with the additional mitigation measures outlined in Attachment 2 and the CNVG. The Contractor will:

- schedule any works to provide respite to impacted directly affected residents and sensitive land use(s) so that respite is achieved
- consider the provision of alternative respite or mitigation to impacted directly affected residents and sensitive land use(s)
- provide documentary evidence in support of any decision made by Transport or its Contractors in relation to respite or mitigation.

All utility work undertaken on behalf of Transport will be assessed and approved, where appropriate, in accordance with the processes documented in this protocol.

Alternative accommodation

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

Verification

Verification should include measurement of the background noise level and construction noise (and vibration where considered a risk factor). Monitoring would be undertaken in accordance with Section 7.1 of this protocol and applying the methodology documented in the Transport CNVG.

[illegible]

Appendix E – Construction plant and equipment and sound power levels (SWL), dB(A)

ID	Scenario	Plant Item	SWL LAeq(15min) ₁
1	Pre-construction and site establishment	Truck (HIAB)	103
		Road Trucks	108
		Light vehicles	89
		Heavy vehicles (floats, semi-trailers)	108
		Excavators	102
		Backhoe	100
		Front end loader	107
		Fuel trucks	108
		Chainsaws	118
		Mulcher	114
		Water cart	98
		Franna crane	98
		Hand Tools	101
		Welding equipment	105
2	Ancillary facility – establishment	Truck (HIAB)	103
		Road Trucks	108
		Light vehicles	89
		Heavy vehicles (floats, semi-trailers)	108
		Excavators	102
		Backhoe	100
		Front end loader	107
		Fuel trucks	108
		Chainsaws	118
		Mulcher	114
		Water cart	98
		Small mobile crane	98
		Franna crane	98
		Hand Tools	101
		Welding equipment	105
		Site sheds (workshops)	101
		Generators	94
3	Ancillary facility – operation	Truck (HIAB)	103
		Road Trucks	108
		Light vehicles	89
		Heavy vehicles (floats, semi-trailers)	108
		Backhoe	100
		Fuel trucks	108

ID	Scenario	Plant Item	SWL LAeq(15min) ₁
		Water cart	98
		Franna crane	98
		Hand Tools	101
		Welding equipment	105
		Site sheds (workshops)	101
		Generators	94
4	Batch plant operation (general)	Front end loader	107
		Excavator	102
		Water cart	98
		Dump truck	108
		Franna crane	98
		Road trucks	108
		Rock crusher	115
		Screening equipment	105
	Concrete batch plant operation	Concrete batch plant	111
	Asphalt batch plant operation	Asphalt batch plant	116
5	Clearing, grubbing, and demolition	Excavator	102
		Excavator with harvester attachment	114
		Fuel truck	108
		Bulldozer	114
		Dump truck	108
		Skidder	114
		Chainsaw	118
		Tub grinder/mulcher	114
		Elevated work platform	102
		Light vehicles	89
6	Utility works	Excavators	102
		Backhoes	100
		Dump trucks	108
		Concrete trucks	105
		Road Trucks	108
		Light vehicles	89
		Jackhammers	113
		Concrete saws	120
		Hand held equipment	101
7	Bulk earthworks – cuttings	Excavators	102
		Excavator + hydraulic breaker	120

ID	Scenario	Plant Item	SWL LAeq(15min) ₁
		Dump Trucks	108
		Bulldozers	114
		Front end loaders	107
		Scrapers	110
		Water cart	98
		Truck and dog	108
		Light vehicles	89
		Impact / jaw crusher plant	115
9	Bulk earthworks – fill	Excavators	102
		Dump Trucks	108
		Bulldozers	114
		Grader	113
		Scraper	110
		Water cart	98
		Truck and dog	108
		Vibratory rollers up to 26 tonne	109
		Light vehicles	89
10	Concrete pavement (including pavement drainage)	Water carts	98
		Road trucks	108
		Concrete paver	114
		Texturing machines	103
		Sprayers for curing	103
		Bitumen spraying truck	103
		Concrete saw	120
		Backhoe	100
		Truck Compressor	100
		Light vehicles	89
11	Asphalt pavement (including pavement drainage)	Road trucks/truck and dog	108
		Asphalt paver	103
		Smooth drum vibratory rollers	106
		Multi-tyre roller	106
		Bitumen spraying truck	103
		Aggregate spreader	108
		Aggregate sweeper	104
		Road trucks	108
		Truck Compressor	100
		Light vehicles	89
		Asphalt rotomill	110

ID	Scenario	Plant Item	SWL LAeq(15min) ₁
		Kerbing machine	114
12	Bridge and viaduct superstructure	Large mobile/crawler cranes (350 - 500t)	110
		Franna Crane	98
		Concrete trucks	105
		Concrete Pumps	103
		Generators	94
		Compressors	100
		Excavators	102
		Hand tools	101
		Light vehicles	89
		Welding equipment	105
		Elevated work platforms	102
		Dewatering pumps	103
		Road trucks	108
		Dump trucks	108
		Water carts	98
		Oversize trucks delivering precast elements	108
		Heavy vehicles delivering plant, equipment and materials	108
		Crane barge	106
		Supply barges	106
13	Piling for bridges and bridge approaches	Bored piling rigs	112
		Crawler crane with vibrating/impact driving hammer	121
		Excavator with sheet piling attachment	111
		Excavators	102
		Concrete trucks	105
		Concrete pumps	103
		Hand tools	101
		Welding equipment	105
		Compressors	100
		Generators	94
		Franna crane	98
		Mobile crane	110
		Piling rig barge	106
		Light vehicles	89
		Heavy vehicles delivering piling materials	108
14	Roadside furniture and finishing work	Excavators	102
		Elevated work platforms	102
		Road trucks	108

ID	Scenario	Plant Item	SWL LAeq(15min) ₁
		Mobile cranes	110
		Franna cranes	98
		Concrete trucks	105
		Light vehicles	89
		Hand held tools	101
		Jackhammers	113
		Line Marking Truck	108
		Generators	94
15	Traffic management and control	Small trucks	103
		Light vehicles	89
		Generators	94
		Hand tools	101
16	Landscaping	Light vehicle	89
		Water cart	98
		Bobcat	107
		Excavator	102
		Front end loaders	107
		Graders	113
		Road trucks	108
		Hand held tools	101
		Side tipper	108
17	Cross drainage	Excavators	102
		Backhoe	100
		Elevated work platforms	102
		Mobile cranes	110
		Franna cranes	98
		Concrete trucks	105
		Concrete pumps	103
		Compressors	100
		Generators	94
		Vibratory rollers	109
		Road trucks	108
		Light vehicles	89
		Hand held compactors	105
		Hand held tools	101

¹ Reference source: Appendix C.1 Construction plant and equipment Table C-1 Construction plant and equipment and sound power levels (SWL), dB(A) re. 1pW

Appendix F – Traffic Noise Monitoring Program and Monitoring Report

[REDACTED]
Department of Planning & Environment
320 Pitt Street
Sydney NSW 2001

A46505370

Via email:

[REDACTED]

CC:

[REDACTED]

28 November 2022

Dear Mary,

**M1 Pacific Motorway extension to Raymond Terrace (SSI-7319)
Traffic Noise Monitoring Program and Independent review**

Further to my letter dated 30 August 2022, and review meeting on 21 November 2022 outlining the schedule to undertake additional noise monitoring for the project prior to Christmas.

Please find attached a copy of the revised Traffic Noise Monitoring Program (Attachment 1) and the updated independent review (Attachment 2).

Transport has engaged Arup to deploy the three (3) additional monitors on Monday 28th November to ensure sufficient data can be obtained before the school holidays.

Please contact [REDACTED] should any further clarification be required.

Sincerely,

[REDACTED]

[REDACTED]

[REDACTED], M1 to Raymond Terrace

Attachment 1 – Traffic Noise Monitoring Program v2.

Transport for New South Wales

M1 to Raymond Terrace

Traffic Noise Monitoring Program

Reference: AC02

1 | 24 November 2022

This report takes into account the particular instructions and requirements of our client. It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number: 289109-00

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Document Verification

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Issue Document Verification with Document



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1. Purpose

This document details requirements for updated noise monitoring to be undertaken for the M1 to Raymond Terrace project and is issued for review and approval by the NSW Department of Planning and Environment (DPE) with respect to satisfying Conditions of Approval for the M1 Pacific Motorway Extension to Raymond Terrace project through Detailed Design.

This Traffic Noise Monitoring Program (TNMP) has been developed:

- in response to Transport for NSW (TfNSW) revised environmental management measure (NV10) in the submissions report,
- to fulfil the requirements of Condition E87 and E88 of the draft Conditions of Approval for M1 Pacific Motorway Extension to Raymond Terrace (SSI 7319) V4, and
- to support an operational noise review (ONR), operational noise validation and operational noise monitoring report required by the Draft Conditions of Approval for M1 Pacific Motorway Extension to Raymond Terrace (SSI 7319) V4.

The noise and traffic monitoring locations and noise monitoring methodology have been developed with reference to the following documents:

- NSW Road Noise Policy (RNP) [1]
- TfNSW Road Noise Criteria Guideline (RNCG) [2]
- TfNSW Road Noise Mitigation Guideline (RNMG) [3]
- TfNSW Road Noise Model Validation Guideline (RNMVG) [4]
- EPA Approved Methods for the measurement and analysis of environmental noise in NSW [5]
- NSW Noise Policy for Industry (NPfI) [6]
- EIS noise technical report – Part 1 [7]
- EIS noise technical report – Part 2 [8]
- Submissions Report – Main body [9]
- Submissions Report – Appendix D - Noise supplementary technical report [10]

2. Methodology

2.1 Procedure

Noise monitoring shall be undertaken in general accordance with the EPA Approved Methods for the measurement and analysis of environmental noise in NSW [5] and outside of school holiday periods.

Long-term noise loggers shall be placed at each nominated noise monitoring location listed in Table 1 to continuously record ambient noise levels for a period of up to 21 consecutive days, allowing for adverse weather conditions, with the aim to collect a minimum 7 days of valid data at each location. The nominated period of noise monitoring provides a level of redundancy should there be issues with individual logging locations in the event of malfunction or unforeseen adverse weather conditions. Periodic checks of the noise loggers will be carried out 7 days and 14 days after deployment.

A one-off short-term operator attended noise monitoring will be conducted at each noise logger location and each additional attended noise monitoring location during both the daytime and night-time periods, concurrently with the 15-minute periods logged using the long-term noise loggers. The daytime attended noise monitoring will be carried out after the long-term noise logger has been installed during the period between 7am and 10pm. The night-time attended noise monitoring will be carried out between 10pm and 7am.

Measurements will be taken at a height of 1.5 m above the ground at each agreed location and, wherever appropriate and possible, at 1 m of the building façade with façade corrections being allowed for as applicable. Free field measurement locations used for validation are located within 30 m of the road (no closer than 10 m) and, wherever appropriate and possible, having unobstructed line of sight to approximately 150 degrees of road and tyre interface to verify representative road traffic source levels. The sample time interval will be set at 15 minutes and the meter time constant set to “Fast”.

Maximum noise level analysis will be undertaken of existing noise exposure derived from noise logger data for the project. The analysis will be restricted to locations where maximum noise level events are considered clearly attributable to road traffic noise events. The assessment of the impact of sleep disturbance on residents is made in terms of likely maximum noise levels from road traffic, the extent to which these maximum noise levels exceed the ambient level, and the expected number of noise events from road traffic during the night on an hourly basis.

2.2 Equipment

Equipment used for both unattended and attended noise surveys will be Class 1 as defined in IEC 61672-1:2019 [11] and carry current calibration certificates. Calibration of the noise monitoring equipment will be checked prior to and following all measurements with no significant drift in calibration being recorded. If the noise level recorded during the post-measurement check differs by more than 1.0 dB from the noise level recorded during the pre-measurement check, all measurements made in the intervening period will be disregarded.

2.3 Weather

Weather data will be obtained from the Bureau of Meteorology’s (BOM) from the Williamstown RAAF weather station located within 30 km of all noise monitoring locations for the monitoring period. This weather station is preferred over the Newcastle University and Newcastle Nobbys weather stations as it is expected to be more representative of inland weather conditions. The data must include as a minimum rainfall (mm), wind speed (km/h) and wind direction over 15-minute periods and record the time intervals. The weather station information must include as a minimum the height at which the data has been recorded to account for the height difference between the weather station and the noise monitor microphone location. Where appropriate, correction factors will be applied based on Table C.1 of ISO 4354:2009 [12]. This data will be reviewed to identify periods of adverse weather during the unattended noise logging survey. Where appropriate, periods of high winds and/or rain will be excluded from the analysis in accordance with the NSW Noise Policy for Industry [6].

2.4 Traffic

Classified road traffic counts shall be collected at each nominated traffic count location aligning the existing road corridors (refer Appendix A for an aerial view of proposed traffic count locations). Hourly classified traffic counts must be conducted concurrently with noise logging throughout the entire noise monitoring period.

Traffic counts will not be collected at baseline noise logging locations. Table 2 lists the indicative locations where traffic counts are required as part of this TNMP.

2.5 Locations

Proposed noise monitoring and traffic count locations are provided as a markup on aerial image of the project in Appendix A.

The locations have been selected to establish the following:

- Existing road traffic noise levels for **validation** of the operational noise model ($L_{Aeq, period}$)
- Existing **baseline** noise levels to validate RBLs established in the EIS for each relevant NCA (RBL, $L_{A90, period}$)

The number of locations proposed for monitoring provides a level of redundancy for both model validation and baseline should there be issues with individual logging locations.

Proposed locations for concurrent traffic counting have also been provided for noise monitoring locations that are to be used for validation. Table 1 provides a detailed description of the reasoning behind the selection of the proposed noise monitoring locations.

All noise monitoring locations have been replicated from the EIS with exception of the following:

- Noise measurement location L01A has been removed from this TNMP. It was conducted as a short-term measurement for the EIS adjacent to a long-term unattended noise monitoring location. This TNMP requires concurrent 15-minute attended short-term measurements during both daytime and night-time to determine correlation at each long-term unattended noise monitoring location.
- Noise measurement locations L04A, L05A, L10A and L12, conducted as short-term measurements are proposed to be replaced by long-term unattended noise monitoring locations.
- Noise measurement locations L04A, L05A and L10A have been relocated relative to the location proposed in the EIS to within the operational noise study area (L04A) and construction noise study area (L05A and L10A)
- Noise measurement location L18 has been relocated further south on the New England Highway to facilitate access to the noise monitoring location. The new location is expected to be exposed to a similar traffic noise profile as the location proposed in the EIS and facilitate access to the noise logging location.
- Noise measurement locations L21, L22, L23, L24, L25, L26, L27, L28, L29 and L30 are proposed as new long-term unattended noise monitoring locations:
 - L21, L22, L29 and L30 have been proposed to determine propagation loss and accuracy of barrier design. L22 will also be used to determine RBLs for NCA04B.
 - L23 and L24 have been proposed to validate traffic noise impacts on Anderson Drive and New England Highway respectively.
 - L25, L26, L27 and L28 have been proposed as additional locations to determine RBLs at the residential areas in NCA09, NCA14A & B, NCA13 and NCA04A respectively.
- Attended short-term noise monitoring locations A01, A02, A03 and A04 are proposed to be used to supplement the understanding of propagation loss in free field and propagation loss and accuracy of barrier design relative to the nearest unattended long-term noise monitoring location. These are additional to those required at each long-term noise monitoring location.

Table 1: Proposed long-term unattended noise monitoring locations

ID	NCA	Address	Suburb	Purpose	Comments
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

ID	NCA	Address	Suburb	Purpose	Comments
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED] [REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]

ID	NCA	Address	Suburb	Purpose	Comments
[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]

ID	NCA	Address	Suburb	Purpose	Comments
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED] [REDACTED]

Table 2: Proposed traffic count locations

ID	Address	Suburb	Comments
[REDACTED]	[REDACTED]	[REDACTED]	I [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	I [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	I [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	I [REDACTED]
[REDACTED]	[REDACTED] [REDACTED]	[REDACTED]	I [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	I [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	I [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	I [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	I [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	I [REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	I [REDACTED]

3. Reporting

The following sections describe the contents of the Traffic Noise Monitoring Report (TNMR).

The requirements for measuring, analysis and reporting noise in the EPA *Approved methods for the measurement and analysis of environmental noise in NSW* [5] must be considered as part of the report of the noise survey data.

3.1 Existing noise environment

As a minimum, the TNMR would contain the following information for each of the noise monitoring locations:

1. Describe the study area.
2. Discuss the noise catchment areas defined in the EIS working paper, noise monitoring procedures and identify the monitoring locations and corresponding monitoring periods.
3. A map clearly identifying the monitoring location.
4. Outline instrumentation used, including equipment manufacturer, model and serial number. Example table to be provided is shown below:

Measurement location	Equipment/model	Serial No.	Logger / SLM Type
			Class 1

Notes:

All meters must comply with AS IEC 61672.1 2013 “Electroacoustics - Sound Level Meters” and designated Class 1 as per table, and suitable for field use.

5. Document equipment calibration before and after the noise monitoring period
6. Tabulate locations and measured noise levels, including the following as a minimum:
 - a. Long-term noise levels should be tabulated on the basis of the descriptors:
 - RBL, L_{Aeq} , L_{10} and L_1 for the daytime (7am – 6pm), evening (6pm – 10pm) and night-time (10pm – 7am) periods.
 - Weekday, weekend and weekly L_{Aeq} for the daytime (7am – 6pm) and night-time (10pm – 7am) periods.
 - b. Short-term noise levels are to be tabulated on the basis of the descriptors $L_{90(15min)}$, $L_{Aeq(15min)}$ and L_{max} .
 - c. Graphical representation of the descriptors L_{Amax} , L_{A10} , L_{Aeq} and L_{A90} , for each 15-minute period, including excluded periods due to adverse weather or extraneous conditions and reasoning for exclusion.
7. Event sound levels and other relevant sound level data to determine and demonstrate compliance with licence conditions, including the A-weighted maximum noise level (L_{Amax}) and $L_{n1,T}$.
8. A qualitative summary of the acoustic environment at each monitoring location, including a description of identified noise sources that are not representative of the ambient noise environment and contribution to the measures noise levels.
9. Assessment against the established RBLs in the EIS to comment on the validity of RBLs for each relevant NCA.
10. Document any corrections applied to the noise monitoring data and how it was derived.

3.2 Existing traffic flow and composition

As a minimum, the TNMR will contain the following information for each of the traffic count locations:

1. A map clearly identifying the monitoring location.
2. Tabulated traffic volumes and percentages for each class of vehicle during the noise monitoring period in order to implement heavy vehicle corrections for model validation as per Peng, et.al. [13].
3. Outline average hourly number of vehicles classified in light, medium and heavy vehicles during the daytime (7am to 10pm) and night-time (10pm to 7am) periods and average speed. Example table to be provided is shown below:

Road name	Posted speed	Average speed	Direction	Daytime							Night-time						
				LV	HV1	HV2	HV3	HV4	HV5	Total	LV	HV1	HV2	HV3	HV4	HV5	Total
			NB														
			SB														

3.3 Noise monitoring summary template

Table 3 provides a template noise monitoring summary for reference. A comparable format shall be provided for each noise monitoring location.

Table 3: Template noise monitoring summary sheet

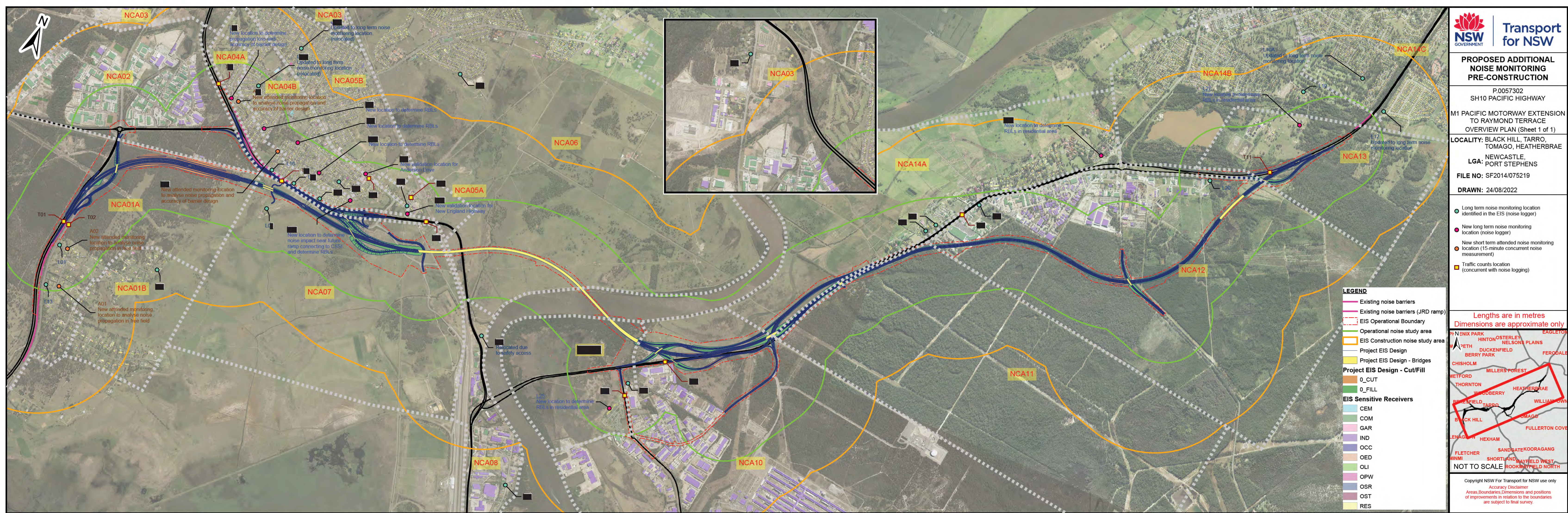
Noise Monitoring Location:					Map of Noise Monitoring Location
Noise Monitoring Address:					
Noise Logger Type and serial number:					
Noise Monitoring Period:	dd/mm/yyyy	To	dd/mm/yyyy		
Description of noise environment:					
Ambient Noise Logging Results – NPfI Defined Time Periods					Photo of Noise Monitoring Location
Time Period	Noise Level (dBA)				
	RBL	L _{Aeq}	L ₁₀	L ₁	
Daytime (0700 – 1800)					
Evening (1800 – 2200)					
Night-Time (2200 – 0700)					
Ambient Noise Logging Results – RNP Defined Time Periods					
Time Period	Noise Level (dBA)				
	Weekday L _{Aeq}	Weekend L _{Aeq}	Weekly L _{Aeq}		
Number of valid days					
Daytime (0700 – 2200)					
Night-Time (2200 – 0700)					
Attended Noise measurement Results					
Date	Start Time	Duration	Noise Level (dBA)		
			L _{A90}	L _{Aeq}	L _{Amax}
	(daytime)				
	(night-time)				

References

- [1] Department of Environment, Climate Change and Water NSW, “NSW Road Noise Policy,” NSW Government, 2012.
- [2] Transport for NSW, “Road Noise Criteria Guideline,” Transport for NSW, 2022.
- [3] Transport for NSW, “Road Noise Mitigation Guideline,” Transport for NSW, Sydney, 2022.
- [4] Transport for NSW, “Road Noise Model Validation Guideline,” Transport for NSW, 2022.
- [5] Environment Protection Authority, “Approved methods for the measurement and analysis of environmental noise in NSW,” NSW Environment Protection Authority, 2022.
- [6] State of NSW and Environment Protection Authority, “Noise Policy for Industry,” Environment Protection Authority, 2017.
- [7] Transport for NSW, “M1 Pacific Motorway extension to Raymond Terrace - Noise and vibration working paper (Part 1),” NSW Government, July 2021.
- [8] Transport for NSW, “M1 Pacific Motorway extension to Raymond Terrace - Noise and vibration working paper (Part 2),” NSW Government, July 2021.
- [9] Transport for NSW, “M1 Pacific Motorway extension to Raymond Terrace - Submissions report,” NSW Government, June 2022.
- [10] Transport for NSW, “M1 Pacific Motorway extension to Raymond Terrace - Submissions report Appendix D,” June 2022.
- [11] International Electrotechnical Commission, “IEC 61672-1:2019 Electroacoustics - Sound level meters - Part 1: Specifications,” International Standard, 2013.
- [12] International Organisation for Standardization, “ISO 4354:2009 Wind actions on structures,” 2009.
- [13] J. Peng, J. Parnell and N. Kessissoglou, “A six-category heavy vehicle noise emission model in free-flowing condition,” *Applied Acoustics*, vol. 143, pp. 211-221, 2019.

Appendix A

Noise and traffic monitoring locations aerial map



Appendix B

Previous noise surveys

B.1 Noise monitoring for EIS

Various noise monitoring was undertaken as part of the EIS assessment. The following sections provide a summary of this information for reference and has been used as the starting point for derivation of this updated noise monitoring plan.

B.1.1 Unattended noise monitoring

Long-term unattended noise monitoring was conducted at 11 locations between 1 June and 15 July 2018 as part of the EIS assessment, to establish existing background and ambient noise levels.

Table 4: Long-term unattended noise monitoring locations to monitor background ambient noise levels

Logger ID	Address	Suburb
█	█	█
█	█	█
█	█	█
█	█	█
█	█	█
█	█	█
█	█	█
█	█	█
█	█	█
█	█	█
█	█	█

Long-term unattended noise monitoring of existing traffic noise levels was conducted at eight locations between 15 March and 24 March 2016.

Table 5: Long-term unattended noise monitoring locations to monitor existing traffic noise levels

Logger ID	Address	Suburb
█	█	█
█	█	█
█	█	█
█	█	█
█	█	█
█	█	█
█	█	█
█	█	█

B.1.2 Attended noise monitoring

Short-term attended measurements were conducted during the day and night-time periods, concurrently with the long-term unattended noise monitoring in 2018 (locations listed in Table 4).

Table 6: Short-term attended measurement locations conducted during the daytime and night-time periods

Logger ID	Address	Suburb
█	█	█
█	█	█
█	█	█
█	█	█
█	█	█

B.1.3 Measured noise levels

Table 7 and Table 8 presents a summary of the background and traffic noise levels provided in the EIS and Appendix D of the Submissions Report.

Table 7: Re-analysed and re-established RBLs

Logger ID	Address	Suburb	Measured RBL, dB(A)		
			Day	Evening	Night
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█
█	█	█	█	█	█

Table 8: Monitored road traffic noise levels

Logger ID	Address	Suburb	Monitored traffic noise levels, dB(A)	
			L _{Aeq} (15h) (7am-10pm)	L _{Aeq} (9h) (10pm-7am)
█	█	█	█	█
█	█	█	█	█
█	█	█	█	█
█	█	█	█	█
█	█	█	█	█
█	█ █	█	█	█
█	█	█	█	█
█	█ █ █	█	█	█

Attachment 2 – Independent Review.



November 24, 2022

██████████
Transport for NSW
Level 7, 6 Stewart Ave
Newcastle West, NSW 2302
Email: Paul.Galvin@Transport.nsw.gov.au

Dear ██████████

**Re: M1 Pacific Motorway extension to Raymond Terrace (SSI-7319)
Proposed Additional Noise Monitoring –Peer Review**

Introduction

The M1 Pacific Motorway extension to Raymond Terrace project involves 15km of new motorway between Black Hill and Raymond Terrace. RWDI Australia Pty Ltd (RWDI) has been commissioned by Transport NSW to conduct a peer review of the M1 to Raymond Terrace Traffic Noise Monitoring Program Reference: AC02, 24 November 2022 (Arups).

The monitoring review is aimed to be independent and consistent with the proposed draft planning conditions E87 and the noise commitment NV10 to provide additional noise monitoring for the project.

The relevant draft planning condition and noise commitment is presented below:

Draft Condition E87

Before the commencement of Work, a Traffic Noise Monitoring Program must be prepared to inform the calculation of operational road traffic noise impacts at sensitive land use(s). The program must:

(a) include monitoring at the noise monitoring locations used to inform the EIS; and

(b) identify additional locations at which monitoring will be undertaken to determine the change in operational traffic noise as a result of the CSSI.

NV10

Prior to construction, additional noise monitoring be carried out to validate the Rating Background Levels adopted for the project during construction.

Traffic Noise Monitoring

The M1 to Raymond Terrace Traffic Noise Monitoring Program proposes the following additional monitoring for traffic noise to support traffic noise modelling and model validation (15 monitoring locations):

ID	Location	Location considered appropriate (Yes/No)
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■

ID	Location	Location considered appropriate (Yes/No)
█	█	█

For traffic noise model validation, traffic counting is required to be conducted. The M1 to Raymond Terrace Traffic Noise Monitoring Program proposes the following monitoring locations:

ID	Location	Location considered appropriate (Yes/No)
█	█ █ █ █	█
█	█ █ █	█
█	█ █ █	█
█	█ █ █	█
█	█ █ █	█

On review of the M1 to Raymond Terrace Traffic Noise Monitoring Program Reference: AC02, 24 November 2022 (Arup), RWDI considers that the additional post approval monitoring locations and traffic counting locations are representative of the range of sound propagation conditions along the length of the M1 Pacific Motorway extension to Raymond Terrace project corridor.

Background Noise Monitoring

The M1 to Raymond Terrace Traffic Noise Monitoring Program proposes the following additional background monitoring to support any further construction noise assessment post Approval (18 monitoring locations):

ID	Location	Location considered appropriate (Yes/No)
█	█	█
█	█ █	█
█	█	█
█	█	█
█	█	█
█	█	█
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█	█	█

ID	Location	Location considered appropriate (Yes/No)
■	■■■■■■■■■■ ■■■■	■
■	■■■■■■■■■■	■
■	■■■■■■■■■■	■
■	■■■■■■■■■■	■

On review of the M1 to Raymond Terrace Traffic Noise Monitoring Program report Reference: AC02, 24 November 2022 (Arup), RWDI considers that the additional post approval background noise monitoring locations proposed are appropriate to confirm the Rating Background Levels (RBLs) for any post Approval construction noise assessment.

Conclusion

RWDI Australia Pty Ltd (RWDI) has been commissioned by Transport NSW to conduct a peer review of the M1 to Raymond Terrace Traffic Noise Monitoring Program Reference: AC02, 24 November 2022 (Arup).

On review of the Noise Monitoring Program, RWDI considers that:

- monitoring locations are consistent with those used in the EIS;
- the additional post approval monitoring locations and traffic counting locations proposed are representative of the range of sound propagation conditions along the length of the M1 Pacific Motorway extension to Raymond Terrace project corridor;
- the additional post approval background noise monitoring locations proposed are appropriate to confirm the Rating Background Levels (RBLs) for any post Approval construction noise assessment; and
- the Noise Monitoring Program is consistent with draft condition 87 and commitment NC10.

M1 Pacific Motorway extension to Raymond Terrace
Peer Review
RWDI #2300972
November 24, 2022



I trust this information is sufficient. Please contact us if you have any further queries.

Yours Faithfully
RWDI



Senior Technical Director

Appendix G – EPL Out-Of-Hours-Work Procedure

M1 Pacific Motorway Extension to Raymond Terrace BH2T EPL Out of Hours Works Procedure

Document Number: M1RTBH2T-JHGM-6003-EN-PRO-200001

Revision Number: B

Issue Date: 30/10/2023



Revisions and Distribution

Revisions

Draft issues of this document are identified as Revision A, B, C, etc. Upon initial issue (generally Contract Award) this will be changed to a sequential number commencing at Revision 0. Revision numbers will continue at Revision 1, 2, etc.

Rev	Date	Prepared By [Name]	[Signature]	Reviewed By [Name]	[Signature]	Approved By [Name]	[Signature]	Remarks
A	25/10/2023	K. Lloyd	KL	K. Lloyd	KL	R. Petaccia	RP	Initial submission
B	30/10/2023	K. Lloyd	KL	K. Lloyd	KL	R. Petaccia	RP	Update following comments

The controlled master version of this document is available for distribution as appropriate and maintained on the document management system being used on the Project, available to all Project workers. All circulated hard copies of this document are deemed to be uncontrolled.

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EPL Out of Hours Works Procedure

Plan Profile

Management System	The Project will use John Holland's Environmental Management System (EMS) and core Project plans to support Project delivery. Additional functional plans have been developed for the Project.
Name	EPL Out of Hours Works Procedure
Authorisation	All personnel employed on the Project will perform their duties in accordance with the requirements of this Plan and in compliance with Project system procedures and any specific Project instructions. This Plan is authorised by the Project Director.
Review and update	This Plan will be regularly reviewed, developed, and updated: • For changes in design or construction sequence, staging, methodology or resourcing • To consider progress of the Project Company's Work • For changes in access to the Project Site and Temporary Areas • To consider changes directed by Transport's Representative under the D&C Deed. • For changes in the EPL out of hours works conditions

1. Introduction

1.1. Scope of the EPL OOHW Procedure

This Out-Of-Hours Work (OOHW) Procedure has been developed to manage any work associated with construction of the M1 Pacific Motorway Extension to Raymond Terrace – Black Hill to Tomago (the Project) that will be carried outside the standard construction hours, and subject to the Environment Protection Licence (No. 21808) (EPL). This Procedure describes how to ensure compliance with the EPL and Minister's Conditions of Approval (CoA), considering relevant sensitive landuses and construction activities. For OOHW, not subject to an EPL, works will be undertaken consistent with the requirements of the OOHW Protocol which has been prepared by Transport for NSW (TfNSW) to meet CoA E67.

This OOHW Procedure has been developed in accordance with the EPL and NSW CoA E66(c)(i), and is to be read in conjunction with the Construction Noise and Vibration Guideline (TfNSW, 2022) (CNVG) and OOHW Protocol.

This procedure has been prepared in accordance with Revised Environmental Mitigation Measure (REMM) NV09 as detailed in Table 1-1 below:

Table 1-1: Compliance with REMM NV09

Requirements	Area addressed
An out of Hours Work Procedure will be included as part of the CNVMP. The procedure will follow the approach in the Roads and Maritime Services Construction noise and vibration guideline (Roads and Maritime Services 2016b) and include, but not be limited to:	This Procedure, Section 1.2
Details of works required outside standard construction hours and justifications of why the works are required outside standard construction hours	Appendix A - Sections 2 & 5
The noise and vibration impact assessment processes that will be followed to identify potentially affected receivers and clarify potential level of impacts	Section 4, Appendix A – Sections 2 & 8
Details of the approval process (internal and external) for works proposed outside standard construction hours	Section 8
Scheduling of noise intensive or high noise impact work to evening periods where feasible	Section 5
Use of alternative plant and equipment and/or construction techniques to minimise noise	Section 3.3 Appendix A - Section 6
Notification and consultation requirements including preparation of a 'look ahead' program for likely out of hours work	Section 3.2 Section 6.2
Use of temporary noise barriers	Section 7.2
Respite periods	Section 5 Section 7.2
Representative noise monitoring	Section 9.3 Appendix A - Section 6

Requirements	Area addressed
Offers of reasonable and temporary alternative accommodation or an act of good will	Section 7.2
Use of negotiated agreements.	Section 3.9
Community information sessions at regular intervals for residents or groups around the Tarro interchange affected by longer periods of OOHW.	Section 7.2

1.2. Environment Protection Licence

An EPL is a regulatory approval issued to strategically control the localised, cumulative and acute impacts of pollution. The EPA is responsible for issuing EPLs for 'scheduled activities' under the *Protection of the Environment Operations (POEO) Act 1997* (NSW). An EPL has been obtained for the Project under Schedule 1 of the *Protection of the Environment Operations Act 1997* (POEO Act) for 'road construction' and 'contaminated soils treatment'.

The process for approving OOHW outside of those already permitted in accordance with an EPL, is governed by the conditions of the EPL. For these types of OOHW to be approved, an application to vary the EPL is to be prepared and submitted to the EPA for approval. The JHGA Environment Manager is responsible for preparing the EPL variations and the application is to be in accordance with the CNVG and EPL requirements.

OOHW that are subject to an EPL are permitted in accordance with NSW CoA E66(c)(i) of the Infrastructure Approval, and therefore do not require approval by the Planning Secretary.

2. Environmental Management Systems overview

This OOHW Procedure forms part of the environmental management framework for the Project, as described in Section 1.5 of the CEMP. This OOHW Procedure is to be used in conjunction with the CNVG, the CNVMP, Noise and Vibration Impact Statements (NVIS), and the EPL. These documents establish minimum requirements for managing noise and vibration impacts on the Project. All construction noise and vibration documentation including NVIS that discuss OOHW must be aligned and consistent with this OOHW Procedure.

2.1. TfNSW Construction Noise and Vibration Guideline

The Project will be implemented in accordance with the CNVG. Relevant cross references to the CNVG occur through this document to avoid duplication.

The CNVG is available at: [Construction noise and vibration guideline \(nsw.gov.au\)](https://www.nsw.gov.au/construction-noise-and-vibration-guideline)

Some discrepancies between the Infrastructure Approval (SSI 7319), the EPL and CNVG exist. This OOHW Procedure, which specifically aligns to the project-specific CoA, takes precedence over the CNVG where inconsistencies occur.

All relevant Standard and Additional Mitigation Measures of the CNVG will apply to OOHW to minimise impacts to the local community and stakeholders, which are identified within Appendix A and Appendix B of the CNVG. Additional Mitigation Measures that specifically relate to OOHW and residual impacts are described in Section 7 of this OOHW Procedure.

2.2. Construction Noise and Vibration Management Plan

The CNVMP provides specific mitigation and management measures to minimise potential noise and vibration impacts during works outside of standard hours. The CNVMP includes a Noise and Vibration Monitoring Program (Appendix C) which outlines how noise and vibration monitoring will be carried out,

how the results of monitoring will be reported and procedures to identify and implement additional mitigation measures as necessary.

2.3. Noise and Vibration Impact Statement(s)

A Noise and Vibration Impact Statement (NVIS) is a location and activity specific document that provides an assessment of the anticipated noise and vibration impacts of construction at sensitive receivers. In accordance with NSW CoA E71, a NVIS is to be prepared for any work that may exceed the noise management levels and vibration criteria specific in NSW CoA E68 and E69 at any residence outside the approved standard hours, or where receiver will be highly noise affected, i.e. noise levels above 75dB(A).

During development of an NVIS to support proposed works, consideration of the assessment steps provided in Sections 5, 6 and 7 of the CNVG, including the identification of all applicable mitigation measures such as those required by the NSW CoA, REMMs, and the Standard and Additional Mitigation Measures outlined in Appendix A and B of the CNVG. The aim of this assessment is to minimise the impact of noise and vibration on sensitive receivers because of OOHV. It is noted that applied Standard and Additional Mitigation Measures may be modified as a result of community consultation outcomes and detailed in the OOHV approval request (see Section 8 for more details). Feedback on mitigation measures will be sought from affected sensitive receivers through notifications or via phone calls. A copy of the NVIS must be provided to the ER prior to the commencement of the associated work. The Planning Secretary and NSW Environment Protection Authority (EPA) may request copies of the NVIS.

Section 7.2 of the CNVMP provides a detailed list of what will be included within the projects NVIS.

3. Hours of work

3.1. Standard Hours of Works

In accordance with NSW CoA E64 and the EPL draft condition L5.1, the approved standard hours are:

- 7:00 am to 6:00 pm Monday to Friday
- 8:00 am to 5:00 pm Saturday
- At no time on Sunday or public holidays.

These hours take precedent from the standard construction hours identified in CNVG. There are exemptions to these standard hours of work as outlined in Sections 3.4, 3.5 and **Error! Reference source not found.** Any crushing and grinding works as specified in NSW CoA E80 will only be undertaken within these hours, unless the activity is determined to be Highly Noise Intensive Works, in which case they will only be undertaken in accordance with the details set out in Section 3.3 below.

3.2. Out of Hours Works Periods

Certain activities may need to be carried out outside of approved standard hours where the requirements of the NSW CoA are satisfied. OOHV can be divided into two periods of sensitivity:

- 1) OOHV Period 1:
 - a. Monday to Friday: 6:00 pm to 10:00 pm
 - b. Saturday: 7:00 am to 8:00 am and 5:00 pm to 10:00 pm; and
 - c. Sunday and Public Holidays: 8:00 am to 6:00 pm.
- 2) OOHV Period 2:
 - a. Monday to Friday: 10:00 pm to 7:00 am
 - b. Saturday: 10:00 pm to 8:00 am; and

- c. Sunday and Public Holidays: 6:00 pm to 7:00 am the following day (unless that day is Saturday then to 8:00 am).

Standard hours of work for construction of the Project are summarised in Table 3-1. Note that this does not include Highly Noise Intensive Works which are subject to additional restrictions as described in Section 3.3.

For any works outside the standard hours of work specified in Section 3.1 and are assessed to be above the NML along the M1, Pacific Motorway, New England Highway and Pacific Highway corridor only be undertaken in accordance with the following per CoA E78:

- two consecutive evenings and/or nights per week; or
- three non-consecutive evenings and/or nights per week; or
- 10 evenings and/or nights per month; or
- except as identified by the EPL; or
- in accordance with an agreement with a potentially impacted receiver(s) as required by CoA E66(c)(iii).

Table 3-1: Construction Hours

Hour	12 AM	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM
commencing																								
Monday																								
Tuesday																								
Wednesday																								
Thursday																								
Friday																								
Saturday																								
Sunday																								
Public Holiday																								

3.3. Highly Noise Intensive Works

In accordance with EPL draft condition L5.2 and NSW CoA E65, highly noise intensive works that result in the exceedance of an applicable noise management level (NML) at the same receiver must only be undertaken:

- Monday to Friday: 8:00 am to 6:00 pm
- Saturday: 8:00 am to 1:00 pm
- If continuously, and the location of the works means that it is likely to impact the same receivers, then not exceeding three hours, with a minimum cessation of work of not less than one hour.

For the purposes of this condition, 'continuously' includes any period during which there is less than a one hour between ceasing and recommencing any of the work.

Highly Noise Intensive Work is only permitted outside of these hours by an EPL and this OOHW Procedure. No blasting activities are proposed as part of the construction methodology for the Project.

The definition of Highly Noise Intensive Work is provided in Table 1 in the Infrastructure Approval, being any works, which are defined as 'annoying' under the *Interim Construction Noise Guideline* (DECC, 2009), including:

- Use of power saws, such as used for cutting timber, rail lines, masonry, road pavement or steel work
- Grinding metal, concrete or masonry
- Rock drilling

- Line drilling
- Vibratory rolling
- Bitumen milling or profiling
- Jackhammering, rock hammering or rock breaking
- Impact piling.

It also includes any other activity identified by the EPA, following an assessment of the character of the noise emitted by an activity based on the Noise Policy for Industry, Factsheet C considerations (EPA, 2017).

Highly Noise Intensive Work is to be considered as part of noise assessments used to determine the risk level. These activities will not always be considered 'high risk', but if the noise from a particular plant item is considered Highly Noise Intensive Work a five (5) dBA penalty is to be added to the noise source sound power level in the noise assessment. The noise assessment will determine the likely impact to sensitive receivers and inform the corresponding risk level.

For OOHW subject to this OOHW Procedure that involves the use of Highly Noise Intensive Work, JHGA will consider, wherever reasonable and feasible:

- Use of alternative quieter plant and equipment
- Planning works during less noise sensitive periods (e.g. try and complete highly noise intensive works as early in the night as possible)
- Schedule highly noise intensive equipment prior to 10 pm and/or midnight.

Note – there may be instances where Highly Noise Intensive Work will be required after 10 pm and/or midnight as outlined above. Examples where this might occur include specific conditions detailed in the Road Occupancy License (ROL), reinstating trafficable areas using whacker packers and asphaltting plant at the end of applicable shifts.

For Highly Noise Intensive Work carried out under the EPL during out of hours, note that:

- The respite provisions as per the requirements of EPL draft condition L5.2(c) do not apply provided that all Highly Noise Intensive Work is undertaken prior to 12:00 am (midnight)
- Where Highly Noise Intensive Work is undertaken after 12:00 am (midnight), the respite provisions in EPL draft condition L5.2(c) apply.

High vibration impact is defined as any work that will exceed the human comfort vibration criteria provided in Section 5.9 of the CNVMP.

3.4. Safety and emergency

OOHW may be undertaken for safety reasons or in the event of an emergency, including:

- For the delivery of materials required by the NSW Police Force or other authority for safety reasons
- Where it is required in an emergency (Emergency Works) to avoid injury or the loss of life, to avoid damage or loss of property, or to prevent environmental harm.

3.5. Low impact out of hours works

Low impact OOHW may be undertaken outside of the approved standard hours. Low impact OOHW, includes all work activities that causes:

- LAeq(15 min) noise levels:
 - No more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and

- No more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land use(s); and
- L_{max} noise levels no more than 15 dB(A) above the rating background level (RBL) at any residence during the night-time period; 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).

Adequate assessment of work activities is required to demonstrate that the proposed works are low impact. An OOHW Permit (Appendix A) is to be used to demonstrate compliance.

3.6. OOHW Approval Pathways

In addition to the exemptions to standard working hours, OOHW may be carried out where it is subject to an approval in accordance with NSW CoA E66(c), including:

- Where different construction hours are permitted or required under an EPL in force in respect of the CSSI (see Section 3.7); or
- Works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by NSW CoA E67 (see Section 3.8); or
- Where negotiated agreements with directly affected residents and sensitive land uses have been reached (see Section 3.9).

Adequate justification of the need for OOHW is required to be developed in accordance with the CNVG, ICNG and EPL, or where OOHW is required, such as:

- For technical considerations (such as the need to meet particular quality specifications)
- To maintain the safety of road users or construction personnel
- Where a ROL 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
- Where a rail authority requires a rail possession for the activities to be performed

3.7. Approved by an EPL

The vast majority of out of hours works on the Project will be undertaken subject to the EPL. Where undertaking works under the EPL, works must be undertaken in accordance with the EPL conditions. An OOHW Permit (Appendix A) is to be used to confirm compliance with EPL conditions. The Environment Manager (or delegate) is responsible for the approval of all OOHW Permits.

An EPL holder can apply to vary the conditions of the licence. The application form for this purpose is available from the EPA. The EPA may also vary the conditions of the EPL at any time by written notice without an application being made. Under Section 5.24 of the *Environmental Planning and Assessment Act 1979* the terms of the licence must be substantially consistent with the planning approval until the EPL is first reviewed under Part 3.6 of the POEO Act.

The Environment Manager will be responsible for the preparation of EPL variations seeking approval to undertake works outside of the approved standard hours which are managed in accordance with the EPL.

As part of the noise and vibration assessment process, JHGA will ensure all OOHW permitted by either the EPL or the OOHW protocol (see Section 3.8); are co-ordinated to ensure cumulative impacts are considered and that appropriate respite and/or mitigation measures for potentially affected sensitive receivers are implemented.

3.8. Approved by the OOHW Protocol (for works not subject to the EPL)

The vast majority of works for the Project will be undertaken subject to the EPL. However there may instances where JHGA are required to work outside of the EPL requirements. Typically, OOHW that is not subject to an EPL will involve service investigations, relocations and other works items that are not scheduled activities under the POEO Act (and associated regulations) and are outside the EPL premise boundary. These instances are to be discussed with TfNSW and the EPA to confirm compliance with the EPL requirements.

For the approval of OOHW not subject to the EPL, the procedures outlined in the OOHW Protocol which has been prepared by TfNSW to meet CoA E67, are to be complied with. An assessment of risk factors is required to determine the approval pathway for these works. For Low and Medium Risk activities the ER is the relevant approval authority. For High-Risk activities, the Planning Secretary (or delegate) is the relevant approval authority. Where the ER determines that the work activity is High-Risk, approval for the out of hours works through this pathway must be submitted to the Planning Secretary for approval.

3.9. Approved by Community Agreement

OOHW may be undertaken where a Community Agreement between JHGA and a substantial majority of the affected noise sensitive receivers has been reached in consideration of the requirements of EPL draft condition E2 and NSW CoA's E66 (c) (iii), E70, E77, E78 (e) and E79, and approval received through the process outlined in Section 8. Any Community Agreement to permit works to be undertaken outside of the approved standard hours must:

- a) Be prepared in writing and implemented in accordance with the relevant sections of the TfNSW CNVG, ICNG, Noise Policy for Industry (EPA, 2017) and AS2346-2010 *"Guide to noise and vibration control on construction, demolition and maintenance sites"*;
- b) include consultation of all noise sensitive receivers within the Community Affected Catchments. This includes Noise Sensitive Receivers that have declined to participate in previous agreements unless a community member has explicitly requested not to be involved in any future consultation about future OOHW
- c) ensure that the noise sensitive receivers understand the nature of the works and any predicted impacts, including that consideration is made of additional requirements relevant to the needs of culturally and linguistically diverse Noise Sensitive Receivers, and include details for interpreting services for languages other than English where required
- d) Include in the community consultations with Noise Sensitive Receivers the following information:
 - i) the actual works proposed
 - ii) any expected impacts in clear, simple English based on noise modelling
 - iii) the expected duration of the works
 - iv) any expected benefits for receivers
 - v) any other concurrent OOHW that will be occurring as a result of other project activities

- vi) any other OOHW as a result of project activities 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.
- e) request consent from the Noise Sensitive Receiver for their responses to be provided to the EPA
- f) ensure that a record is kept when a licensee is unable to contact a noise sensitive receiver after three attempts, including leaving "sorry I missed you" cards explaining the reason for the visit and requesting a return phone call; and
- g) demonstrate, where the OOHW is predicted to go on longer than 28 calendar days, that the licensee has consulted the community in relation to re-engagement periods for the purpose of determining agreement from the community is maintained and continuing
- h) Community Agreements will be used to support an OOHW approval request where they are intended to be used to provide justification for OOHW with approval for implementation sought through the process outlined in Section 8
- i) Be kept for the duration of the Community Agreement and made available to TfNSW, the ER EPA and the Planning Secretary on request

Undertake community notification as required by Section 6.2.

3.9.1. Agreement Thresholds

The following agreement thresholds will be observed when considering if a substantial majority of the affected community have agreed to OOHW (note both apply):

- a) Noise sensitive receivers predicted to be impacted by noise levels exceeding those specified in Section 3.53.5 of this OOHW Procedure
- b) Noise sensitive receivers predicted to be impacted by noise levels above a highly noise affected level of 75dB(A).

The agreement threshold will be determined by the EPA and no set threshold has been set in the EPL

3.9.2. Agreements by Phone

Where a Community Agreement has been reached with noise sensitive receivers over the phone, the following applies:

- a) The phone script used to describe the proposed agreement (including information required under EPL draft condition E2.3 and NSW CoA E77 is to be provided to EPA or Planning Secretary with the Community Agreement for approval
- b) The script must include a clear question requesting receiver agreement to the proposal
- c) Detailed records are to be maintained of all Community Agreement phone conversations and must be maintained for the duration of the Community Agreement
- d) Any noise sensitive receiver who requests a copy of the phone agreement must be supplied with one.

3.9.3. Notification

All noise sensitive receivers must be advised of any Community Agreement that has been attained in writing within seven calendar days of the agreement being finalised and must:

- a) Include a website link to the project website, specifically to a summary of the approved project agreement
- b) Include details of the Project 24-hour complaints line.

The notification requirements in Section 6.2 also apply to Community Agreements and must comply with the Communication Strategy prepared by TfNSW to meet CoA B2.

3.9.4. Noise Monitoring

A noise validation monitoring plan must be submitted to the EPA for approval as part of the Community Agreement documentation prior to any OOHW occurring.

In accordance with EPL draft condition E2.5, validation monitoring must be undertaken for any works that are the subject of the Community Agreement and must:

- a) be undertaken in accordance with a noise validation monitoring plan prepared as part of the community agreement documentation submitted to EPA for approval;
- b) be performed by a Competent Person;
- c) be performed on at least the first 2 occasions (day, evening, nights) where OOHW will be undertaken and are likely to impact Noise Sensitive Receivers;
- d) be performed on any other occasion (day, evening, night) where the nature of the works is likely to cause greater noise impacts than the first 2 occasions;
- e) be representative of the impacts in terms of monitoring locations, time and duration of measurements; and
- f) be recorded and provided to an EPA officer upon request.

If validation monitoring undertaken under EPL draft condition E2.5 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 immediately so that measured noise levels do not exceed predicted levels.

Where it has been determined that works cannot be modified to achieve the predicted noise levels:

- a) the licensee must report immediately to the EPA; and
- b) the EPA may terminate the community agreement.

3.9.5. Ongoing community engagement and agreement

For any community agreement longer than 28 calendar days to remain valid, it must be demonstrated that agreement from the community is maintained and continuing. To demonstrate that the agreement from the community is maintained and continuing JHGA must:

- a) Engage the community to determine if a substantial majority of Noise Sensitive Receivers continue to consent to the OOHW pursuant to the re-engagement period determined under EPL draft condition E2.2(g);
- b) provide the EPA with a report within 7 calendar days of the end of each re-engagement period summarising the community response including ongoing consent rates of the Noise Sensitive Receiver

Where JHGA is unable to demonstrate a substantial majority of agreement from the Community Affected Catchment is maintained and continuing the Environment Manager must report immediately to the EPA; and the EPA may withdraw the Community Agreement.

4. Assessment of noise and vibration impacts

4.1. Noise assessments

A quantitative noise assessment is to be developed in accordance with the NSW CoA, the CNVG, EPL, this OOHW Procedure and the Interim Construction Noise Guideline (DEC, 2009) and will:

- Describe the works/activities proposed outside of the approved standard hours
- Identify the exceedances of construction scenarios against the NMLs adopted for each Noise Catchment Area (NCA) or other sensitive land uses (see Section 6 of the CNVMP)
- Determine the extent of noise impacts the construction activities will have on sensitive receivers, including predicted noise levels¹, frequency and duration of OOHW, awakening events/sleep disturbance

¹ Provide predictions of LAeq (15 minute) dB noise levels at noise sensitive land uses from these works and activities, where noise levels are predicted to be greater than those permitted under EPL draft condition L5.8

- Determine the appropriate standard and additional mitigation measures
- Consider if feasible and reasonable work practices have been identified to minimise the noise. See Section 2.3 for details on NVIS
- Provide a monitoring plan to validate the noise predictions, based on monitoring at the boundary of representative sensitive receivers during noise generating activities that are representative of the works and activities, including during the period/s predicted to have the highest noise level impacts.

4.2. Vibration assessments

An assessment will be required for vibration intensive OOHW within the safe working distances for human comfort (refer to Section 6.3.3 of the CNVMP) for the nominated plant and equipment. Prior to undertaking an assessment, all other feasible and reasonable options to use less vibration intensive equipment will be investigated and exhausted.

The vibration assessment will make detailed predictions of the proposed works by taking into account:

- Type, size and power rating of plant and equipment to be used
- Ground types that plant and equipment will be working on
- Confirm the distances of vibration and potential energy drop from the activity
- Trial vibration testing prior to any works commencing near to any structures, where a risk of exceedance of the criteria has been determined.

5. Scheduling Works and Respite

5.1. Hierarchy of Preferred Working Hours

Where work outside of the standard construction hours is planned to take place the following hierarchy of preferred working hours must be considered when timetabling works unless otherwise agreed with affected community through consultation (Section 6.1).

1. Saturday morning periods between 8am and 1pm (approved standard hours)
2. Saturday afternoon periods between 1pm and 5pm (Daytime OOH, also applicable to Highly Noise Intensive Works as defined in CoA E65)
3. Sunday and public holiday day periods between 8am and 6pm (Period 1 Day)
4. Weekday evening periods between 6pm and 10pm (Period 1 Evening)
5. Weekend evening periods between 5pm and 10pm (Saturdays Period 1 Evening/Sundays Period 2)
6. Weekend night periods between 10pm and 8am (Period 2)
7. Work during the weekday evening and night and scheduling the noisiest or vibration intensive work first (between 6pm and 10pm) to minimise sleep disturbance impacts in the night period between 10pm and 7am) (Period 1 Evening & Period 2)
8. All other times outside recommended standard hours.

This hierarchy does not apply to Emergency Work.

5.2. Road Traffic Noise

When planning OOHW, consideration must be given to minimising road traffic noise caused by construction of Project, including but not limited to:

- Restricting heavy vehicle movements to standard hours; and/or
- Planning heavy vehicle haulage routes that have fewer sensitive receivers.

As required by the TfNSW Construction Noise and Vibration Guideline (TfNSW, 2022), an initial screening test should first be applied by evaluating whether noise levels would increase by more than 2 dB (an increase in the number vehicles of around 60%) due to construction traffic or a temporary reroute due to a road closure.

Where noise levels increase by more than 2 dB (i.e. 2 dB or greater) further assessment is required using the criteria presented in the RNP.

5.3. Co-ordination of OOHW with third parties

In accordance with draft EPL condition L5.6, all reasonable and feasible efforts to coordinate wall works outside of standard construction hours with any neighbouring concurrent construction works that have the potential to impact the same Noise Sensitive Receivers. The Project will ensure that Respite Periods are being achieved as much as is reasonably practicable.

5.4. Emergency Works

Occasionally there may be a need to undertake emergency works outside of standard work hours. In this situation, works are permitted to proceed without prior approval, provided that the works are:

- An emergency (i.e. an unforeseen occurrence; a sudden and urgent occasion for action); and
- Required to avoid injury, loss of life, damage or loss of property or prevent environmental harm.

On becoming aware of the need for Emergency Works in accordance with EPL draft condition L5.4 and NSW CoA E66(a)(ii), TfNSW, the ER, the EPA and the Planning Secretary must be notified, including the reasons for such emergency work. The EPA's Environment Line must be notified as soon as practicable.

As a form of mitigation, the construction team will use best endeavours to notify all affected sensitive receivers of the likely impact and duration of the Emergency Works. These notifications will generally be prepared using a small hand-completed information card for distribution to properties immediately adjacent to or impacted by the Emergency Works. These cards should include the following details as a minimum:

- scope
- location
- hours
- duration
- types of equipment to be used
- likely impacts
- Project 24-hour Telephone Contact Number, postal address and email address.

On the next business day after the Emergency Works commenced, a written Emergency Works report is to be prepared and submitted to the EPA (by 4:00 pm), including as a minimum:

- the cause, time and duration of the emergency;
- action taken by or on behalf of the licensee in relation to the emergency; and
- details of any measures taken or proposed to be taken by the licensee to prevent or mitigate against a recurrence of the emergency.

6. Consultation

6.1. Community Consultation

In order to undertake works outside the hours specified under EPL draft condition L5.1 / NSW CoA E64, appropriate respite periods for the OOHW must be determined in consultation with the community at each affected location on a regular basis.

Appropriate work and respite periods must be identified in consultation with the community at three monthly intervals (at a minimum). NSW CoA E77 requires that this consultation must include (but not be limited to) providing the community with:

- a) A progressive schedule (look ahead) for periods no less than three (3) months, of likely out-of-hours work
- b) A description of the potential Work, location and duration of the out-of-hours work
- c) The noise characteristics and likely noise levels of the work
- d) Likely mitigation and management measures which aim to achieve the relevant noise management levels and vibration criteria under NSW CoA E68(a) and (b) (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers).

Consultation mechanisms will be consistent with those nominated in the Communication Strategy prepared by TfNSW to meet CoA B2 and the JHGA Community and Stakeholder Engagement Plan (CSEP), and tailored to the affected community as advised by the JHGA Community Relations Manager, in conjunction with TfNSW.

A variety of communication and engagement tools and techniques are required to achieve adequate engagement objectives. These tools include (but are not limited to) a project website, a 24 hour toll-free project information line, information brochures, fact sheets, face-to-face interaction and community information sessions, and will be used to achieve the consultation outcomes required for NSW CoA E77 and to inform respite preferences.

Where additional mitigation measures are proposed, the JHGA Community Relations Manager will consult with affected sensitive receivers to ensure that their personal circumstances have been taken into account to identify the most appropriate mitigation measures. This must be done prior to seeking approval of an OOHW Permit (Appendix A).

The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour work must be provided to the TfNSW Senior Environment and Sustainability Officer (or delegate), ER, EPA and the Planning Secretary for information prior to work scheduled for the subject period being undertaken.

6.1.1. Tarro Interchange

Community information sessions will be held at regular intervals for residents or groups around the Tarro interchange affected by longer periods of OOHW.

6.2. Community Notification

Community notifications are used as a mitigation measure for receivers of noise and vibration impacts from OOHW. Community notifications usually comprise of letterbox-dropped or hand-distributed notification letters to identified stakeholders prior to the commencement of works. Communities are more likely to understand and accept the impacts from noise and vibration if they are provided with honest detailed information and commitments on mitigation measures to be implemented that are adhered to by the project prior to the works commencing.

In accordance with EPL condition L5.5, affected noise sensitive receivers must be notified of works outside of the approved standard hours not less than five (5) calendar days and not more than 14 calendar days before those works are to be undertaken. Further details on community notification requirements are outlined in the CNVG, the Communication Strategy prepared by TfNSW to meet CoA B2. Community notifications are to be implemented in accordance with these documents.

7. Determining mitigation

7.1. Standard Mitigation Measures

The CNVMP Section 8.1 includes the standard mitigation and management measures that apply to works undertaken for the Project, with reference to the CNVG, the ICNG and in accordance with the Infrastructure Approval. These standard mitigation measures apply to all works and will be implemented as appropriate.

7.2. Additional Mitigation Measures

In instances where noise levels are still predicted to exceed the NML at receivers, after the application of noise mitigation and management measures (refer to NVMP Section **Error! Reference source not found.**), the CNVG directs that the Project should consider implementing the additional mitigation measures such as (refer to Appendix C of the CNVG for more detail):

- Notification (letterbox drop or equivalent) detailing work activities, time periods of which these will occur, impacts and mitigation measures
- Specific notifications, which provide additional information when relevant and informative to more highly affected receivers than covered in general letterbox drops
- Phone calls, which detail relevant information to identified/affected stakeholders and provide personalised contact, tailored advice and the opportunity to comment on the proposed work
- Individual briefings, which inform stakeholders about the impacts of high noise activities and mitigation measures, and provide personalised contact, tailored advice and the opportunity to comment on the proposed work
- Respite offers, to provide residents with respite from an ongoing impact
- Respite period 1, where out-of-hours construction noise in OOHW Period 1 is generally limited to no more than three consecutive evenings per week
- Respite period 2, where night-time construction noise in OOHW Period 2 is generally limited to two consecutive nights
- Duration respite, which is where the work duration, number of evenings and/or nights is increased so that the Project can be completed more quickly
- Alternative accommodation or an act of good will
- Verification, including measurement of the background noise level and construction noise
- Use temporary noise barriers to shield sensitive land uses from noise static noise sources, where reasonable and feasible.

Error! Reference source not found. and Figure 7-2 detail the additional mitigation measures for airborne noise and ground-borne noise respectively. Figure 7-3 details the additional mitigation measures for vibration.

OOHW period	Perception	dB(A) above RBL	dB(A) above NML	Additional mitigation measures	Noise levels at which additional mitigation measures are applicable
OOHW period 1	Noticeable	5 to 10	0	-	NML
Monday– Friday: 6 pm – 10 pm	Clearly audible	10 to 20	5-15	- Notification - Duration respite - Respite offer period 1	NML+5
Saturday: 7 am - 8 am and 5 pm – 10 pm	Moderately intrusive	20 to 30	15-25	- Notification - Respite offer period 1 - Verification - Duration respite	NML+15
Sunday and Public Hol.: 8 am – 6 pm	Highly Intrusive	>30	>25	- Notification - Respite offer period 1 - Phone calls - Verification - Duration respite - Individual briefings - Specific notifications	NML+25
OOHW period 2	Noticeable	5 to 10	<5	Notification	NML
Monday– Friday: 10 pm – 7 am	Clearly audible	10 to 20	5-15	- Notification - Respite offer period 2 - Verification - Duration respite	NML+5
Saturday: 10 pm - 8 am	Moderately intrusive	20 to 30	15-25	- Notification - Individual briefing - Duration respite - Specific notifications - Verification - Respite offer period 2	NML+15
Sunday and Public Hol. 8 pm – 7 am (8am if the following day is a Saturday)	Highly Intrusive	>30	>25	- Notifications - Individual briefing - Duration respite - Specific notifications - Verification - Respite offer period 2 - Phone calls - Alternative accommodation	NML+25

Figure 7-1: Hierarchy for application of additional mitigation for air-borne noise

OOHW period	dB(A) above ground-borne NML	Additional mitigation measures	
OOHW period 1			
Monday–Friday: 6 pm – 10 pm	10-20 above NML	• Verification • Specific notification • Duration respite	• Notification • Respite offer period 1
Saturday: 7 am – 8 am and 5 pm – 10 pm	>20 above NML	• Verification • Individual briefing • Duration respite • Specific notifications	• Notification • Respite offer period 1 • Phone calls
Sunday and Public Hol.: 8 am – 6 pm			
OOHW period 2			
Monday– Friday: 10 pm – 7 am	10-20 above NML	• Notifications • Individual briefing • Duration respite • Specific notifications	• Verification • Respite offer period 2 • Phone calls • Alternative accommodation
Saturday: 10 pm – 8 am			
Sunday and Public Hol. 6 pm – 7 am (8am if the following day is a Saturday)	>20 above NML	• Notifications • Individual briefing • Duration respite • Specific notifications	• Verification • Respite offer period 2 • Phone calls • Alternative accommodation

Figure 7-2: Hierarchy for application of additional mitigation for ground-borne noise

Predicted vibration level receiver	Additional mitigation measures type	
Perception	Type ¹	Apply to ²
Standard hours: Mon-Fri (7am-6pm), Sat (8am-5pm), Sun/Public Holiday (Nil)		
Predicted vibration exceeds maximum levels for human comfort	V, N, RP	All
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am and 5pm – 10pm), Sun/Public Holiday (8am – 6pm)		
Predicted vibration exceeds maximum levels for human comfort	V, IB, N, RO, PC, RP, SN	All
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Public Holiday 6pm to 7am		

Notes:

1. The additional mitigation measures have used the following abbreviations: AA = Alternative Accommodation, V = Validation of predicted level, PC = Phone calls, IB = Individual briefings, SN = Specific notifications, N = Notification drops, RP = Respite Period

2. All affected receivers

Figure 7-3: Triggers for additional vibration measures

The additional management measures may become less effective over time. At-receiver noise mitigation may be considered where feasible and reasonable, where all options for at-source noise mitigation and management measures have been exhausted. At-receiver mitigation may include temporary window and door screens, temporary localised shielding or other permanent forms of mitigation.

Feasible and reasonable considerations for providing at-receiver treatments should include: Time of day where construction noise exceeds the NML; Time of use of affected receivers; Amount construction noise exceeds the NML; How long the mitigation will provide benefit to the receiver during the project; Optimal design of acoustic sheds and noise barriers/hoardings.

Where additional mitigation measures are proposed, consultation would be carried out by the JHGA Community Relations Manager (or delegate) in conjunction with TfNSW with affected sensitive receivers to ensure that their personal circumstances have been taken into consideration to identify the most appropriate mitigation measures. This must be undertaken as part of the OOHW Permit.

8. Approval of Out of Hours Works

The following approval process will be followed for proposed out of hours works subject to an EPL:

- 1) The Project OOHW Permit (Appendix A) will be commenced by relevant JHGA staff and submitted to the Environment Manager for review.
- 2) NVIS to be developed as required, in accordance with E71, including identify controls, scheduling etc and determining standard, specific and additional mitigation measures.
- 3) The OOHW Permit (Appendix A) will be finalised by the Environment Manager (or delegate) and include information on:
 - Activities
 - Required plant and equipment
 - Location
 - Duration
 - Justification for the work
 - Scheduling of works in accordance with Section 5 of this OOHW Procedure
 - Details of consultation with the community regarding respite periods and scheduling as outlined in Section 6 of this OOHW Procedure
 - Details of the completed quantitative noise and vibration assessment (see Sections 4.1 and 4.2) including predicted impacts and appropriate management measures in accordance with Section 7 of this OOHW Procedure.
- 4) The JHGA Community Relations Manager will develop a community notification required for the OOHW and submit to TfNSW for approval in accordance with the CSEP and Communications Strategy.
- 5) Following endorsement of each OOHW request by the Environment Manager, and approval of the notification by TfNSW, community consultation and notification in accordance with Section 6 of this OOHW Procedure will be undertaken.
- 6) Where works are being approved through a Community Agreement (see Section 3.9), the Community Agreement must be submitted to the EPA for approval at least 15 business days prior to any works that are the subject of the agreement being undertaken. A copy of the Community Agreement is to be kept on site by JHGA for the duration of the EPL and also be made available on JHGA's project website for the duration of the agreement (personal details of noise sensitive receivers must be omitted).
- 7) Once the relevant authority approvals have been awarded, the Environment Manager will endorse and issue the internal OOHW permit (Appendix A) for sign-off and issue to the construction team.
- 8) Noise monitoring and reporting will be carried out in accordance with the Construction Noise and Vibration Monitoring Program, and Section 9.4 of the CNVMP.

9. Compliance management

9.1. Roles and responsibilities

The organisational structure for the Project and overall roles and responsibilities are outlined in the CEMP. Specific responsibilities for the implementation of standard mitigation measures are detailed in Section 8.1 of the CNVMP.

The Environment Manager is responsible for endorsing all OOHW.

The JHGA Community Relations Manager, in conjunction with TfNSW, will be responsible for ensuring that notification and consultation has occurred with community stakeholders, in accordance with CoA, EPL and Communications Strategy, on the likely impacts of OOHW activities.

The Environment Manager will implement and oversee the Construction Noise and Vibration Monitoring Program for OOHW to assess compliance with the CoA, the EPL and the EPL OOHW Procedure.

9.2. 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.

9.3. Monitoring and inspections

Weekly and other routine inspections by the JHGA environmental personnel, TfNSW Senior Environment and Sustainability Officer (or delegate), ER and Environmental Review Group (ERG) representatives will occur throughout construction. Detail on the nature and frequency of these inspections and activities are documented in the CEMP.

Noise and vibration monitoring will also occur routinely for the duration of the Project, in accordance with the Construction Noise and Vibration Monitoring Program, which is detailed in Appendix C of the CNVMP. The Construction Noise and Vibration Monitoring Program details when monitoring will be undertaken, as well as the representative locations adjacent to the construction works where noise and vibration monitoring will be undertaken.

Attended monitoring of OOHW will be carried out as determined by the quantitative noise assessment with consideration of the Additional Mitigation Measures identified in Section 7. Additional noise and vibration monitoring will also be carried out if complaints about an OOHW activity are received which is attributable to the works.

Validation monitoring will be undertaken for any works that are the subject of a Community Agreement 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 the relevant noise modelling undertaken as part of the Community Agreement, work practices will be modified so that measured noise levels do not exceed predicted levels.

In the event that OOHW is undertaken without approval, or if approved OOHW are undertaken but not carried out in accordance with the conditions of the approval or required management measures, the non-conformances / non-compliances will be determined (refer to the CEMP for further details) and be reported as an incident in accordance with the Project Incident Classification and Reporting Procedure contained in the CEMP.

9.4. Reporting

Reporting requirements relevant to the management of noise and vibration, including OOHW are identified in Table 9-3 of the CNVMP. Reporting of noise and vibration monitoring results is detailed in the Monitoring Program (Appendix C of the CNVMP). Requirements and responsibilities for reporting are further described in the CEMP. Upon request of an authorised officer of the EPA, JHGA must provide within five (5) business days:

- Construction noise and vibration impact assessment(s) required by EPL draft condition L5.8(a)
- Noise monitoring results required by EPL draft condition L5.8(b)
- Written evidence demonstrating the works are necessary and permitted under EPL draft condition L5.7
- Any other relevant information or records requested by the EPA.

Accurate records will be maintained substantiating all construction activities associated with the Project or relevant to the conditions of approval, including measures taken to implement this OOHW Procedure. Records will be made available to the TfNSW, the ER, EPA and DPE upon request, within the timeframe nominated in the request.

9.5. Review and improvement

The continuous improvement will be achieved through the ongoing evaluation of environmental management performance as described in Section 10 of the CNVMP. The Environment Manager is responsible for ensuring stage-specific environmental risks are identified and included in the Project risk register and appropriate mitigation measures implemented throughout the construction, as part of the continuous improvement process. The process for ongoing risk identification and management during construction is outlined in the CEMP.

The processes described in the CEMP may result in the need to update or revise this OOHW Procedure. This will occur as needed. Any revisions to this Procedure and other Sub-plans will be in accordance with the process outlined in the CEMP. A copy of the updated OOHW Procedure and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure (refer to the CEMP for further detail).

Appendix A – OOHW Permit - EPL

Out of Hours Work Approval Permit

SECTION 1: GENERAL DETAILS

Permit request no:		Application date:	
Permit Requestor:			

SECTION 2: JUSTIFICATION FOR OUT OF HOURS WORKS

Assign one of the below justifications to the work outlined in Section 4: APPROVED WORKS

A	LAeq (15 minute) noise levels less than 5dB above the day, evening and/or night RBL as applicable
	LAmx noise levels less than 15dB above the night RBL for night works
	continuous or impulsive vibration values less 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)
	intermittent vibration values lower 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)
B	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.
C	Carrying on the work during standard hours would result in a high risk to construction personnel or public safety, based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2009 "Risk Management"
D	The road network operator has advised JHCPB in writing that carrying out the work during standard hours would result in a high risk to road network operational performance
E	The relevant utility service operator has advised the JHCPB in writing that carrying out the work standard hours would result in a high risk to the operation and integrity of the utility network
F	The road authority has refused to issue a road occupancy licence during standard hours
G	Sydney Trains (or other rail authority) requires a Rail Possession outside the standard hours for the work to be performed.
H	EPL Variation: required where no other clause covers the work
I	Works may be undertaken outside of standard construction hours if agreement between the licensee and a substantial majority of potentially affected sensitive receivers has been reached

SECTION 3: COMMUNITY

Community Portal / Notifications	
Contact Number (In the event of contact with the community)	

SECTION 4: SUPERVISORS

Who from JHCPB will be supervising the work? (Include contact details)	
In the case of any emergency or issue during a night shift. Please contact the specified supervisors to the right for shared use of resources including labour or plant/equipment to deal with the issue.	

SECTION 5: APPROVED WORKS

Activities	Location	Justification	Dates	Time	CNIA	Plant/Equipment (Red = High Impact)
Work Area:						
Work Area:						
Work Area:						

SECTION 6: MITIGATION MEASURES

Assessment ID								
Proposed mitigation measures:								
NCA								
Monitoring Locations								
NML (N)								
PNL								

SECTION 8: NOISE IMPACTED RECEIVERS MAP

Work Area:
Work Area:
Work Area:

Out of Hours Work Approval Permit



SECTION 9: APPROVALS (Permit must be signed by all parties to be issued)		
Environment Manager (or delegate) Endorse	Name:	Date: Signature:
Community Place Manager (or delegate) Confirm Notifications	Name:	Date: Signature:
Area Manager (or delegate) Review	Name:	Date: Signature:
Superintendent (or delegate) Review	Name:	Date: Signature:
Construction Director (or delegate) Endorse	Name:	Date: Signature:

M12RT

Black Hill to Tomago

By signing this permit, I understand:

- [illegible]