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Sydney Infrastructure Development
Infrastructure and Place
Transport for NSW
Level 7 27-31 Argyle Street
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22 November 2021

Ref: CNVMP & OOHWP Rev G.02

Dear Deanne,

RE: Endorsement of M12 Motorway – Construction Noise and Vibration Management Sub-plan Revision G.02 and Out of Hours Work Protocol Rev G.02

Thank you for providing the following documents for Environmental Representative (ER) review and endorsement as required by the Condition of Approval A34(d)(i) and C15, and for ER consultation as required by Condition of Approval E37 of the M12 Motorway approval (SSI 9364):

- M12 Motorway – Construction Noise and Vibration Management Sub-plan Revision G.02 November 2021
- M12 Motorway – Construction Noise and Vibration Monitoring Program Revision G.02 November 2021 (CNVMP Appendix B)
- M12 Motorway – Out of Hours Work Protocol Revision G.02 November 2021 (CNVMP Appendix C)

I have reviewed the Overarching Construction Environmental Management Plan (OCEMP) and associated Sub-plans, which have been prepared by Transport for NSW. Previous versions of the subject documents have been reviewed and updated following comments from the ER.

As an approved ER for the M12 Motorway project, I consider this OCEMP Sub-plan is consistent with the requirements under the project approval, including the Noise and Vibration Monitoring Program as per Condition of Approval C11. This OCEMP Sub-plan may be submitted to the Planning Secretary for approval.

This endorsement is limited to the requirements of the Condition of Approval C4, C5, C11 and C13 relating to this plan. The OCEMP and other associated Sub-plans are not part of this endorsement, as these endorsements will be provided separately.

Additionally, I have been consulted on the included Overarching Construction Out of Hours Work Protocol. Previous versions of the document have been reviewed and updated following consultation with the ER, and this version is consistent with the OOHW Protocol previously approved under Condition of Approval E37.

I am satisfied my comments have been sufficiently addressed and consider consultation on this Out of Hours Work Protocol to be complete.

Yours sincerely

George Kollias
Environmental Representative – M12 Motorway

Australian Government

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Appendix B3

Construction Noise and Vibration Management Sub-plan

M12 Motorway

December 2021

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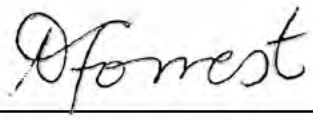
Document control

File Name	M12PPW-ADAP-ALL-EN-PLN-000008_H_S3_CNVMP
Title	M12 Motorway OCEMP Appendix B3 – Construction Noise and Vibration Management Sub-plan
Document Number (Teambinder)	M12PPW-ADAP-ALL-EN-PLN-000008

Approval and authorisation

Plan reviewed by:	Plan reviewed by:
Suzette Graham TfNSW Environment and Sustainability Manager	Deanne Forrest TfNSW Project Director, M12
16/12/2021	17/12/2021
	

Revision history

Revision	Date	Description
A	09/09/2020	First draft for TfNSW review
B	01/10/2020	Response to TfNSW comments
C	21/10/2020	Response to TfNSW comments
D	16/07/2021	Updated with Final NSW and Commonwealth CoA
E	06/08/2021	Response to TfNSW and ER comments
F	26/08/2021	Response to ER comments
G	19/10/2021	Updated following consultation
G.02	22/11/2021	Updated to address DPIE comments
H	16/12/2021	Updated to address DPIE comments

Contents

Figures

Tables

Appendices

Glossary/ Abbreviations

Abbreviations	Expanded Text
ABL	Assessment Background Level
Allowable hours	Works undertaken from 1:00pm and 6:00pm on Saturday (the work hours on Saturdays identified in the Infrastructure Approval)
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
ARNTG	At-Receiver Noise Treatment Guideline (Roads and Maritime 2018)
ARSR	Amendment Report to the Submissions Report
Attenuation	The reduction in the level of sound or vibration
AVTG	Assessing Vibration – a technical guideline (DEC 2006)
CCHMP	Construction Cultural Heritage Management Plan
CEMP	Construction Environmental Management Plan
CMS	Complaints Management System
CNVMP	Construction Noise and Vibration Management Plan
CNVG	Construction Noise and Vibration Guideline (Roads and Maritime 2016)
CoA	Condition of Approval
Commonwealth CoA	Federal Conditions of Approval under the EPBC Act
Construction	Includes all activities required to construct the CSSI as described in the documents listed in Condition A1, including commissioning trials of equipment and temporary use of any part of the CSSI, but excluding Low Impact Work which is carried out to complete prior to the approval of the CEMP, works approved under a Site Establishment Management Plan, demolition of acquired residential houses, structures and sheds, and works specified in Appendix B and approved under an environmental management plan(s) in accordance with Condition A24.
CSSI	Critical State Significant Infrastructure
DAWE	Commonwealth Department of the Water, Agriculture and Environment
dB(A)	Decibels using the A-weighted scale measured according to the frequency of the human ear
DEC	Department of Environment and Conservation (now EPA)
DECC	Department of Environment and Climate Change (now EPA)

Abbreviations	Expanded Text
DECCW	Department of Environment, Climate Change and Water (now EPA)
DPIE	NSW Department of Planning, Industry and Environment
DR	Duration Respites
EES	Environmental, Energy and Science (a part of NSW DPIE)
EIS	Environmental Impact Statement
EMM	Environmental Management Measure
EMS	Environmental Management System
Environmental Assessment Documentation	Collective reference to the M12 EIS (Oct 2019), Submissions Report (Oct 2020), Amendment Report (Oct 2020), Amendment Report-Submissions Report (Dec 2020) and supplementary reports as detailed in NSW CoA A1.
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 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	*Environmental Planning and Assessment Act 1979*
EPA	NSW Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence
ER	Environmental Representative
ERG	Environmental Review Group – generally comprising representatives of TfNSW, ER, Project delivery team, regulatory authorities (EPA, EES) and councils (Penrith City Council, Liverpool City Council and Fairfield City Council). The ERG will be maintained for the duration of the Project and will meet regularly and undertake environmental inspections. The role the ERG is to work collaboratively with the project team to provide proactive advice on environmental management issues on the Project.
ESM	Environment and Sustainability Manager

Abbreviations	Expanded Text
EWMS	Environmental Work Method Statements
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements
Federal Approval	Approval (EPBC 2018/8286) for carrying out the M12 Project under Part 8 of the Environmental Protection and Biodiversity Conservation Act 1999 subject to specific CoA as detailed in Annexure A of the approval.
Highly Noise Affected	Where noise affected management level represents the level above which there may be strong community reaction to noise, determined as the exceedance of noise management levels (NML).
Highly Noise Intensive Works	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.
IB	Individual briefing
ICNG	Interim Construction Noise Guideline (DECC 2009)
Infrastructure Approval	Approval (SSI 9364) for carrying out of the M12 Project under Section 5.19 of the *Environmental Planning and Assessment Act 1979* subject to specific CoA as detailed in Schedule 2 of the approval.
km	Kilometres
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
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
LGA	Local Government Area

Abbreviations	Expanded Text
NCAs	Noise catchment areas
NML	Noise management level
Noise affected	The noise affected level represents the point above which there may be some community reaction to noise.
NPfI	Noise Policy for Industry
NSW CoA	NSW Conditions of Approval
NVIS	Noise and Vibration Impact Statement
OCEMP	Overarching Construction Environmental Management Plan
OCS	Overarching Communication Strategy
OEH	Office of Environment and Heritage, now EES
ONR	Operational Noise Review
OOHW	Out-of-Hours Works – work completed outside of standard construction hours
Planning Secretary	Secretary of the NSW Department of Infrastructure, Planning and Environment, or delegate
PLO	Public Liaison Officer
Primary CoA/REMM	CoA/REMM that are specific to the development of this Plan
Project, the	M12 Motorway Project
QA	Quality Assurance
R1	Respite Period 1
R2	Respite Period 2
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)
REMMs	Revised Environmental Management Measures
RNP	NSW Road Noise Policy (DECCW 2011)
Roads and Maritime	Former NSW Roads and Maritime Services (now Transport for New South Wales)
SAP	Sensitive Area Plan
SEAR's	Secretary's Environmental Assessment Requirements

Abbreviations	Expanded Text
Secondary CoA/REMM	CoA/REMM that are related to, but not specific to, the development of this Plan
SEMP	Site Establishment Management Plan(s)
Standard construction hours	Hours during which construction work is permitted by the CoA
SN	Specific notifications
SWL	Sound Power Level
SPL	Sound Pressure Level
TfNSW	Transport for New South Wales
VDVs	Vibration dose values
Work	Any physical work to build or facilitate the building of the CSSI, including low impact work, environmental management measures and utility works. However, it does not include activities that inform or enable detailed design of the CSSI and generate noise that is no more than 5 dB(A) above the rating background level at any sensitive receiver.
WSIA	Western Sydney International Airport

1 Introduction

1.1 Context

This Construction Noise and Vibration Management Sub-plan (CNVMP or Plan) forms part of the Overarching Construction Environmental Management Plan (OCEMP) for the M12 Motorway (the Project).

This CNVMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA), the Revised Environmental Management Measures (REMMs) listed in the M12 Motorway Environmental Impact Statement (EIS), Amendment Report, and Amendment Report Submissions Report (ARSR), all applicable legislation and Transport for New South Wales (TfNSW) Quality Assurance (QA) specifications.

1.2 Background

TfNSW is planning to construct and operate the M12 Motorway (the Project) to provide direct access between the Western Sydney International Airport (WSIA) at Badgerys Creek and Sydney's motorway network. The M12 Motorway will run between the M7 Motorway at Cecil Hills and The Northern Road at Luddenham for about 16 kilometres (km) and is expected to be opened to traffic prior to opening of the WSIA.

The Project will be constructed in three separate stages under four separate construction contracts:

- M12 West (construct only contract) – between The Northern Road, Luddenham and about 250 metres east of Badgerys Creek
- M12 Central (construct only contract) – between about 500 metres west of South Creek and the Western Sydney Parklands at Duff Road, Cecil Park
- M12 East (construct only contract) - Elizabeth Drive connections south of Cecil Park
- M12 East (design and construct contract) – the M7/M12 interchange.

The Project is subject to an approval under Division 5.2 of the *Environmental Planning and Assessment Act* 1979 (EP&A Act) as Critical State Significant Infrastructure (CSSI). The Project is also a controlled action under Section 75 of *the Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), requiring a separate approval from the Australian Minister for the Environment.

An EIS was prepared to describe and assess the Project and recommend management measures to address impacts. The EIS was exhibited by the NSW Department of Planning, Industry and Environment (DPIE) for 34 days from 16 October 2019 to18 November 2019 to give the community and stakeholders the opportunity to provide comment.

In accordance with Section 5.17 of the EP&A Act, the Planning Secretary requested TfNSW to provide a response to submissions. These were addressed within the Submission Report. Due to design developments since the exhibition of the EIS, an Amendment Report was developed to assess the impacts of these amendments. The Amendment Report was exhibited by DPIE for 14 days from 21 October 2020 to 4 November 2020. Following exhibition of the Amendment Report, an Amendment Report Submissions Report (ARSR) was developed in December 2020 to address the identified issued followed by the ARSR in March 2021. Collectively the EIS, Submission Report, Amendment Report, ARSR and ARSR amendment are herein referred to as Environmental Assessment Documentation which addressed biodiversity matters only.

The Project must be carried out generally in accordance with the EIS, Submissions Report, Amendment Report, Amendment Report-Submissions Report and the Amendment Report – Submissions Report (amendment) in accordance with NSW CoA A1. These documents are collectively referred to as the Environmental Assessment Documentation. The CSSI must also be carried out in accordance with all procedures, commitments, preventative actions, performance outcomes and mitigation measures set out in the Environmental Assessment Documentation as required by NSW CoA A2.

Approval for the Project under the EP&A Act was granted by the Minister for Planning on 23 April 2021 (SSI 9364). Approval for the Project under the EPBC Act was granted by the Federal Minister for the Environment on 3 June 2021 (EPBC 2018/8286). The Project must be carried out in accordance with the terms of the NSW and Commonwealth Approvals.

The EIS assessed the impacts of construction of the Project on noise and vibration. As part of EIS development, a detailed Noise and Vibration Assessment Report was prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued by the NSW Department of Planning, Industry and Environment (DPIE) and the Commonwealth EIS Guidelines issued by the Commonwealth Department of the Water, Agriculture and Environment (DAWE). The noise and vibration assessment was included in the EIS as Appendix K: Noise and Vibration.

Further assessment of noise and vibration impacts was carried out subsequent to exhibition of the EIS and incorporated into the Amendment Report. The additional assessment considered the impacts on noise and vibration due to refinements in the Project design, including changes in the Project footprint and additional ancillary facilities and associated activities. A noise and vibration supplementary technical report was included in the Amendment Report as Appendix G.

Revised Environmental Management Measures (REMMs) were provided within the Amendment Report and further updated in the ARSR. Where applicable, the REMMs from the ARSR have been included in this Plan.

Further, design development has progressed, providing additional environmental assessment, and where relevant, this detail has been included within this Plan. Section 2 of the OCEMP provides a detailed Project description.

1.3 Scope of the Plan

The scope of this overarching CNVMP is to describe how the Construction Contractors propose to manage potential noise and vibration impacts during construction of the Project. The Construction Contractor responsible for each section of the Project (M12 West, M12 Central, both M12 East (Elizabeth Drive connections) and M12 East (M7/M12 interchange)) must use this CNVMP as the basis for their section specific CNVMP, considering relevant sensitive receivers, ambient noise levels and construction activities.

In accordance with NSW CoA A7, references in the terms of this CNVMP to any guideline, protocol, Australian Standard or policy are to such guidelines, protocols, Standards or policies in the form they are in as at the date of this CNVMP.

Operational noise and vibration impacts, and operation measures do not fall within the scope of this CNVMP and therefore are not included within the processes contained within the CNVMP.

1.4 Environmental Management Systems overview

The overarching Environmental Management System (EMS) for the Project is described in Section 3 of the OCEMP. The Construction Contractor delivering the Project will have an EMS, consistent

with the overarching EMS described in the OCEMP. The Construction Contractor will develop stage-specific CNVMPs in accordance with the OCEMP, the Environmental Protection Licence (EPL) and their EMS. This overarching CNVMP forms part of the environmental management framework for the Project, as described in Section 3 of the OCEMP.

The Construction Contractor will be required to develop, as part of their stage-specific CNVMPs, detailed procedures and plans to address specific requirements of the CoA and REMMs identified in this overarching CNVMP. The purpose of these environmental management documents in regard to minimisation and management of impacts on noise and vibration associated with the Project is outlined in Section 6 of this CNVMP.

The review and document control processes for this CNVMP are described in Section 6.4.2 and Section 6.6 of the OCEMP.

Management measures identified in this CNVMP may also be incorporated into site or activity specific Environmental Work Method Statements (EWMS). EWMS incorporate appropriate mitigation measures and controls and identify key procedures to be used concurrently with the EWMS. A EWMS template for use by the Construction Contractors is provided in Appendix A8 of the OCEMP. Appendix A8 also contains a template EWMS register and template EWMS training register.

EWMS will be prepared by the Construction Contractor's Environmental Site Representatives (ESR) and reviewed by the TfNSW Environment and Sustainability Manager (ESM) (or delegate) and independent Environmental Representative (ER) prior to the commencement of the construction activities to which they apply. Construction personnel undertaking a task governed by a EWMS will undertake the activity in accordance with the mitigation and management measures identified in the EWMS.

Used together, the OCEMP, strategies, procedures and EWMS form management guides that clearly identify required environmental management actions for reference by TfNSW and its Construction Contractors.

1.4.1 CNVMP preparation, endorsement and approval

This overarching CNVMP has been prepared to satisfy the NSW and Commonwealth CoA in relation to noise and vibration management during construction of the Project, particularly NSW CoA C4(b). This CVNMP includes a Construction Noise and Vibration Monitoring Program (Appendix B) to satisfy the requirements of NSW CoA C11(a) and NSW CoA C14.

This CNVMP and Construction Noise and Vibration Monitoring Program (Appendix B) will be reviewed by the TfNSW Senior Project Manager and the ESM (or delegate) and endorsed by the ER prior to submission to the Planning Secretary for approval in accordance with NSW CoA C9, NSW CoA C10 and NSW CoA C15.

This CNVMP will be submitted to the Planning Secretary for approval no later than one month prior to commencement of construction of the Project.

In accordance with NSW CoA C10 and NSW CoA C16, construction of the Project will not commence prior to approval by the Planning Secretary of the CNVMP and the Construction Noise and Vibration Monitoring Program, and all relevant noise and vibration baseline data for the Project has been collected.

1.4.2 Interactions with other management plans

This Plan has the following interrelationships with other management plans and documents:

- Sensitive Area Plans (SAP) and Site Establishment Management Plan(s) (SEMP) identify adjacent residential and other receivers, Noise Catchment Areas and will be progressively updated to incorporate physical management measures identified in Construction Noise Impact Statements
- Overarching Communication Strategy (OCS) details procedures and processes for community notification, consultation and complaints management
- Construction Cultural Heritage Management Plan (CCHMP) provides details of heritage structures and items in the areas surrounding the Project worksites, which are to be protected from vibration generated during the construction works.

1.5 Consultation

1.5.1 Consultation for preparation of the CNVMP

The following government agencies and stakeholders have been consulted with during the development of this CNVMP, in accordance with NSW CoA C4(b):

- WaterNSW (where vibration generating activities will impact on WaterNSW mains including the Upper Canal in a tunnel below Western Sydney Parklands and the M7 Motorway, and a Sydney Water reservoir in Western Sydney Parklands)
- Sydney Water (where vibration generating activities will impact on their water mains)
- Pipeline operators such as:
    - Jemena (where vibration generating activities will impact on the Wilton to Horsley Park trunk main and Eastern Gas Pipeline)
- Penrith City Council (PCC)
- Liverpool City Council (LCC
- Fairfield City Council (FCC).

In accordance with NSW CoA A5 (b), Table 1-1 provides a log of engagement or attempted engagement with the identified government agencies and stakeholders.

Table 1-1: Log of engagement with government agencies and stakeholders

Agency	Date	Person Contacted	Comment	Consultation Status
WaterNSW	9 September 2021	WaterNSW Representative	TfNSW emailed CNVMP to WaterNSW requesting comment	Open
	22 September 2021	TfNSW Representative	Response received from WaterNSW via email (See Appendix A)	Open

Agency	Date	Person Contacted	Comment	Consultation Status
	October 2021	WaterNSW Representative	Updated Plan and response table emailed to WaterNSW to demonstrate how comments have been addressed.	Closed
Sydney Water	9 September 2021	Sydney Water Representative	TfNSW emailed CNVMP to Sydney Water requesting comment	Open
	23 September	TfNSW Representative	Response received from Sydney Water via email (See Appendix A)	Open
	October 2021	Sydney Water Representative	Updated Plan and response table emailed to Sydney Water to demonstrate how comments have been addressed.	Closed
Jemena	9 September 2021	Jemena Representative	TfNSW emailed CNVMP Jemena requesting comment	Open
	6 October 2021	TfNSW Representative	Response received from Jemena via email (See Appendix A)	Open
	7 October 2021	Jemena Representative	TfNSW emailed Jemena to clarify the Jemena response (See Appendix A)	Open
	7 October 2021	TfNSW Representative	Response received from Jemena via email (See Appendix A)	Open
	October 2021	TfNSW Representative	Updated plan and response table emailed to Jemena to demonstrate how comments have been addressed	Closed
Fairfield City Council	9 September 2021	Fairfield City Council (FCC) Representative	TfNSW emailed CNVMP FCC requesting comment	Open
	27 September 2021	TfNSW Representative	Response received from FCC via email	Open
	October 2021	FCC Representative	Updated plan and response table emailed to FCC to demonstrate how comments have been addressed.	Closed
Penrith City Council	9 September 2021	Penrith City Council (PCC) Representative	TfNSW emailed CNVMP to PCC requesting comment	Open

Agency	Date	Person Contacted	Comment	Consultation Status
	7 October 2021	PCC Representative	TfNSW contacted the PCC Representative via phone and email to indicate that consultation is closed as no response has been received	Closed
Liverpool City Council	9 September 2021	Liverpool City Council (LCC) Representative	TfNSW emailed CNVMP to LCC requesting comment	Open
	29 September 2021	LCC Representative	TfNSW followed up and resent the CNVMP to LCC requesting comment	Open
	7 October 2021	LCC Representative	TfNSW contacted the LCC Representative via phone, who indicated that will send through comments in the following week (11/10/2021).	Open
	21 October 2021	LCC Representative	TfNSW contacted the LCC Representative to notify that as comments have not been received, consultation is considered closed.	Closed

In accordance with NSW CoA C4 and A5, the consolidated evidence of consultation undertaken for the preparation of this CNVMP will be submitted to the Planning Secretary as part the document submission. The consolidated evidence of consultation includes:

- Documentation of the engagement with the parties identified in Table 1-3 that occurred before submitting the document to the Secretary for approval
- A log of the points of engagement or attempted engagement with the identified parties and a summary of the issues raised by them
- Documentation of the follow-up with the identified parties where feedback has not been provided to confirm that they have no feedback or have failed to provide feedback after repeated requests
- An outline of the issues raised by the identified parties, a summary of how they have been addressed and a cross reference to the section or Sub-plan of the OCEMP where the issue has been addressed
- A description of the outstanding issues raised by the identified parties and the reasons why they have not been addressed.

Refer to Appendix A for evidence of consultation undertaken with stakeholders and government agencies for the preparation of this Plan.

1.5.2 Ongoing consultation during construction

Ongoing consultation between TfNSW, Construction Contractors, stakeholders, and community and relevant agencies regarding the management of noise and vibration impacts will be

undertaken during the construction of the Project as required. The process for the consultation will be documented in the OCS.

During construction of the Project, it may be necessary for the Construction Contractors to undertake work outside standard construction hours in the circumstances described in NSW CoA E36. On becoming aware of the need for works, the Construction Contractors will notify the ER, the Planning Secretary and the EPA of the reasons for such emergency work. Prior to carrying out such works, the Construction Contractors will use their best endeavours to notify all affected sensitive receivers of the likely impact and duration of the emergency works, as required by NSW CoA E36.

The Construction Contractor will consult with the community with regards to respite at affected locations, in accordance with the consultation requirements prescribed by NSW CoA E37 and E47. The outcomes of the community consultation, the identified respite periods and the scheduling of the likely Out-of-Hours Work (OOHW) will be provided to the EPA, ER and Planning Secretary for information prior to the Work occurring. The consultation must include (but not be limited to) providing the community with:

- Progressive schedule for periods no less than three months, of likely out-of-hours work
- Description of the potential work, location and duration of the out-of-hours Work
- Noise characteristics and likely noise levels of the work
- Mitigation and management measures which aim to achieve the relevant noise management levels and vibration criteria under NSW CoA E38(a) and (b).

An Out-of-Hours Work Protocol is provided in Appendix C, in accordance with NSW CoA E37, for work which is outside of standard working hours and that are not subject to an EPL. The Out-of-Hours Work Protocol requires that mitigation measures for residual noise and vibration impacts on the community are selected and implemented in consultation with the community at each affected location.

In accordance with NSW CoA E39, prior to scheduling the construction works, the Construction Contractors will consult with of potentially-affected community, religious and educational institutions and noise and vibration-sensitive businesses and critical working areas (such as flight simulators, theatres, laboratories and operating theatres) to determine whether any sensitive time periods are applicable. Noise and vibration generating work resulting in noise levels above the NMLs must not be timetabled within these sensitive periods unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.

In accordance with NSW CoA E42, the Construction Contractor will consult with WaterNSW in relation to vibration monitoring for the Upper Canal.

1.5.3 Consultation with other projects and utility providers

Consultation between TfNSW, Construction Contractors, utility providers and other projects being constructed in the area regarding the management of noise and vibration impacts will be undertaken during the construction of the Project as required. The process for the consultation is documented in the OCS including:

- Liaison with councils and utility providers. The relevant owner or provider of the service or utility will be consulted to make suitable arrangements for access to diversion, protection

and support of the affected infrastructure as required. This includes consultation with WaterNSW in regards to vibration monitoring of the Upper Canal.

- Liaison with other projects being constructed in the area to identify potential cumulative impacts. This will include potential cumulative noise impacts during both standard working hours and out-of-hours works.

The Construction Contractor will reschedule any work to provide respite to noise impacted sensitive land users so that the respite is achieved in accordance with NSW CoA E45. The consideration of respite will also include all other CSSI, State Significant Infrastructure (SSI) and State Significant Development (SSD) projects in the area which may cause cumulative and/or consecutive impacts at receivers affected by the delivery of the CSSI.

2 Purpose and objectives

2.1 Purpose

The purpose of this CNVMP is to describe how each Construction Contractor will manage potential noise and vibration impacts during construction of the Project.

2.2 Objectives

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

To aid in achieving this objective all CoA, REMMs and licence/permit requirements relevant to noise and vibration are described, scheduled and assigned responsibility as outlined in:

- Environmental Assessment Documentation
- NSW CoA granted to the project on 23 April 2021
- TfNSW QA Specifications
- All relevant legislation and other requirements described in Section 3.1 of this Plan.

2.3 Targets

Targets for the management of noise and vibration impacts during the Project include:

- Full compliance with the relevant legislative requirements, CoA and environmental management measures
- Implementation of feasible and reasonable noise mitigation measures with the aim of achieving the construction NMLs detailed in the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009)
- Implementation of 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)
- Minimising impacts on, and complaints from, the community and stakeholders.

3 Environmental requirements

3.1 Relevant legislation

3.1.1 Legislation

Legislation and regulations relevant to noise and vibration management includes:

- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Protection of the Environment Operations (Noise Control) Regulation 2017.*

Relevant provisions of the above legislation are identified in the register of legal requirements included Appendix A1 of the OCEMP.

3.1.2 Guidelines

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

- Construction noise
  - TfNSW QA Specification G36 – Environmental Protection (Management System)
  - *Interim Construction Noise Guideline* (ICNG), Department of Environment and Climate Change 2009
  - *Construction Noise and Vibration Guidelines* (TfNSW 2016)
  - *Draft Construction Noise and Vibration Guidelines* (TfNSW 2019)
  - *Road Noise Policy*, Department of Environment, Climate Change and Water 2011.
- Construction vibration
  - TfNSW QA Specification G36 – Environmental Protection (Management System)
  - *Assessing Vibration – a technical guideline* (AVTG), Department of Environment and Conservation 2006
  - *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)
  - Australian Standard AS/NZS 2107:2000 Acoustics - Recommended design sound levels and reverberation times for building interiors.
- Construction sleep disturbance guidance
  - *Road Noise Policy*, Department of Environment, Climate Change and Water 2011
  - *Noise Policy for Industry*, Environment Protection Authority 2017
- PS300 – Environmental Design and Compliance, specifically:
  - M12 Motorway – Central Package, Building Condition and Public Utilities Assessment Report (GHD, 2021)
  - M12 Motorway Package 1 - West, Building Condition and Public Utilities Assessment Report (WSP, 2020).

3.2 Minister's Conditions of Approval

The primary NSW CoA relevant to the development of this Plan are listed in Table 3-1 below. Secondary conditions relevant to this Plan have been listed in Appendix D. A cross reference is also included to indicate where the condition is addressed in this Plan or other project management documents.

Table 3-1: Minister's Conditions of Approval

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
C4	The following **CEMP Sub-plans** must be prepared in consultation with the relevant agencies identified for each **CEMP Sub-plan**. Details of all information requested by an agency during consultation must be included in the relevant **CEMP Sub-plan**, including copies of all correspondence from those agencies. (b) Noise and vibration - WaterNSW, Sydney Water and pipeline operators (where vibration generating activities will impact on their assets) and relevant council(s)	✓	✓	✓	Section 1.5.1
C6	The Noise and Vibration CEMP Sub-Plan must include, but not be limited to:	✓	✓	✓	This Plan
	(a) details of all sensitive land uses (including noise and/or vibration sensitive working areas) that are potentially exposed to construction noise and vibration;				Section 4.1
	(b) construction noise and vibration performance criteria for the CSSI;				Section 5
	(c) details of mitigation and management measures and procedures that will be implemented to manage construction noise and vibration impacts				Section 8
	(d) construction timetabling, in particular construction activities outside of standard hours; and				Section 5.3.1 Section 5.3.4
	(e) measures to minimise cumulative construction impacts and the likelihood for construction fatigue from both concurrent activities and other projects in the area.				Section 8

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
C11	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies 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: (a) Noise and vibration - relevant councils	✓	✓	✓	Appendix B
C14	The Construction Noise and Vibration Monitoring Program must include, but not be limited to: (a) noise and vibration monitoring at representative residential and other locations (including at the worst- affected residences), subject to property owner approval, to confirm construction noise and vibration levels; (b) noise monitoring during the day, evening and night time periods throughout the construction period, covering the range of activities (including worst-case construction noise levels) being undertaken; (c) method and frequency for reporting monitoring results; and (d) procedures to identify and implement additional mitigation measures where monitoring indicates noise and/or vibration levels in excess in excess of noise and vibration criteria.	✓	✓	✓	Section 9.5.1 Section 6.2 of Appendix B
E34	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 6:00 pm Saturdays; and (c) at no time on Sundays or public holidays.	✓	✓	✓	Section 5.3.1
E35	Except as permitted by an EPL, highly noise intensive works that result in an exceedance of the applicable noise management level (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 (3) hours, with a minimum cessation of work of not less than one (1) hour.	✓	✓	✓	Section 5.3.2

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
	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.				
E36	Notwithstanding Condition E34 and E35, 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; or On becoming aware of the need for emergency work in accordance with Condition (E36(a), the Proponent must notify the ER, the Planning Secretary and the EPA of the reasons for such emergency 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 the emergency work. (b) **Work that causes**: (i) 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 user(s); and (ii) LAFmax(15 minute) noise levels no more than 15 dB(A) above the rating background level at any residence during the night time period; and (iii) continuous or impulsive vibration values, measured at the most affected residence, thatare 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	✓	✓	✓	Section 5.3.3

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
	(iv) intermittent vibration values measured at the most affected residence that are no morethan 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 respect of the CSSI; or (ii) works which are <u>not</u> subject to an EPL that are approved under an **Out-of-Hours Work Protocol** as required by **Condition E37**; or (iii) negotiated agreements with directly affected residents and sensitive land user(s).				
E37	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 E34**, and that are not subject to an EPL. The Protocol must be approved by the Planning Secretary beforecommencement of the out-of-hours Work. The Protocol must be prepared in consultation with the **ER**. The Protocol must provide: (a) identification of low and high-risk activities and an approval process that considers the riskof activities, proposed mitigation, management, and coordination, including where: (i) the **ER** reviews all proposed out-of-hours activities and confirm their risk levels, (ii) low risk activities can be approved by the **ER**, and (iii) high risk activities that 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 E47**. 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 user(s) will be exposed to, including the number of noise awakening events;	✓	✓	✓	Section 1.5.2 Section 5.3.4 Appendix C

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
	(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 Work. This condition does not apply to Work where the requirements of **Condition E36(a)** or **(b)** are met.				
E38	Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration objectives (a) construction 'Noise affected' NML 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) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and (d) the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage). Any construction or early works identified as exceeding the noise management levels and/or vibration criteria must be managed in accordance with the respective **Noise and Vibration CEMP Sub-plan** or **Early Works Environmental Management Plan**. *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 2.3 Section 8
E39	Noise generating work in the vicinity of potentially-affected community, religious, educational institutions, noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise levels above the NMLs must not be timetabled within sensitive periods, unless offers of other reasonable arrangements have been made to the affected institutions and are implemented at no cost to the affected institution.	✓	✓	✓	Section 1.5.2 Section 8

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
E40	Noise and Vibration Impact Statements (NVIS) must be prepared for any Work that may exceed the noise management levels and vibration criteria specified in Condition E38 at any residence outside the construction hours identified in Condition E34, or where receivers will be highly noise affected. The NVIS must include specific mitigation measures identified through consultation with affected sensitive land user(s) and the mitigation measures must be implemented for the duration of the Work. A copy of the NVIS must be provided to the ER prior to the commencement of the associated Work. The Planning Secretary may request a copy/ies of the NVIS.	✓	✓	✓	Section 8 Appendix C
E41	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 must be provided with 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 Noise and Vibration CEMP Sub-plan required by Condition C4 and the Communication Strategy required by Condition B1.	✓	✓	✓	Section 8 Section 9.9.1 OCS
E42	The Proponent must conduct vibration testing during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In addition, vibration monitoring must be undertaken during construction for relevant remaining Fleurs Radio Telescope structures, the Upper Canal (in consultation with WaterNSW) and McMaster Farm and McGarvie-Smith Farm group of remaining buildings. 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 8
E43	Advice from a heritage specialist must be sought on methods and locations for installing equipment used for vibration, movement and noise monitoring at heritage-listed structures.	✓	✓	✓	Section 5.6 Section 8

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
E44	Before conducting at-property treatment at any heritage item identified in the documents listed in Condition A1, the advice of a suitably qualified and experienced built heritage specialist must be obtained and implemented to ensure such work does not have an adverse impact on the heritage significance of the item.	✓	✓	✓	Section 8
E45	All Work undertaken for the delivery of the CSSI, including that 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 user(s) so that the respite is achieved in accordance with Condition E47; or (b) where respite outlined in Condition E47 cannot be achieved, consider the provision of alternative respite or mitigation to impacted noise sensitive land user(s); 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 1.5.3 Section 8 Appendix C
E46	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 (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.	✓	✓	✓	Section 8 Appendix C

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
	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 noise treatment. The noise levels and duration requirements identified in this condition may be changed through an EPL applying to the CSSI.				
E47	In order to undertake out-of-hours Work outside the hours specified under **Condition E34**, 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 (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; and (d) likely mitigation and management measures which aim to achieve the relevant noisemanagement levels and vibration criteria under **Condition E38(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). 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 **ER**, EPA and the Planning Secretary for information prior to Work scheduled for the subject period being undertaken. *Note: Respite periods can be any combination of days or hours where out-of-hours work will not be more than 5 dB(A) above the rating background noise level at any residence.*	✓	✓	✓	Section 1.5.2 Section 8 Appendix C
E48	Crushing and grinding works must only be undertaken during the hours specified in Condition E34 unless otherwise approved by the Planning Secretary or through an EPL or it meets the requirements of Condition E36(a).	✓	✓	✓	Section 8
E49	Blasting is not permitted as part of this CSSI approval.	✓	✓	✓	Section 8

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
E56	The implementation of at-property treatment does not preclude the application of other noise and vibration mitigation and management measures including temporary accommodation to address construction noise.	✓	✓	✓	Section 8
E76	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 (1) month before the commencement of all other potentially impacting works	✓	✓	✓	Section 8
E77	Where pre-construction surveys have been undertaken in accordance with Condition E76, 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 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 (4) months following the completion of construction activities that have the potential to impact on the structure / asset	✓	✓	✓	Section 8

3.3 Revised Environmental Management Measures

The primary REMMs relevant to the development of this Plan are listed in Table 3-2 below. Secondary REMMs relevant to this Plan are listed in Appendix D. A cross reference is also included to indicate where the REMM is addressed in this Plan or other Project documents.

Table 3-2: Environmental management measures relevant to this Plan

ID	Measure/Requirement	Timing	Applicability			Document Reference
			M12 West	M12 Central	M12 East	
NV01	A construction noise and vibration management plan (CNVMP) will be prepared for the project to mitigate and manage noise and vibration impacts during construction. The CNVMP will be implemented for the duration of construction of the project and will:	Prior to and during construction	✓	✓	✓	This Plan
	• Identify nearby sensitive receivers					Section 4.1
	• Include a description of the construction activities equipment and working hours					Section 7.1
	• Identify relevant noise and vibration performance criteria for the project and license and approval conditions.					Section 5.2 Section 5.6
	• Include modelling results showing construction noise impacts based on detailed design information					Section 7
	• Outline standard and additional mitigation measures from the Construction Noise and Vibration Guideline (CNVG) (Roads and Maritime 2016) and information about when each will be applied					Section 8
	• Outline requirements for the development and implementation of an Out-of-hours Work Protocol					Section 5.3.4 Appendix C

ID	Measure/Requirement	Timing	Applicability			Document Reference
			M12 West	M12 Central	M12 East	
	• Outline requirements for noise and vibration monitoring that will be carried out to monitor project performance associated with the noise and vibration criteria					Section 9.5 Appendix B
	• Describe community consultation and complaints handling procedures in accordance with the Community Communication Strategy to be developed for the project					Section 1.5 OCS
	• Outline measures to manage noise impacts associated with heavy vehicle movements both on and offsite					Section 8
	• Outline measures to minimise cumulative construction impacts and the likelihood for 'construction fatigue' from concurrent and consecutive projects in the area					Section 8
	• Outline requirements to minimise and manage construction fatigue, in consultation with the community.					Section 8

3.4 TfNSW QA Specifications

The TfNSW QA Specifications set out the minimum requirements for the detailed outcomes in terms of quality or performance expected in the finished product for construction projects and are relevant to various construction activities on work sites to minimise impacts to the environment. The TfNSW QA Specifications are Project contract documents and are not publicly accessible.

The Construction Contractor will incorporate the appropriate M12 TfNSW QA Specifications into the stage specific CNVMPs including the requirements from, but not limited to:

- G1 – Job Specific Requirements
- G2 – General Requirements
- G10 – Traffic Management
- G36 – Environmental Protection
- G40 – Clearing and Grubbing
- G61 – Communication and Community Engagement
- R44 – Earthworks.

4 Existing environment

The following section summarises the existing noise and vibration conditions within and adjacent to the Project corridor, based on information contained in the Environmental Assessment Documentation. The information provided below comprises the baseline data used for the Construction Noise and Vibration Monitoring Program (Appendix B). As referenced in the Amendment Report, it is considered that the baseline data obtained during the EIS is sufficiently comprehensive and that no further baseline data will be required to be collected by the Construction Contractors. Notwithstanding, attended noise monitoring will be carried out prior to the commencement of construction to verify the noise environment.

The noise environment within the suburban areas is generally influenced by sources of road traffic noise from the M7 Motorway and Elizabeth Drive, particularly during the daytime period. During the evening and night-time periods, ambient noise levels typically decrease due to a reduction in the volume of road traffic on Elizabeth Drive and the M7 Motorway. The noise environment in the rural locations is generally influenced by environmental noises such as wind and insects.

4.1 Sensitive receivers

The Project is situated within three local government areas (LGAs); Penrith to the north, Fairfield to the east and Liverpool to the south. The Project will also pass through the Western Sydney Parklands at its eastern extent. The Project includes a mix of rural and suburban areas in the South West Sydney Growth Area and Western Sydney Aerotropolis and will traverse the following suburbs from east to west; Abbotsbury, Cecil Park, Cecil Hills, Mount Vernon, Kemps Creek, Badgerys Creek and Luddenham.

The study area includes a mix of rural and suburban areas. Cecil Hills, Abbotsbury (suburban areas), Cecil Park and Mount Vernon (small-lot rural residential areas) are located in the eastern section of the project near to the M7 Motorway and Elizabeth Drive. Kemps Creek, Badgerys Creek and Luddenham are in the western section of the project which are sparsely populated and consist primarily of large rural lots.

The noise and vibration assessment in the Environmental Assessment Documentation identified and considered potential noise and vibration impacts for sensitive receivers along the Project alignment. Receivers potentially sensitive to noise and vibration were categorised as residential dwellings, commercial/industrial buildings (including small businesses), or ‘other’ sensitive land uses which includes educational institutions, childcare centres, medical facilities, and places of worship. Sensitive receivers potentially affected by the Project are concentrated in Kemps Creek and Cecil Park in M12 East. The central and western sections of the Project area are mainly semi-rural properties with few residences.

Noise sensitive receivers and the Noise Catchment Areas (NCAs) for the Project are shown in Figure 4-1. The predicted noise contours for the bulk earthworks – peak impact scenario has been included as a reference for predicted construction noise impacts. Predicted construction noise contours for the various scenarios can be found on the M12 Motorway web portal (https://caportal.com.au/rms/m12) and within the M12 Motorway Amendment Report Appendix G Noise and Vibration updated technical report.

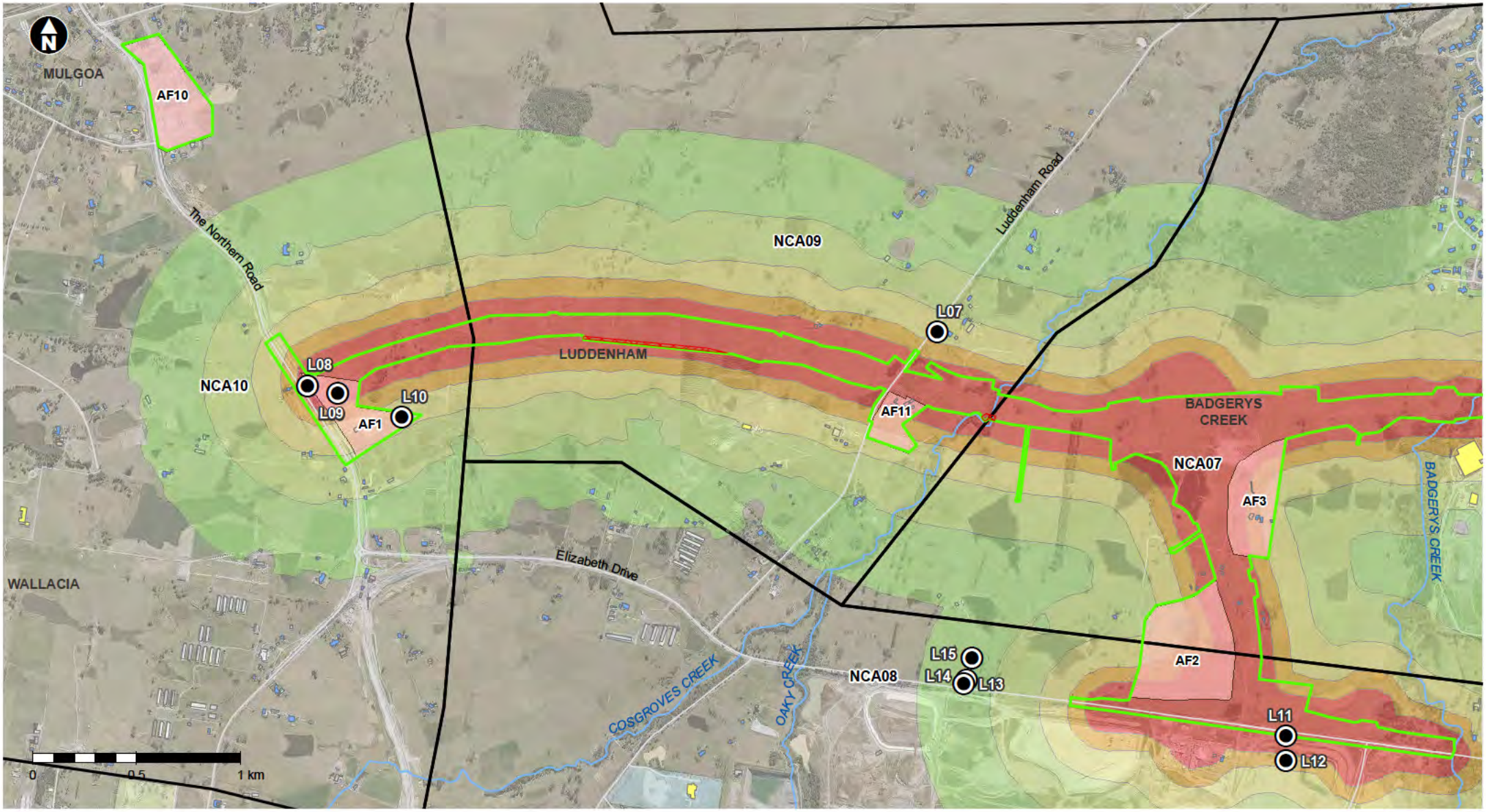


Figure 4-1 Location of noise catchment areas, noise and vibration sensitive receivers and noise monitoring location

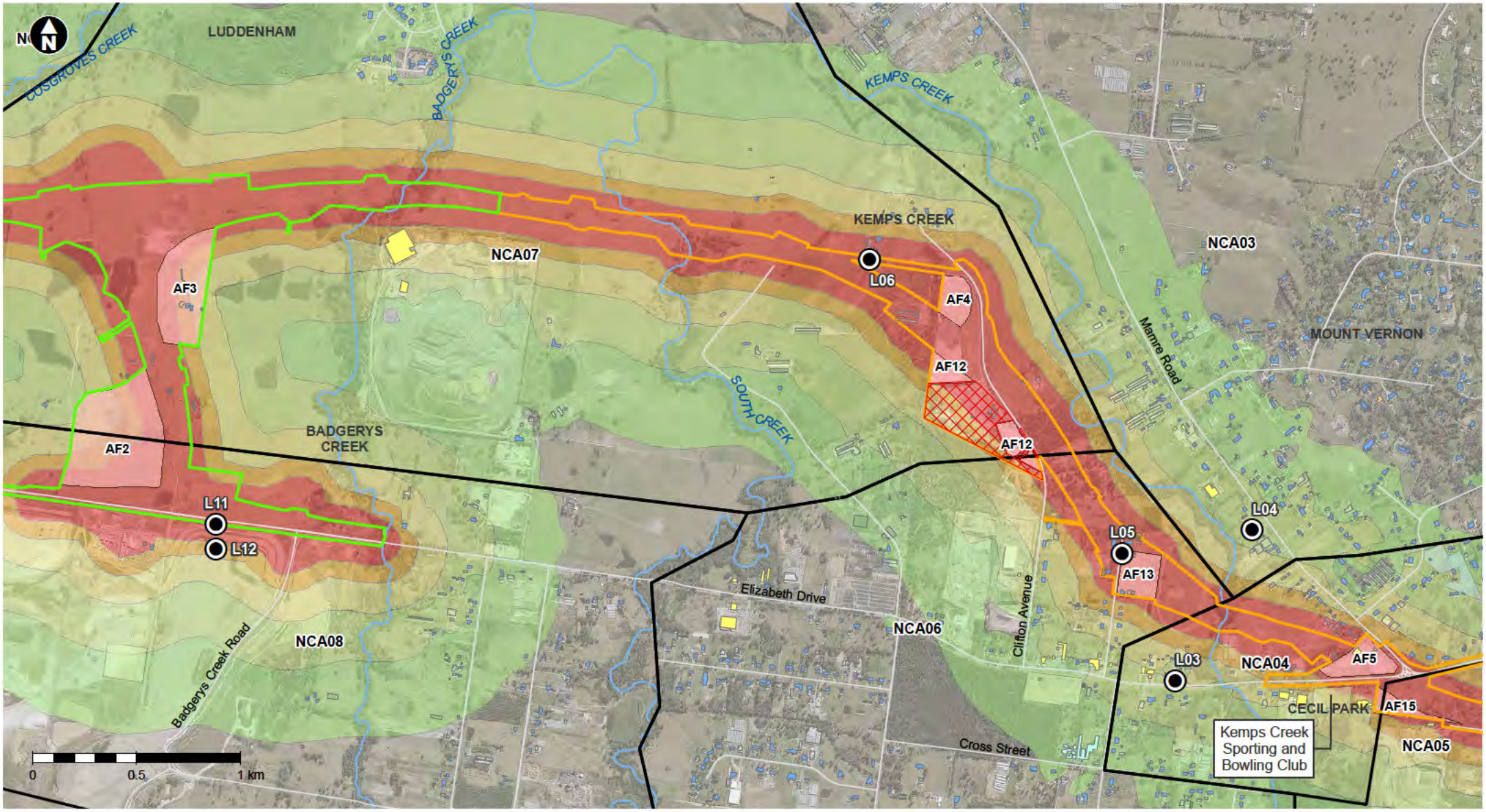
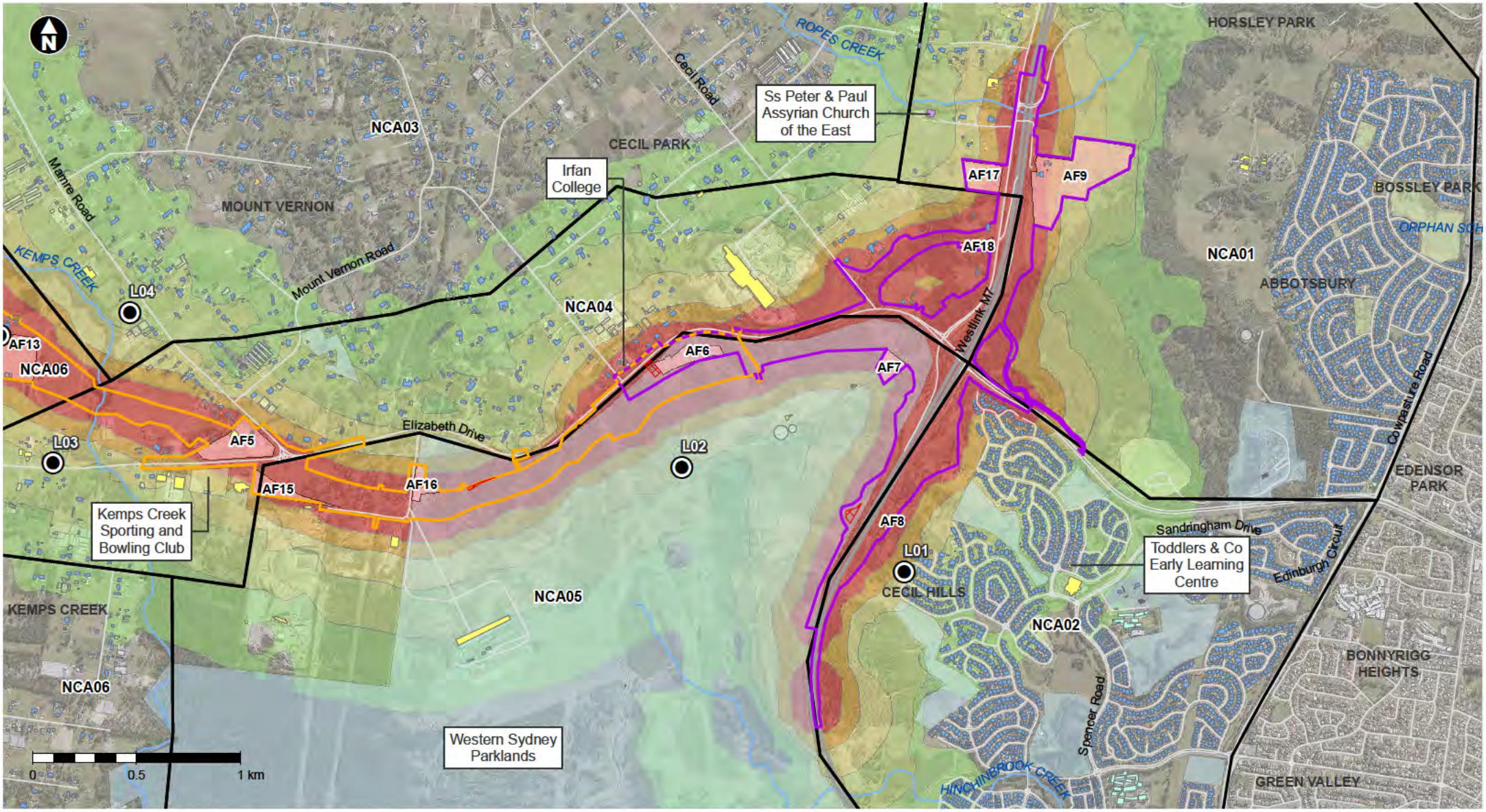


Figure 4-1 Location of noise catchment areas, noise and vibration sensitive receivers and noise monitoring location



Project construction boundary (CA for West and Central, Jul 2021; ARSR for East, Dec 2020)
- M12 Central
- M12 East
- Ancillary facility
- The amended project exclusion zones

NCA

Receiver type*
- Residential
- Commercial
- Other (Educational)
- Other (Place of Worship)
- Other (Childcare)
- Other (Outdoor Active)
- Other (Outdoor Passive)
- Other (Shed)
- Other (Remaining)

Noise monitoring location
Existing motorway
Existing road
Waterways

- <45 dBA
- 45 to 50 dBA
- 50 to 55 dBA
- 55 to 60 dBA
- 60 to 65 dBA
- >65 dBA

*As per M12 Motorway Appendix G Noise and Vibration updated technical report (October 2020)

Page 3 of 3

Imagery: Aerometrex August 2020

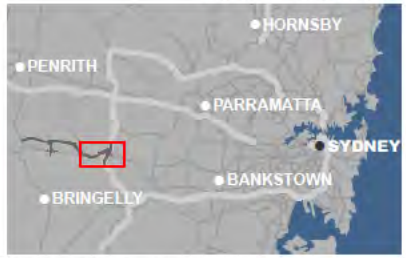


Figure 4-1 Location of noise catchment areas, noise and vibration sensitive receivers and noise monitoring location

4.2 Noise catchment areas

The area around the Project has been summarised using ten NCAs which collectively make up the study area. The NCAs were selected to be representative of the varying land uses and noise environment of sensitive receiver locations around the Project.

NCAs that reflect land uses and the nature and types of receivers within each NCA were established as part of the noise assessment. The land use characteristics within each NCA are described in Table 4-1.

Table 4-1: Noise catchment areas

NCA	Minimum distance[1]	Description
NCA01	40 m	This catchment area is located along Wallgrove Road and to the east of the M7 Motorway and extends south to Elizabeth Drive. Receivers in this catchment are largely residential with the nearest receiver located to the east of the Project.
NCA02	85 m	This catchment area is located to the south of Elizabeth Drive and east of the M7 Motorway. It is primarily suburban residential with the nearest receivers located to the east of the Project.
NCA03	440 m	This catchment area is located to the north of Elizabeth Drive and west of the M7 Motorway, extending to the west of Mamre Road. The nearest receivers are located north of the project on Mamre Road.
NCA04	90 m	This catchment area is located to the north of Elizabeth Drive and west of the M7 Motorway and extends west to the intersection of Devonshire Road and Cross Street. It is primarily residential with the nearest receivers located adjacent the project on the north of Elizabeth Drive.
NCA05	60 m	This catchment area is located to the south of Elizabeth Drive and west of the M7 Motorway and extends west to Kemps Creek. It primarily consists of the Western Sydney Parklands with no residential receivers
NCA06	70 m	This catchment area is located to the west of Kemps Creek and east of South Creek and extends to the north and south of Elizabeth Drive. It primarily consists of rural residential receivers.
NCA07	100 m	This catchment area is located to the west of Kemps Creek, east of Cosgroves Creek, and north of Elizabeth Drive. This catchment primarily consists of rural residential receivers and a cluster of residential dwellings 500 metres to the north of the Project.
NCA08	420 m	This catchment area is located along the western section of Elizabeth Drive to the west of South Creek and east of The Northern Road. This catchment is primarily rural residential.

[1] Approximate minimum horizontal distance in metres from the project to the nearest sensitive receiver.

NCA	Minimum distance[1]	Description
NCA09	90 m	This catchment area is located to the west of Cosgroves Creek, east of The Northern Road, and north of Elizabeth Drive. It is set back from Elizabeth Drive and The Northern Road to represent receivers which are not adjacent to the existing major roads. This catchment represents mostly rural receivers.
NCA10	160 m	This catchment area is located along The Northern Road. It is primarily rural residential with the nearest receivers located opposite the west end of the project to the west of The Northern Road.

4.3 Ambient noise

The ambient noise environment is dominated by a combination of road traffic noise in the vicinity of major roads and general environmental noise (such as wind and insects) in the more rural locations.

Unattended noise surveys in the Project area were conducted at 15 locations as part of the preparation of the Environmental Assessment Documentation, namely the EIS in 2017, and the Amendment Report in 2020. The measured noise levels were used to determine the existing noise environment and to set criteria to assess the potential impacts from the Project. The monitoring equipment was generally located at receivers which will have line-of-sight to the Project or to existing major roads, within constraints such as accessibility, security and permission of landowners.

The rating background level (RBL) is used to determine the appropriate noise management level (NML). The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours).

Works undertaken from 1:00pm and 6:00pm on Saturday (the allowable work hours on Saturdays identified in the Infrastructure Approval) have been assessed in the Environmental Assessment Documentation as Daytime OOH.

A summary of the noise monitoring results and adopted RBLs is provided in Table 4-2.

Table 4-2: Ambient noise monitoring results (dB(A))

ID	Background noise (RBL) – Periods based on extended construction hours[2]					Average noise level LA_{eq} (period) based on Road Noise Policy[3]	
	Morning shoulder	Day	Evening	Evening shoulder	Night	Day 15 hour	Night 9 hour
L01	51	45	44	46	40	52	51

[2] RBL periods are based on extended construction hours: Morning shoulder is 6:00 am to 7:00 am Monday to Friday; Daytime is 7:00 am to 6:00 pm Monday to Saturday and 8:00 am to 6:00 pm Sunday and Public Holidays; Evening is 7:00 pm to 10:00 pm Monday to Friday and 6:00 pm to 10:00 pm Saturday, Sunday and Public Holidays; Evening shoulder is 6:00 pm to 7:00 pm Monday to Friday; Night-time is 10:00 pm to 6:00 am Monday to Friday, 10:00 pm to 7:00 am Saturday and 10:00 pm to 8:00 am Sunday and Public Holidays

[3] LAeq periods are based on the Road Noise Policy: Daytime is 7:00 am to 10:00 pm; Night-time is 10:00 pm to 7:00 am.

ID	Background noise (RBL) – Periods based on extended construction hours[2]					Average noise level LA_{eq} (period) based on Road Noise Policy[3]	
	Morning shoulder	Day	Evening	Evening shoulder	Night	Day 15 hour	Night 9 hour
L02	47	36	39	41	34	46	45
L03	60	54	48	56	37	66	63
L04	54	48	46	52	37	57	55
L05	49	39	42	45	35	49	48
L06	43	34	35	39	31	53	44
L07	46	40	36	42	31	56	52
L08	58	46	50	57	34	60	59
L09	56	44	48	54	36	56	55
L10	51	40	44	49	37	51	49
L11	57	46	40	51	31	69	66
L12	50	40	37	44	30	49	48
L13	50	42	38	48	33	64	60
L14	50	42	39	48	33	55	52
L15	50	39	40	47	34	52	49

5 Noise and vibration criteria for NSW

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

- *Interim Construction Noise Guideline* (ICNG) (DECC, 2009)
- *Assessing Vibration: A Technical Guideline* (DEC, 2006).

Relevant elements of these documents are summarised and discussed below.

5.1 Construction noise and assessment objectives

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

The main objectives of the ICNG are to:

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

5.2 Construction noise assessment criteria

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

5.2.1 Residential land use

Table 5-1 (reproduced from Table 2 of the ICNG) sets out the NMLs for residences.

The RBL is used as the basis for determining NMLs. The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the *Noise Policy for Industry* (EPA, 2017). The calculated NML for each NCA is provided in Table 5-3.

Table 5-1: Residential NML guideline

Time of day	LAeq(15min)
Recommended standard construction hours • Monday to Friday 7 am to 6 pm • Saturday 8am to 1pm • No work on Sundays or public holidays	Noise affected RBL + 10 dB
	Highly noise affected 75 dB(A)
Outside recommended standard hours	Noise affected RBL + 5 dB

Note: Saturday 1pm to 6pm have been identified as work hours in accordance with NSW CoA E34, however fall within "outside recommended standard hours" and are classified as Daytime OOHW.

5.2.2 Other sensitive land uses

Other sensitive land uses, such as schools and offices, typically find noise from construction to be disruptive when the properties are being used (such as during work and school times). Table 5-2 presents NML for sensitive land uses based on the principle that the characteristic activities for each of these land uses should not be unduly disturbed. The Construction Contractors will undertake consultation with noise sensitive land use occupants likely to be affected by noise from the Project to schedule construction activities and work hours to achieve a reasonable noise outcome.

The NML in Table 5-2 are 5 dB above the corresponding road traffic noise levels in the *Environmental Criteria for Road Traffic Noise* (EPA 1999) (and the 'maximum' levels in the *NSW Industrial Noise Policy* (EPA 2000) for commercial and industrial uses) to account for the variable and short-term nature of construction noise.

Table 5-2: Non-residential sensitive land uses noise management levels

Land use	Noise assessment location	NML LAeq(15min)[3]
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Passive recreation areas[1]	External	60
Active recreation areas[2]	External	65
Industrial premises	External	75
Office, retail outlets	External	70

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

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

[3] Applies only when properties are being used

5.3 Working hours

5.3.1 Hours of work

In accordance with NSW CoA E34, work will be undertaken during the following hours:

- 7:00 am to 6:00 pm Monday to Friday
- 8:00 am to 6:00 pm Saturday (subject to prior approval from TfNSW)
- At no time on Sunday or public holidays.

Any application to work between 8:00am and 6:00pm on Saturdays (the allowable work hours on Saturdays identified in the Infrastructure Approval) must be submitted to the TfNSW no later than 12:00 pm on the Thursday immediately prior to the Saturday proposed to undertake work. The application must include the details of the work activities to be undertaken. Approval is at the discretion of TfNSW.

The Construction Contractor will include construction timetabling, particularly for construction activities outside of standard hours, within their stage-specific CNVMP and stage-specific OOHW Protocol (refer Section 5.3.4).

5.3.2 Highly noise intensive works

As required by NSW CoA E35, 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:

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

Highly noise intensive works will be carried out in continuous blocks not exceeding three hours each, with a minimum respite of at least one hour between ceasing and recommencing each block of work. 'Continuous' includes any period during which there is less than a one hour respite between ceasing and recommencing the work.

Highly noise intensive works are defined as annoying under the Interim Construction Noise Guideline (DECC, 2009) and include:

- 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; and
- Impact piling.

The Construction Contractors will confirm the highly noise intensive works required for the Project in the Construction Contractors' CNVMPs.

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

5.3.3 Variation to hours of work

Works outside of the standard construction hours identified in Section 5.3.1 may be undertaken in the following circumstances as permitted by NSW CoA E36:

- For the delivery of materials required by the NSW Police Force or other authority for safety reasons or
- Where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property, or to prevent environmental harm.
- Work 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
    - LAeq(15 min) noise levels no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s).
    - LAFmax(15 min) noise levels no more than 15 dB(A) above the rating background level at any residence during the night time period
    - 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).
- By approval:
    - Where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or
    - Works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by NSW CoA E37; or
    - Where negotiated agreements with directly affected residents and sensitive land uses have been reached.

On becoming aware of the need for emergency works, the Construction Contractor will notify the ER, the Planning Secretary and the EPA of the need for the emergency works. The Construction Contractor will use its best endeavours to notify all affected sensitive receivers of the likely impact and duration of the emergency works.

5.3.4 Out of hours work

This overarching CNVMP includes an OOHW Protocol in Appendix C which outlines how assessment, approval and management of Project OOHW **not** the subject of an EPL will occur. The OOHW Protocol has been prepared to address the requirements of NSW CoA E37. The OOHW Protocol will be submitted to the Planning Secretary for approval before commencement of

the OOHW; amendments to the OOHW Protocol will be sent to the ER for consultation and then forwarded to the Planning Secretary for approval. The OOHW Protocol is also in accordance with the *Construction Noise and Vibration Guidelines* (Roads and Maritime, 2016) and TfNSW QA specifications.

The Construction Contractors will prepare and implement a stage-specific OOHW Protocol prior to commencement of construction. The Construction Contractors will need to detail the specific activities and timetabling that will be undertaken for the OOHW. The OOHW Protocol will be included in the Construction Contractor's CNVMP.

The OOHW Protocol will include, but not be limited to:

- The process for obtaining approval for OOHW
- The details to be provided in any OOHW application, including information on the nature and need and justification for activities to be conducted during the varied construction hours
- Requirements for consultation with potentially affected receivers and local Councils.

The Construction Contractors' OOHW Protocols will be prepared in consultation with the ER and approved by the Planning Secretary.

5.4 Adopted construction noise management levels

The adopted Project construction NMLs for each NCA have been determined based on the measured noise levels described in Section 4.3.

For work during standard construction hours:

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

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

For work outside standard construction hours, the construction NML is calculated by adding 5 dB(A) to the RBL. For assessing the potential for sleep disturbance, the RNP outlines a screening level of the prevailing RBL plus 15 dB(A).

The adopted Project construction NMLs and sleep disturbance screening criterion for residential receivers are provided in Table 5-3. As required by the Noise Policy for Industry (NPfI) when setting project construction NMLs, the evening NML should be no greater than the daytime NML. Likewise, the night-time NML should be no greater than the day or evening NML. Table 5-2 sets out the adopted Project construction NMLs for non-residential receivers.

Table 5-3: Construction NMLs and sleep disturbance screening criteria at residences

NCA	Monitoring location	NML LAeq(15min) (dBA)						Sleep disturbance screening criteria (RBL + 15 dB)
		Standard construction (RBL + 10dB)	Out-of-hours (RBL + 5dB)					
		Day[4]	Morning shoulder[5]	Day[6]	Evening[7]	Evening shoulder[8]	Night[9]	
NCA01	L01	55	50	50	49	49	45	55
NCA02	L01	55	50	50	49	49	45	55
NCA03	L05	49	44	44	44	44	40	50
NCA04	L03	64	59	59	53	53	42	52
NCA05	L02	46	41	41	41	41	39	49
NCA06	L05	59	44	44	44	44	40	50

[4] *Daytime period is the standard construction hours of 7:00 am to 6:00 pm Monday to Friday and 8:00 am to 1:00 pm Saturday*

[5] *Morning shoulder period is 6:00 am to 7:00 am Monday to Friday. Where the morning shoulder RBL is higher than the daytime RBL, the daytime RBL was adopted*

[6] *Daytime OOH period is 7:00 am to 8:00 am and 1:00 pm to 6:00 pm Saturday, and 8:00 am to 6:00 pm Sunday and Public Holidays*

[7] *Evening period is 7:00 pm to 10:00 pm Monday to Friday and 6:00 pm to 10:00 pm Saturday, Sunday and Public Holidays*

[8] *Evening shoulder period is 6:00 pm to 7:00 pm Monday to Friday. Where the evening shoulder RBL is higher than the evening RBL, the evening RBL was adopted*

[9] *Night-time period is 10:00 pm to 6:00 am Monday to Friday, 10:00 pm to 7:00 am Saturday and 10:00 pm to 8:00 am Sunday and Public Holidays*

NCA	Monitoring location	NML LAeq(15min) (dBA)						
		Standard construction (RBL + 10dB)	Out-of-hours (RBL + 5dB)					Sleep disturbance screening criteria (RBL + 15 dB)
		Day[4]	Morning shoulder[5]	Day[6]	Evening[7]	Evening shoulder[8]	Night[9]	
NCA07	L06	44	39	39	39	39	36	46
NCA08	L14	52	47	47	44	44	38	48
NCA09	L07	50	45	45	41	41	36	46
NCA10	L09	54	49	49	49	49	41	51

5.4.1 Triggers for additional mitigation measures

In accordance with the CNVG, additional mitigation measures will be required to be implemented should the NML be exceeded. Table 5-4 (extracted Table C.1 of the CNVG) details the triggers for additional mitigation measures for air-borne noise. Table 7-2 to Table 7-6 detail the predicted construction noise exceedances against the NML for each works period.

Table 5-4: Triggers for additional mitigation measures – airborne noise (TfNSW CNVG)

Perception	Predicted airborne $L_{Ae1(15min)}$ noise level receiver		Additional mitigation measures type[1]	Mitigation levels[2]
	dB(A) above RBL	dB(A) above NML		
All hours				
75 dB(A) or greater			N, V, PC, RO	HA
Standard Hours: Mon – Fri (7am – 6pm), Sat (8am – 6pm), Sun/Pub Hol (Nil)				
Noticeable	5 to 10	0	-	NML
Clearly audible	10 to 20	< 10	-	NML
Moderately intrusive	20 to 30	10 to 20	N, V	NML+10
Highly intrusive	> 30	> 20	N, V	NML+25
OOHW Period 1: Mon – Fri (6pm – 10pm), Sat (7am – 8am & 6pm – 10pm), Sun/Pub Hol (8am-6pm)				
Noticeable	5 to 10	< 5	-	NML
Clearly audible	10 to 20	5 to 15	N, R1, DR	NML+5
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR	NML+15
Highly intrusive	> 30	> 25	V, IB, N, R1, DR, PC, SN	NML+25
OOHW Period 2: Mon – Fri (10pm – 7am), Sat (10pm – 8am), Sun/Pub Hol (6pm – 7am)				
Noticeable	5 to 10	< 5	N	NML
Clearly audible	10 to 20	5 to 15	V, N, R2, DR	NML+5
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR	NML+15
Highly intrusive	> 30	> 25	AA, V, IB, N, PC, SN, R2, DR	NML+25
Notes (refer to detailed descriptions):	1. AA – Alternative Accommodation		R1 – Respite Period 1	

Perception	Predicted airborne $L_{Ae1(15min)}$ noise level receiver		Additional mitigation measures type[1]	Mitigation levels[2]
	dB(A) above RBL	dB(A) above NML		
	V – Verification IB – Individual briefings N – Notification R2 – Respite Period 2 DR – Duration Respites 2. NML – Noise Management Level		PC – Phone calls SN – Specific notifications Perception – related to the level above RBL HA – Highly Affected (>75 dB(A) – applies to residences only)	

5.5 Construction vibration assessment objectives

The following construction vibration goals apply for the Project:

- For structural damage to heritage structures, the vibration limits set out in the German Standard *DIN 4150-3: Structural Vibration - effects of vibration on structures*
- For damage to other buildings and/or structures, the vibration limits set out in the British Standard *BS 7385-1:1990 - Evaluation and measurement for vibration in buildings - Guide for measurement of vibration and evaluation of their effects on buildings*
- For human exposure, the acceptable vibration values set out in *Assessing Vibration: A Technical Guideline* (DEC, 2006).

5.6 Vibration criteria

Effects of ground vibration on buildings resulting from construction can be classified as follows:

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

5.6.1 Human comfort vibration

Assessment of potential disturbance from tactile vibration on human occupants of buildings is made in accordance with *Assessing Vibration: A Technical Guideline* (DEC, 2006). The guideline provides criteria which are based on the British Standard *BS 6472-1992 Evaluation of human exposure to vibration in buildings (1-80Hz)*. Sources of vibration are defined as either 'continuous', 'impulsive' or 'intermittent':

- Continuous vibration – from uninterrupted sources, e.g. machinery, steady road traffic, continuous construction activity

- Impulsive vibration – up to three instances of sudden impact per monitoring period e.g. occasional dropping of heavy equipment, occasional loading and unloading
- Intermittent vibration – such as from drilling, compacting or activities that will result in continuous vibration if operated continuously.

Maximum and preferred values for continuous and impulsive vibration are defined in Table 5-5. Application of the continuous and impulsive vibration criteria considers the level, duration of exposure, time of day, and varies for land uses.

Table 5-5: Continuous and impulsive vibration acceleration (m/s^2) 1-80 Hz

Location	Assessment period[1]	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration					
Critical areas[2]	Day or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
Workshops	Day or night- time	0.04	0.029	0.080	0.058
Impulsive vibration					
Critical areas[2]	Day or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night- time	0.64	0.46	1.28	0.92

Notes: [1] Daytime is 7.00am to 10.00pm and night-time is 10.00pm to 7.00am
[2] Such as hospital operating theatres or precision laboratories.

Intermittent vibration impact is assessed using vibration dose values (VDVs). The VDV method is more sensitive to peaks in the acceleration waveform and makes corrections to the criteria based on the exposure duration. The acceptable VDVs for intermittent vibration are defined in Table 5-6.

Table 5-6: Acceptable vibration dose values (m/s$^{1.75}$) for intermittent vibration.

Location	Daytime[1]		Night-time[1]	
	Preferred Values	Maximum Values	Preferred Values	Maximum Values
Critical areas[2]	0.10	0.20	0.10	0.02
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes: [1] Daytime is 7.00am to 10.00pm and night-time is 10.00pm to 7.00am

[2] Includes operating theatres, precision laboratories and other areas where vibration sensitive activities may occur.

5.6.2 Structural damage

The standards by which building damage from construction-induced vibration is assessed are British Standard *BS 7385 Part 2 Evaluation and measurement of vibration in buildings* (BS 7385) and the German Standard *DIN 4150: Part 3 – 1999 Effects of Vibration on Structure* (DIN 4150-3) (DIN, 1999).

British Standard

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

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

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

BS 7385 is based on peak particle velocity and specifies damage criteria for frequencies within the range 4 to 250 Hz, being the range usually encountered in buildings. Table 5-7 sets out the BS 7385 criteria for cosmetic, minor and major damage.

Table 5-7: BS 7385 structural damage criteria

Group	Type of structure	Damage level	Peak component particle velocity[1] (mm/s)		
			4 – 15 Hz	15 – 40Hz	≥40Hz
1	Reinforced or framed structures Industrial and heavy commercial buildings	Cosmetic	50	50	50
		MinorP2	100	100	100
		MajorP2	200	200	200
2	Un-reinforced or light framed structures Residential or light commercial type buildings	Cosmetic	15 - 20	20 - 50	50
		MinorP2	30 - 40	40 - 100	100
		MajorP2	60 - 80	80 - 200	200

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

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

German Standard

DIN 4150-3 provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are generally recognised to be a more stringent criteria set than that of BS 7385. DIN 4150-3 presents the recommended maximum limits over a range of frequencies (Hz), measured in any direction, and at the foundation or in the plane of the uppermost floor of a building or structure.

Where heritage structures are impacted, DIN 4150-3 vibration criteria will be applied. The criteria applicable to heritage buildings are identified in Table 5-8. Based on DIN 4150-3, a measured value exceeding those listed in Table 5-8 will not necessarily lead to damage if it is significantly exceeded, however, further investigations may be necessary.

In accordance with NSW CoA E43, a heritage specialist will be engaged throughout the Project to provide TfNSW and its Construction Contractors with advice on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures.

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

Type of structure	Guideline values for vibration velocity (mm/s)			
	Vibration at the foundation at a frequency of			Vibration at the horizontal plane of the highest floor at all frequencies
	1 - 10 Hz	10 - 50 Hz	50 - 100 Hz[1]	
Heritage buildings	3	3 - 8	8 - 10	8

Notes: [1]At frequencies above 100 Hz the values given in this column may be used as minimum values.

Jemena Assets

Jemena guideline 'Designing, constructing and operating assets near Jemena gas pipelines' (GAS-960-GL-PL-001) identifies a maximum level of vibration of 20 mm/second which is to be measured at the nearest surface of the buried pipeline. The Construction Contractor will set a trigger alert where vibration monitoring identifies vibration at 15mm/s. At this point, construction activities will cease to minimise impact on Jemena assets. Alternative construction methods will be investigated to ensure vibration limits do not exceed 20 mm/second.

5.6.3 Safe working distances

Where vibration intensive plant such as rock breakers and vibratory rollers are used, vibration must be managed to minimise disturbance to building occupants and to avoid damage to buildings and other structures. Table 5-9 indicates the safe working distances recommended by the CNVG for typical items of vibration intensive plant that must be complied with unless otherwise approved by TfNSW.

Table 5-9: Safe working distances for vibration intensive plant (TfNSW 2019)

Plant item	Rating/description	Safe working distance		
		Cosmetic damage (British Std 7385) – Light framed structures	Cosmetic damage (DIN 4150) Heritage and other sensitive structures	Human response (EPA's vibration guideline)
Vibratory roller	<50 kN (typically 1-2 t)	5 m	14 m	15 m to 20 m
	<100 kN (typically 2-4 t)	6 m	16 m	20 m
	<200 kN (typically 4-6 t)	12 m	33 m	40 m
	<300 kN (typically 7-13 t)	15 m	41 m	100 m
	>300 kN (typically 13-18 t)	20 m	54 m	100 m
	>300 kN (> 18 t)	25 m	68 m	100 m
Small hydraulic hammer	300 kg – 5 to 12 t excavator	2 m	5 m	7 m
Medium hydraulic hammer	900 kg – 12 to 18t excavator	7 m	19 m	23 m
Large hydraulic hammer	1600 kg – 18 to 34 t excavator	22 m	60 m	73 m
Vibratory pile driver	Sheet piles	20 m	50 m	100 m
Pile boring	≤800 mm	2 m (nominal)	5 m	7 m
Jackhammer	Hand held	1 m (nominal)	2 m	3 m

The safe working distances presented in Table 5-9 are indicative and will vary depending on the item of plant (particularly its power rating) and local geotechnical conditions. The cosmetic damage

thresholds apply to typical buildings under typical geotechnical conditions and vibration monitoring is recommended at specific sites. Where structures are more sensitive such as heritage items, more stringent conditions may be applicable and will be considered individually by the Construction Contractor. A heritage specialist (built structures) will be engaged by the Construction Contractor to provide advice on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures in accordance with NSW CoA E43.

In relation to human response, the safe working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent and higher vibration levels over shorter periods are acceptable. Additional assessment will be undertaken by the Construction Contractor where the human response criteria are exceeded.

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. In order to assess the level of potential impact on noise and vibration sensitive receivers, the broad categories of construction activity likely to interact with these receivers include:

- Site establishment and decommissioning
- Construction compounds (carparks, office buildings, laydown areas)
- Clearing and grubbing
- Demolition
- Utilities and drainage
- Earthworks
- Material haulage
- Concrete batching
- Crushing and screening
- Road works
- Bridgeworks (including piling)
- Paving and concrete saw cutting
- Finishing works (road furnishing and landscaping).

6.2 Environmental impacts

The potential for noise and vibration impacts on sensitive receivers or structures will depend on a number of factors including:

- Type of equipment in use
- Number of equipment simultaneously in use
- Ground condition
- Topography and other physical barriers
- Proximity to sensitive receivers
- Condition of sensitive receivers
- Hours/duration of construction works
- Proximity of heavy traffic areas.

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

Modelling of noise and vibration shows that impacts attributable to the Project are anticipated, this is detailed in Section 7 of this Plan. Section 8 of this Plan provides a suite of mitigation measures

that will be implemented to avoid or minimise noise and vibration impacts on the receiving community and/or built environment.

6.3 Cumulative impacts, respite and construction fatigue

The multitude of other projects in the area including The Northern Road, the Western Sydney International Airport, work associated with the Aerotropolis, Sydney Metro – Western Sydney Airport and other residential and retail developments may lead to construction and consultation fatigue for the local community.

Interagency communication between government departments undertaking work in the area is required to manage the cumulative impacts with the aim of combining messages when possible and minimising impacts to the local community. Several key interface meetings have been established to coordinate construction activities:

1. Elizabeth Drive Construction Coordination Group meet on a fortnightly basis to discuss upcoming work schedules, OOHW, program efficiencies, sharing of information, etc
2. Sydney Metro – Western Sydney Airport Communication Interface Coordination Group who meet on a fortnightly basis. This group includes communications specialists whose goal it is to ensure the major projects working in the area coordinate messages and work activities if possible, and to manage and plan for cumulative impacts that are likely to be sensitive to the community during the construction phase of the projects
3. Regular interface meetings with other project stakeholders such as WSIA, Sydney Metro – Western Sydney Airport, Sydney Water and other major SSD projects within the vicinity of the M12 Project
4. Once contracts are awarded, TfNSW will facilitate coordination meetings between M12 East, West and Central construction contractors as required.

The Construction Contractor will ensure works will be scheduled with the aim of minimising concurrent works near sensitive receivers. This will include:

- Coordination between project teams and other CSSI, SSI and SSD projects that are being constructed nearby
- Rescheduling of work to provide respite to impacted noise sensitive land user(s) so that respite is achieved during OOHW
- Consideration to the provision of alternative respite or mitigation to impacted noise sensitive land users where OOHW respite as per NSW CoA E47 cannot be provided.

The ER will be informed of decisions made in relation to respite or mitigation for OOHW. The implementation of respite and OOHW management measures as per NSW CoA E45 have been detailed in Section 8 and will be managed in accordance with the Out of Hours Work Protocol (Appendix C).

Construction fatigue will be managed in accordance with the OCS, which includes a Construction Fatigue Protocol to minimise impacts associated with construction fatigue. The Protocol will include consideration of noise attenuation and restriction of OOHW or use of noise intensive equipment where reasonable and feasible.

7 Construction noise and vibration assessment

A range of plant and equipment will be required to undertake activities associated with the Project. A summary of anticipated construction scenarios and predicted noise and vibration levels is provided in the sections below.

7.1 Construction activities

Table 7-1 provides a summary of the Project construction phases and description of activities anticipated to be used for the phase.

Table 7-1: Construction scenarios and associated activities

Scenario reference no.	Construction scenario	Description
1a	Ancillary facility establishment/ decommissioning – Peak impact	Before construction begins, the ancillary facilities will need to be prepared to allow construction works to occur. The works will vary depending on location and the existing conditions but could include: • Minor clearing • Minor earthworks • Installation of office accommodation • Utilities • Amenities • Secure perimeter fencing, including visual screening of construction ancillary facilities where necessary Highly noise intensive works will be required at certain times and will include the use of excavators and front-end loaders.
1b	Ancillary facility establishment/ decommissioning – Typical impact	
2a	Ancillary facilities – Operation	The ancillary facilities will generally comprise: • Temporary buildings (generally prefabricated) including offices and meeting rooms, amenities and first aid facilities (the size and number of office facilities at the main ancillary facilities will be greater than at the secondary ancillary facilities) • Hardstand parking areas with sufficient space to accommodate the numbers of construction workers expected at any site • Materials laydown, storage and handling areas, including purpose built temporary structures as required • Batching plants are currently proposed to be located at AF 2, AF 3, AF 4 and AF 10. The location of the batching plant has been assumed to be all of AF 10 and in the centre of AF 2 and AF 3. • Crushing, grinding and screening operations are currently proposed to be located at AF 1, AF 2 and AF 10. The site layout of all ancillary facilities is considered indicative and will be confirmed as the project progresses.
2b	Ancillary facilities – Stockpiling	
2c	Ancillary facilities – Batching plant	
2d	Ancillary facilities – Crushing activities	

Scenario reference no.	Construction scenario	Description
		• Bridge construction support areas • Workshops with appropriate safety and environmental controls for servicing plant and equipment. The operation of all ancillary sites has been assessed for 24/7 operation. It should be noted that the assessment does not include any source mitigation or localised screening which will be investigated by the Construction Contractors following confirmation of the site layout.
3a	Utilities and drainage - including relocation of existing - Peak impact	The Project will require the construction of new drainage infrastructure and alterations to existing drainage. Construction of drainage works will involve localised excavation, compaction and installation of drainage pipes and pits, and construction of table drains and temporary construction sediment basins. High noise impact works will be required at certain times and will include the use of rock-breakers.
3b	Utilities and drainage - including relocation of existing - Typical impact	
4a	Demolition - bridges and buildings (including breaker)	Certain buildings and structures within the construction footprint will require demolition and removal where they are not proposed to be used as ancillary facilities during construction. This includes: • Buildings, sheds or farm infrastructure that fall within the construction footprint. • A bridge crossing South Creek on private property. Peak noise impact works will be required at certain times and will include the use of rock-breakers.
4b	Demolition - bridges and buildings (no breaker)	
5a	Clearing - Peak impact	Vegetation and topsoil will be stripped before earthworks are carried out. This is likely to involve: • Removal of vegetation • Topsoil stripping Peak noise impact works will be required at certain times and will include the use of chainsaws and chippers.
5b	Clearing - Typical impact	
6a	Earthworks - Peak impact	Earthworks will be required along the entire length of the project for: • Areas of new cut and fill along the construction footprint, including at all interchanges • Construction of retaining walls • Cut and fill or preparation of site for construction of all bridges. Peak noise impact works will be required at certain times and will include the use of dozers or graders.
6b	Earthworks - Typical impact	

Scenario reference no.	Construction scenario	Description
6c	Earthworks - onsite truck haulage	Onsite haulage will be required to move spoil between areas of the site as required. These activities have the potential to cause impacts as the truck travel between the various sites within the construction footprint.
7a	Bridge works - Peak impact (including piling)	Construction of the bridges will generally involve: • Construction of foundations (piling) • Construction of bridge piers • Construction of bridge abutments and spill-throughs where required • Installation of pre-cast concrete planks/girders and barriers • Installation of the deck • Installation of throw screens where required. For the proposed bridge lifts occurring over existing roads, it is likely that these activities will be required to occur outside of standard hours to minimise traffic disruption.
7b	Bridge works - Typical impact	
7c	Bridge works - concrete works	
7d	Bridge works - girder lifts over existing roads	
8a	Road works - concrete works	Road works will generally include the surfacing and concrete/asphalt works associated with the construction of the road surface. Road works involving the tie-in works to existing roads at the M7 Interchange, Elizabeth Drive at Airport Road, Wallgrove Road will likely be required to occur outside of standard hours. Additionally, works around the private access road along Luddenham Road, bike path connection into Elizabeth Drive near Mamre Road and utility access road will likely be required to occur outside of standard hours. Peak noise impact works will be required at certain times and will include the use of concrete saws.
8b	Road works - Typical impact	
8c	Road works - tie-in works to existing roads	
9a	Signage, lighting and landscaping - installation and finishing works	Finishing works are required to complete the project and include activities such as line marking, installing signs, etc Installation and finishing work generally have no requirement for peak noise impact equipment.

7.2 Construction noise impacts

7.2.1 General construction noise impacts

A summary of the potential impacts to receivers for each NCA from standard hours (daytime) and out-of-hours construction scenarios are presented in Table 7-2 to Table 7-6.

The construction impacts presented in Table 7-2 to Table 7-6 are based on representative worst-case noise construction scenarios assuming all equipment operates concurrently and that equipment is located at the closest point to receivers. The tables provide an assessment against Table C.1 of the CNVG (represented as Table 5-4 in this Plan) and demonstrates the requirement (or not) for additional mitigation measures.

The construction noise modelling undertaken for the assessment identified several sensitive receivers as being subjected to levels that exceed the Highly Noise Affected criteria (>75 dB(A)). Appendix G of the Amendment Report: Noise and vibration updated technical report, provides a detailed prediction of construction noise at sensitive receivers.

The Construction Contractors will develop stage specific construction scenarios, timings, offset distances, equipment and identify concurrent / overlapping activities. The Construction Contractors will re-assess all construction noise and vibration impacts in accordance with the ICNG and CNVG and describe the construction impacts and the necessary noise, vibration and management mitigation measures which will be implemented in the Construction Contractors' CNVMPs.

Activities that are predicted to exceed the NMLs are listed in Table 5-3 and Table 5-4, and the requirements of NSW CoA E36 will only occur in accordance with the EPL. Generally, construction work will be undertaken in standard construction hours whenever practicable. Some activities, such as bridgeworks, paving and operation of ancillary facilities may occur outside of standard of hours in accordance with the requirements of NSW CoA E36 and the EPL.

Table 7-2: Predicted construction noise exceedances morning shoulder (6am to 7am Monday to Friday) at residential receivers

Period	ID	Scenario	Activity	Noise Catchment Area									
				NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	NCA10
Morning Shoulder (OOHW Period 2)	1a	Ancillary facility establishment	Peak impact										
	1b		Typical impact										
	2a	Ancillary facilities operations	Operation										
	2b		Stockpiling										
	2c		Batching plant										
	2d		Crushing works										
	3a	Utilities and drainage	Peak impact										
	3b		Typical impact										
	4a	Demolition	Peak impact										
	4b		Typical impact										
	5a	Clearing	Peak impact										
	5b		Typical impact										
	6a	Earthworks	Peak impact										
	6b		Typical impact										
	6c		Onsite truck haulage										
	7a	Bridge works	Peak impact										
	7b		Typical impact										
	7c		Concrete works										
	7d		Girder lifts										
	8a	Road works	Concrete works										
	8b		Typical works										
	8c		Tie-in works										
	9a	Signage, lighting and landscaping											

Legend:
Receiver Perception (dB above NML):
● Noticeable (<5 dB) ● Clearly Audible (5dB to 15dB) ● Moderately Intrusive (15dB to 25dB)
● Highly Intrusive (>25dB)

Table 7-3: Predicted construction noise exceedances daytime (7am to 6pm Monday to Friday, and 8am to 6pm on Saturdays) at residential receivers

Period	ID	Scenario	Activity	Noise Catchment Area									
				NCA-01	NCA-02	NCA-03	NCA-04	NCA-05	NCA-06	NCA-07	NCA-08	NCA-09	NCA-10
Standard Daytime Hours	1a	Ancillary facility establishment	Peak impact										
	1b		Typical impact										
	2a	Ancillary facilities operations	Operation										
	2b		Stockpiling										
	2c		Batching plant										
	2d		Crushing works										
	3a	Utilities and drainage	Peak impact										
	3b		Typical impact										
	4a	Demolition	Peak impact										
	4b		Typical impact										
	5a	Clearing	Peak impact										
	5b		Typical impact										
	6a	Earthworks	Peak impact										
	6b		Typical impact										
	6c		Onsite truck haulage										
	7a	Bridge works	Peak impact										
	7b		Typical impact										
	7c		Concrete works										
	7d		Girder lifts										
	8a	Road works	Concrete works										
	8b		Typical works										
	8c		Tie-in works										
	9a	Signage, lighting and landscaping											

Legend:
Receiver Perception (dB above NML):
● Noticeable (0 dB) ● Clearly Audible (1dB to 9dB) ● Moderately Intrusive (10dB to 20dB)
● Highly Intrusive (>20dB)

Table 7-4: Predicted construction noise exceedances evening shoulder (6pm to 7pm Monday to Friday) at residential receivers

Period	ID	Scenario	Activity	Noise Catchment Area									
				NCA-01	NCA-02	NCA-03	NCA-04	NCA-05	NCA-06	NCA-07	NCA-08	NCA-09	NCA-10
Evening Shoulder (OOHW Period 1)	1a	Ancillary facility establishment	Peak impact										
	1b		Typical impact										
	2a	Ancillary facilities operations	Operation										
	2b		Stockpiling										
	2c		Batching plant										
	2d		Crushing works										
	3a	Utilities and drainage	Peak impact										
	3b		Typical impact										
	4a	Demolition	Peak impact										
	4b		Typical impact										
	5a	Clearing	Peak impact										
	5b		Typical impact										
	6a	Earthworks	Peak impact										
	6b		Typical impact										
	6c		Onsite truck haulage										
	7a	Bridge works	Peak impact										
	7b		Typical impact										
	7c		Concrete works										
	7d		Girder lifts										
	8a	Road works	Concrete works										
	8b		Typical works										
	8c		Tie-in works										
	9a	Signage, lighting and landscaping											

Legend:

Receiver Perception (dB above NML):

Noticeable (<5 dB) Clearly Audible (5dB to 15dB) Moderately Intrusive (15dB to 25dB)

Highly Intrusive (>25dB)

Table 7-5: Predicted construction noise exceedances evening (7pm to 10pm Monday to Friday, 6pm to 10pm Saturday, Sunday and Public Holidays) at residential receivers

Period	ID	Scenario	Activity	Noise Catchment Area									
				NCA-01	NCA-02	NCA-03	NCA-04	NCA-05	NCA-06	NCA-07	NCA-08	NCA-09	NCA-10
Evening (OOHW Period 1)	1a	Ancillary facility establishment	Peak impact										
	1b		Typical impact										
	2a	Ancillary facilities operations	Operation										
	2b		Stockpiling										
	2c		Batching plant										
	2d		Crushing works										
	3a	Utilities and drainage	Peak impact										
	3b		Typical impact										
	4a	Demolition	Peak impact										
	4b		Typical impact										
	5a	Clearing	Peak impact										
	5b		Typical impact										
	6a	Earthworks	Peak impact										
	6b		Typical impact										
	6c		Onsite truck haulage										
	7a	Bridge works	Peak impact										
	7b		Typical impact										
	7c		Concrete works										
	7d		Girder lifts										
	8a	Road works	Concrete works										
	8b		Typical works										
	8c		Tie-in works										
	9a	Signage, lighting and landscaping											

Legend:

Receiver Perception (dB above NML):

● Noticeable (<5 dB) ● Clearly Audible (5dB to 15dB) ● Moderately Intrusive (15dB to 25dB)

● Highly Intrusive (>25dB)

Table 7-6: Predicted construction noise exceedances night time (10pm to 6am Monday to Friday, 10pm to 7am on Saturdays and 10pm to 8am on Sundays and Public Holidays) at residential receivers

Period	ID	Scenario	Activity	Noise Catchment Area									
				NCA-01	NCA-02	NCA-03	NCA-04	NCA-05	NCA-06	NCA-07	NCA-08	NCA-09	NCA-10
Night-time (OOHW Period 2)	1a	Ancillary facility establishment	Peak impact										
	1b		Typical impact										
	2a	Ancillary facilities operations	Operation										
	2b		Stockpiling										
	2c		Batching plant										
	2d		Crushing works										
	3a	Utilities and drainage	Peak impact										
	3b		Typical impact										
	4a	Demolition	Peak impact										
	4b		Typical impact										
	5a	Clearing	Peak impact										
	5b		Typical impact										
	6a	Earthworks	Peak impact										
	6b		Typical impact										
	6c		Onsite truck haulage										
	7a	Bridge works	Peak impact										
	7b		Typical impact										
	7c		Concrete works										
	7d		Girder lifts										
	8a	Road works	Concrete works										
	8b		Typical works										
	8c		Tie-in works										
	9a	Signage, lighting and landscaping											

Legend:
Receiver Perception (dB above NML):
● Noticeable (<5 dB) ● Clearly Audible (5dB to 15dB) ● Moderately Intrusive (15dB to 25dB)
● Highly Intrusive (>25dB)

The noise assessment determined there will be a number of highly noise affected (subject to noise levels of 75 dBA or greater) residential receivers as outlined in Table 7-7.

Table 7-7: Number of predicted highly noise affected residential receivers

Scenario	Activity	NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	NCA10
Ancillary facility establishment	Peak impact						1				
Utilities and drainage	Peak impact		7		2		1	1			
Clearing	Peak impact		4		1		1	1			
Earthworks	Peak impact		3		1		1	1			
Road works	Peak impact						1				

There are several categories of 'other' sensitive receivers in the study area, including educational facilities, places of worship and outdoor areas.

The predicted NML exceedances for 'other' sensitive receivers show that:

- Exceedances at 'other' sensitive receivers are limited to receivers in NCA01, NCA02, NCA04 and NCA05
- The closest School (Irfan College) is located in NCA04. Under Option 1 presented in the Amendment Report it is likely to be subject to 'moderate impacts' during worst-case scenarios when noise intensive equipment is being used. Under Option 2 presented in the Amendment Report it is likely to be subject to 'high impacts' during worst-case scenarios when noise intensive equipment is being used
- A minor 1 dB exceedance is predicted at Saints Peter and Paul Assyrian Church of the East located in NCA01 and at the Head Start Long Day Care Centre in Cecil Hills, located in NCA02
- Minor exceedances of up to 7 dB are predicted at two outdoor sensitive receiver areas (Kemps Creek Sporting and Bowling Club and Western Sydney Parklands) adjacent to the project in NCA04 and NCA05
- 'Other' sensitive receivers in the study area are not expected to be impacted by construction of the project.

The worst-case noise levels and the impacts on 'other' sensitive receivers will only be apparent for relatively short durations of the works.

The predicted construction noise impacts in each NCA for commercial receivers showed that:

- Minor impacts are seen in NCA05 during the 'Peak impact' scenarios for Ancillary facility establishment, Utilities and drainage, Clearing and Earthworks
- The worst-case impacts are seen in the 'Peak impact' scenarios, which is due to the use of noise intensive equipment. Noise levels and exceedances during the 'Typical impact' works do not exceed the noise management levels
- Other NCAs either have no commercial receivers or they are sufficiently distant from the construction footprint to be compliant with the noise goals
- No commercial receivers are predicted to have moderate or peak impacts.

7.2.2 Ancillary facility and stockpile operation (including access)

Temporary ancillary facilities required for the Project will include compounds and laydown areas. The locations of the ancillary facilities assessed in the Environmental Assessment Documentation are shown in

Figure 7-1. The compounds and ancillary facilities will accommodate a range of activities, plant and equipment including, but not limited to:

- Offices and meeting rooms
- Staff amenities
- Light vehicle parking and access
- Plant and equipment maintenance workshops
- Materials laydown and storage areas
- Perimeter fencing, including visual screening
- Equipment storage
- Crushing, grinding and screening.

The final type, location and number of ancillary facilities (except for minor ancillary facilities) will be identified in the Construction Contractors' Site Establishment Management Plans (SEMP), prepared in accordance with NSW CoA A16. The SEMPs will be prepared prior to the establishment of any ancillary facility (other than minor ancillary facilities) and included as part of the Construction Contractors' CEMPs.

The SEMPs will detail all sites intended for use as ancillary facilities for the Project. Any additional ancillary facilities identified for the Project that have not been assessed in the Environmental Assessment Documentation will be assessed in accordance with the criteria in NSW CoA A15, using the ancillary facilities assessment provided in Appendix A4 of the OCEMP. This will include assessment of the ancillary facilities proximity to sensitive receivers, impacts to heritage items, threatened species, populations or ecological communities and whether the ancillary facility can be managed within the performance outcomes set out in the Infrastructure Approval. Where additional ancillary facilities do not meet the requirements of NSW CoA A15, a modification assessment report will be prepared for the Planning Secretary's approval.

In accordance with NSW CoA A20, lunch sheds, office sheds, portable toilet facilities can also be established when the ER has assessed that only minor amenity impacts to surrounding residences

and businesses are present. This includes consideration of matters such as compliance with the *Interim Construction Noise Guideline* (DECC, 2009).

Project construction boundary (CA for West and Central, Jul 2021; ARSR for East, Dec 2020)

M12 West

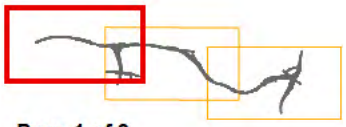
Ancillary facility

The amended project exclusion zones

Existing road

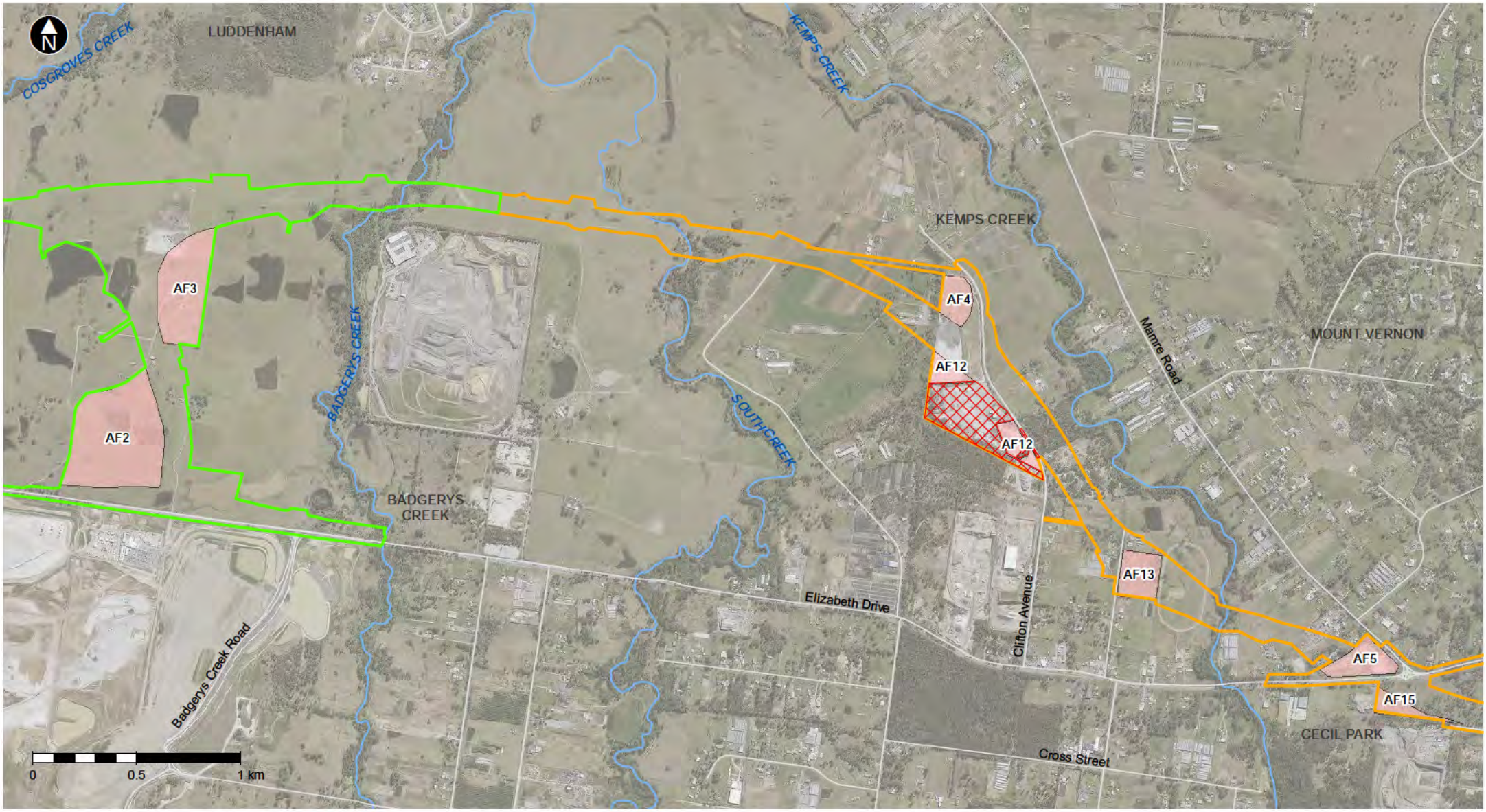
Waterways

Imagery: Aerometrex August 2020



Page 1 of 3

Figure 7-1 Location of ancillary facilities



Project construction boundary (CA for West and Central, Jul 2021; ARSR for East, Dec 2020)

- M12 West
- M12 Central
- Ancillary facility
- The amended project exclusion zones
- Existing road
- Waterways

Imagery: Aerometrex August 2020

Page 2 of 3

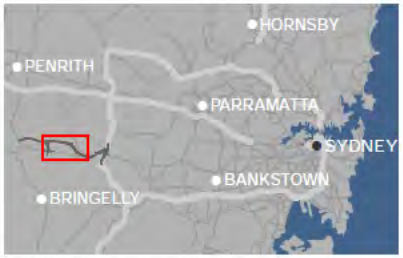
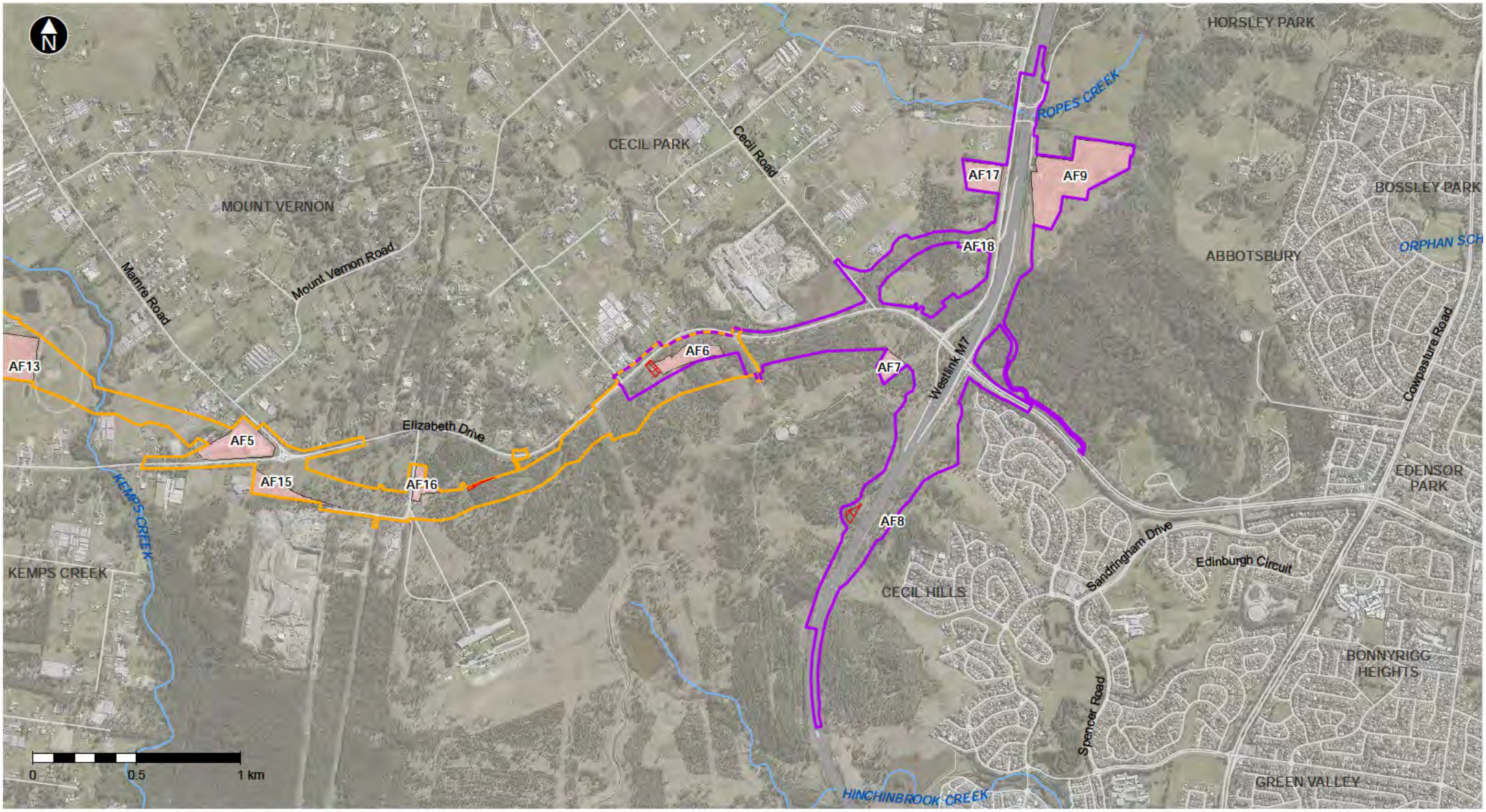


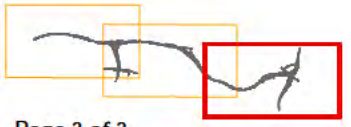
Figure 7-1 Location of ancillary facilities



Project construction boundary (CA for West and Central, Jul 2021; ARSR for East, Dec 2020)

- M12 Central
- M12 East
- Ancillary facility
- The amended project exclusion zones
- Existing motorway
- Existing road
- Waterways

Imagery: Aerometrex August 2020



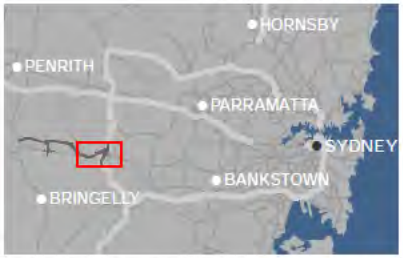


Figure 7-1 Location of ancillary facilities

7.2.3 Construction traffic noise impacts

Construction traffic will access construction sites using only designated heavy vehicle routes such as the M7 Motorway, Elizabeth Drive and The Northern Road. The assessment of construction traffic noise in the Environmental Assessment Documentation concluded that no noticeable increases in road traffic noise are predicted where construction vehicles use major roads.

Where local roads are used to access compounds, the Construction Contractors will be required to complete an assessment once detailed vehicle movements are confirmed. In the event that an increase greater than 2 dB(A) is predicted, existing road traffic noise levels will be further evaluated by the Construction Contractors to determine if the receiver is also above the relevant RNP base criteria. If the receiver is above the RNP base criteria and predicted to experience an increase in noise greater than 2 dB(A) from construction traffic, mitigation options will be required to be further investigated by the Construction Contractor.

7.2.4 Operational Noise Treatments

Noise modelling was undertaken in the ARSR to determine operational noise treatment options. The assessment concluded that diamond grind continuous reinforced concrete pavement and at-property treatments will be provided for operational noise mitigation. This pavement type would reduce the overall noise levels by about 3 dB when compared to plain concrete as previously reported in the EIS and Amendment Report. Further noise modelling will continue to be completed during detailed design to confirm operational noise mitigation measures and this will be included within the Operational Noise Review (ONR).

In accordance with NSW CoA E53, where the NML is likely to be exceeded, mitigation must be implemented within six months of the commencement of construction in the vicinity of the impacted receivers to minimise construction noise impacts, unless otherwise agreed with the Planning Secretary. As such, TfNSW have progressed detailed design to determine which properties qualify for at-property treatment. This is currently being finalised through the development of an Operational Noise Review (ONR) by GHD (2021) for M12 Central and M12 West; an ONR for M12 East will be developed during M12 East detailed design and as such at-property treatments are yet to be confirmed. Appendix G of the Amendment Report details the current at-property treatment mitigation for M12 East.

TfNSW have engaged a suitably qualified consultant to install at-property treatment as they are confirmed at impacted properties within 6 months of the commencement of construction focussed on properties closest to the alignment first (greatest impact) and moving away from the alignment (least impact). Figure 7-2 details the indicative locations and types of at-property treatment for receivers located in M12 West and M12 Central.

The types of at-property treatments detailed in the ONR have been calculated using the DRAFT *At-Receiver Noise Treatment Guideline* (ARNTG) (Roads and Maritime, 2018). Table 7-8 details the level of exceedance above the criteria following any noise reduction from quieter pavements. Details of the treatment packages are provided in Appendix B of the ARNTG and are dependent on the building construction material (Appendix E).

Table 7-8: Indicative treatment packages for M12 West and Central

Treatment Package	Exceedance of criteria, dBA	Affected M12 West residential properties	Affected M12 Central residential properties	Affected M12 Central non-residential properties
Type 1	1-5	13	64	1
Type 2	6-8	5	55	2
Type 3	9-11	4	42	1
Type 4	12-14	3	23	2
Type 5	>14	0	15	2
Total	-	25	199	8

Where at-property treatment cannot be installed within six months of the commencement of construction, a report justifying why operational noise mitigation measures will not be implemented will be provided to DPIE in accordance with NSW CoA E55. This will include details of the temporary measures to be implemented to reduce construction noise impacts, until such time that the operational noise mitigation measures will be implemented. All temporary measures will be implemented within six months of the commencement of construction in the vicinity of the impacted receivers.

In accordance with NSW CoA E54, if the ONR for M12 East is not completed within the six months of commencement of construction as per NSW CoA E53, the at-property operational noise mitigation measures must be consistent with the measures and the properties identified in Section 7.2 of Appendix G in the M12 Motorway Amendment Report.

Paper Size ISO A4

0 200 400 600 800 m

Map Projection: Transverse Mercator
Horizontal Datum: GDA 2020
Grid: GDA 2020 / MGA Zone 56

N

Legend

Treatment package
- Type 1
- Type 2
- Type 3
- Type 4
- Type 5

M12 road design

Study area

GHD

Transport for NSW
M12 Motorway
Operational Noise and Vibration Review

M12 West
No mitigation at-property treatments

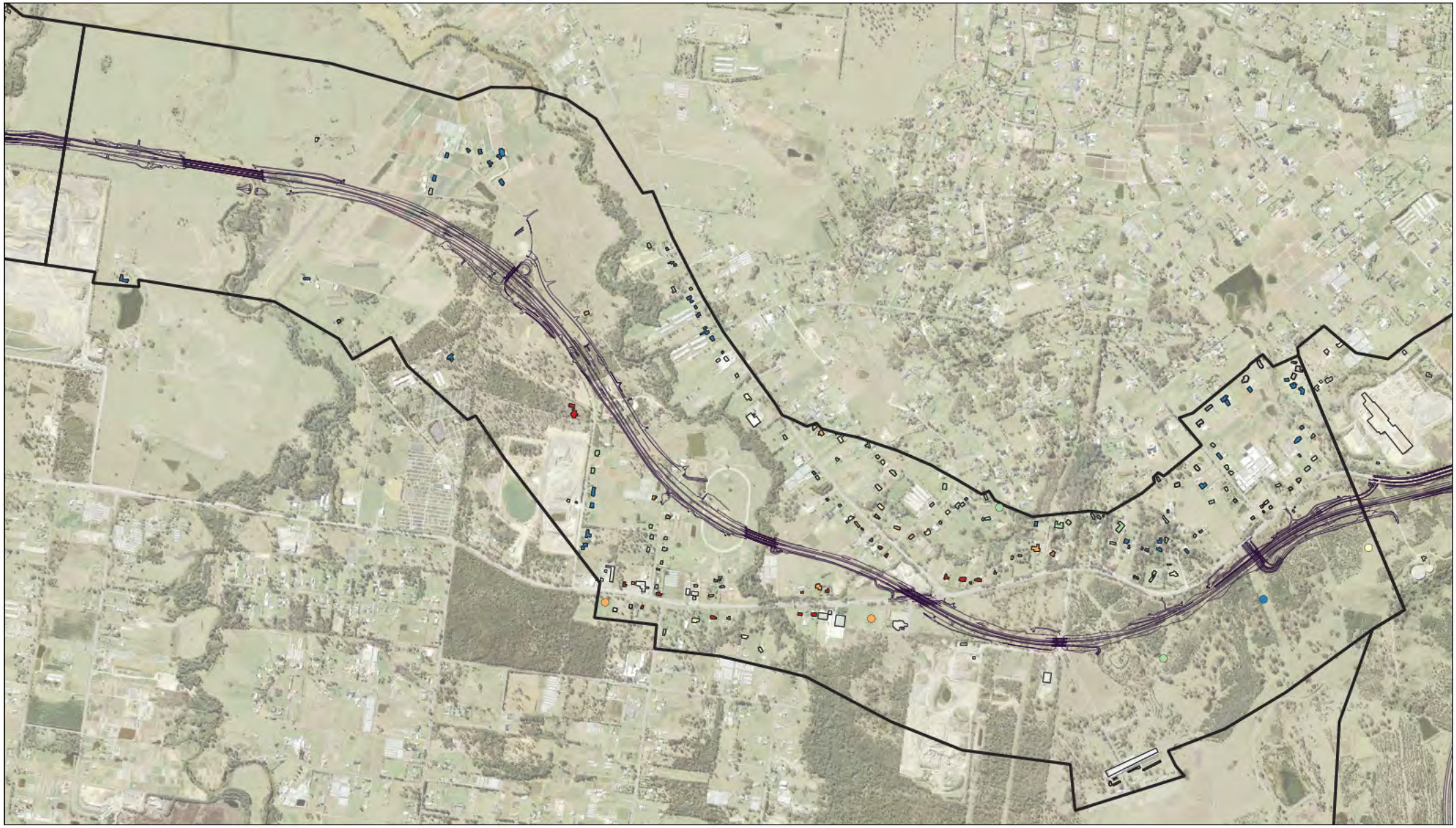
Project No 12520102
Revision No A
Date 26/10/2021

Figure 7.2

Document Path: \\ghdnet\ghd\AU\Sydney\Projects\21\12520102\Tech\Noise\00_GIS\12520102_GIS.qgz

Data Source: Base map imagery courtesy Google Imagery ©2021 CNES / Airbus, Maxar Technologies

Created By: vlau



Paper Size ISO A4

0 200 400 600 800 m

Map Projection: Transverse Mercator
Horizontal Datum: GDA 2020
Grid: GDA 2020 / MGA Zone 56

N

Legend

Treatment package
- Type 1
- Type 2
- Type 3
- Type 4
- Type 5

M12 road design

Study area

GHD

Transport for NSW
M12 Motorway
Operational Noise and Vibration Review

M12 Central
No mitigation at-property treatments

Project No **12520102**
Revision No **A**
Date **26/10/2021**

Figure 7.2

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Data Source: Base map imagery courtesy Google Imagery ©2021 CNES / Airbus, Maxar Technologies

Created By: vlau

7.3 Construction vibration impacts

7.3.1 Construction vibration assessment

Vibration impacts to residents and buildings are expected during construction of the Project. The main sources of construction vibration include:

- Vibratory rollers
- Rock breaking
- Hydraulic hammers
- Vibratory pile drivers
- Pile boring
- Jackhammers.

The main sources of vibration during construction of the Project will be associated with the use of vibratory rollers and rock breakers. A large vibratory roller produces noticeable vibration and is likely to be used throughout the construction of the Project. It is expected that vibration impacts will be able to be controlled to avoid cosmetic and structural damage to all structures. Where works are within the minimum working distances of structures, a detailed review of the required construction methods will be completed and attended vibration measurements will be required at the start of the works to determine the risk of exceeding the vibration objectives.

The distance between the construction works and the nearest sensitive receivers is generally sufficient for most buildings not to suffer cosmetic damage. However, about 21 structures spread across NCA02, NCA04, NCA05, NCA06, NCA07 and NCA10 where receivers are located close to the works are located within the recommended minimum working distance.

Where works are within the minimum working distances and considered likely to exceed the cosmetic damage objectives, construction works will not proceed unless:

- A different construction method with lower source vibration levels is used, where feasible
- Attended vibration measurements are carried out at the start of the works to determine the risk of exceeding of the vibration objectives.

Certain receivers which are near the construction footprint are within the human comfort minimum working distance and occupants of affected buildings may be able to perceive vibration impacts at times when vibration generating equipment is in use. Where impacts will be perceptible, they will likely only be apparent for relatively short durations when equipment such as rock-breakers or vibratory rollers are in use nearby.

Detailed heritage assessments carried out for the Project as part of the EIS identified nine heritage items as being potentially impacted by vibration:

- McGarvie-Smith farm
- The Fleur radio telescope site
- Luddenham Road alignment
- Cecil Park school, post office and school church
- Exeter farm archaeological site

- South Kemps and Badgerys Creek confluence weirs scenic landscape
- McMasters field station
- Fleurs Aerodrome
- Upper Canal System.

Where these heritage structures are located within or near the project boundary, they may be susceptible to vibration impacts associated with construction equipment if they are operating within the safe working distance for heritage sensitive receivers.

Refer to the OCS for detail on the properties potentially subject to vibration criteria exceedances.

7.3.2 Construction ground-borne noise

Construction works can cause ground-borne noise impacts in nearby buildings when vibration generating equipment is in use. The majority of receivers are sufficiently distant from the works for ground-borne noise impacts on be minimal. Where residential receivers are located near construction works, airborne noise levels will typically be dominant over the ground-borne component.

8 Environmental control measures

A range of environmental requirements and management measures are identified in the Environmental Assessment Documentation, the CoA and relevant TfNSW documents. Specific measures and requirements to address noise and vibration impacts are outlined in Table 8-1.

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

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
NV1	All employees, contractors and subcontractors are to receive a Project induction prior to commencing work on site. The induction will include: • Existence and requirements of this NVMP • Relevant legislation and guidelines • Normal construction hours and exemptions • The process for seeking approval for out-of-hours works, including consultation • Location of noise sensitive areas • Complaints reporting and recording • How to implement noise and vibration management measures • Specific responsibilities to minimise impacts on the community and built environment from noise and vibration associated with the works.	Construction	Construction Contractor's ESR	✓	✓	✓	Standard industry practice	Induction records
NV2	Training will be provided to relevant Project personnel, including relevant subcontractors, on noise and vibration requirements from this Plan, toolboxes or targeted training	Prior to Construction Construction	Construction Contractor's ESR	✓	✓	✓	Standard industry practice G36	Training records Toolbox talk sign on sheets
NV3	No swearing or unnecessary shouting or loud stereos / radios on site. Dropping of materials from height, throwing of metal items and slamming of doors will also be avoided	Construction	Construction Contractor Foreman / Site Supervisor	✓	✓	✓	Standard industry practice	Site inspection records Toolbox talks

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
NV4	No blasting will be undertaken.	Construction	Construction Contractor Foreman / Site Supervisor	✓	✓	✓	NSW CoA E49	Site inspection records Toolbox talks
NV5	A noise screening assessment will be carried out for ancillary facilities with the potential to involve high noise generating activities. Should OOHW be required, an NVIS would be developed.	Prior to construction	Construction Contractor's ESR	✓	✓	✓	REMM NV03	Noise modelling outputs
NV6	A Construction Noise and Vibration Monitoring Program will be developed and implemented.	Prior to construction	Construction Contractor's ESR	✓	✓	✓	NSW CoA C11(a) NSW CoA C14	Appendix B Monitoring records
NV7	Monitoring will be carried out at the start of high noise and vibration activities (such as piling, rock-breaking, vibratory rolling and concrete sawing) to confirm that actual noise and vibration levels are consistent with the noise and vibration impact predictions.	Construction	Construction Contractor's ESR	✓	✓	✓	REMM NV04	Monitoring records
NV8	Where monitoring identifies higher levels of noise and vibration compared to predicted levels, or where mitigation is shown to be ineffective against measured noise and vibration levels, additional mitigation measures will be identified and implemented to appropriately manage impacts where feasible and reasonable.	Construction	Construction Contractor Construction Manager Construction Contractor's ESR	✓	✓	✓	REMM NV04	Monitoring records Site inspection records

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
NV9	In-situ monitoring will be carried out to confirm the vibration levels and assess the impact of vibration. Where the monitoring identifies exceedances in the relevant criteria, or where impacts are identified, additional mitigation measures will be identified and implemented to appropriately manage impacts.	Prior to Construction	Public Liaison Officer (PLO) Construction Contractor Construction Manager	✓	✓	✓	REMM NV10	Consultation records Construction documentation
NV10	All construction plant and equipment used on site will be fitted with properly maintained noise suppression devices in accordance with the manufacturer's specifications	Construction	Construction Contractor Foreman / Site Supervisor	✓	✓	✓	G36	Plant inspection records
NV11	All construction plant and equipment used on the site will be maintained in an efficient condition, in accordance with the manufacturers' specification. If a piece of plant or equipment is found to exceed the noise levels included in modelling, the following will occur: • If available and appropriate, a quieter piece of plant or equipment will be utilised in place of the offending plant / equipment; • On-site mitigation (e.g. noise blankets) will be reviewed; and /or • The noise assessment will be repeated with the accurate noise level of the plant / equipment.	Construction	Construction Contractor Foreman / Site Supervisor	✓	✓	✓	G36	Plant inspection records Site inspection records

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
NV12	All construction plant and equipment used on the site will be operated in a proper and efficient manner.	Construction	Construction Contractor Foreman / Site Supervisor	✓	✓	✓	G36	Site inspection records Safety inspection records EWMS Toolbox talk record
NV13	Non-tonal (white noise) movement alarms will be used in place of tonal reversing alarms for Contractor owned plant and subcontract plant used at night or during the day.	Construction	Construction Contractor Foreman / Site Supervisor	✓	✓	✓	G36	Site inspection records EWMS Toolbox talk record
NV14	Plant and machinery will be switched off when it is not in use for more than 15 minutes	Construction	Construction Contractor Foreman / Site Supervisor	✓	✓	✓	G36	Induction records EWMS Pre-start briefing
NV15	Stationary noise sources will be enclosed or shielded where reasonable and feasible. This will apply to plant and equipment such as generators, stationary concrete cutters, stationary asphalt corers, stationary vacuum trucks, and stationary jack hammers	Construction	Construction Contractor Foreman / Site Supervisor	✓	✓	✓	Standard industry practice	Site inspection records EWMS
NV16	Additional temporary screening or enclosures will be considered for plant and equipment where additional measures are required to meet relevant NMLs, or where plant and equipment is known to exceed the NMLs	Construction	Construction Contractor Foreman / Site Supervisor	✓	✓	✓	Standard industry practice	Site inspection records EWMS

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
NV17	Construction vehicle movements (both on and offsite) will be managed to minimise noise impacts including (but not be limited to): • Establishment and use of internal haul routes, or existing major roads where this is not feasible • Restriction of heavy vehicle movements to standard construction hours • Locating traffic marshalling areas away from residences to minimise noise impacts from idling vehicles • Instructing workers on the operation of heavy vehicles entering and exiting the site to minimise noise.	Prior to Construction During Construction	Construction Contractor Construction Manager Construction Contractor Foreman / Site Supervisor	✓	✓	✓	REMM NV12	Site inspections Construction TMP
NV18	Where reasonable and feasible, receivers identified as requiring at-property treatment for operational noise mitigation will be identified and offered treatment before construction activities begin that are likely to impact them.	Prior to Construction	TfNSW	✓	✓	✓	REMM NV05	Consultation records OOHW Protocol
NV19	Consideration will be given to at-property noise mitigation at receivers impacted by ancillary facilities subject to the results of the noise assessments	During construction	Construction Contractor Construction Manager	✓	✓	✓	REMM NV03	Monitoring records Consultation records Construction documentation

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
NV20	Appropriate safe working distances will be implemented to avoid impacts on structures and sensitive receivers during activities that generate vibrations.	Construction	Construction Contractor Construction Manager Construction Contractor's ESR	✓	✓	✓	REMM NV06	Site inspection records
NV21	The use of alternatives to vibration generating equipment will be considered where vibration impacts are predicted.	Construction	Construction Contractor Construction Manager Construction Contractor's ESR	✓	✓	✓	REMM NV07	Construction documentation
NV22	Where works are within the minimum working distances and considered likely to exceed the cosmetic damage objectives, construction works will not proceed unless: • A different construction method with lower source vibration levels is used, where feasible • Attended vibration measurements are carried out at the start of the works to determine the risk of exceeding the vibration objectives.	Construction	Construction Contractor Construction Manager Construction Contractor's ESR	✓	✓	✓	REMM NV08	Construction documentation

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
NV23	Properties at risk of exceeding the screening criteria for cosmetic damage will be notified before vibrating works. 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	Construction	PLO Construction Contractor's ES	✓	✓	✓	NSW CoA E41	Consultation records
NV24	Vibration testing will be carried out before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic and structural damage. In the event that the vibration testing and monitoring shows that the preferred values for vibration are likely to be exceeded, the construction methodology will be reviewed and, if necessary, amended and/or implement additional mitigation measures implemented.	Construction	Construction Contractor Construction Manager Construction Contractor's ESR	✓	✓	✓	NSW CoA E42	Monitoring results Construction documentation
NV25	Advice from a heritage specialist will be implemented on methods and locations for installing equipment used for vibration, movement and noise monitoring at heritage-listed structures prior to installing such equipment.	Construction	Construction Contractor's ESR	✓	✓	✓	NSW CoA E43	Heritage specialists report
NV26	Advice from a suitably qualified and experienced built heritage specialist will be obtained and implemented before conducting at-property treatment on heritage items.	Construction	Construction Contractor's ESR	✓	✓	✓	NSW CoA E44	Heritage specialists report

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
NV27	Prior to the commencement of vibration generating works that could impact on the structure/asset (including but not limited to utility assets and heritage items and building/structures of heritage significance), a suitably qualified person will complete a Pre-Construction Survey to the owners of surface and sub-surface structures and other relevant assets identified at risk from vibration (where the offer is accepted).	Building inspector Landowner list	Construction Contractor's ESR	✓	✓	✓	NSW CoA E76 REMM NV09	Pre-Construction Survey Report
NV28	After completion of the works, post-condition surveys of all structures/assets (including but not limited to utility assets, heritage items and building/structures of heritage significance) for which Pre-Construction Condition Surveys were undertaken, will be completed by a suitably qualified person. The results of the surveys will be documented in a Post-Construction Condition Survey for each building surveyed. The Post-Construction Condition Survey Reports will be provided to the owner of the structures/assets surveyed, and no later than four (4) months following the completion of construction activities that have the potential to impact on the structure / asset.	Building inspector Landowner list	Construction Contractor's ESR	✓	✓	✓	NSW CoA E77	Post-Construction Survey Report
NV29	Surveys will be carried out to confirm the existing condition of the WaterNSW Upper Canal System and Jemena high pressure gas pipelines to determine appropriate vibration criteria.	Prior to construction	PLO Construction Contractor	✓	✓	✓	REMM NV10	Consultation records Construction documentation

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
	A vibration criterion of a peak particle velocity (PPV) will be determined in consultation with the relevant utility/service providers, including WaterNSW.		Construction Manager					
NV30	The following structures have the potential to be within the safe working distances for sensitive structures (Group 3 from DIN 4150): • Item 1: McGarvie Smith Farm • Item 2: Fleurs Radio Telescope Site • Item 4: Upper Canal System • Item 6: McMaster Field Station • Item 7: Fleurs Aerodrome. A detailed survey will be completed to determine the potential for vibration impacts and to define appropriate criteria for each heritage item. Vibration monitoring will be carried out when vibration intensive tasks are occurring within the minimum working distances to heritage structures. Where the monitoring identifies exceedances in the relevant criteria, or where impacts are identified, additional mitigation measures will be identified and implemented to appropriately manage impacts.	Prior to construction	PLO Construction Contractor's ESR	✓	✓	✓	REMM NV11	Consultation records Monitoring records
NV31	At-property treatment does not preclude the application of other noise and vibration mitigation and management measures including temporary accommodation to be implemented to manage construction noise.	Construction	PLO Construction Contractor	✓	✓	✓	NSW CoA E56	Consultation records Construction documentation

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
			Construction Manager					
NV32	Measures to minimise and manage construction fatigue will be investigated through the planning of construction staging.	Prior to construction	Construction Contractor Construction Manager Construction Contractor's ESR	✓	✓	✓	REMM NV02	Construction documentation
NV33	Work, including those by third-parties, will be coordinated to ensure respite periods are provided.	Construction	Construction Contractor Construction Manager Construction Contractor's ESR	✓	✓	✓	NSW CoA E45	Consultation records
NV34	Noise and vibration generating work in the vicinity of potentially-affected community, religious, educational institutions, noise and vibration-sensitive businesses and critical working areas resulting in noise levels above the NMLs will not be timetabled within sensitive periods, unless offers of other reasonable arrangements have been made to the affected institutions. The offers of other reasonable arrangements will be implemented at no cost to the affected institution.	Construction	Construction Contractor Construction Manager Construction Contractor's ESR	✓	✓	✓	NSW CoA E39	Construction documentation
NV35	Construction works will be scheduled in consultation with managers of other nearby	Construction	PLO	✓	✓	✓	REMM NV13	Consultation records

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
	projects that are likely to result in a cumulative impacts. This will include the coordination of respite between the various construction projects where receivers are likely to experience concurrent construction impacts where feasible. Coordination between project teams will be carried out throughout construction.		Construction Contractor's ESR Construction Contractor Construction Manager				CoA E45	Construction documentation Interface meeting minutes
NV36	NVIS will be prepared for any work that may exceed the NMLs and vibration criteria specified at any residence outside the construction hours, or where receivers will be highly noise affected.	Construction	Construction Contractor's ESR	✓	✓	✓	NSW CoA E40	NVIS
NV37	Crushing and grinding will only be undertaken during the following hours: (a) 7:00 am to 6:00 pm Mondays to Fridays, inclusive; (b) 8:00 am to 6:00 pm Saturdays; and (c) at no time on Sundays or public holidays. Unless otherwise approved by the Planning Secretary, through an EPL or it meets the requirements of safety and emergencies.	Construction	Construction Contractor's ESR	✓	✓	✓	NSW CoA E48	Site inspections records
NV38	Respite periods or temporary alternative accommodation, will be made available to residents affected by out-of-hours Work where the construction noise levels between: (a) 10:00 pm and 7:00 am, Monday to Friday;	Construction	PLO Construction Contractor's ESR	✓	✓	✓	NSW CoA E46	Consultation records

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
	(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 dB(A) (LAeq(15 min)), whichever is the lesser and the impact is planned to occur for more than two nights over a seven day rolling period.							
NV39	Appropriate respite periods for out-of-hours work will be identified in consultation with the community at each affected location on a regular basis.	Construction	PLO Construction Contractor's ESR	✓	✓	✓	NSW CoA E47	Consultation records
NV40	Select the smallest rock hammers capable of efficiently completing the work, where feasible and reasonable.	Construction	Construction Contractor Construction Manager	✓	✓	✓	Standard industry practice	Site inspections records
NV41	The Construction Contractor will adhere to the Upper Canal Pheasants Nest to Prospect Reservoir Conservation Management Plan (NSW Public Works Governments Architect's Office, 2016) and Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines (WaterNSW, 2020).	Construction	Construction Contractor Construction Manager	✓	✓	✓	NSW CoA E81	Site inspections records
NV42	Construction will not destroy, modify or otherwise cause direct or indirect damage to the	Construction	Construction Contractor	✓	✓	✓	NSW CoA E82	Site inspections records

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
	Upper Canal System, including the Cecil Hills Tunnel, and Tunnel Shafts 3 and 4.		Construction Manager					
NV43	Boundary screening will be erected around all construction ancillary facilities that are adjacent to sensitive receivers.	Construction	Construction Contractor Construction Manager	✓	✓	✓	NSW CoA A21	Site inspections records
Operational noise treatment								
NV44	An Operational Noise Review will be prepared for all Project stages to assess and confirm mitigation measures. Operational noise mitigation measures including at-property treatment will be implemented where the NML is likely to be exceeded and will occur within six months of the commencement of construction in the vicinity of the impacted residences, unless otherwise agreed with the Planning Secretary.	ONR must be submitted to DPIE prior to implementing at-property treatment Within first six months of construction commencement in the vicinity of the impacted residences	TfNSW	✓	✓	✓	NSW CoA E52 NSW CoA E53	Section 7.2.4 Consultation records Operational Noise Review
NV45	If the ONR for M12 East is not completed within the six months of commencement of construction as per NSW CoA E53, the at-property operational noise mitigation measures will be consistent with the measures and the properties identified in Section 7.2 of Appendix G in the M12 Motorway Amendment Report.	Prior to construction and within first six months of commencement of construction	TfNSW			✓	NSW CoA E54	Section 7.2.4 Consultation records Operational Noise Review

ID	Management Measure	When to implement	Responsibility for Implementation	Applicability			Reference or source	Evidence of implementation
				M12 West	M12 Central	M12 East		
NV46	All requests to the Planning Secretary where the NML is likely to be exceeded at receivers will be accompanied with a report justifying why operational noise mitigation measures required will not be implemented within the six months. This report will include details of the temporary measures to be implemented to reduce construction noise impacts and until such time the operational noise mitigation measures will be implemented. All temporary measures will be implemented within six months of the commencement of construction in the vicinity of the impacted receivers. The report will be submitted to the Planning Secretary before the commencement of construction which will affect the identified residences.	Prior to construction and within first six months of commencement in the vicinity of the impacted residences	TfNSW	✓	✓	✓	NSW CoA E55	Section 7.2.4 Consultation records Operational Noise Review

9 Compliance management

9.1 Roles and responsibilities

The Project's organisational structure and overall roles and responsibilities are outlined in Section 5.1 of the OCEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 8 of this NVMP.

9.2 Communication

An OCS has been prepared in accordance with the requirements of NSW CoA B1 and B2 to document the approach to stakeholder and community communications for the Project. The OCS identifies opportunities and tools for providing information and consulting with the community and stakeholders during the construction of the Project. The Construction Contractors will support the delivery of the OCS.

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

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

For further detail on the measures implemented for advising the community in advance of upcoming work, including upcoming out-of-hours work, refer to the OCS.

Further detail about the OCS is provided in Section 5.5 of the OCEMP. Community consultation methods relating to OOHW are contained in the OOHW Protocol (Appendix C).

9.3 Complaints management

In accordance with NSW CoA B6, TfNSW will develop a Complaints Management System (CMS) to document the overall approach to complaints management for the Project.

The Construction Contractor will have the following information available to facilitate complaints and will be accessible to the community:

- 24-hour telephone number for the registration of complaints and enquiries
- Postal address to which written complaints and enquires may be sent
- Email address to which electronic complaints and enquiries may be transmitted; and
- Mediation system for complaints unable to be resolved.

The Construction Contractors will adopt the requirements of the CMS, including reporting requirements. The CMS will include a Complaints Register which will record the details of all complaints relating to the Project. The CMS includes a Complaints Register in accordance with NSW CoA B8, which will record the details of all complaints relating to the Project including the following as a minimum:

- Date and time of the complaint
- Method by which the complaint was made
- Any personal details of the stakeholder
- Number of people affected in relation to a complaint
- Nature of the complaint
- Action taken in relation to the complaint, means by which the complaint was addressed and any follow up
- Whether resolution was reached, with or without mediation
- If no action taken, reasons why
- The status of resolution of the complaint.

All complaints will be recorded in the Complaints Register (by the Communications Manager) within 24 hours. The Complaints Register will be provided to the ER on the day complaints are received. The Complaints Register will be provided to the Planning Secretary on request in accordance with NSW CoA B9. The Construction Contractor is not required to submit a report for any reporting period during which no complaints have been received.

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

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

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

9.4 Training

To ensure that this Plan is effectively implemented, all site personnel (including sub-contractors) will undergo site induction training that includes construction noise and vibration management issues prior to construction commencing. The induction training will address element related to noise and vibration management including:

- Existence and requirements of this overarching CNVMP, the Construction Contractor's CNVMP and all plans and procedures prepared under the CNVMPs
- Relevant legislation, regulations and EPL conditions (where applicable)
- Incident response, management and reporting
- Standard construction hours
- The process for seeking approval for out of hours works, including consultation
- Noise management measures during night works
- Location of noise sensitive areas
- Complaints response and reporting
- General noise and vibration management measures
- Specific responsibilities to minimise impacts on the community and built environment from noise and vibration associated with the works.

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

The ER will review and approve the induction and training program prior to the commencement of construction and monitor implementation.

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

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

9.5 Inspection and monitoring

9.5.1 Monitoring

NSW CoA C11 requires that Construction Monitoring Programs to be prepared in consultation with the relevant government agencies identified for each to compare actual performance of construction against the performance predicted to inform management measures. This includes the development of a Construction Noise and Vibration Monitoring Program. The Construction Noise and Vibration Monitoring Program has been prepared in accordance with NSW CoA C11, C13 and C14 and is provided in Appendix B.

Monitoring will include, but not be limited to:

- Monthly noise monitoring at sensitive receivers
- Spot checks of noise intensive plant
- Attended vibration monitoring
- Continuous vibration monitoring
- Dilapidation surveys of buildings and structures.

Further details of monitoring requirements for the Project are presented in Section 7.2 of the OCEMP.

9.5.2 Inspections

Regular inspections of sensitive areas and activities will occur for the duration of the Project. The Construction Contractor's ESR will carry out weekly site inspections. TfNSW will also conduct independent inspections to confirm the Construction Contractors' compliance with noise and vibration management requirements.

Weekly and other routine inspections by the TfNSW ESM (or delegate), Environmental Review Group (ERG) representatives and the ER will occur throughout construction. Detail on the nature and frequency of these inspections are documented in Section 7.1 of the OCEMP.

9.6 Incident planning and response

Responses to incidents will be undertaken as described in Section 6 of the OCEMP and in accordance with the Environmental Incident Classification and Reporting Procedure (refer to Appendix A7 of the OCEMP).

9.7 Auditing

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

Audit requirements are detailed in Section 7.4 of the OCEMP.

9.8 Non-conformance

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

Where a non-conformance is detected or monitoring results directly attributable to the Project exceed the target set in the Construction Noise and Vibration Monitoring Program, the process described in the Monitoring Program and Section 7.3 of the OCEMP will be implemented. The Construction Contractor's Quality Plan will describe the process for managing non-conforming work practices and initiating corrective / preventative actions or system improvements in accordance with the process outlined in Section 7.3 of the OCEMP.

9.9 Reporting and identified records

Reporting requirements and responsibilities are documented in Section 7.3 of the OCEMP and Section 6.1 and 6.2 of Appendix B of this CNVMP. In summary, the Construction Contractors will prepare monthly environmental reports and quarterly construction monitoring reports.

The Construction Contractors will be required to maintain accurate records substantiating all construction activities associated with the Project or relevant to the conditions of approval, including measures taken to implement this Plan. Records will be made available to the DPIE and DAWE upon request, within the timeframe nominated in the request.

9.9.1 NVIS

Noise and Vibration Impact Statements (NVIS) will be prepared for any work that may exceed the NMLs and vibration criteria specified in NSW CoA E38 at any residence outside the construction work hours, or where receivers will be highly noise affected.

The NVIS will outline mitigation measures identified through consultation with affected sensitive land user(s). The mitigation measures will be implemented for the duration of the work. A copy of the NVIS will be provided to the ER prior to the commencement of the associated work, and may be provided to the Planning Secretary for information.

10 Review and improvement

10.1 Continuous improvement

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

The continuous improvement process will be designed to:

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

The Construction Contractors will be responsible for ensuring Project environmental risks are identified and included in the risk register and appropriate mitigation measures implemented throughout the construction of the Project, as part of the continuous improvement process.

The Construction Contractors will hold environmental risk assessment workshops prior to the commencement of construction to identify high noise and vibration risk activities and representative sensitive receivers that will require monitoring during construction, as outlined in the Construction Noise and Vibration Monitoring Program (refer to Appendix B).

The process for continuous identification and analysis of new risks associated with noise and vibration that may arise during construction will be facilitated by:

- Construction noise and vibration monitoring program(as outlined in Appendix B)
- Regular inspections of sensitive areas and activities and observations by site personnel (refer to Section 9.5.2)
- Revision of this Plan and the Construction Contractor's CNVMP and/or noise and vibration management measures as required in response to community complaints or requests from regulatory agencies, the ER or the Planning Secretary.

This continuous risk analysis approach will ensure prompt identification of new risks and ensure efficient mitigation through implementation of appropriate management measures, as outlined in Section 8.

10.2 Update and amendment

The processes described in Section 7.7 of the OCEMP may result in the need to update or revise this Plan. This will occur as needed.

Any revisions to this Plan will be in accordance with the process outlined in Section 7.7 of the OCEMP. A copy of the updated Plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure.

The review and document control processes for this CNVMP is described in Section 1.12 and 7.6 of the OCEMP.

Appendix A

Consultation Correspondence

M12 Motorway

December 2021

1 Introduction

As detailed in Section 1.5 of the CNVMP, in accordance with NSW CoA C4(b), consultation has been undertaken with the following government agencies and stakeholders during the preparation of the CNVMP:

- WaterNSW
- Sydney Water
- Jemena
- Penrith City Council
- Liverpool City Council
- Fairfield City Council

A log of the dates of engagement or attempted engagement with the parties identified above has been included in Section 1.5.1 of the CNVMP in accordance with NSW CoA A5(b). Section 2 details the evidence of engagement with each party and responses.

2 Government Agency and Stakeholder Responses

This section provides consultation documentation undertaken during the consultation period with parties including:

- Engagement with parties identified in NSW CoA C4(b) that occurred prior to the submission of the CNVMP for approval by the Planning Secretary as required by NSW CoA A5(a)
- A copy of the responses provided during consultation with the required parties
- A summary of the issues raised during consultation and how they have been addressed as required by NSW CoA A5(d). A description of the outstanding issues raised during consultation and why they have not been addressed has also been included where required as per NSW CoA A5(e).

WaterNSW

This section details the engagement and response from WaterNSW regarding the CNVMP prior to submission for approval and a summary of how the issues have been addressed.

Section Reference	Comment	TfNSW Response	Section Amended
Table 8-1	WaterNSW agree that the management measures contained within, should mitigate any noise or vibration impacts on the WaterNSW Upper Canal.	Noted.	N/A
Section 1.5	WaterNSW requests to be consulted on any site specific construction noise and vibration monitoring program as it relates to construction works directly above and adjacent to the Upper Canal Corridor.	In accordance with NSW CoA E42, WaterNSW will be consulted with by the Construction Contractor in relation to vibration monitoring for the Upper Canal. This has been clarified within Section 1.5.3 and is identified in Section 8 (NV29) "*A vibration criterion of a peak particle velocity (PPV) will be determined in consultation with the relevant utility/service providers, including WaterNSW*" and contained in the Table 5-2 of the overarching construction noise and vibration monitoring program (Appendix B). The overarching monitoring procedure for the Upper Canal as detailed in Appendix B, includes: • Identify minimum safe working distances by completing a desktop assessment of planned works • Undertake attended monitoring at the commencement of works to verify and establish safe working distances • Determine site-specific requirements, set up exclusion zones as required and toolbox the requirements to relevant personnel • In the event that the vibration testing and attended vibration 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.	Section 1.5.2 Section 1.5.3

				Management Plan (Rev F) - draft for consultation		

Transmitted by: Suzette Graham, Transport for NSW

Attachments:
M12 - Feedback on Document Comments or Responses.xlsx(41KB)

From: Justine Clarke
To: Suzette Graham
Subject: WaterNSW response - M12 CEMP sub plans - Heritage & Noise and vibration
Date: Wednesday, 22 September 2021 12:52:59 PM
Attachments: image001.png
ARK M12 Motorway - Overarching Construction Cultural Heritage Management Plan (Rev F) For Review.msg
ARK M12 Motorway - Consultation on Construction Noise and Vibration Management Plan.msg
M12 - Feedback on Document Comments or Responses - Heritage CEMP - 22.09.21.xlsx
M12 - Feedback on Document Comments or Responses - Noise & Vibration CEMP - 22.09.21.xlsx

Hi Suzette

Please find attached WaterNSW's comments regarding the 2 CEMP sub plans submitted for WaterNSW comment with regard to the M12 project.

Comments on the CEMP Contamination will be provided by the due date.

If you have any questions please let me know.

Regards Justine

Justine Clarke
Catchment and Asset Protection Adviser

Please note: *I am currently working from home. I can be reached via email or 0457 535 955*

Level 14, 169 Macquarie Street
PO Box 398
Parramatta NSW 2150
[redacted]

Sydney Water

This section details the engagement and response from Sydney Water regarding the CNVMP prior to submission for approval and a summary of how the issues have been addressed.

Section Reference	Comment	TfNSW Response	Section Amended
Section 1.5.3, Table 8.1	When constructing near SWC asset, there is a need to undertake vibration assessment to identify impact and implement protection measures as necessary.	A range of vibration mitigation measures are contained in the CNVMP Table 8-1 in relation to the management of vibration impacts (i.e. NV7, NV8, NV9, NV20, NV21, NV22, NV27, NV28, NV40). In relation to Sydney Water assets, minimum working distances would be adhered to in the first instance (NV20). Where works are within the minimum working distances and considered likely to exceed the cosmetic damage objectives (NV22), construction works will not proceed unless: • A different construction method with lower source vibration levels is used, where feasible • Attended vibration measurements are carried out at the start of the works to determine the risk of exceeding the vibration objectives. In addition, both pre-construction survey (NV27) and post-construction survey (NV28) would be carried out where vibration generating works could impacts on the structure/asset. Detailed information regarding vibration criteria and safe working distances are included in Section 5.6 of the CNVMP.	N/A
General	The CNVMP makes specific reference to Water NSW and Jemena assets while SWC is included under utility service provider in general. Is it based on assessment that our assets will not be nearby or expected to have protection measures prior to M12 construction	Reference to Water NSW and Jemena assets are included in the CNVMP based upon wording of specific conditions from the EIS (i.e. Revised Environmental Management Measures NV10) and Conditions of Approval for the Project SSI 9364 (i.e. NSW CoA E42) Mitigation measures as identified in the above comment response outline measures relevant to the management of Sydney Water assets.	N/A

1	M12PPW-TFNSW-ALL-EN-PLN-000016	F.01	S3	M12 Motorway Construction Noise and Vibration Management Plan (Rev F) - draft for consultation	M12PPW	

Transmitted by: Suzette Graham, Transport for NSW

Attachments:
M12 - Feedback on Document Comments or Responses.xlsx(41KB)

From: Suzette Graham
To: "KANG, EUI"
Cc: BRUNET, LINDA; Daniel Farrugia; M12 Detailed Design
Subject: RE: [External] M12 Motorway - Consultation on Construction Noise and Vibration Management Plan
Date: Monday, 4 October 2021 8:35:00 PM
Attachments: ~WRD000.jpg
image001.jpg

Hi Eui,

Thank you for providing comments and sorry for not responding to your question sooner.
I believe the wording probably reflects that the WaterNSW and Jemena assets in proximity to the M12 alignment are major critical assets and have other specific conditions of approval relating to them.
For example the WaterNSW Upper Canal is also a State listed heritage item, so there are some particular considerations of this for the CNVMP.

Happy to discuss further.

Thanks,

Kind regards,
Suzette Graham
Environment and Sustainability Manager
Sydney Infrastructure Development | Safety, Environment and Regulation
[redacted]
Transport for NSW
27 Argyle Street, Parramatta NSW 2150

OFFICIAL

From: KANG, EUI [mailto [redacted]
Sent: Thursday, 23 September 2021 12:10 PM
To: M12 Teambinder [redacted]
Subject: RE: [External] M12 Motorway - Consultation on Construction Noise and Vibration Management Plan

Hi Suzette,

Please find attached our comment on CNVMP.
It's one comment which we want to flag as the CNVMP makes specific reference to Water NSW and Jemena assets while SWC is included under utility service provider in general.
Is it based on assessment that our assets will not be nearby or expected to have protection

measures prior to M12 construction?

Regards
Eui

From: [redacted]
Sent: Thursday, 9 September 2021 1:15 PM
To: KANG, EUI [redacted]
Subject: [External] M12 Motorway - Consultation on Construction Noise and Vibration Management Plan

> **CAUTION:** This email originated from outside the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Document Transmittal

Transmittal No: M12PPW-TFNSW-TX-000441

Date: 09 September 2021 01:14 PM

Reason for Issue: Issued For Review

Subject: M12 Motorway - Consultation on Construction Noise and Vibration Management Plan

Contract No: M12PPW - M12 - Project Wide

Message:

Dear Eui and Linda,

As you are aware, Transport for NSW (TfNSW) is delivering the M12 Motorway Project between the M7 Motorway and The Northern Road.

The M12 Motorway is to be open by 2026 prior to the opening of the Western Sydney International Airport.

An overarching Construction Environmental Management Plan has been drafted and is ready for stakeholder feedback.

As required by Condition of Approval (CoA) C4(b) in the M12 Motorway Infrastructure Approval (23 April 2021), TfNSW is required to consult with Sydney Water in relation to the following construction environmental management sub-plans:

- Construction Noise and Vibration Management Sub-Plan

Please provide your comments using the attached MS Excel spreadsheet by **23/09/2021.**

If you have any questions in relation to this email, please contact me on the details below.

Kind regards,

Suzette Graham
Environment and Sustainability Manager

Sydney Infrastructure Development | Safety, Environment and Regulation

[redacted]
Transport for NSW
27 Argyle Street, Parramatta NSW 2150

OFFICIAL

Please submit your comments by 23 September 2021

Transmitted to:

Company	Name
Sydney Water	Eui Kang
Sydney Water	Linda Brunet

Transmitted cc:

Company	Name
Transport for NSW	Suzette Graham
Transport for NSW	Christine Stuart
Transport for NSW	Daniel Farrugia

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Click on Document Nos to download them individually.

Item	Document No	Rev	Sts	Title	Contract No	Design Package No
1	M12PPW-TFNSW-ALL-EN-PLN-000016	F.01	S3	M12 Motorway Construction Noise and Vibration Management Plan (Rev F) - draft for	M12PPW	

				consultation		

Transmitted by: Suzette Graham, Transport for NSW

TeamBinder Transmittal Reference: {61FE80D3-D50B-4D3D-ACA4-D0F3E10B1E6F}

Jemena

This section details the engagement and response from Jemena regarding the CNVMP prior to submission for approval and a summary of how the issues have been addressed.

Section Reference	Comment	TfNSW Response	Section Amended
Section 5.6	The vibration limit for the Jemena main is 20mm/s for the construction and when the main is operational. The third party (Contractor) needs to set a high alarm at 15mm/s. Please see attached guideline document with ref. to vibration limits at para 4.1.7.	In accordance with the guideline provided by Jemena, the following text has been included into the CNVMP (Section 5.6.2): *Jemena guideline 'Designing, constructing and operating assets near Jemena gas pipelines' (GAS-960-GL-PL-001) identifies a maximum level of vibration of 20 mm/second which is to be measured at the nearest surface of the buried pipeline. The Construction Contractor will set a trigger alert where vibration monitoring identifies vibration at 15mm/s. At this point, construction activities will cease to minimise impact on Jemena assets. Alternative construction methods will be investigated to ensure vibration limits do not exceed 20 mm/second.* Measure NV22 also identifies that where works are within the minimum working distances and considered likely to exceed the cosmetic damage objectives, construction works will not proceed unless: • A different construction method with lower source vibration levels is used, where feasible • Attended vibration measurements are carried out at the start of the works to determine the risk of exceeding the vibration objectives.	Section 5.6.2 Appendix B

Penrith City Council

This section details the engagement and response from Penrith City Council regarding the CNVMP prior to submission for approval and a summary of how the issues have been addressed.

Section Reference	Comment	TfNSW Response	Section Amended
N/A	No comment received.	N/A	N/A

Item	Document No	Rev	Sts	Title	Contract No	Design Package No
1	M12PPW-TFNSW-ALL-EN-PLN-000016	F.01	S3	M12 Motorway Construction Noise and Vibration Management Plan (Rev F) - draft for consultation	M12PPW	

Transmitted by: Suzette Graham, Transport for NSW

Attachments:
M12 - Feedback on Document Comments or Responses.xlsx(41KB)

From:	John Martin
To:	Daniel Farrugia; Dario Stella
Cc:	Suzette Graham; Andrew Walker
Subject:	RE: M12 Overarching Noise and Vibration Management Plan
Date:	Thursday, 7 October 2021 10:43:10 AM
Attachments:	image001.jpg image002.png image003.gif GAS-960-GL-PL-001 Guideline - Designing Constructing and Operating Assets near Jemena Gas Pipelines.pdf

Hi Daniel,

Please see attached guideline document with ref. to vibration limits at para 4.1.7.

Hi Dario, FYI

Regards

John

John Martin
Engineering Support Manager – Gas Distribution
Jemena
[redacted]

From: Daniel Farrugia [redacted]
Sent: Thursday, 7 October 2021 10:25 AM
To: John Martin [redacted]
Cc: Suzette Graham [redacted]
Subject: FW: M12 Overarching Noise and Vibration Management Plan

Hi John,

I sent the below email to Andrew Walker and received an out of office reply with you as the contract.
Could you please provide some input on the vibration limits for these pipelines.

Regards,
Daniel Farrugia
Project Development Manager
Infrastructure and Place | Western Sydney Project Office

[redacted]

OFFICAL

From: Daniel Farrugia
Sent: Thursday, 7 October 2021 9:01 AM
To: Reza Liravi [redacted]; Jawad Ahmad [redacted]
Cc: Andrew Walker [redacted] Suzette Graham [redacted]>; Foster Walker [redacted] Rikard Smit [redacted]>; Kurt Bridde [redacted]; Shubhangi Rampure [redacted]
Subject: RE: M12 Overarching Noise and Vibration Management Plan

Hi Reza / Jawad,

Could you please confirm if this vibration limit is for EGP, JGN and secondary mains?
If there is a different limit for each main could you please confirm the limit for each.

Regards,
Daniel Farrugia
Project Development Manager
Infrastructure and Place | Western Sydney Project Office

Transport for NSW
Lvl 7, 27 Argyle Street, Parramatta 2750
[redacted]

OFFICAL

From: Reza Liravi [redacted]
Sent: Wednesday, 6 October 2021 2:53 PM
To: Suzette Graham [redacted]
Cc: Andrew Walker [redacted]>; Daniel Farrugia [redacted]
Subject: RE: M12 Overarching Noise and Vibration Management Plan

Hi Suzette,

The vibration limit for the Jemena main is 20mm/s for the construction and when the main is operational. The third party (Contractor) needs to set a high alarm at 15mm/s.

Regards

Reza Liravi
FEED Project Manager
Jemena
[redacted]

From: Suzette Graham [redacted]>
Sent: Wednesday, 6 October 2021 2:44 PM
To: Reza Lirav [redacted]
Cc: Andrew Walker [redacted]; Daniel Farrugia [redacted]
Subject: M12 Overarching Noise and Vibration Management Plan

Hi Reza,

Good to talk to you just now about the Jemena comments on the M12 Overarching Noise and vibration Management Plan.
If you could please confirm the comments via email, that would be great.

Thanks,

Kind regards,
Suzette Graham
Environment and Sustainability Manager
Sydney Infrastructure Development | Safety, Environment and Regulation
[redacted]
Transport for NSW
27 Argyle Street, Parramatta NSW 2150

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				Management Plan (Rev F) - draft for consultation		

Transmitted by: Suzette Graham, Transport for NSW

Attachments:
M12 - Feedback on Document Comments or Responses.xlsx(41KB)

From: Suzette Graham
To: Ari Fernando
Cc: M12 Detailed Design
Subject: M12 Motorway Overarching Construction Management Plans

---

Hi Ari,

Just getting in touch again regarding the following plans that have been sent to Penrith City Council for review and comment in August and September 2021:

- Construction Flora and Fauna Management Plan
- Construction Cultural Heritage Management Plan
- Construction Noise and Vibration Management Plan
- Construction Contaminated Land Management Plan
- M12 Non-Aboriginal heritage interpretation plan

To date TfNSW hasn't received feedback from PCC on these plans.
I wanted to let you know that TfNSW will now be moving onto finalising the plans to address comments received from other stakeholders and they will then be sent to DPIE for approval.

Please feel free to get in touch with me if you wish to discuss.

Thanks,

Kind regards,
Suzette Graham
Environment and Sustainability Manager
Sydney Infrastructure Development | Safety, Environment and Regulation
[redacted]
Transport for NSW
27 Argyle Street, Parramatta NSW 2150

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				Management Plan (Rev F) - draft for consultation		

Transmitted by: Suzette Graham, Transport for NSW

Attachments:
M12 - Feedback on Document Comments or Responses.xlsx(41KB)

Liverpool City Council

This section details the engagement and response from Liverpool City Council regarding the CNVMP prior to submission for approval and a summary of how the issues have been addressed.

Section Reference	Comment	TfNSW Response	Section Amended
N/A	No comment received.	N/A	N/A

Fairfield City Council

This section details the engagement and response from Fairfield City Council regarding the CCHMP prior to submission for approval and a summary of how the issues have been addressed.

Section Reference	Comment	TfNSW Response	Section Amended
Section 3.1.1	Within Section 3.1.1 Legislation of the Construction Noise and Vibration Sub-plan (CNVMSP), the plan makes reference to a regulation that is no longer in force this being the Protection of the Environment Operations (Noise Control) Regulation 2008. The CNVMSP should make reference to current regulation, this being Protection of the Environment Operations (Noise Control) Regulation 2017.	This reference has been amended to correctly state '*Protection of the Environment Operations (Noise Control) Regulation 2017*.'	Section 3.1.1
Section 4, Figure 4-1	Within Section 4 Existing Environment of the CNVMSP, it has been stated that "As referenced in the Amendment Report, it is considered that the baseline data obtained during the EIS is sufficiently comprehensive and that no further baseline data will be required to be collected by the Construction Contractors". This referring to the background noise levels collected from the Nosie Catchment Areas (NCA). When examining Figure 4-1 titled, Location of noise catchment areas, noise and vibration sensitive receivers and noise monitoring locations, no ambient background noise monitoring was undertaken in NCA01. NCA01 is also not labelled on Figure 4-1, however from the description of the area in the CNVMSP, it is assumed that NCA01 is located east of the M7 near the suburb of Abbotsbury. The noise levels obtained from location LO1 which is located in NCA02 have been used to establish the Noise Management Levels for NCAO1.	Figure 4-1 has been amended to identify NCA01. Section 2 of the M12 Motorway Amendment Report Appendix G Noise and Vibration updated technical report (October 2020) outlines how the ambient noise surveys were conducted and analysed (i.e. adopted from the EIS). As noted in the EIS, the measured existing noise levels are representative of receivers that would most likely be affected by the construction and operation of the Project in each NCA. Where NCAs are likely to have a similar noise environment and noise levels, it is not necessary to measure noise levels in every NCA provided representative noise monitoring is carried out in similar location. L01 was identified in the EIS to be representative of sensitive receivers near the M7 motorway	Figure 4-1, Section 4 Appendix B

Section Reference	Comment	TfNSW Response	Section Amended
	Concerns are raised that the Rated Background Level (RBL) obtained for NCA02 may not accurately reflect the RBL in NCA01. Therefore it is recommended that further background noise monitoring be undertaken in areas where the noise monitoring locations and collected background noise levels may not accurately reflect the RBL of the NCA. This also applies to NCA04, being such a long catchment area which runs along the project corridor. One would assume that the RBL obtained from noise monitoring which occurred at one end (in Kemps Creek) of the NCA would be different to the background noise level at the other end of the NCA (in Cecil Park). This therefore highlighting the need for additional background noise monitoring to occur which should be implemented in the CNVMSP.	(i.e. NCA01 and NCA02). L03 was identified in the EIS to be representative of the receivers in NCA04 along Elisabeth Drive. Given that noise monitoring was undertaken at similar representative locations, it is not considered necessary to undertake further unattended background noise monitoring. Further information regarding noise monitoring locations is contained in Section 4.13.1.2 of the M12 Motorway Submissions report (October 2020) Notwithstanding the above, Table 5-1 of the Construction Noise and Vibration Monitoring Program identifies that attended noise monitoring would be undertaken by the Construction Contractor prior to the commencement of construction to verify the existing noise environment (RBL and NML). This will determine whether there have been changes to the existing background noise levels since the publication of the EIS, and therefore if new RBLs and NMLs need to be calculated for each NCA.	
Section 4, Figure 4-1	It has been indicated that the sensitive noise receivers that are most affected from construction noise of the project have been identified in Section 4.1 Sensitive receivers within the CNVMSP. However, this section provides a general description of where the sensitive noise receivers are located to the Project corridor. It would be beneficial to have all the sensitive receivers including residential receivers clearly identified on Figure 4-1 to ensure they are capture in the Contractor's CNVMP.	Figure 4-1 has been updated to include all the sensitive receivers as per the EIS.	Figure 4-1
Table 4-2	When reviewing the ambient noise monitoring results present in Table 4-2, Council raises concerns on how the morning shoulder period noise levels for location LO1 and LO3 were	Section 2.2 of the M12 Motorway Amendment Report Appendix G Noise and Vibration updated technical report (October 2020) outlines how the ambient noise	N/A

Section Reference	Comment	TfNSW Response	Section Amended
	calculated. As stated in the NSW EPA Noise Policy for Industry 2017 (NPfi), background noise levels are steadily rising in the early morning hours (5am-7am). This does not appear to be the case for the noise levels for the morning shoulder period, as the noise levels are significantly higher than the day time noise levels. (A copy of the table for reference is indicated below). Clarification shall be provided on how these morning shoulder period noise levels were calculated in accordance with NPfi.	surveys were conducted and analysed. The results of the noise monitoring were processed with reference to the NSW EPA Noise Policy for Industry (NPfI). The morning shoulder is defined as 6:00 am to 7:00 am Monday to Friday. The RBL was calculated using the lowest 10th percentile of LAF90, 15min dB measurements for the equivalent of at least one weeks' worth of valid data taken over the shoulder period. The RBL determined for the morning shoulder period is representative of the morning peak hour road traffic noise. Therefore, it is higher than the daytime RBL, which is representative of the quietest periods of the day. The NML for the morning shoulder period was determined by using the lower daytime RBL. Refer Section 5.4 of the CNVMP	
Figure 4-1	The report does not contain any noise modelling maps that demonstrates the predicted worst case construction noise contours and the affected sensitive receivers. The noise modelling maps should clearly identify sensitive receivers and the predicted noise levels to be received at each receiver. The Interim Construction Noise Guideline (July 2009) states "Where many people are likely to be affected by construction noise, a map showing predicted noise contours surrounding the site may be required".	Figure 4-1 has been updated to include all the sensitive receivers as per the EIS. Noise contours have also been added for the earthworks scenario as a reference point as this generally represents the worst case scenario (excluding ancillary facility operations). The complete set of noise impact contours associated with different construction scenarios are provided in the M12 Motorway Amendment Report Appendix G Noise and Vibration updated technical report (October 2020).	Figure 4-1
Out-of-hours Work Protocol Attachment 2	The Out-of-hours Work (OOHW) Protocol includes Attachment 2 Application of OOHW Mitigation measures which lists mitigation measures to be implement during various OOHW periods. When reviewing these measures, it appears that a number of mitigation measures which are listed in Section 8 of the	The Out-of-hours Work Protocol has been prepared consistent with the TfNSW Construction Noise and Vibration Guideline (CNVG) (2016). Reference to the CNVMP Table 8 mitigation measures has been included in the amended Section 3 and OOHW Protocol Attachment 2	OOHW Protocol Section 3 and Attachment 2

Section Reference	Comment	TfNSW Response	Section Amended
	CNVMSP are not listed as measures to be implemented at various noise level exceedances, for example: "Where reasonable and feasible, receivers identified as requiring at-property treatment for operational noise mitigation will be identified and offered treatment before construction activities begin that are likely to impact them". The application of OOHW mitigation measures during various OOHW periods present in Attachment 2 of the Out-of-hours Work Protocol, should include all the reasonable and feasible noise mitigation measures as listed in Section 8 of the CNVMP		

				Management Plan (Rev F) - draft for consultation		

Transmitted by: Suzette Graham, Transport for NSW

Attachments:
M12 - Feedback on Document Comments or Responses.xlsx(41KB)

From: Suzette Graham
To: [redacted]
Cc: M12 Detailed Design
Subject: M12 Motorway Interpretation Plan and Construction Environmental Management Plans
Date: Wednesday, 29 September 2021 11:13:00 AM

Hi Charles,

Following our phone call this morning, just confirming that I have re-sent the following M12 Motorway documents to you via Teambinder:

- Non-Aboriginal heritage Management Plan – comments were due 3 September 2021
- Construction Cultural Heritage Management Plan – comments were due 27 September 2021
- Noise and Vibration Management Plan – comments were due 23 September 2021
- Contaminated Land Management Plan- Comments were due 22 September 2021
- Flora and Fauna Management Plan – Comments were due 22 September 2021

Can you please advise if Council wish to make comments on these documents, and if so when comments can be expected?

Thomas – I have copied you in as an FYI as I know we sent the Interpretation plan to you as well.

Thanks,

Kind regards,
Suzette Graham
Environment and Sustainability Manager
Sydney Infrastructure Development | Safety, Environment and Regulation
[redacted]
Transport for NSW
27 Argyle Street, Parramatta NSW 2150

I work flexibly. Unless it suits you, I don't expect you to read or respond to my emails outside of your normal work hours.

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Liverpool City Council	Charles Wiafe

Transmitted cc:

Company	Name
Transport for NSW	Suzette Graham
Transport for NSW	Christine Stuart

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Item	Document No	Rev	Sts	Title	Contract No	Design Package No
1	M12PPW-TFNSW-ALL-EN-PLN-000016	F.01	S3	M12 Motorway Construction Noise and Vibration Management Plan (Rev F) - draft for consultation	M12PPW	

Transmitted by: Suzette Graham, Transport for NSW

TeamBinder Transmittal Reference: {9F04CF1C-04E6-4F64-B1D3-D6C714DF792D}

				Management Plan (Rev F) - draft for consultation		

Transmitted by: Suzette Graham, Transport for NSW

Attachments:
M12 - Feedback on Document Comments or Responses.xlsx(41KB)

Company	Name
Fairfield City Council	Kerren Ven

Transmitted cc:

Company	Name
Transport for NSW	Suzette Graham
Transport for NSW	Christine Stuart

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Item	Document No	Rev	Sts	Title	Contract No	Design Package No
1	M12PPW-TFNSW-ALL-EN-PLN-000016	F.01	S3	M12 Motorway Construction Noise and Vibration Management Plan (Rev F) - draft for consultation	M12PPW	

Transmitted by: Suzette Graham, Transport for NSW

Discipline: Environmental

Location: General

Attachments: FEEDBACK ON DOCUMENT COMMENTS OR RESPONSES - CNVMP.XLSX, TABLE 4-2(HIGHLIGHTED).PNG

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Attachments
FEEDBACK ON DOCUMENT COMMENTS OR RESPONSES - CNVMP.XLSX (29 KB), TABLE 4-2(HIGHLIGHTED).PNG (87 KB)

A summary of the noise monitoring results and adopted RBLs is provided in Table 4-2.

Table 4-2: Ambient noise monitoring results (dB(A))

ID	Background noise (RBL) – Periods based on extended construction hours[2]					Average noise level LA_{eq} (period) based on Road Noise Policy[3]	
	Morning shoulder	Day	Evening	Evening shoulder	Night	Day 15 hour	Night 9 hour
L01	51	45	44	46	40	52	51

[2] RBL periods are based on extended construction hours: Morning shoulder is 6:00 am to 7:00 am Monday to Friday; Daytime is 7:00 am to 6:00 pm Monday to Saturday and 8:00 am to 6:00 pm Sunday and Public Holidays; Evening is 7:00 pm to 10:00 pm Monday to Friday and 6:00 pm to 10:00 pm Saturday, Sunday and Public Holidays; Evening shoulder is 6:00 pm to 7:00 pm Monday to Friday; Night-time is 10:00 pm to 6:00 am Monday to Friday, 10:00 pm to 7:00 am Saturday and 10:00 pm to 8:00 am Sunday and Public Holidays

[3] LAeq periods are based on the Road Noise Policy: Daytime is 7:00 am to 10:00 pm; Night-time is 10:00 pm to 7:00 am.

ID	Background noise (RBL) – Periods based on extended construction hours[2]					Average noise level LA_{eq} (period) based on Road Noise Policy[3]	
	Morning shoulder	Day	Evening	Evening shoulder	Night	Day 15 hour	Night 9 hour
L02	47	36	39	41	34	46	45
L03	60	54	48	56	37	66	63
L04	54	48	46	52	37	57	55

Appendix B

Construction Noise and Vibration Monitoring Program

M12 Motorway

December 2021

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Document control

File Name	M12PPW-ADAP-ALL-EN-PLN-000008_H_S3_CNVMP APP B Appendix B: Construction Noise and Vibration Monitoring Program
Title	M12 Motorway OCEMP Construction Noise and Vibration Management Sub-plan Appendix B: Construction Noise and Vibration Monitoring Program
Document Number (Teambinder)	M12PPW-ADAP-ALL-EN-PLN-000008

Approval and authorisation

Plan reviewed by:	Plan reviewed by:
Suzette Graham TfNSW Environment and Sustainability Manager	Deanne Forrest TfNSW Project Director, M12
16/12/2021	17/12/2021
	

Revision history

Revision	Date	Description
A	09/09/2020	First draft for TfNSW review
B	01/10/2020	Response to TfNSW comments
C	21/10/2020	Response to TfNSW comments
D	16/07/2021	Updated with Final NSW and Commonwealth CoA
E	06/08/2021	Response to TfNSW and ER comments
F	26/08/2021	Response to ER comments
G	19/10/2021	Updated following consultation
G.02	22/11/2021	Updated to address DPIE comments
H	16/12/2021	Updated to address DPIE comments

Contents

Figures

Tables

Glossary/Abbreviations

Abbreviation	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.
Attenuation	The reduction in the level of sound or vibration
BS	British Standard
CEMP	Construction Environmental Management Plan
CNVG	Construction Noise and Vibration Guideline
CNVMP	Construction Noise and Vibration Management Sub-plan
CoA	Condition of Approval
DAWE	Commonwealth Department of Agriculture, Water and the Environment
dB(A)	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DEC	Former NSW Department of Environment and Conservation
DPIE	NSW Department of Planning, Industry and Environment
EES	NSW Environment, Energy and Science (a part of DPIE)
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 Assessment Documentation	Collective reference to the M12 EIS (Oct 2019), Submissions Report (Oct 2020), Amendment Report (Oct 2020), Amendment Report-Submissions Report (Dec 2020) and supplementary reports as detailed in NSW CoA A1.
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.
EMM	Environmental Management Measure
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.

Abbreviation	Expanded Text
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
EPA	NSW Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
ER	Environmental Representative
ERG	Environmental Review Group
ESM	Environment and Sustainability Manager
ESR	Environmental Site Representatives
EWMS	Environmental Work Method Statements
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
Highly Noise Affected	Where noise affected management level represents the level above which there may be strong community reaction to noise, determined as the exceedance of NMLs.
Highly Noise intensive Works	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.
Km	Kilometres

Abbreviation	Expanded Text
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.
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.
Monitoring Program, this	Construction Noise and Vibration Monitoring Program
NCA	Noise Catchment Areas
NML	Noise Management Level
POEO Act	NSW *Protection of the Environment Operations Act 1997*
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)
SPL	Sound Pressure Level
SWL	Sound Power Level
TfNSW	Transport for New South Wales
VDV	Vibration dose value
WSIA	Western Sydney International Airport

1 Introduction

1.1 Background

Transport for New South Wales (TfNSW) is planning to construct and operate the M12 Motorway (the Project) to provide direct access between the Western Sydney International Airport (WSIA) at Badgerys Creek and Sydney's motorway network. The M12 Motorway will run between the M7 Motorway at Cecil Hills and The Northern Road at Luddenham for about 16 kilometres (km) and is expected to be opened to traffic prior to opening of the WSIA.

The Project will be constructed in three separate stages under four separate construction contracts:

- M12 West (construct only contract) – between The Northern Road, Luddenham and about 250 metres east of Badgerys Creek
- M12 Central (construct only contract) – between about 500 metres west of South Creek and the Western Sydney Parklands at Duff Road, Cecil Park
- M12 East (construct only contract) – Elizabeth Drive connections south of Cecil Park
- M12 East (design and construct contract) – the M7/M12 interchange.

1.2 Scope of the program

This overarching Construction Noise and Vibration Monitoring Program (this Monitoring Program) has been developed in accordance with NSW Condition of Approval (CoA) C11(a). It describes the environmental noise and vibration monitoring activities to be undertaken by Construction Contractors for the M12 Motorway Project (the Project). The purpose of this Monitoring Program is to:

- Provide a procedure to monitor noise and vibration impacts during construction of the Project
- Meet the requirements of the CoA for the Project
- Meet any relevant legal and other requirements for the Project.

The Construction Contractors will develop a detailed stage specific Construction Noise and Vibration Monitoring Programs in accordance with this overarching Noise and Vibration Monitoring Program. The Construction Contractors will supplement this overarching Monitoring Program with stage specific information and include the updated Monitoring Program in their Construction Noise and Vibration Management Sub-plan (CNVMP).

The SMART (Specific, Measurable, Achievable, Realistic and Timely) principles have been considered in the preparation of this Monitoring Program. Refer to Section 5 for further details on how the monitoring procedures are being conducted.

1.3 Responsibilities

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

The Construction Contractors' Construction Managers are responsible for ensuring that all legal and other requirements described in this Monitoring Program are met.

1.4 Approval, review and modification

In accordance with NSW CoA C15, this Monitoring Program will be endorsed by the Environmental Representative (ER) and will be submitted to the Secretary for approval at least one month before commencement of construction.

Construction will not commence until the Planning Secretary has approved this required Monitoring Program and all relevant baseline data for the specific construction activity has been collected. This Monitoring Program, as approved by the Planning Secretary, 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 Monitoring Program or specified by the Planning Secretary, whichever is the greater.

This Monitoring Program will be reviewed every six months by TfNSW in consultation with the Construction Contractors.

In accordance with NSW CoA C17, minor amendments to this Monitoring Program may be approved by the ER.

Any amendments to the Monitoring Program will be documented in subsequent revisions of this Monitoring Program. A copy of the updated Monitoring Program and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure outlined in the Construction Contractors' CEMPs. Site personnel with responsibilities relevant to noise and vibration monitoring will be informed of any amendments to the Monitoring Program and training provided where required.

TfNSW will review the Construction Contractors' Monitoring Programs to confirm compliance with the requirements of the CNVMP and specifications.

1.5 Consultation

The following consultation was required for the preparation of this Monitoring Program, in accordance with NSW CoA C11(a):

- Penrith City Council
- Liverpool City Council
- Fairfield City Council.

In accordance with NSW CoA C11(a), details of all information requested during consultation must be provided to the Planning Secretary as part of any submission of the Monitoring Program.

Refer to Appendix A of the CVNMP for a record of the consultation carried out during the development of this Monitoring Program.

1.6 Guidelines

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

- TfNSW QA Specification G36 – Environmental Protection (Management System)
- TfNSW *Construction Noise and Vibration Guidelines* (Roads and Maritime 2016)
- NSW *Interim Construction Noise Guideline (ICNG)*, Department of Environment and Climate Change (DECC) 2009
- NSW Road Noise Policy, Dept. of Environment, Climate Change and Water 2011
- NSW Noise Policy for Industry, Environment Protection Authority 2017
- NSW *Assessing Vibration – a technical guideline* (AVTG), (DEC 2006)
- Australian Standard 2659.1 – 1998 *Guide to the use of sound measuring equipment – portable sound level meters*
- Australian Standard IEC 61672.1 *Electroacoustic – Sound Level Meters – Specifications*
- Australian Standard 2775 *Mechanical Mounting of Accelerometers*
- Australian Standard AS/NZS 2107:2000 Acoustics - *Recommended design sound levels and reverberation times for building interiors*
- Australian Standard 2834-1995 *Computer Accommodation, Chapter 2.9 Vibration*
- Australian Standard AS 2187.2 *Explosives - Storage and use - Part 2 Use of explosives*
- Australian Standard 1055 *Acoustics – Description and Measurement of Environmental Noise*
- Australian Standard AS2436-1981 *Guide to Noise Control on Construction, Maintenance and Demolition Sites*
- British Standard BS 6472-2008, *'Evaluation of human exposure to vibration in buildings (180Hz)*
- British Standard 7385: Part 2-1993 *'Evaluation and measurement of vibration in buildings'*
- German Standard DIN4150-1999 *Structural vibration Part 3: Effects of vibration on Structures.*

1.7 Conditions of Approval

The NSW CoA relevant to this Monitoring Program and their applicability to each stage of the Project are listed in Table 1-1. A cross reference is also included to indicate where the condition is addressed in this Monitoring Program or other project management documents.

Table 1-1: NSW CoA relevant to the preparation of this Monitoring Program

CoA no.	Condition	Applicability			Reference
		M12 West	M12 Central	M12 East	
A46	The Planning Secretary must be notified in writing via the Major Projects website within seven (7) days after the Proponent becomes aware of any non-compliance.	✓	✓	✓	Section 6.3
A47	A non-compliance notification must identify the CSSI and the application number for it, set out the condition of approval that the CSSI is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.	✓	✓	✓	Section 6.3
C11	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies 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: (a) Noise and Vibration	✓	✓	✓	Section 1.5 Appendix A of the CNVMP
C12	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 Construction Monitoring Programs, including copies of all correspondence from those agencies as required by Condition A5.	✓	✓	✓	Section 1.5
C13	Each Construction Monitoring Program must provide:				
	(a) details of baseline data available;	✓	✓	✓	Section 2
	(b) details of baseline data to be obtained and when;	✓	✓	✓	Section 2
	(c) details of all monitoring of the CSSI to be undertaken;	✓	✓	✓	Section 4
	(d) the parameters of the CSSI to be monitored;	✓	✓	✓	Section 5.1 Section 5.2

CoA no.	Condition	Applicability			Reference
		M12 West	M12 Central	M12 East	
	(e) the frequency of monitoring to be undertaken;	✓	✓	✓	Section 5.1 Table 4-1 Section 5.2 Table 4-2
	(f) the location of monitoring;	✓	✓	✓	Section 5.3
	(g) the reporting of monitoring results and analysis of results against the relevant criteria;	✓	✓	✓	Section 6
	(h) details of methods that will be used to analyse monitoring data;	✓	✓	✓	Section 6.1
	(i) procedures to identify and implement additional mitigation measures where results of monitoring indicate unsatisfactory CSSI impacts;	✓	✓	✓	Section 5
	(j) a consideration of SMART principles;	✓	✓	✓	Section 1.2 Section 5
	(k) any consultation to be undertaken in relation to the monitoring programs; and	✓	✓	✓	Section 1.5 Appendix A of the CNVMP
	(l) any specific requirements as required by Condition C14.	✓	✓	✓	Section 5.1 Section 5.2
C14	The Construction Noise and Vibration Monitoring Program must include, but not be limited to:				
	(a) noise and vibration monitoring at representative residential and other locations (including at the worst- affected residences), subject to property owner approval, to confirm construction noise and vibration levels;	✓	✓	✓	Section 5.1 Section 5.2
	(b) noise monitoring during the day, evening and night time periods throughout the construction period, covering the range of activities (including worst-case construction noise levels) being undertaken;	✓	✓	✓	Section 5.1

CoA no.	Condition	Applicability			Reference
		M12 West	M12 Central	M12 East	
	(c) method and frequency for reporting monitoring results; and	✓	✓	✓	Section 6.2
	(d) procedures to identify and implement additional mitigation measures where monitoring indicates noise and/or vibration levels in excess in excess of noise and vibration criteria.	✓	✓	✓	Section 5.4
C15	The Construction Monitoring Programs must be endorsed by the ER and then submitted to the Planning Secretary for approval at least one (1) month before the commencement of construction.	✓	✓	✓	Section 0
C16	Unless otherwise agreed with the Planning Secretary, construction must not commence until all of the relevant Construction Monitoring Programs have been approved by the Planning Secretary, and all relevant baseline data for the specific construction activity has been collected.	✓	✓	✓	Section 0
C17	The Construction Monitoring Programs, as approved by the Planning Secretary, 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 0
C18	The results of the Construction Monitoring Programs must be submitted to the Planning Secretary, and relevant government agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	✓	✓	✓	Section 6.2
E38	Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration objectives: (a) construction 'Noise affected' NML 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);	✓	✓	✓	Section 3

CoA no.	Condition	Applicability			Reference
		M12 West	M12 Central	M12 East	
	(c) BS 7385 Part 2-1993 "*Evaluation and measurement for vibration in buildings Part 2*" as they are "applicable to Australian conditions"; and (d) vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage). Any construction or early works identified as exceeding the noise management levels and/or vibration criteria must be managed in accordance with the respective Noise and Vibration CEMP Sub-plan or Early Works Environmental Management Plan. *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.*				
E42	The Proponent must conduct vibration testing during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In addition, vibration monitoring must be undertaken during construction for relevant remaining Fleurs Radio Telescope structures, the Upper Canal (in consultation with WaterNSW) and McMaster Farm and McGarvie-Smith Farm group of remaining buildings. 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 5.2 Section 8 of the CNVMP
E43	Advice from a heritage specialist must be sought on methods and locations for installing equipment used for vibration, movement and noise monitoring at heritage-listed structures.	✓	✓	✓	Section 5.1.1 Section 5.2.1 Section 8 of the CNVMP
E44	Before conducting at-property treatment at any heritage item identified in the documents listed in Condition A1, the advice of a suitably qualified and experienced built heritage specialist must be obtained and implemented to ensure such work does not have an adverse impact on the heritage significance of the item.	✓	✓	✓	Section 8 of the CNVMP
E76	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	✓	✓	✓	Section 6.4

CoA no.	Condition	Applicability			Reference
		M12 West	M12 Central	M12 East	
	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 (1) month before the commencement of all other potentially impacting works.				
E77	Where pre-construction surveys have been undertaken in accordance with Condition E76, 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 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 (4) months following the completion of construction activities that have the potential to impact on the structure / asset.	✓	✓	✓	Section 6.4

1.8 Revised Environmental Management Measures

The REMMs relevant to this Monitoring Program and their applicability to each stage of the Project are listed in Table 1-2. A cross reference is also included to indicate where the requirement is addressed in this Monitoring Program or other project management documents.

Table 1-2: REMMs relevant to the preparation of this Monitoring Program

REMM	Requirement	Applicability			Reference
		M12 West	M12 Central	M12 East	
NV04	Monitoring will be carried out at the start of high noise and vibration activities to confirm that actual noise and vibration levels are consistent with the noise and vibration impact predictions. Where mitigation measures were included, measurements will be carried out to confirm the effectiveness. Where the monitoring identifies higher levels of noise and vibration compared to predicted levels, or where mitigation is shown to be ineffective against measured noise and vibration levels, additional mitigation measures will be identified and implemented to appropriately manage impacts where feasible and reasonable.	✓	✓	✓	Section 5.1 Section 5.2 Section 5.4 Section 8 of the CNVMP
NV08	Where works are within the minimum working distances and considered likely to exceed the cosmetic damage objectives (as shown in Figure 7-3 of Appendix G of the amendment report), construction works will not proceed unless: • A different construction method with lower source vibration levels is used, where feasible Attended vibration measurements are carried out at the start of the works to determine the risk of exceeding the vibration objectives.	✓	✓	✓	Section 5.2 Section 8 of the CNVMP
NV10	Surveys will be carried out to confirm the existing condition of the WaterNSW Upper Canal System and Jemena high pressure gas pipelines to determine appropriate vibration criteria. This will also include consideration of distances from the vibration intensive activity (piling, rock-breaking and vibratory rolling), as well as ground conditions.	✓	✓	✓	Section 5.2 Section 5.4 Section 8 of the CNVMP

REMM	Requirement	Applicability			Reference
		M12 West	M12 Central	M12 East	
	A vibration criterion of a peak particle velocity (PPV) will be determined in consultation with the relevant utility/service providers, including WaterNSW. In-situ monitoring will be carried out to confirm the vibration levels and assess the impact of vibration. Where the monitoring identifies exceedances in the relevant criteria, or where impacts are identified, additional mitigation measures will be identified and implemented to appropriately manage impacts.				
NV11	The following structures have the potential to be within the safe working distances for sensitive structures (Group 3 from DIN 4150): • Item 1: McGarvie Smith Farm • Item 2: Fleurs Radio Telescope Site • Item 4: Upper Canal System • Item 6: McMaster Field Station • Item 7: Fleurs Aerodrome. A detailed survey will be completed to determine the potential for vibration impacts and to define appropriate criteria for each heritage item. Vibration monitoring will be carried out when vibration intensive tasks are occurring within the minimum working distances to heritage structures. Where the monitoring identifies exceedances in the relevant criteria, or where impacts are identified, additional mitigation measures will be identified and implemented to appropriately manage impacts.	✓	✓	✓	Section 5.2 Section 5.4 Section 8 of the CNVMP

2 Baseline Data

2.1 Noise and vibration sensitive receivers

The noise and vibration assessment in the EIS, Response to Submissions, Amendment Report and Amendment Report Submissions Report (collectively Environmental Assessment Documentation), identified and considered potential construction noise and vibration impacts for each habitable dwelling or park along the Project alignment and within 1200 m either side of the new or existing road centre line.

Sensitive receivers potentially affected by the Project are concentrated in Kemps Creek, Cecil Hills and Cecil Park in M12 East. The central and western sections of the Project area are mainly semi-rural properties with few residences.

The noise and vibration assessment in the Environmental Assessment Documentation identified and considered potential noise and vibration impacts for sensitive receivers along the Project alignment.

The location of noise and vibration sensitive receivers within the Project area are shown in Figure 2-1.

2.2 Noise catchment areas

Noise catchment areas (NCAs) that reflect land uses and the nature and types of receivers within each NCA were established as part of the noise assessment. The land use characteristics within each NCA are described in Table 2-1. Figure 2-1 shows the locations and extents of the NCAs.

Table 2-1: Noise catchment areas

NCA	Minimum distance[1]	Description
NCA01	40 m	This catchment area is located along Wallgrove Road and to the east of the M7 Motorway and extends south to Elizabeth Drive. Receivers in this catchment are largely residential with the nearest receiver located to the east of the project.
NCA02	85 m	This catchment area is located to the south of Elizabeth Drive and east of the M7 Motorway. It is primarily suburban residential with the nearest receivers located to the east of the project.
NCA03	440 m	This catchment area is located to the north of Elizabeth Drive and west of the M7 Motorway, extending to the west of Mamre Road. The nearest receivers are located north of the project on Mamre Road.

[1] Approximate minimum horizontal distance in metres from the Project to the nearest sensitive receiver.

NCA	Minimum distance[1]	Description
NCA04	90 m	This catchment area is located to the north of Elizabeth Drive and west of the M7 Motorway and extends west to the intersection of Devonshire Road and Cross Street. It is primarily residential with the nearest receivers located adjacent the project on the north of Elizabeth Drive.
NCA05	60 m	This catchment area is located to the south of Elizabeth Drive and west of the M7 Motorway and extends west to Kemps Creek. It primarily consists of the Western Sydney Parklands with no residential receivers
NCA06	70 m	This catchment area is located to the west of Kemps Creek and east of South Creek and extends to the north and south of Elizabeth Drive. It primarily consists of rural residential receivers.
NCA07	100 m	This catchment area is located to the west of Kemps Creek, east of Cosgroves Creek, and north of Elizabeth Drive. This catchment primarily consists of rural residential receivers and a cluster of residential dwellings 500 metres to the north of the project.
NCA08	420 m	This catchment area is located along the western section of Elizabeth Drive to the west of South Creek and east of The Northern Road. This catchment is primarily rural residential.
NCA09	90 m	This catchment area is located to the west of Cosgroves Creek, east of The Northern Road, and north of Elizabeth Drive. It is set back from Elizabeth Drive and The Northern Road to represent receivers which are not adjacent to the existing major roads. This catchment represents mostly rural receivers.
NCA10	160 m	This catchment area is located along The Northern Road. It is primarily rural residential with the nearest receivers located opposite the west end of the project to the west of The Northern Road.

2.3 Existing noise environment (baseline data)

The ambient noise environment is dominated by a combination of road traffic noise in the vicinity of major roads and general environmental noise (such as wind and insects) in the more rural locations.

Unattended noise surveys in the Project area were conducted at 15 locations as part of the preparation of the Environmental Assessment Documentation, namely the EIS in 2017, and the Amendment Report in 2020. The measured noise levels were used to determine the existing noise environment and to set criteria to assess the potential impacts from the Project. The monitoring equipment was generally located at receivers which would have line-of-sight to the Project or to existing major roads. The locations in which background noise monitoring surveys were carried out are shown on Figure 2-1.

The rating background level (RBL) is used to determine the appropriate noise management level (NML). The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours).

A summary of the noise monitoring results and adopted RBLs is provided in Table 2-2.

Table 2-2: Ambient noise monitoring results (dB(A))

ID	Background noise (RBL) – Periods based on extended construction hours[2]					Average noise level LA_{eq} (period) based on Road Noise Policy[3]	
	Morning shoulder	Day	Evening	Evening Shoulder	Night	Day 15 hour	Night 9 hour
L01	51	45	44	46	40	52	51
L02	47	36	39	41	34	46	45
L03	60	54	48	56	37	66	63
L04	54	48	46	52	37	57	55
L05	49	39	42	45	35	49	48
L06	43	34	35	39	31	53	44
L07	46	40	36	42	31	56	52
L08	58	46	50	57	34	60	59
L09	56	44	48	54	36	56	55
L10	51	40	44	49	37	51	49
L11	57	46	40	51	31	69	66
L12	50	40	37	44	30	49	48
L13	50	42	38	48	33	64	60

Prior to the commencement of construction, the Construction Contractor will carry out additional baseline monitoring. This will determine whether there have been changes to the existing background noise levels since the publication of the EIS, and therefore if new RBLs and NMLs need to be calculated for each NCA.

[2] RBL periods are based on extended construction hours: Morning shoulder is 6:00 am to 7:00 am Monday to Friday; Daytime is 7:00 am to 6:00 pm Monday to Saturday and 8:00 am to 6:00 pm Sunday and Public Holidays; Evening is 7:00 pm to 10:00 pm Monday to Friday and 6:00 pm to 10:00 pm Saturday, Sunday and Public Holidays; Evening shoulder is 6:00 pm to 7:00 pm Monday to Friday; Night-time is 10:00 pm to 6:00 am Monday to Friday, 10:00 pm to 7:00 am Saturday and 10:00 pm to 8:00 am Sunday and Public Holidays

[3] LA_{eq} periods are based on the Road Noise Policy: Daytime is 7:00 am to 10:00 pm; Night-time is 10:00 pm to 7:00 am.

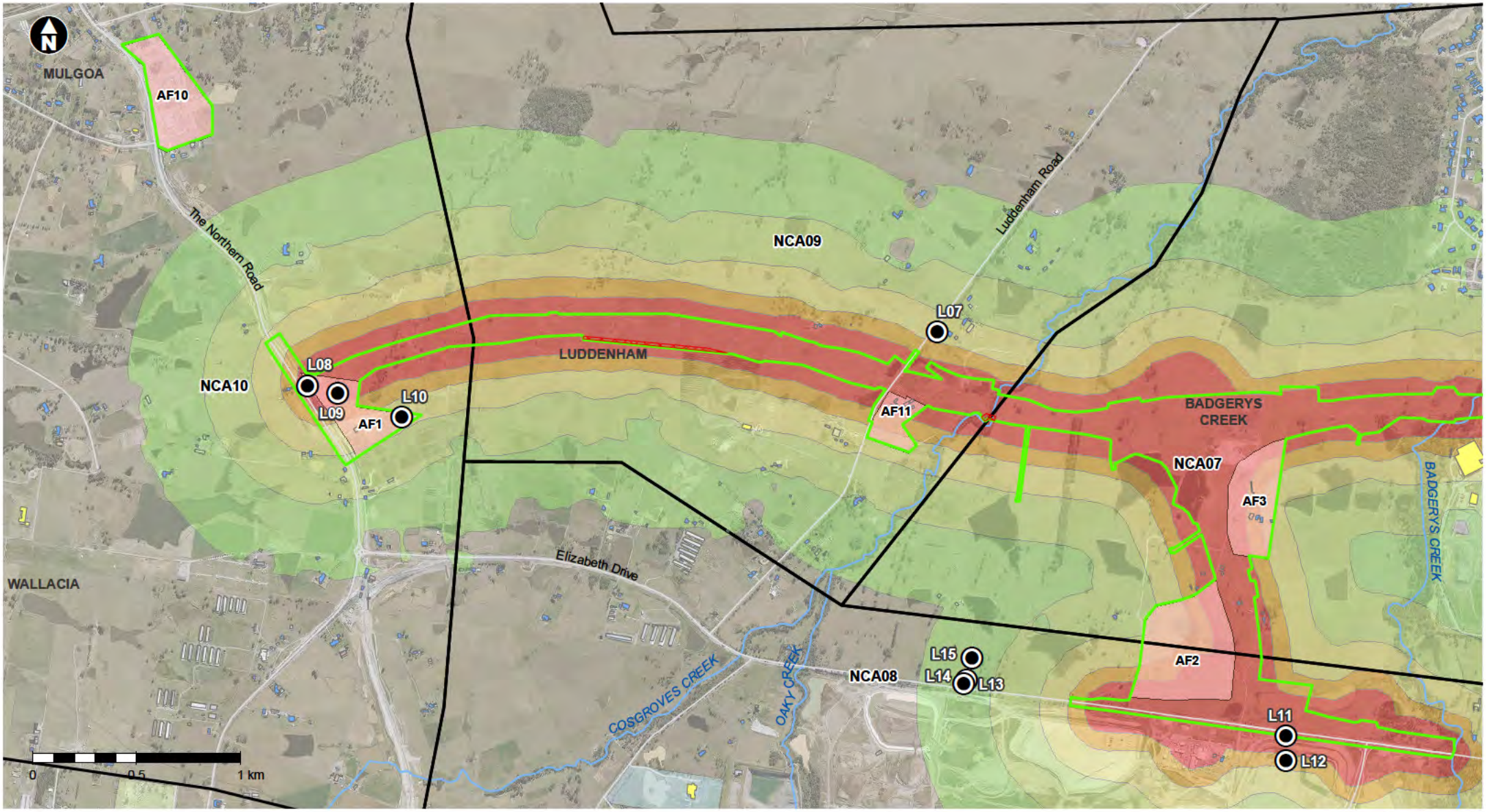

Figure 2-1 Location of noise catchment areas, noise and vibration sensitive receivers and noise monitoring location

Date: 7/10/2021 Path: \\hc-aus-ns-fs-01\jobs\300584841\L-GIS\A_Current\B_Maps\ManagementPlans\G300584841_CNVMP_001_NCARecieverLocations_DDP_A4L_v5.mxd
Created by : GC | QA by : RB

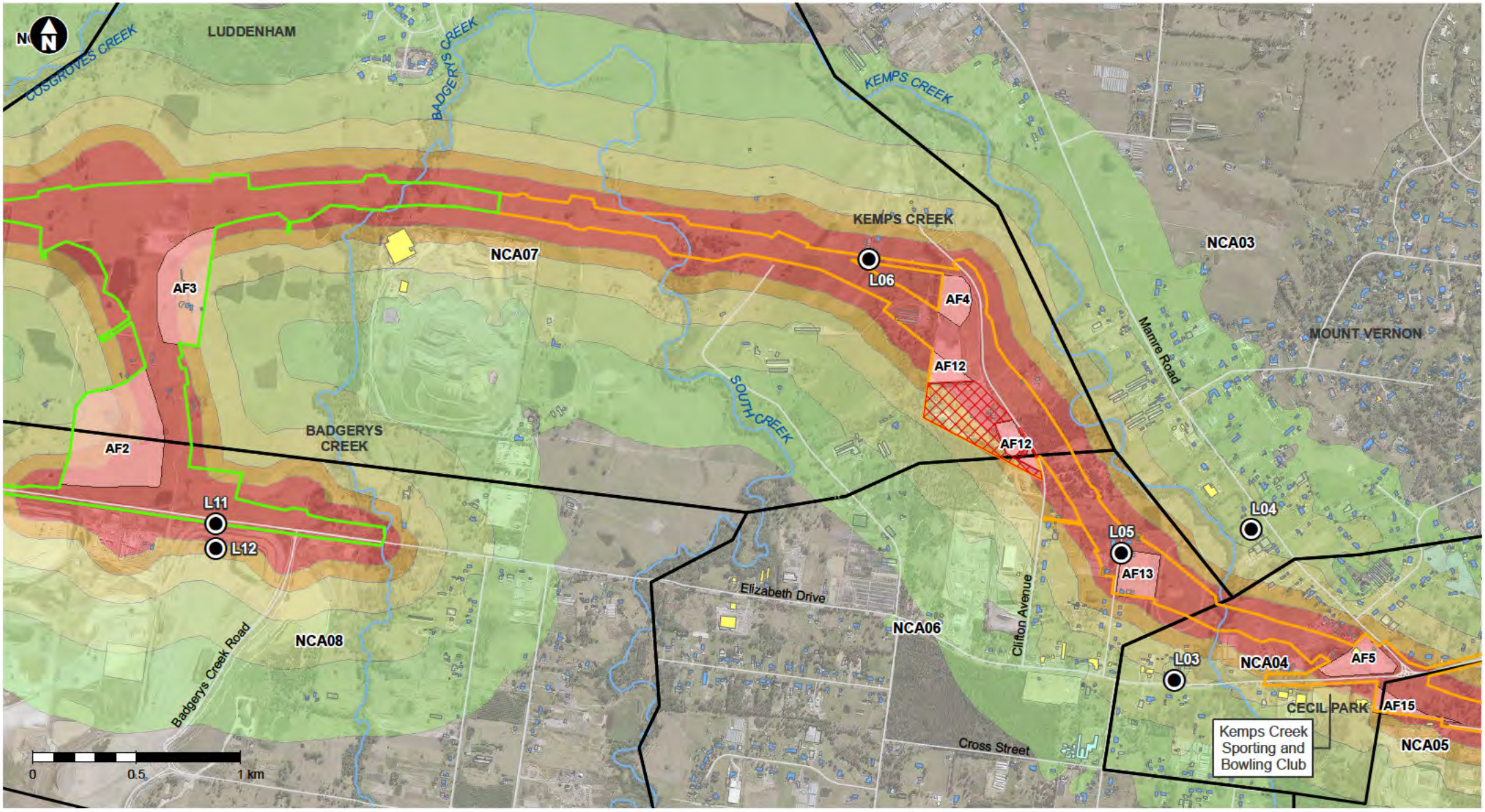

Figure 2-1 Location of noise catchment areas, noise and vibration sensitive receivers and noise monitoring location

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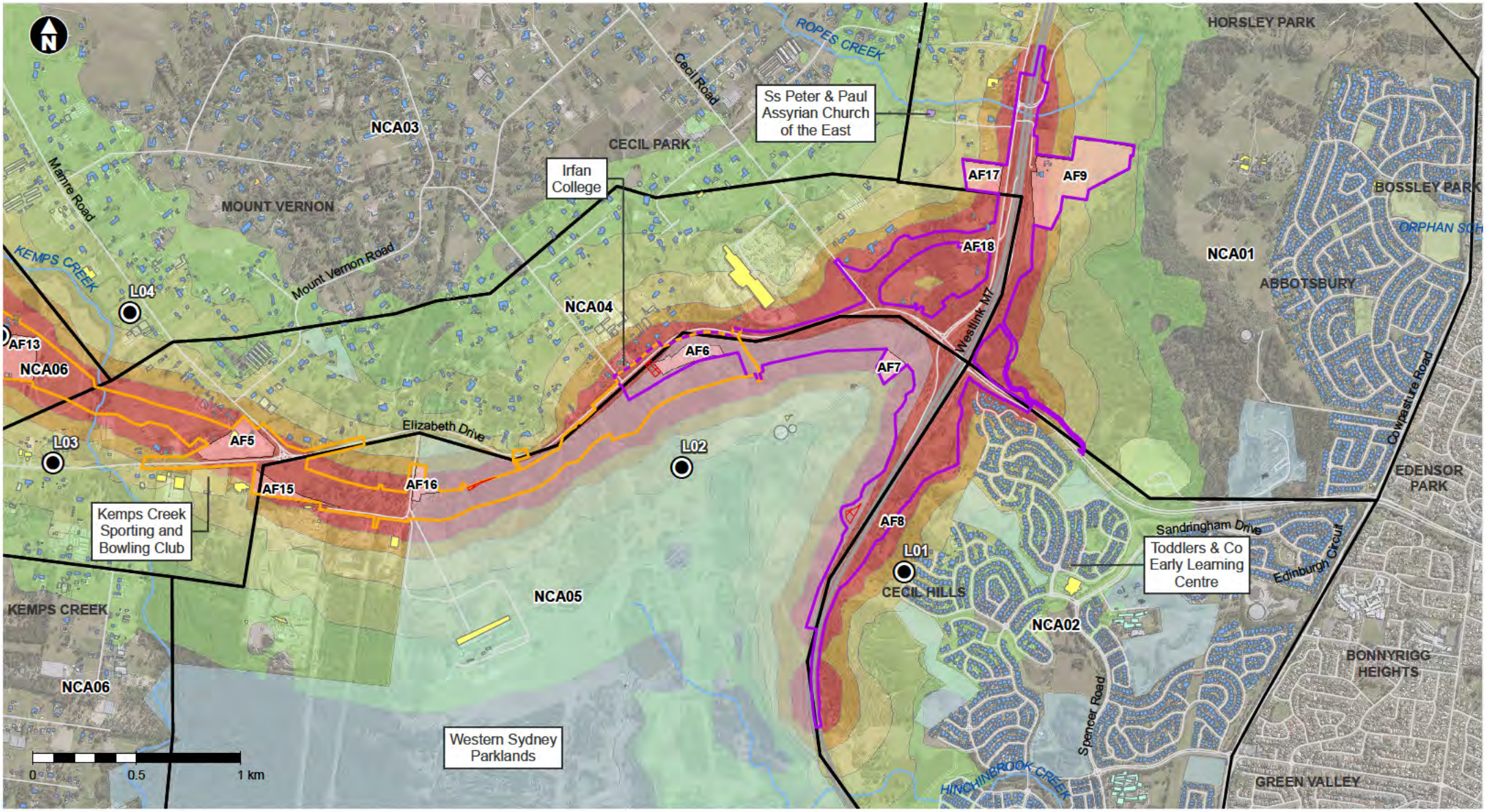

Project construction boundary (CA for West and Central, Jul 2021; ARSR for East, Dec 2020)

- M12 Central
- M12 East
- Ancillary facility
- The amended project exclusion zones

NCA

Receiver type*

- Residential
- Commercial
- Other (Educational)
- Other (Place of Worship)
- Other (Childcare)
- Other (Outdoor Active)
- Other (Outdoor Passive)
- Other (Shed)
- Other (Remaining)

Noise monitoring location

- Existing motorway
- Existing road
- Waterways

- <45 dBA
- 45 to 50 dBA
- 50 to 55 dBA
- 55 to 60 dBA
- 60 to 65 dBA
- >65 dBA

*As per M12 Motorway Appendix G Noise and Vibration updated technical report (October 2020)

Page 3 of 3

Imagery: Aerometrex August 2020

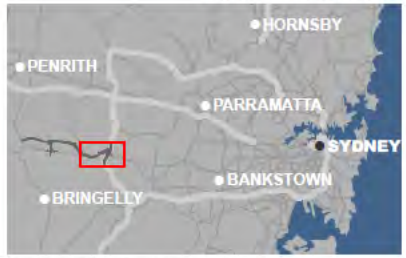

Figure 2-1 Location of noise catchment areas, noise and vibration sensitive receivers and noise monitoring location

3 Noise and vibration criteria

3.1 Construction noise criteria

The noise criteria adopted for the Project are set out in Table 3-1 and Table 3-2.

Table 3-1: Construction NMLs and sleep disturbance screening criteria at residences

NCA	Monitoring location	NML LAeq(15min) (dB(A))						Sleep disturbance screening criteria (RBL + 15 dB)
		Standard construction (RBL + 10dB)	Out-of-hours (RBL + 5dB)					
		Day[4]	Morning shoulder[5]	Day[6]	Evening[7]	Evening shoulder[8]	Night[9]	
NCA01	L01	55	50	50	49	49	45	55
NCA02	L01	55	50	50	49	49	45	55
NCA03	L05	49	44	44	44	44	40	50
NCA04	L03	64	59	59	53	53	42	52
NCA05	L02	46	41	41	41	41	39	49
NCA06	L05	59	44	44	44	44	40	50
NCA07	L06	44	39	39	39	39	36	46

[4] *Daytime period is the standard construction hours of 7:00 am to 6:00 pm Monday to Friday and 8:00 am to 1:00 pm Saturday.*

[5] *Morning shoulder period is 6:00 am to 7:00 am Monday to Friday. Where the morning shoulder RBL is higher than the daytime RBL, the daytime RBL was adopted.*

[6] *Daytime OOH period is 7:00 am to 8:00 am and 1:00 pm to 6:00 pm Saturday, and 8:00 am to 6:00 pm Sunday and Public Holidays.*

[7] *Evening period is 7:00 pm to 10:00 pm Monday to Friday and 6:00 pm to 10:00 pm Saturday, Sunday and Public Holidays*

[8] *Evening shoulder period is 6:00 pm to 7:00 pm Monday to Friday. Where the evening shoulder RBL is higher than the evening RBL, the evening RBL was adopted.*

[9] *Night-time period is 10:00 pm to 6:00 am Monday to Friday, 10:00 pm to 7:00 am Saturday and 10:00 pm to 8:00 am Sunday and Public Holidays.*

NCA	Monitoring location	NML LAeq(15min) (dB(A))						Sleep disturbance screening criteria (RBL + 15 dB)
		Standard construction (RBL + 10dB)	Out-of-hours (RBL + 5dB)					
		Day[4]	Morning shoulder[5]	Day[6]	Evening[7]	Evening shoulder[8]	Night[9]	
NCA08	L14	52	47	47	44	44	38	48
NCA09	L07	50	45	45	41	41	36	46
NCA10	L09	54	49	49	49	49	41	51

Table 3-2: Construction NMLs for non-residential receivers

Land use	Noise assessment location	NML (LAeq,15min) [3]
Classrooms at schools and other educational institutions	Internal	45
Places of worship		
Passive recreation areas[1]	External	60
Active recreation areas[2]	External	65
Industrial premises	External	75
Office, retail outlets	External	70

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

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

[3] Applies only when properties are being used

3.2 Construction vibration criteria

3.2.1 Disturbance to building occupants

Maximum and preferred values for continuous and impulsive vibration for the Project are defined in Table 3-3.

Table 3-3: Continuous and impulsive vibration acceleration (m/s^2) 1-80 Hz

Location	Assessment period[1]	Preferred Values		Maximum Values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration					
Critical areas[2]	Day or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
Workshops	Day or night- time	0.04	0.029	0.080	0.058
Impulsive vibration					
Critical areas[2]	Day or night-time	0.0050	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night- time	0.64	0.46	1.28	0.92

Notes: [1] Daytime is 7.00am to 10.00pm and night-time is 10.00pm to 7.00am
[2] Such as hospital operating theatres or precision laboratories.

Intermittent vibration impact is assessed using vibration dose values (VDVs). The VDV method is more sensitive to peaks in the acceleration waveform and makes corrections to the criteria based on the exposure duration. The acceptable VDV for intermittent vibration for the Project are defined in Table 3-4.

Table 3-4: Acceptable vibration dose values (m/s$^{1.75}$) for intermittent vibration

Location	Daytime[1]		Night-time[1]	
	Preferred Values	Maximum Values	Preferred Values	Maximum Values
Critical areas[2]	0.10	0.20	0.10	0.02
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes: [1] Daytime is 7.00am to 10.00pm and night-time is 10.00pm to 7.00am

[2] Includes operating theatres, precision laboratories and other areas where vibration sensitive activities may occur.

3.2.2 Structural damage

British Standard (BS) 7385 has been adopted as a guide to assess the likelihood of building damage from ground vibration. BS 7385 suggests levels at which 'cosmetic', 'minor' and 'major' categories of damage. Table 3-5 sets out the BS 7385 criteria for cosmetic, minor and major damage. Where heritage structures are impacted, German Standard DIN 4150-3 vibration criteria will be applied. The criteria applicable to heritage buildings is identified in Table 3-6

Table 3-5: BS 7385 structural damage criteria

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

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

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

Table 3-6: DIN 4150-3 vibration guideline for heritage buildings

Type of structure	Guideline values for vibration velocity (mm/s)			
	Vibration at the foundation at a frequency of			Vibration at the horizontal plane of the highest floor at all frequencies
	1 - 10 Hz	10 - 50 Hz	50 - 100 Hz[1]	
Heritage buildings	3	3 - 8	8 - 10	8

Notes: [1]At frequencies above 100 Hz the values given in this column may be used as minimum values.

Jemena guideline 'Designing, constructing and operating assets near Jemena gas pipelines' (GAS-960-GL-PL-001) identifies a maximum level of vibration of 20 mm/second which is to be measured at the nearest surface of the buried pipeline. The Construction Contractor will set a trigger alert where vibration monitoring identifies vibration at 15mm/s. At this point, construction activities will cease to minimise impact on Jemena assets. Alternative construction methods will be investigated to ensure vibration limits do not exceed 20 mm/second.

3.2.3 Safe working distances

Where vibration intensive plant such as rock breakers and vibratory rollers are used, vibration must be managed to minimise disturbance to building occupants and to avoid damage to buildings and other structures. Table 3-7 indicates the safe working distances recommended by the CNVG for typical items of vibration intensive plant that must be complied with unless otherwise approved by TfNSW.

Table 3-7: Safe working distances for vibration intensive plant (TfNSW 2019)

Plant item	Rating/description	Safe working distance		
		Cosmetic damage (British Std 7385) – Light framed structures	Cosmetic damage (DIN 4150) Heritage and other sensitive structures	Human response (EPA's vibration guidelines)
Vibratory roller	<50 kN (typically 1-2 t) <100 kN (typically 2-4 t) <200 kN (typically 4-6 t) <300 kN (typically 7-13 t) >300 kN (typically 13-18 t) >300 kN (> 18 t)	5 m 6 m 12 m 15 m 20 m 25 m	14 m 16 m 33 m 41 m 54 m 68 m	15 m to 20 m 20 m 40 m 100 m 100 m 100 m
Small hydraulic hammer	300 kg – 5 to 12 t excavator	2 m	5 m	7 m

Plant item	Rating/description	Safe working distance		
		Cosmetic damage (British Std 7385) – Light framed structures	Cosmetic damage (DIN 4150) Heritage and other sensitive structures	Human response (EPA's vibration guidelines)
Medium hydraulic hammer	900 kg – 12 to 18t excavator	7 m	19 m	23 m
Large hydraulic hammer	1600 kg – 18 to 34 t excavator	22 m	60 m	73 m
Vibratory pile driver	Sheet piles	20 m	50 m	100 m
Pile boring	≤800 mm	2 m (nominal)	5 m	7 m
Jackhammer	Hand held	1 m (nominal)	2 m	3 m

The safe working distances presented in Table 3-7 are indicative and will vary depending on the item of plant (particularly its power rating), local geotechnical conditions and the dominant frequency of the construction vibration levels. The cosmetic damage thresholds apply to typical light-framed residential buildings and heritage buildings and assume that construction vibration could include low frequency content with associated increased risk of cosmetic damage. Vibration monitoring is recommended to confirm the minimum working distances at specific sites. Additionally, further detailed analysis based on the frequency dependent guideline vibration levels in BS7385-2:1993 and DIN4150-3:2016 may be utilised in conjunction with site-specific measurements to derive alternative cosmetic damage objectives and minimum working distances. For heritage listed / fragile structures, specialist advice from an appropriately qualified structural engineer who is familiar with heritage structures is required to support any proposed relaxation of the initial cosmetic damage screening criterion.

In relation to human response, the safe working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent and higher vibration levels over shorter periods are acceptable. Additional assessment will be undertaken where the human response criteria are exceeded.

4 Construction noise and vibration impacts

4.1 Noise impacts

4.1.1 General construction noise

A summary of the potential impacts to receivers for each NCA from standard hours (daytime) and OOHW construction scenarios are presented in Section 7 of the CNVMP. The construction impacts presented are based on representative worst-case noise construction scenarios assuming all equipment operates concurrently and that equipment is located at the closest point to receivers.

The construction noise modelling undertaken for the assessment identified several sensitive receivers as being subject to levels that exceed the Highly Noise Affected criteria (>75 dB(A)). Appendix G of the ARSR provides a detailed prediction of construction noise at these sensitive receivers.

Activities that are predicted to exceed the NMLs are listed in Section 7 of the CNVMP. Generally, construction work will be undertaken in standard construction hours whenever practicable. Some activities, such as bridgeworks, paving and operation of ancillary facilities may occur outside of standard of hours in accordance with the requirements of NSW CoA E36 and the EPL.

4.1.2 Ancillary facilities noise

Temporary ancillary facilities required for the Project will include compounds and laydown areas. The final type, location and number of ancillary facilities (except for minor ancillary facilities) will be identified in the Construction Contractors' Site Establishment Management Plans (SEMP), prepared in accordance with NSW CoA A16. The SEMP will include mitigation measures to minimise the potential impact from noise on sensitive receivers located within the vicinity of the ancillary facility.

Any additional ancillary facilities identified for the Project that have not been assessed in the Environmental Assessment Documentation will be assessed in accordance with the criteria in NSW CoA A15, using the ancillary facilities assessment provided in Appendix A4 of the OCEMP.

4.1.3 Construction traffic

Construction traffic will access construction sites using only designated heavy vehicle routes such as the M7 Motorway, Elizabeth Drive and The Northern Road. The assessment of construction traffic noise in the Environmental Assessment Documentation concluded that no noticeable increases in road traffic noise are predicted where construction vehicles use major roads.

4.2 Vibration impacts

4.2.1 Residents and buildings

Vibration impacts to residents and buildings are expected during construction of the Project. The main sources of vibration during construction of the Project will be associated with the use of vibratory rollers and rock breakers. It is expected that vibration impacts will be able to be controlled to avoid cosmetic and structural damage to all structures. Where works are within the minimum

working distances of structures, a detailed review of the required construction methods will be completed and attended vibration measurements will be required at the start of the works to determine the risk of exceeding the vibration objectives.

The distance between the construction works and the nearest sensitive receivers is generally sufficient for most buildings not to suffer cosmetic damage. However, about 21 structures spread across NCA02, NCA04, NCA05, NCA06, NCA07 and NCA10 where receivers are located close to the works are located within the recommended minimum working distance.

Where works are within the minimum working distances, and considered likely to exceed the cosmetic damage objectives, construction works will not proceed unless:

- A different construction method with lower source vibration levels is used, where feasible
- Attended vibration measurements are carried out at the start of the works to determine the risk of exceeding of the vibration objectives.

Certain receivers which are near the construction footprint are within the human comfort minimum working distance and occupants of affected buildings may be able to perceive vibration impacts at times when vibration generating equipment is in use. Where impacts will be perceptible, they will likely only be apparent for relatively short durations when equipment such as rock-breakers or vibratory rollers are in use nearby.

4.2.2 Heritage items

Detailed heritage assessments carried out for the Project as part of the EIS identified nine heritage items as being potentially impacted by vibration:

- McGarvie-Smith farm
- The Fleur radio telescope site
- Luddenham Road alignment
- Cecil Park school, post office and school church
- Exeter farm archaeological site
- South Kemps and Badgerys Creek confluence weirs scenic landscape
- McMasters field station
- Fleurs Aerodrome
- Upper Canal System.

Where these heritage structures are located within or near the project boundary, they may be susceptible to vibration impacts associated with construction equipment if they are operating within the safe working distance for heritage sensitive receivers.

5 Monitoring Procedures

5.1 Noise monitoring

The overarching noise monitoring procedure to be adopted for the Project is provided in Table 5-1. Noise monitoring will be undertaken by the Construction Contractor's Environmental Site Representatives (ESR) who will be appropriately trained in the measurement and assessment of construction noise and vibration and has working knowledge of the requirements of AS 2659.1.

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

Subject to property owner approval, noise monitoring will be conducted at representative residential and other locations (including at the worst- affected residences) to confirm construction noise levels. The Interim Construction Noise Guideline (DECC, 2009) states that noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 metres above ground level. If the property boundary is more than 30 metres from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 metres of the residence.

Table 5-1: Noise monitoring procedure

Monitoring details	Frequency	Test procedure
Attended noise surveys will be carried out to verify noise environment, RBL and NML	Prior to the commencement of construction	• Surveys to be carried out at the 15 locations identified in the Environmental Assessment Documentation • Monitoring equipment to be located at receivers which would have line-of-sight to the Project or to existing major roads • Noise monitoring equipment will continuously measure existing noise levels in 15-minute periods during the daytime, evening and night-time periods for the survey period. All equipment must carry current National Association of Testing Authorities (NATA) or manufacturer calibration certificates
Attended monitoring will be carried out at the commencement of activities for which a NVIS has been prepared to confirm that actual noise	On the first occasion of activities for which a NVIS has been prepared	The testing method includes: • Sound level meter configured for "Fast" time weighting and "A" frequency weighting • Sound level meter height set at around 1.5 m above ground level The test environment will be free from

Monitoring details	Frequency	Test procedure
Attended OOHW noise monitoring at sensitive receivers during evening, night and OOH (weekends/ public holidays)	As required during OOHW	reflecting objects where possible. Where the noise monitoring is conducted within 3.5 metres of large walls or a building facade, then a reflection correction of up to -2.5 dB(A) will be applied to remove the effect of increased noise due to sound reflections from such structures • Tests will not be carried out during rain or when the wind speed at the test site exceeds 5 m/s • Conditions such as wind velocity, wind direction, temperature, relative humidity and cloud cover will be recorded. These may be obtained from the nearest Bureau of Meteorology monitoring station or on-site weather station/observations • The monitoring period should be sufficient such that the measured noise levels are representative of the noise over a 15-minute period • Selected monitoring periods should vary to cover the range of activities being undertaken, including the worst-case construction scenario • At a minimum Leq, Lmax, L_{10} and L_{90} levels will be measured and reported • If any noise intensive equipment is used, they should be factored into the quantitative assessment by adding 5 dB(A) to the predicted levels. The attended noise monitoring data will be compared to the NMLs presented in Section 3 and predicted noise levels. Observations will also be reported including audibility of construction noise, other noise in the environment and any discernible construction activities contributing to the noise at the receiver.
Attended monitoring where a complaint is received and monitoring is considered an appropriate response to determine if noise levels exceed predicted 'worst case' Construction noise levels documented	Related to noise complaint	
Attended monitoring to confirm noise levels are no more than 5 dB(A) above night time RBL levels using the LAeq (15min) descriptor for works undertaken in accordance with NSW CoA E36(b)(i)	On each occasion works undertaken in accordance with NSW CoA E36(b)(i) on each occasion it is used.	
Noise monitoring at non-sensitive receivers predicted to be impacted by moderate exceedances of the NML from work in standard hours	As required	
Spot checks of noise intensive plant where it is required to check the noise emission from the plant against manufacturer's specifications	When a noise intensive piece of equipment commences works on site	The test procedure for construction plant will be guided by the stationary test procedures according to Australian Standard AS 2012.1. • Sound level meter configured for "Fast" time weighting and "A" frequency weighting • The test environment will be free from reflecting objects • Tests will not be carried out during rain or when the wind speed at the test site exceeds 5 m/s
Where required for the purposes of refining construction methods or techniques to reduce noise levels	As required	
Real time (unattended) monitoring	As required	Refer to Section 5.1.2

Monitoring details	Frequency	Test procedure
Validation monitoring	At least the first two nights of OOHW	For any works that are the subject of a community agreement under the EPL on at least the first two nights where OOHW will be undertaken in accordance with the community agreement. If validation monitoring shows that noise levels are higher than those predicted by any noise modelling undertaken as part of the community agreement, work practices will be modified so that measured noise levels do not exceed predicted levels.

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

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

5.1.1 Noise monitoring equipment

All monitoring will be undertaken by competent personnel, 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.

Advice from a heritage specialist will be sought on methods and locations for installing equipment used for noise monitoring at heritage-listed structures.

Acoustic instrumentation employed in the noise monitoring surveys will carry current manufacturer conformance certificates and comply with the guidelines identified in Section 1.6.

5.1.2 Real time noise monitoring

Real-time (unattended) noise monitoring may also be undertaken to provide useful indications of noise exceedances, particularly during highly intensive noise activities. Real-time noise monitoring would only be used as a backup for attended noise monitoring and will not be used alone.

If unattended noise monitors (with the ability to provide levels in real time) are used, they will be installed by a suitability qualified person.

Monitoring will also be undertaken by a suitability qualified person who is appropriately trained in the measurement and assessment of construction noise and vibration and who is familiar with the requirements of the relevant standards and procedures.

5.2 Vibration monitoring

The overarching vibration monitoring procedure to be adopted for the Project is provided in Table 5-2. The Construction Contractor's ESR will be trained to undertake vibration monitoring for the duration of construction. Dilapidation surveys will be the responsibility of the Construction Contractor Managers.

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

Subject to property owner approval, vibration monitoring will be conducted at representative residential and other locations (including at the worst- affected residences) to confirm construction vibration levels.

Table 5-2: Vibration monitoring procedure

Monitoring details	Frequency	Test procedure
At the commencement of vibratory compaction work within 50 m of residential buildings	As required	Attended vibration monitoring will be undertaken when checking the safe working distances from construction plant or in response to a complaint. The testing method includes: • Transducer to be affixed to ground or building in general accordance with AS 2775- 2004 • Monitoring to be conducted for at least three distances from the plant, including a representative distance for the nearest sensitive structures and/or receivers • The testing will be conducted at each location to obtain a suitable representation of the range of vibration levels that would occur from the tested plant • The plant will be tested in the settings in which it is expected to operate. For vibratory rollers this may include both "High" and "Low" settings • PPV with sufficient temporal resolution to determine vibration impacts and the dominant frequency of the vibration will be recorded for assessment against the structural and cosmetic damage criteria. In situations in which human comfort is also of concern then a metric which is appropriate for calculating vibration does values.
Where a complaint is received in relation to human exposure to vibration levels and monitoring is considered an appropriate response	As required	
Where a complaint is received in relation to suspected property damage due to vibration impacts and monitoring is considered an appropriate response	As required	
Where an activity may occur within safe working distances for cosmetic damage for no more than one day continuously	As required	
Where required for the purposes of refining Construction methods to reduce vibration levels	As required	
Where an activity may occur within safe working distances for cosmetic damage for a period of more than one day continuously	As required	Continuous vibration monitoring will be undertaken in situations where there is a risk that vibration from a particular construction activity may exceed the cosmetic damage criteria at a sensitive structure. This will be where activities may occur within the safe working distances for cosmetic damage identified in Section 3.2 of this Monitoring Program. The testing method includes: • Transducer to be affixed to ground or building in general accordance with AS 2775- 2004

Monitoring details	Frequency	Test procedure
		• Vibration logger to continuously measure vibration levels while the relevant works are occurring within the safe working distance for cosmetic damage • Measurement to be conducted as close as possible to the sensitive structure. • A warning system will be implemented with the monitoring system including one or both of the following: ◦ Audible and/or visual warning alarm ◦ SMS and/or email alerts to site personnel. • PPV with sufficient temporal resolution to determine vibration impacts and the dominant frequency of the vibration will be recorded for assessment against the structural and cosmetic damage criteria. In situations in which human comfort is also of concern then a metric which is appropriate for calculating vibration does values.
Vibration testing for vibration generating activities that have the potential to impact on heritage items	As required	• Identify minimum working distances to prevent cosmetic damage • When conducting at-property treatment at any heritage item, the advice of a suitably qualified and experienced built heritage specialist will be obtained and implemented to ensure such work does not have an adverse impact on the heritage significance of the item.
Vibration monitoring for remaining Fleurs Radio Telescope structures, the Upper Canal (in consultation with WaterNSW) and McMaster Farm and McGarvie-Smith Farm group of remaining buildings	As required	• Identify minimum safe working distances by completing a desktop assessment of planned works • Undertake attended monitoring at the commencement of works to verify and establish safe working distances • Determine site-specific requirements, set up exclusion zones as required and toolbox the requirements to relevant personnel • In the event that the vibration testing and attended vibration 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.

Monitoring details	Frequency	Test procedure
Dilapidation surveys of buildings and structures where construction works occurs within the safe working distance for cosmetic damage	Prior to that work being undertaken and post-Construction	At a minimum, dilapidation surveys and reports will comprise: • A visual inspection of the structure, including all internal and external walls, ground level floors and external pavements, all connections of other structures above ground level and their connection at ground level and any exposed foundations • Full written building Condition Survey Report outlining the condition of the internal and external components of each property • A series of photographs of each identified defect/crack • A sketched floor plan showing the exact location of each defect and measurements of crack width/defect size • Identification of any condition changes relative to Pre-construction and the likely cause of the change (Post-construction only).

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

Attended vibration monitoring will be undertaken to determine site-specific minimum working distances for structural damage and human response. Site-specific minimum working distances will be determined whenever significant vibration generating plant will be working close to or within the recommended minimum working distances listed in Table 5-3.

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

Table 5-3: Recommended minimum working distance for vibration intensive plant

Plant item	Rating/description	Safe working distance		
		Cosmetic damage (British Std 7385) – Light framed structures	Cosmetic damage (DIN 4150) Heritage and other sensitive structures	Human response (EPA's vibration guideline)
Vibratory roller	<50 kN (typically 1-2 t) <100 kN (typically 2-4 t) <200 kN (typically 4-6 t) <300 kN (typically 7-13 t) >300 kN (typically 13-18 t) >300 kN (> 18 t)	5 m 6 m 12 m 15 m 20 m 25 m	14 m 16 m 33 m 41 m 54 m 68 m	15 m to 20 m 20 m 40 m 100 m 100 m 100 m

Plant item	Rating/description	Safe working distance		
		Cosmetic damage (British Std 7385) – Light framed structures	Cosmetic damage (DIN 4150) Heritage and other sensitive structures	Human response (EPA's vibration guideline)
Small hydraulic hammer	300 kg – 5 to 12 t excavator	2 m	5 m	7 m
Medium hydraulic hammer	900 kg – 12 to 18t excavator	7 m	19 m	23 m
Large hydraulic hammer	1600 kg – 18 to 34 t excavator	22 m	60 m	73 m
Vibratory pile driver	Sheet piles	20 m	50 m	100 m
Pile boring	≤800 mm	2 m (nominal)	5 m	7 m
Jackhammer	Handheld	1 m (nominal)	2 m	3 m

5.2.1 Vibration monitoring equipment

The Construction Contractors will identify the vibration monitoring equipment to be used and a maintenance/calibration program to ensure equipment is implemented. Monitoring methods and instrumentation employed in the vibration monitoring surveys will comply with *AS2775.2004 Mechanical vibration and shock—Mechanical mounting of accelerometers* and *AS2670.1 Evaluation of human exposure to whole body vibration*.

Advice from a heritage specialist will be sought on methods and locations for installing equipment used for vibration monitoring at heritage-listed structures.

5.3 Noise and vibration monitoring locations

The locations of noise and vibration sensitive receivers are shown in Figure 2-1. The Construction Contractors will review and identify the locations for monthly noise and vibration monitoring in the risk assessment workshop to be held prior to the commencement of construction and confirm the locations for noise and vibration monitoring in the stage specific Monitoring Programs.

Noise monitoring locations will include representative sensitive receivers in each NCA relevant to the Project stage. Noise monitoring will also be undertaken for non-sensitive receivers predicted to be impacted by moderate exceedances of the NML from work in standard hours.

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

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

5.4 Adaptive management

This section outlines the procedures to identify and implement additional mitigation measures where monitoring indicates noise and/or vibration levels in excess in excess of noise and vibration criteria.

Should noise and vibration monitoring results directly attributable to the Project exceed the criteria set out in Section 3 of this Monitoring Program, the following steps will be undertaken:

- Analysis of the results by the Construction Contractor's ESR in more detail with a view of determining possible causes for the exceedance
- Site inspection by the Construction Contractor's ESR
- Advising relevant personnel of the problem
- Identifying and agreeing on actions and/or additional mitigation measures to resolve or mitigate the exceedance
- Implementing actions to rectify or mitigate the exceedance, including stop work arrangements where necessary or if directed by the ER
- Identifying and implementing additional mitigation measures.

Where actual noise levels are found to exceed the predicted worst case levels, the source of excessive noise generations will be identified, and any additional feasible and reasonable measures available will be implemented to either reduce noise emissions or reduce the impacts on receivers. Where necessary, monitoring will be implemented to follow-up on any noise and vibration issues that arise during construction.

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

Mitigation measures and preventative / corrective actions will be developed in accordance with TfNSW specifications and the procedure for dealing with non-compliance with environmental management measures outlined in Section 7.3 of the OCEMP. The Construction Contractors will be required to verify and document the effectiveness of any management measures or preventative / corrective actions implemented to avoid further exceedances.

The timing for any improvement will be agreed between the relevant Construction Contractor Project Engineer/Superintendent and TfNSW Project Manager and SEO (or delegate) based on

the level of risk or reoccurrence of the exceedance (e.g. a significant risk will require immediate action).

6 Reporting

6.1 Monthly Environmental Report

The Construction Contractors will prepare Monthly Environmental Reports for the duration of the Project for incorporation in Project Monthly Reports and submission to the Transport for NSW Environment and Sustainability Manager (ESM) (or delegate) for review. It will also be provided to the ER for information.

Information to be detailed in the reports includes:

- Results summary and analysis of the environmental monitoring
- Performance of this Monitoring Program
- Summary of complaints received that are related to noise and vibration.

The monitoring data will be collected and analysed prior to the preparation of the report. The monitoring data will be compared with the NML and vibration criteria. Following this, a Construction Noise and Vibration Monitoring Report will be prepared.

Refer to Section 7.2 of the OCEMP for further detail on environmental reporting.

6.2 Construction Noise and Vibration Monitoring Report

The Construction Contractor will prepare Noise and Vibration Monitoring Reports detailing the results of the monitoring undertaken in accordance with this Monitoring Program. The Noise and Vibration Monitoring Reports will be undertaken as soon as the first noise and vibration monitoring event takes place during construction.

The results of the monitoring will be collected in the form of a Construction Monitoring Report. The Monitoring Reports will be submitted to the Planning Secretary and to relevant regulatory agencies for information in accordance with NSW CoA C18. The Construction Monitoring Reports will be submitted quarterly until commencement of operation.

Reports will include, but not be limited to, the following information:

- The date(s) and time at which the monitoring was undertaken
- The locations and description of monitoring undertaken
- The name of the person who undertook the monitoring
- Tabulations of monitoring data
- Compliance monitoring results with the criteria identified in Section 3 of this Monitoring Program
- Identification of exceedances of the nominated criteria and descriptions of the causes of these exceedances
- Details of any alteration to the Monitoring Program
- Summary of any complaints received regarding noise and vibration.

The Construction Contractors will maintain accurate records of all noise and vibration monitoring activities.

6.3 Reporting on non-conformances and exceedances

In the event that the criteria identified in Section 3 of this Monitoring Program are exceeded, the Construction Contractor will investigate and report the exceedance to the TfNSW Project Manager, ESM (or delegate) and the ER within seven days of identification of the exceedance. Details of exceedances will be provided in the Monthly Environmental Reports and quarterly Construction Monitoring Reports.

The investigation into the exceedance will determine if the exceedance is related to Project activities or noise from another source. If the exceedance is attributed to Project activities, the exceedance will be classified as a non-compliance, incident or reportable event as defined by the M12 Environment Incident Classification and Reporting Procedure (Appendix A7 of the OCEMP).

In accordance with NSW CoA A46, the Planning Secretary must be notified in writing via the Major Projects website within seven days after TfNSW becomes aware of any non-compliance.

As required by NSW CoA A47, a non-compliance notification must identify the Project and the application number for it, set out the CoA that the Project is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.

It is noted that in accordance with the POEO Act, a pollution incident does not include an incident or set of circumstance involving only the emission of any noise. As a result, noise exceedances cannot be classified as a Material Harm incident and do not require incident notification and reporting outlined in NSW CoA A44 and A45.

6.4 Pre and Post Construction Surveys

Pre-construction surveys will be completed by a suitably qualified and experienced engineer and/or building survey for owners of surface and subsurface structures (including but not limited to utility assets and heritage items and building/structures of heritage significance) that are identified at risk from vibration, if the offer is accepted in accordance with NSW CoA E76. The Pre-Construction Survey will be completed prior to the commencement of vibration generating works that could impact the structure.

The results of the surveys will be documented in a Pre-construction Surveys Report for each building and structure surveyed. Copies of Building Condition Survey Reports will be provided to the owner of the structures/assets surveyed no later than four months following the completion of construction activities that have the potential to impact on the structure / asset.

After the completion of the works, a suitably qualified and experienced engineer and/or building surveyor will undertake a subsequent post-construction surveys of the structure / asset in accordance with NSW CoA E77. The results of the post-construction surveys will be documented in a Post-Construction Condition Survey Report for each item surveyed. The Post-construction Condition Survey Reports will 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.

6.5 Complaints management and reporting

Recording and reporting of complaints will be undertaken in accordance with the Complaints Management System for the Project (refer to Section 5.5 of the OCEMP).

Appendix C – Out of Hours Work Protocol

Appendix C

Out-of-Hours Work Protocol

M12 Motorway

December 2021

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Document control

File Name	M12PPW-ADAP-ALL-EN-PRG-000008_H_S3_ CNVMP APP C
Title	M12 Motorway OCEMP Construction Noise and Vibration Management Sub-plan Appendix C – Out of Hours Work Protocol
Document Number (Teambinder)	M12PPW-ADAP-ALL-EN-PLN-000008

Approval and authorisation

Plan reviewed by:	Plan reviewed by:
Suzette Graham TfNSW Environment and Sustainability Manager	Deanne Forrest TfNSW Project Director, M12
16/12/2021	Date 17/12/2021
	Signed
	

Revision history

Revision	Date	Description
A	16/09/2020	First draft for TfNSW review
B	14/10/2020	Response to TfNSW comments
C	30/10/2020	Response to TfNSW comments
D	16/07/2021	Updated with Final NSW and Commonwealth CoA
E	06/08/2021	Response to ER and TfNSW comments
F	26/08/2021	Response to ER comments
G	19/10/2021	Updated following consultation
G.02	22/11/2021	Updated to address DPIE comments
H	13/12/2021	Updated to address DPIE comments

Contents

Glossary/ Abbreviations

Abbreviations	Expanded Text
ABL	Assessment Background Level
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
ARSR	Amendment Report to the Submissions Report
Attenuation	The reduction in the level of sound or vibration
AVTG	Assessing Vibration – a technical guideline (DEC 2006)
CMS	Complaints Management System
CNVMP	Construction Noise and Vibration Management Plan
CNVG	Construction Noise and Vibration Guideline (Roads and Maritime 2016)
CoA	Condition of Approval
Construction	Includes all activities required to construct the CSSI as described in the documents listed in Condition A1, including commissioning trials of equipment and temporary use of any part of the CSSI, but excluding Low Impact Work which is carried out to complete prior to the approval of the CEMP, works approved under a Site Establishment Management Plan, demolition of acquired residential houses, structures and sheds, and works specified in Appendix B and approved under an environmental management plan(s) in accordance with Condition A24.
CSSI	Critical State Significant Infrastructure
DAWE	Commonwealth Department of the Water, Agriculture and Environment
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear
DEC	Department of Environment and Conservation (now EPA)
DECC	Department of Environment and Climate Change (now EPA)
DECCW	Department of Environment, Climate Change and Water (now EPA)
DPIE	NSW Department of Planning, Industry and Environment
DR	Duration Respites
EES	Environmental, Energy and Science (a part of NSW DPIE)
EIS	Environmental Impact Statement
EMS	Environmental Management System

Abbreviations	Expanded Text
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	NSW Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence
ER	Environmental Representative
EWMS	Environmental Work Method Statements
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements
Highly Noise Affected	Where noise affected management level represents the level above which there may be strong community reaction to noise, determined as the exceedance of NMLs.
Highly Noise Intensive Works	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.
IB	Individual briefing
ICNG	Interim Construction Noise Guideline (DECC 2009)
Infrastructure Approval	Approval (SSI 9364) for carrying out of the M12 Project under Section 5.19 of the *Environmental Planning and Assessment Act 1979* subject to specific CoA as detailed in Schedule 2 of the approval.
km	Kilometres

Abbreviations	Expanded Text
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
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
LGA	Local Government Area
NCAs	Noise catchment areas
NML	Noise management level
Noise affected	The noise affected level represents the point above which there may be some community reaction to noise.
NPfI	Noise Policy for Industry
NSW CoA	NSW Conditions of Approval
NVIS	Noise and Vibration Impact Statement
OCEMP	Overarching Construction Environmental Management Plan
OCS	Overarching Communication Strategy
OEH	Office of Environment and Heritage, now EES
OOH	Out-of-Hours
OOHW	Out-of-Hours Works – work completed outside of standard construction hours
Planning Secretary	Secretary of the NSW Department of Infrastructure, Planning and Environment, or delegate
PLO	Public Liaison Officer
Primary CoA/REMM	CoA/REMM that are specific to the development of this Plan
Project, the	M12 Motorway Project
QA	Quality Assurance
R1	Respite Period 1
R2	Respite Period 2
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)
REMMs	Revised Environmental Management Measures

Abbreviations	Expanded Text
RNP	NSW Road Noise Policy (DECCW 2011)
Roads and Maritime	Former NSW Roads and Maritime Services (now Transport for New South Wales)
SAP	Sensitive Area Plan
SEAR's	Secretary's Environmental Assessment Requirements
Secondary CoA/REMM	CoA/REMM that are related to, but not specific to, the development of this Plan
SEMP	Site Establishment Management Plan(s)
SEO	Senior Environment Officer
Standard construction hours	Hours during which construction work is permitted by the CoA
SN	Specific notifications
SWL	Sound Power Level
SPL	Sound Pressure Level
TfNSW	Transport for New South Wales
VDVs	Vibration dose values
Work	Any physical work to build or facilitate the building of the CSSI, including low impact work, environmental management measures and utility works. However, it does not include activities that inform or enable detailed design of the CSSI and generate noise that is no more than 5 dB(A) above the rating background level at any sensitive receiver.
WSIA	Western Sydney International Airport

1 Introduction

This overarching Out-Of-Hours Work (OOHW) Protocol has been developed to assist with any work associated with construction of the Project that will be carried outside the standard hours of work, as defined with the NSW Conditions of Approval (CoA) E34 and that are not subject to an Environment Protection Licence (EPL). This OOHW Protocol also satisfies NSW CoA E36(c)(ii), where works can be approved outside the standard construction hours through an approval of an OOHW Protocol.

This OOHW Protocol forms part of the Construction Noise and Vibration Management Sub-Plan (CNVMP) and is Appendix C of the CNVMP. This OOHW Protocol has been prepared in consultation with the Environmental Representative (ER).

1.1 Scope

This OOHW Protocol identifies a process for the consideration, management and approval of work, which is outside the hours outlined in NSW CoA E34 and that are not subject to an EPL. Works that are not subject to an EPL, may include, but are not limited to, Early Works, low-impact works, property access and amendment, and works outside the EPL premises boundary.

The Construction Contractor will prepare:

- A stage-specific OOHW Protocol for works not subject to an EPL in accordance with NSW CoA E37 and this overarching OOHW Protocol
- An OOHW Protocol in accordance with the EPL that will outline the specific requirements from the EPL including their own processes and procedures regarding OOHW which are covered under an EPL.

Each OOHW Protocol will include the appropriate noise and vibration management measures and respite periods (where applicable) and be reviewed by the Construction Contractor's Environmental Site Representative (ESR) and Construction Manager prior to submission to TfNSW for review and approval (see Section 1.4 for further detail).

This OOHW Protocol is for works ***NOT*** subject to an EPL.

1.2 Justification for OOHW

In accordance with NSW CoA E34, the Construction Contractors will conduct construction activities within the approved standard construction hours:

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

In accordance with NSW CoA E35, highly noise intensive activities 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, then not exceeding three hours, with a minimum cessation of work of not less than one hour

Certain activities may need to be carried out outside of standard construction hours. There are two periods of OOHW including:

1) OOHW Period 1
    a. Monday to Friday: 6pm to 10pm
    b. Saturday: 7am to 8am and 6pm 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).

Where requirements of the CoA and EPL are satisfied, the Construction Contractors may carry out OOHW.

Construction Contractors will provide justification of the need for OOHW in accordance with the Interim Construction Noise Guideline or where OOHW is required:

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

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

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

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

1.3 Exclusions

Works outside of the standard construction hours (as identified in Section 1.1) may be undertaken in the following circumstances as permitted by NSW CoA E36:

- Safety and Emergencies, including:
  - For the delivery of materials required by the NSW Police Force or other authority for safety reasons or
  - Where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property, or to prevent environmental harm.
- Work 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 user(s).
  - LAFmax(15 min) noise levels no more than 15 dB(A) above the rating background level 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).
- By approval, including:
  - Where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or
  - Works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by NSW CoA E37; or
  - Where negotiated agreements with directly affected residents and sensitive land uses have been reached.

On becoming aware of the need for emergency works, the Construction Contractor will notify TfNSW, ER, the Planning Secretary and the EPA of the need for the emergency works. The Construction Contractor will use its best endeavours to notify all affected sensitive receivers of the likely impact and duration of the emergency works.

Emergency work is defined as work that is required to:

- Avoid injury or the loss of life;
- To avoid damage or loss of property; or
- To prevent environmental harm.

Work carried out outside standard construction hours without prior approval or where the definition of emergency work isn't met is considered an environmental incident and non-compliance and will be managed in accordance with processes set out in the Overarching Environmental Management Plan.

OOHW that is approved but not carried out in accordance with the approval or required management measures would also be considered a non-compliance and managed in accordance with processes outlined in the Overarching Environmental Management Plan.

1.4 Review, approval and modification of this Protocol

This OOHW Protocol must be approved by the Planning Secretary prior to the commencement of the OOHW.

Amendments to this OOHW Protocol will be sent to the ER for consultation and then forwarded to the Planning Secretary for approval.

2 OOHW noise and vibration assessment

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

The proposed OOHW is classified low risk (in accordance with E37(a) if it meets the following criteria:

- Works that generate noise up to the “Clearly Audible” OOHW classification as outlined Attachment 2, and meets the following durations (as experienced by the receiver):
    - Three evenings and night periods in a calendar week with only two consecutive evenings and night periods permitted
    - A maximum of 10 evenings and nights periods in a calendar month.

The effect of the above facilitates two evening and night periods in a row and at least one period off before the third period that week. In accordance with CoA E37(a)(ii)), the Environmental Representative (ER) has the authority to approve low risk OOHW activities.

If the duration limitations outlined above cannot be achieved, the proposed OOHW is classified as high risk. In this instance, the assessment of the proposed OOHW and the OOHW Permit will be issued to the Planning Secretary for review and approval.

2.1 Noise

The noise assessment is to be developed by the Construction Contractor with the CoA and this OOHW Protocol and will determine the extent of noise impact the construction activities will have on sensitive receivers by undertaking a quantitative assessment. The assessment will identify the exceedances of construction scenarios against the NMLs adopted for each Noise Catchment Area (NCA) or other sensitive land uses (refer to Section 5.4 of the CNVMP).

The noise assessment will document predicted noise levels, frequency and duration of OOHW, awakening events/sleep disturbance and determine the appropriate standard and additional mitigation measures. The noise assessment will also consider if feasible and reasonable work practices have been identified to minimise the noise.

Where a noise assessment has been prepared for an approved Stage Specific Noise and Vibration Management Plan and considers OOHW for the type of activity to be undertaken, this assessment can be relied upon to fulfil this requirement.

Noise and Vibration Impact Statements (NVIS) will be prepared for any work that may exceed the NMLs and vibration criteria specified in NSW CoA E38 at any residence outside the construction work hours identified in NSW CoA E34, or where receivers will be highly noise affected. The NVIS must include specific mitigation measures identified through consultation with affected sensitive receivers; the mitigation measures must be implemented for the duration of the work. 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 may request copies of the NVIS.

2.2 Vibration

An assessment will be required for vibration intensive OOHW within the safe working distances for human comfort (refer to Section 5.6.1 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.

2.3 Co-ordination of OOHW with third parties

All OOHW, including works undertaken by a third party, will be co-ordinated with other CSSI, SSI and SSD projects that are being constructed nearby, to implement the appropriate management measures and respite periods as specified in NSW CoA E45.

Works will be scheduled with the aim of minimising concurrent works near sensitive receives in consultation with managers of other nearby projects that are likely to result in a cumulative impact. This will include:

- Coordination between project teams
- Rescheduling of work to provide respite to impacted noise sensitive land user(s) so that respite is achieved during OOHW
- Consideration to the provision of alternative respite or mitigation to impacted noise sensitive land users where OOHW respite as per NSW CoA E47 cannot be provided.

Consultation will be undertaken in accordance with the Overarching Communication Strategy (OCS) to ensure works can be coordinated with third parties under NSW CoA E37(d).

3 OOHW noise and vibration management measures

Following the noise and vibration assessment, the Construction Contractor will identify any additional mitigation measures, consistent with the TfNSW Construction Noise and Vibration Guideline (CNVG) (2016), that are proposed to manage OOHW noise and vibration impacts from the Project. The most appropriate reasonable and feasible management measures will be determined in accordance with the ICNG. Additional mitigations measures will be implemented and will relate directly to the risk factor (Table 3-1) of the proposed OOHW.

The Construction Contractor will identify the OOHW period, the predicted airborne LAeq(15mins) noise level at receiver, and dB(A) above the RBL and NML. This will determine the appropriate management measures to mitigate the noise and vibration impacts. Attachment 2 outlines the approach for the application of standard and additional mitigation measures to minimise impacts from OOHW.

Where additional mitigation measures are proposed, the Construction Contractor's Public Liaison Officer (PLO) in conjunction with TfNSW 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 request form.

The standard mitigation measures as outlined in the TfNSW CNVG (2016) are also included in Section 8 of the CNVMP and generally include:

- Behavioural practices on site (NV3, NV17)
- Equipment selection / Maintaining and monitoring plant (NV10, NV11, NV21, NV22, NV40)
- Use and siting of plant and hoardings (NV12, NV14, NV15, NV16, NV20, NV43)
- Site inductions (NV1, NV2)
- Use of non-tonal reversing alarms (NV13)
- Notification and consultation (NV23, NV34)
- Mitigating cumulative impacts and planning noisier work to be carried out earlier in the period (NV32, NV33, NV35)
- Implementation of at-property treatment for operation noise mitigation (NV18, NV44) – TfNSW responsibility.

Details on the additional mitigation measures are provided below. These mitigation measures are provided in the TfNSW CNVG (2016) and are to be applied during OOHW as outlined in Attachment 2.

Stakeholder notifications

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

Specific notifications (SN)

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

Phone calls (PC)

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

Individual briefings (IB)

Individual briefings will be used to inform affected sensitive receivers about the impacts of work that is assessed to be moderately intrusive (OOHW period 2) or highly noise intrusive (OOHW period 1 and 2) as outlined in Attachment 2 and the mitigation measures that will be implemented for the work. The Construction Contractor's PLO will identify the relevant sensitive receivers through the noise and vibration impact assessment and visit identified stakeholders as part of the planning for the OOHW prior to submitting an OOHW request for approval. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the Project. Where the resident cannot be met with individually, then an alternative form of engagement will be used.

Respite offers (RO)

Respite offers will be considered where there are high noise and vibration generating activities near sensitive receivers. The offers will provide residents with respite from an ongoing impact. Respite consultation with affected sensitive receivers must be carried out in accordance with Section 5.1.

Respite periods (R1 and R2)

All work will be scheduled to enable respite periods. The Construction Contractors will:

- Reschedule any work to provide respite to impacted noise sensitive land user(s) so that the respite is achieved, or
- Where respite cannot be achieved, the provision of alternative respite or mitigation to impacted noise sensitive land user(s) will be considered, and
- Provide documentary evidence to the ER in support of any decision made.

OOHW noise in Period 1 (defined in Attachment 2) 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.

OOHW night time noise in Period 2 (defined in Attachment 2) 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.

Duration respite (DR)

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

Where the work exceeds the noise and vibration criteria outlined in NSW CoA E36(b), the Construction Contractor's PLO, in conjunction with TfNSW, will negotiate agreements with the directly affected sensitive receivers as outlined in Section 5.2. If the Construction Contractor and TfNSW cannot reach agreements with 100% of directly affected sensitive receivers, then the work is considered a high risk activity and approval is required from the Planning Secretary to carry out duration respite.

Alternative accommodation (AA) or other agreed mitigation measures

Temporary alternative accommodation or other agreed mitigation measures will be offered / made available to residents affected by out-of-hours work as specified in NSW CoA E46. This will include where the construction noise levels during OOHW Period, i.e. between:

- 10:00 pm and 7:00 am, Monday to Friday;
- 10:00 pm Saturday and 8:00 am Sunday; and
- 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 5dB where the noise contains annoying characteristics and may be increased by 10dB if the property has received at-property noise treatment.

The noise and vibration assessment outlined in Section 2.1 would identify receivers that are eligible for alternative accommodation. Initial discussion about offers to affected residents should be made during the planning phase of OOHW and prior to seeking approval for the work.

Verification (V)

Attended measurements will be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration. The attended measurements will include evaluation of both construction noise and background noise levels compared with the predicted and estimated levels used in the assessment. The attended measurements may include:

- **Noise levels for plant and equipment:** attended measurements will be undertaken within a period of 14 days of equipment arriving on site to confirm that the operating noise levels of all plant items comply with the maximum levels in the CNVG (TfNSW 2016). The attended measurements are to be repeated on a three-monthly basis to ensure that noise from individual plant items are still within the acceptable noise range.
- **Noise and vibration verification in the community**: attended measurements are to be undertaken within a period of 14 days from the commencement of construction activities. The attended measurements will need to be repeated on a three-monthly basis as part of the audit cycle to ensure that noise and vibration levels in the adjacent community remain

consistent with the predicted levels in the noise assessment, approval and/or licence conditions.

The results of the attended noise measurements will be used to update the Construction Noise and Vibration Management Plan and other relevant environmental management documents as required.

4 Compliance management

4.1 Roles and responsibilities

Subject to the approval pathway, an OOHW approval request will be developed. The Construction Contractor will be required to complete an OOHW approvals request form (refer to Attachment 1).

The Construction Contractor's PLO, in conjunction with TfNSW, will be responsible for ensuring that notification and consultation has occurred with community stakeholders, in accordance with CoA and OCS, on the likely impacts of OOHW activities.

The Construction Contractor's ESR will implement and oversee the noise monitoring program for OOHW to assess compliance with the CoA, the EPL and the OOHW Protocol. The Construction Contractor's ESR is also responsible for notifying the ER and Planning Secretary of any noise exceedances or complaints during OOHW.

4.2 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 Protocol. Training will include inductions, toolbox talks, pre-starts and targeted training as required.

4.3 OOHW process and approval

For proposed OOHW, the following process will be followed:

1) The OOHW approval request (Attachment 1) will be prepared by the Construction Contractor and include information on:
    - Activities
    - Required plant and equipment
    - Location
    - Duration
    - Justification for the work
    - Details of the completed quantitative noise assessment (in accordance with Section 2.1) including predicted impacts and appropriate management measures as per Section 3 and Attachment 2 of this protocol
    - Details of consultation with the community regarding respite periods and scheduling as outlined in Section 5 of this protocol
2) The Construction Contractor will submit the OOHW request to TfNSW for review. The TfNSW Project Manager and Environment and Sustainability Manager (or delegate) will determine if the justification for the OOHW is satisfactory

3) TfNSW will provide the OOHW request to the ER for review and confirmation of the risk level, in accordance with NSW CoA E37(a) and Section 2 of this protocol

4) The identification of the OOHW as a low or high-risk activity will determine who can then approve the OOHW:

   - **Low Risk Activities:** approved by the ER. The ER will consider the criteria outlined in Section 2 as well as ongoing and cumulative impacts, construction fatigue and complaints in reviewing the determined risk level. If required, the ER may consult with DPIE to discuss the assessed risk level. The ER will have 10 days to review the OOHW approval request. The Planning Secretary will also be notified of all approved low risk OOHW
   - **High risk activities:** must be approved by the Planning Secretary. The Planning Secretary will have one month to review the OOHW approval request.

5) Following approval of each OOHW request, the Construction Contractor, in conjunction with TfNSW, will undertake community consultation and notification in accordance with Section 5 of this protocol

6) Noise monitoring and reporting will be carried out in accordance with Section 6 of this protocol.

5 Communication and notification

Prior to undertaking OOHW, the Construction Contractor, in conjunction with TfNSW, will consult with the potentially affected sensitive receivers, where applicable. The Construction Contractor's PLO, in conjunction with TfNSW, will notify the potentially affected receivers of upcoming OOHW 5-10 working days before commencing the work, in accordance with the OCS.

Letterbox notification letters will be used to inform directly affected residents and businesses about any changes that may impact on properties, such as access arrangements, construction of temporary work and permanent changes and work outside normal working hours. Notification of OOHW will be delivered to the relevant stakeholders at least seven calendar days prior to work starting. The Construction Contractor will provide the notification letters for TfNSW approval at least 15 business days before work commences.

5.1 Respite consultation

In order to undertake OOHW outside the hours specified under NSW CoA E34, the Construction Contractor will identify appropriate respite periods for the OOHW in consultation with the community at each affected location on a regular basis. The Construction Contractor will consult with the community at affected locations, in accordance with the consultation requirements prescribed by NSW CoA E47. The outcomes of the community consultation, the identified respite periods and the scheduling of the likely OOHW will be provided to the EPA, ER and Planning Secretary for information within one week of undertaking the community consultation.

The consultation must include (but not be limited to) providing the community with:

- Progressive schedule for periods no less than three months, of likely OOHW
- Description of the potential work, location and duration of the OOHW
- Noise characteristics and likely noise levels of the work
- Mitigation and management measures which aim to achieve the relevant noise management levels and vibration criteria under NSW CoA E38(a) and (b).

The Construction Contractor will provide the TfNSW Project Manager and TfNSW ESM (or delegate) evidence of the consultation undertaken for the OOHW.

5.2 Negotiated agreements

Works outside of standard construction hours that do not meet the circumstances listed in NSW E36(a), E36(b), E36(c)(i) or E36(c)(ii) may be undertaken if agreement between the Construction Contractor and the noise sensitive receivers has been reached in accordance with NSW CoA E36(c)(iii). The community agreements between the Construction Contractor and the potentially affected institution or business will be:

- Prepared in writing and a copy of the agreement(s) kept on the premises for the duration of the OOHW

- Made available for the duration of the agreement (personal details of noise sensitive receivers will be omitted).

Where a community agreement has been attained by phone, the following may apply:

- Phone script used to describe the proposed agreement is to be provided to TfNSW with the community agreement for evidence
- Phone script to include a description of the proposed works, the likely impacts and benefits for the community and a clear question requesting receiver agreement to the proposal
- Detailed records are to be maintained for the duration of the community agreement
- Any noise sensitive receiver, who requests a copy of the phone agreement will be supplied with one.

It is noted that where negotiated agreements are used to undertake OOHW not subject to an EPL under E36(c)(iii), then agreements must be reached with 100% of the directly affected residents and sensitive land users.

In accordance with NSW CoA E39, noise generating work in the vicinity of potentially affected community, religious, educational institutions, noise and vibration-sensitive businesses, and critical working areas (such as theatres, laboratories and operating theatres), resulting in noise levels above the NMLs will not be scheduled within sensitive periods, unless TfNSW and the potentially affected institution or business have made other arrangements. These arrangements will be implemented at no cost to the affected institution.

6 Monitoring and reporting

6.1 Monitoring for OOHW

The Construction Contractor's ESR will ensure the following noise and vibration monitoring is undertaken for all OOHW:

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

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

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

6.2 Complaints management

Complaints received as a result of the OOHW will be managed in accordance with the Complaints Management Strategy, OCS and Section 9.3 of the CNVMP.

6.3 Reporting on non-conformances and exceedances

Where monitoring identifies any exceedances of the levels predicted in the OOHW assessments, a review of OOHW activities will be carried out to determine where noise or vibration levels can be further reduced. Where monitored noise or vibration levels are found to exceed the relevant criteria, the exceedance will be managed in accordance with the procedures outlined in Section 9.8 of the CNVMP.

6.4 Records

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

Attachment 1 – OOHW approval request form

Out of hours work approval request form			
No:	**Notification date:**	**Approval date:**	**Project:**
A. Contact details	**Name**	**Mobile number**	**Email**
Construction Contractor ESR			
Contractor Construction Manager			
Contractor Foreman / Site Supervisor			
Contractor Project Engineer			

B. Details of work: Include a map showing location of work extent and nearest sensitive receivers	Location (Chainage):	
	NCA/s:	
	Description of activities to be carried out:	
	Plant and equipment to be used	
	Traffic control measures required:	
	Lighting required:	
	Proposed mitigation measures:	
	Proposed dates:	
	Proposed timings:	
	Justification (Why does work need to occur outside of standard construction hours?):	
C. Risk factor category (low, high) and evidence of risk confirmation from the ER:	Low High Comments	

Out of hours work approval request form			
D. Details of noise or vibration assessment completed:	Provide details of quantitative assessments for all proposed works, including predicted noise levels, potential noise exceedances against relevant NMLs, potentially affected sensitive receivers and proposed management measures in accordance with ICNG and CNVG. Where alternative accommodation or other agreed mitigation is triggered, include details of and offers made to qualifying residents.		
E. Review/ Endorsements			
TfNSW Senior Environment Officer (or delegate) and Project Manager notified	TfNSW notified? Yes / No		
	Comments:		
Environmental Representative	ER notified? Yes / No		
	Comments:		
Contractor Community Relations Manager	Community notified? Yes / No		Date:
	Provide details of consultation with affected receivers, in accordance with Overarching Communication Strategy		
	Have the works been reviewed and endorsed?		Yes / No
	Name:	Signature:	Date:
	Comments:		
F. Approvals (if required)	**Low Risk Activities**		
	ER approval required		Yes / No
	ER approval letter attached? **Or** signature obtained:		Yes / No Yes / No
	High Risk Activities		
	Planning Secretary approval required?		Yes / No
	Planning Secretary approval letter attached?		Yes / No
Construction Contractor Project Manager (or delegate)	Are the works approved?		Yes / No
	Name:	Signature:	Date:
	Comments:		

Attachment 2 - Application of OOHW mitigation measures

Predicted Airborne LAeq (15mins) Noise Level at Receiver				Mitigation Measures		
OOHW Period	Perception	dB(A) above RBL	dB(A) above NML	Standard Mitigation Measures	Additional Mitigation Measures	
					Type	Mitigation Level
OOHW Period 1						
Monday–Friday: 6 pm – 10 pm Saturday: 7 am - 8 am and 1 pm – 10pm Sunday and Public Holidays: 8 am – 6 pm	Noticeable	5-10	<5	• Behavioural practices on site (NV3, NV17) • Equipment selection / Maintaining and monitoring plant (NV10, NV11, NV21, NV22, NV40) • Use and siting of plant and hoardings (NV12, NV14, NV15, NV16, NV20, NV43) • Site inductions (NV1, NV2) • Use of non-tonal reversing alarms (NV13) • Notification (NV23, NV34) • Managing cumulative impacts and planning noisier work to be carried out earlier in the period (NV32, NV33, NV35) • Implementation of at-property treatment for operation noise mitigation (NV18, NV44) (TfNSW responsibility)	N/A	NML
	Clearly Audible	10-20	5-15	• Standard measures as above	• Notification • Respite period 1 • Duration respite	NML + 5
	Moderately intrusive	20-30	15-25	• Standard measures as above	• Notification • Verification • Respite period 1	NML + 15

Predicted Airborne LAeq (15mins) Noise Level at Receiver				Mitigation Measures		
					• Duration respite	
	Highly intrusive	>30	>25	• Standard measures as above	• Notification • Verification • Individual briefing • Respite period 1 • Duration respite • Phone calls • Specific notifications	NML + 25
OOHW Period 2						
Monday–Friday: 10 pm – 7 am Saturday: 10 pm – 8 am Sunday and Public Holidays: 6 pm – 7 am the following	Noticeable	5-10	<5	• Behavioural practices on site (NV3, NV17) • Equipment selection / Maintaining and monitoring plant (NV10, NV11, NV21, NV22, NV40) • Use and siting of plant and hoardings (NV12, NV14, NV15, NV16, NV20, NV43) • Site inductions (NV1, NV2) • Use of non-tonal reversing alarms (NV13) • Notification (NV23, NV34) • Managing cumulative impacts and planning noisier work to be carried out earlier in the period (NV32, NV33, NV35) • Implementation of at-property treatment for operation noise mitigation (NV18, NV44)	N/A	NML

Predicted Airborne LAeq (15mins) Noise Level at Receiver				Mitigation Measures		
day (unless that day is Saturday then to 8:00am)	Clearly Audible	10-20	5-15	• Standard measures as above	• Notification • Verification • Respite period 2 • Duration respite	NML + 5
	Moderately intrusive	20-30	15-25	• Standard measures as above	• Notification • Verification • Individual briefing • Respite period 2 • Duration respite • Phone calls • Specific notifications	NML + 15
	Highly intrusive	>30	>25	• Standard measures as above.	• Notification • Verification • Individual briefing • Respite period 2 • Duration respite • Phone calls • Specific notifications • Temporary alternative accommodation	NML + 25

Appendix D

Secondary CoA and REMMs

M12 Motorway

December 2021

CoA

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
A5	Where the terms of this approval require a document or monitoring program to be prepared or a review to be undertaken and submitted to the Planning Secretary, and the terms of this approval require the document, monitoring program or review to be prepared/undertaken in consultation with identified parties, evidence of the consultation must be submitted to the Planning Secretary with the relevant document, monitoring program or review. The evidence must include: (a) documentation of the engagement with the party identified 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.	✓	✓	✓	Section 1.5.1 Appendix A
A15	Construction ancillary facilities (excluding minor construction ancillary facilities established under Condition A20) that are not identified by description and location in the documents listed in Condition A1 may only be established and used in each case if: (a) they are located within or immediately adjacent to the construction boundary; and (b) they are not located next to a sensitive receiver(s) (including where an access road is between the facility and the receiver(s)), unless the sensitive receiver(s) (both the landowner(s) and occupier(s)2) have given written acceptance to the carrying out of the relevant facility in the proposed location; (c) they have no impacts on heritage items (including areas of archaeological sensitivity), threatened species, populations or ecological communities beyond the impacts approved under the terms of this approval; and	✓	✓	✓	Section 7.2.2

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
	(d) the establishment and use of the facility can be carried out and managed within the outcomes set out in the terms of this approval, including in relation to environmental, social and economic impacts.				
A16	Before establishment of a construction ancillary facility(ies) (excluding minor construction ancillary facilities established under **Condition A20**), the Proponent must prepare a **Site Establishment Management Plan** which outlines the environmental management practices and procedures to be implemented for the establishment of the construction ancillary facility(ies). The **Site Establishment Management Plan** must be prepared in consultation with the relevant council(s) and relevant State government agencies. The Plan must be endorsed by the **ER** and then submitted to the Planning Secretary for approval one (1) month before the establishment of the construction ancillary facility(ies). The **Site Establishment Management Plan** must detail the management of the construction ancillary facility(ies) and include: (a) a description of activities to be undertaken during establishment of the construction ancillary facility(ies) (including scheduling and duration of work to be undertaken at the site); (b) figures illustrating the proposed site layout and the location of the closest sensitive receiver(s); (c) a program for ongoing analysis of the key environmental risks arising from the site establishment activities described in subsection (a) of this condition, including an initial risk assessment undertaken before the commencement of site establishment work; (d) details of how the site establishment activities described in subsection (a) of this condition will be carried out to: (i) meet the performance outcomes stated in the documents listed in **Condition A1**, and (ii) manage the risks identified in the risk analysis undertaken in subsection © of this condition; and (e) a program for monitoring the performance outcomes, including a program for noise monitoring consistent with the requirements of **Condition C14**. The **Site Establishment Management Plan** must be approved before the establishment of a construction ancillary facility(ies) (excluding minor construction ancillary facilities established	✓	✓	✓	Section 7.2.2

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
	under **Condition A20**). Nothing in this condition prevents the Proponent from preparing individual **Site Establishment Management Plans** for each construction ancillary facility. *Note: **Condition A16** does not apply to minor construction ancillary facilities established under **Condition A20**.*				
A20	Lunch sheds, office sheds, portable toilet facilities, and the like, can be established and used where they have been assessed in the documents listed in **Condition A1** or satisfy the following criteria: (a) are located within or adjacent to the construction boundary; and (b) have been assessed by the **ER** to ha–e - (i) minor amenity impacts to surrounding residences and businesses, after consideration of matters such as compliance with the *Interim Construction Noise Guideline* (DECC, 2009), traffic and access impacts, dust and odour impacts, and visual (including light spill) impacts, and (ii) minor environmental impact with respect to waste management, soil, water and flooding, and (iii) no impacts on heritage items (including areas of archaeological sensitivity), threatened species, populations or ecological communities beyond the impacts approved under the terms of this approval.	✓	✓	✓	Section 7.2.2
A21	Boundary screening must be erected around all construction ancillary facilities that are adjacent to sensitive receivers for the duration of construction of the CSSI unless otherwise agreed with affected residents, business operators and landowners.	✓	✓	✓	Section 8
B1	A Communication Strategy must be prepared to provide mechanisms to facilitate communication about Work, construction and operation of the CSSI with: (a) the community (including adjoining affected landowners and businesses, and others directly impacted by the CSSI); and (b) the relevant councils and relevant government agencies.	✓	✓	✓	Section 9.2

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
	The Communication Strategy must address who (the Proponent, Independent Appointments and/or construction contractor) will engage with the community, relevant councils and agencies, how they will engage and the timing of engagements.				
B2	The **Communication Strategy** must: (a) identify people, organisations, councils and agencies to be consulted during the design and Work phases; (b) identify details of the community demographics; (c) set out procedures and mechanisms for the regular distribution of accessible information, including to Language Other than English and Culturally and Linguistically Diverse and vulnerable communities, about or relevant to the CSSI; (d) detail the measures for advising the community in advance of upcoming Work, including utility works and upcoming out-of-hours work as required by **Condition E47**; (e) provide for the formation of issue or location-based community forums that focus on key environmental management issues of concern to the relevant community(ies); and (f) set out procedures and mechanis–s - (i) through which the community can discuss or provide feedback to the Proponent 24 hours a day, seven days per week; (ii) through which the Proponent will respond to enquiries or feedback from the community; and (iii) to resolve any issues and mediate any disputes that may arise in relation to the environmental management and delivery of the CSSI, including disputes regarding rectification or compensation.	✓	✓	✓	Section 9.2
B6	A Complaints Management System must be prepared and implemented before the commencement of any Work and maintained for the duration of construction and for a minimum for 12 months following completion of construction of the CSSI. The Complaints Management System must require complainants to be advised that: (a) the Complaints Register may be forwarded to Government agencies, including the Department, to allow them to undertake their regulatory duties;	✓	✓	✓	Section 9.3

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
	(b) by providing personal information, the complainant authorises the Proponent to provide that information to government agencies; (c) the supply of personal information by the complainant is voluntary; and (d) the complainant has the right to contact government agencies to access personal information held about them and to correct or amend that information (Collection Statement). The Collection Statement must be included on the Proponent's or project website to make prospective complainants aware of their rights under the Privacy and Personal Information Protection Act 1998. For any complaints made in person, the complainant must be made aware of the Collection Statement.				
B7	The following information must be available to facilitate community enquiries and manage complaints one (1) month before the commencement of Work and for 12 months following the completion of construction: (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 B10.	✓	✓	✓	Section 9.3
C2	The CEMP must provide:				
	(h) a list of all the CEMP Sub-plans required in respect of construction, as set out in Condition C4. Where staged construction of the CSSI is proposed, the CEMP must also identify which CEMP Sub-plan applies to each of the proposed stages of construction;	✓	✓	✓	Section 1.4
	(k) for periodic review and update of the CEMP and all associated plans and programs; and	✓	✓	✓	Section 10

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
C5	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 cumulative impacts), as identified through ongoing environmental risk analysis, will be managed through SMART (Specific, Measurable, Achievable, Realistic and Timely) principles.	✓	✓	✓	Section 2.3 Section 6.3 Section 8
C9	Any of the CEMP Sub-plans may be submitted to the Planning Secretary for approval along with, or subsequent to, the submission of the CEMP but in any event, no later than one (1) month before the commencement of construction.	✓	✓	✓	Section 1.4.1
C10	Construction must not commence until the CEMP and all CEMP Sub-plans have been approved, unless otherwise agreed by the Planning Secretary. The CEMP and CEMP Sub-plans, as approved by the Planning Secretary, including any minor amendments approved by the ER must be implemented for the duration of construction. Where construction of the CSSI is staged, construction of a stage must not commence until the CEMP and sub-plans for that stage have been endorsed by the ER and approved by the Planning Secretary.	✓	✓	✓	Section 1.4.1
C12	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 Construction Monitoring Programs, including copies of all correspondence from those agencies as required by Condition A5.	✓	✓	✓	Appendix B
C13	Each Construction Monitoring Program 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 CSSI to be undertaken; (d) the parameters of the CSSI to be monitored;	✓	✓	✓	Section 9.5.1 Appendix B

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
	(e) the frequency of monitoring to be undertaken; (f) the location of monitoring; (g) the reporting of monitoring results and analysis of results against the relevant criteria; (h) details of methods that will be used to analyse monitoring data; (i) procedures to identify and implement additional mitigation measures where results of monitoring indicate unsatisfactory CSSI impacts; (j) a consideration of SMART principles; (k) any consultation to be undertaken in relation to the monitoring programs; and (l) any specific requirements as required by Condition C14.				
C15	The Construction Monitoring Programs must be endorsed by the ER and then submitted to the Planning Secretary for approval at least one (1) month before the commencement of construction.	✓	✓	✓	Appendix B
C16	Unless otherwise agreed with the Planning Secretary, construction must not commence until all of the relevant Construction Monitoring Programs have been approved by the Planning Secretary, and all relevant baseline data for the specific construction activity has been collected.	✓	✓	✓	Section 1.4.1 Appendix B
C17	The Construction Monitoring Programs, as approved by the Planning Secretary, 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.	✓	✓	✓	Appendix B
C18	The results of the Construction Monitoring Programs must be submitted to the Planning Secretary, and relevant government agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	✓	✓	✓	Section 6.2 of Appendix B
E52	An Operational Noise Review (ONR) must be prepared (based on the detailed design of the CSSI) to confirm noise mitigation measures that would be implemented for the operation of the	✓	✓	✓	Section 7.2.4

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
	CSSI. The ONR must be prepared in consultation with the Planning Secretary and relevant council(s) and must:				Section 8 Operational Noise Review
	(a) confirm the appropriate operational noise objectives and levels for existing sensitive receivers;	✓	✓	✓	
	(b) confirm the operational noise impacts based on the final design of the CSSI and modelling undertaken under Condition E51, E51, including operational daytime LAeq,15 hour and night-time LAeq, 9-hour traffic noise contours;	✓	✓	✓	
	(c) review the suitability of the operational noise mitigation measures identified in the documents listed in Condition A1 and, where necessary, investigate and identify additional noise and vibration mitigation measures required to achieve the noise criteria outlined in the NSW Road Noise Policy (DECCW, 2011), including the timing of implementation;	✓	✓	✓	
	(d) include a consultation strategy to seek feedback from directly affected landowners on the noise and vibration mitigation measures; and	✓	✓	✓	
	(e) procedures for the management of operational noise and vibration complaints.	✓	✓	✓	
	The ONR must be undertaken at the Proponent's expense and be submitted to the Planning Secretary for information prior to implementing at-property noise mitigation, unless otherwise agreed by the Planning Secretary.	✓	✓	✓	
	The Proponent must implement the identified noise mitigation measures and make the ONR publicly available following its submission to the Planning Secretary for information.	✓	✓	✓	
	Note: The design of noise barriers and the like must be undertaken in consultation with the community as part of the Place, Design and Landscape Plan required under Condition E69.	✓	✓	✓	
E53	Operational noise mitigation measures as identified in Condition E52 that will not be physically affected by construction and where the noise management level in Condition E38(a) is likely to be exceeded, must be implemented within six (6) months of the commencement of construction in the vicinity of the impacted residence(s) to minimise construction noise impacts, unless	✓	✓	✓	Section 7.2.4 Section 8

CoA No.	Condition Requirements	Applicability			Document Reference
		M12 West	M12 Central	M12 East	
	otherwise agreed by the Planning Secretary in accordance with Condition E55. The operational noise mitigation measures must be detailed in the Noise and Vibration CEMP Sub-plan required by Condition C4.				Operational Noise Review
E54	If the ONR required by Condition E52 is not prepared within six (6) months of the commencement of construction, the at-property operational noise mitigation measures required by Condition E53 must be consistent with the measures and the properties identified in Appendix G of the M12 Motorway Amendment Report (October, 2020).	✓	✓	✓	Section 7.2.4 Section 8 Operational Noise Review
E55	All requests to the Planning Secretary under Condition E53 must be accompanied by a report justifying why operational noise mitigation measures will not be implemented within six (6) months, along with details of the temporary measures that the Proponent would implement 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 which would affect identified residences. All temporary measures must be implemented within six (6) months of the commencement of construction in the vicinity of the impacted residences.	✓	✓	✓	Section 7.2.4 Section 8 Operational Noise Review
E81	The Proponent must have regard to the Upper Canal Pheasants Nest to Prospect Reservoir Conservation Management Plan (NSW Public Works Governments Architect's Office, 2016) and Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines (WaterNSW, 2020) when constructing the CSSI.	✓	✓	✓	Section 8
E82	Construction and operation of the CSSI must not destroy, modify or otherwise cause direct or indirect damage to the Upper Canal System, including the Cecil Hills Tunnel, and Tunnel Shafts 3 and 4.	✓	✓	✓	Section 8

REMMs

ID	Measure/Requirement	Timing	Applicability			Document Reference
			M12 West	M12 Central	M12 East	
NV02	Measures to minimise and manage construction fatigue are to be investigated through the planning of construction staging.	Detailed design, prior to construction and during construction	✓	✓	✓	Section 8
NV03	Detailed noise assessments will be carried out for ancillary facilities with the potential to involve high noise generating activities (including batching plant operations). The assessments will consider the proposed site layouts and noise generating activities that will occur at the facilities and assess predicted noise levels against the relevant noise management criteria. The assessments will also consider the requirement for appropriate noise mitigation within ancillary facilities and adjacent to construction works, depending on the predicted noise levels. Any mitigation measures required will be implemented before the start of activities that generate noise and vibration impacts.	Prior to construction	✓	✓	✓	Section 8
NV04	Monitoring will be carried out at the start of high noise and vibration activities to confirm that actual noise and vibration levels are consistent with the noise and vibration impact predictions. Where mitigation measures were included, measurements will be carried out to confirm the effectiveness. Where the monitoring identifies higher levels of noise and vibration compared to predicted levels, or where mitigation is shown to be ineffective against measured noise and vibration levels, additional mitigation measures will be identified and implemented to appropriately manage impacts where feasible and reasonable.	Construction	✓	✓	✓	Section 8 Appendix B
NV05	Where reasonable and feasible, receivers identified as requiring at-property treatment for operational noise mitigation will be identified and offered treatment before construction activities begin that are likely to impact them.	Prior to construction	✓	✓	✓	Section 8 Appendix C

ID	Measure/Requirement	Timing	Applicability			Document Reference
			M12 West	M12 Central	M12 East	
NV06	Activities that generate vibration will be managed to avoid impacts on structures and sensitive receivers. This includes implementing appropriate safe working distances where practicable.	Prior to and during construction	✓	✓	✓	Section 8
NV07	The use of alternatives to vibration generating equipment will be considered where vibration impacts are predicted.	During construction	✓	✓	✓	Section 8
NV08	Where works are within the minimum working distances and considered likely to exceed the cosmetic damage objectives (as shown in Figure 7-3 of Appendix G of the amendment report), construction works will not proceed unless: • A different construction method with lower source vibration levels is used, where feasible • Attended vibration measurements are carried out at the start of the works to determine the risk of exceeding the vibration objectives.	During construction	✓	✓	✓	Section 8 Appendix B
NV09	Building Condition Surveys will be offered in writing to property owners before construction where there is a potential for construction activities to cause structural or cosmetic damage. A comprehensive report will be prepared by a suitably qualified professional before the relevant works begin and will comprise a written and photographic condition.	Prior to construction	✓	✓	✓	Section 8 Appendix C
NV10	Surveys will be carried out to confirm the existing condition of the WaterNSW Upper Canal System and Jemena high pressure gas pipelines to determine appropriate vibration criteria. This will also include consideration of distances from the vibration intensive activity (piling, rock-breaking and vibratory rolling), as well as ground conditions.	Detailed design and during construction	✓	✓	✓	Section 8 Appendix B

ID	Measure/Requirement	Timing	Applicability			Document Reference
			M12 West	M12 Central	M12 East	
	A vibration criterion of a peak particle velocity (PPV) will be determined in consultation with the relevant utility/service providers, including WaterNSW. In-situ monitoring will be carried out to confirm the vibration levels and assess the impact of vibration. Where the monitoring identifies exceedances in the relevant criteria, or where impacts are identified, additional mitigation measures will be identified and implemented to appropriately manage impacts.					
NV11	The following structures have the potential to be within the safe working distances for sensitive structures (Group 3 from DIN 4150): • Item 1: McGarvie Smith Farm • Item 2: Fleurs Radio Telescope Site • Item 4: Upper Canal System • Item 6: McMaster Field Station • Item 7: Fleurs Aerodrome. A detailed survey will be completed to determine the potential for vibration impacts and to define appropriate criteria for each heritage item. Vibration monitoring will be carried out when vibration intensive tasks are occurring within the minimum working distances to heritage structures. Where the monitoring identifies exceedances in the relevant criteria, or where impacts are identified, additional mitigation measures will be identified and implemented to appropriately manage impacts.	Prior to and during construction	✓	✓	✓	Section 8 Appendix B

ID	Measure/Requirement	Timing	Applicability			Document Reference
			M12 West	M12 Central	M12 East	
NV12	Construction vehicle movements (both on and offsite) will be managed to minimise noise impacts. Where feasible, this will include (but not be limited to): • Establishment and use of internal haul routes, or existing major roads where this is not feasible • Restriction of heavy vehicle movements to standard construction hours • Locating traffic marshalling areas away from residences to minimise noise impacts from idling vehicles • Instructing workers on the operation of heavy vehicles entering and exiting the site to minimise noise.	During construction	✓	✓	✓	Section 8
NV13	The likelihood of cumulative construction noise impacts will be considered during detailed design when detailed construction schedules of other projects are available. Construction works will be scheduled with the aim of minimising concurrent works near sensitive receivers where possible in consultation with managers of other nearby projects that are likely to result in a cumulative impact. This will include the coordination of respite between the various construction projects where receivers are likely to experience concurrent construction impacts where feasible. Coordination between project teams will be carried out throughout construction.	Prior to and during construction	✓	✓	✓	Section 8
CU01	Regular consultation will be carried out with nearby/adjoining projects and key stakeholders during construction to review potential cumulative impacts and construction methodologies (including traffic impacts and noise management), as far as practicable to minimise cumulative impacts.	Prior to and during construction	✓	✓	✓	Section 6.3 OCS

Appendix E

Construction Materials – ARNTG Appendix B

M12 Motorway

December 2021

Appendix B – Deemed to comply mitigation packages (Based on R_w+C_{tr})

Construction	Treatment Package Type				
	1	2	3	4	5
Exceedance, dBA	1-5	6-8	9-11	12-14	>14
All	• Optional ceiling fans[1] • Mechanical ventilation (MV)[2] • New acoustic seals for windows • Seal around window architraves / door jambs • Seal all vents and openings	• As per Category 1 treatments • External solid core door (40mm) with perimeter acoustic seals, drop seals and threshold seals			
Brick veneer or double brick Window area less than or equal to 20% floor area		For 6 dBA exceedance: • 6.38mm laminate and roof insulation (R4.0 215mm thick) or 6.5mm lam with acoustic interlayer For 7 dBA exceedance: • 8.5mm lam with acoustic interlayer or 10.38mm lam For 8 dBA exceedance: • 8.5mm lam with acoustic interlayer or 10.5mm lam with acoustic interlayer or 10mm acrylic panel with nominally 100mm gap or >4mm secondary window with 100mm gap or equivalent	• Roof insulation (R4.0 215mm thick) For 9 dBA exceedance: • 8.5mm lam with acoustic interlayer or 10.38mm lam Otherwise: • 10.5mm lam with acoustic interlayer or 10mm acrylic panel with nominally 100mm gap or >4mm secondary window with 100mm gap or equivalent	• >4mm secondary window with 100mm gap, or equivalent • Roof insulation (R4.0 215mm thick)	• >6mm secondary window with nominally 100mm gap, or equivalent • Roof insulation (R4.0 215mm thick)
Brick veneer or double brick Sliding door area less than or equal to 50% wall area	• 6.38mm lam, or equivalent	• 6.5mm lam with acoustic interlayer, or equivalent • Roof insulation (R4.0 215mm thick) Or • 8.5mm lam with acoustic interlayer, or equivalent	• 8.5mm lam with acoustic interlayer or >4mm secondary window with nominally 100mm gap, or equivalent • Roof insulation (R4.0 215mm thick)	• >6mm secondary window with nominally 100mm gap, or equivalent • Roof insulation (R4.0 215mm thick)	• >6mm secondary window with nominally 100mm gap, or equivalent • Roof insulation (R4.0 215mm thick)
Lightweight Window area less than or equal to 20% floor area	• Seal subfloor • Roof insulation (R4.0 215mm thick)	• As per Category 1 treatments For 8 dBA exceedance: • 10mm acrylic panel with nominally 100mm gap, or equivalent • Re-sheet wall lining (1x 6mm fibre cement sheeting with nominal board weight of 11 kg/m^2 and 1 x 13mm plasterboard with nominal board weight of 10.5 kg/m^2 to finish, or equivalent) • Wall insulation (R2.7 90mm thick) Otherwise: • 10mm acrylic panel with 100mm gap, or equivalent • Additional wall lining (1 x 13mm plasterboard with nominal board weight of 10.5 kg/m^2 to finish, or equivalent)	• As per Category 1 treatments • 10mm acrylic panel with nominally 100mm gap, or equivalent • Re-sheet wall lining (1x 6mm fibre cement sheeting with nominal board weight of 11 kg/m^2 and 1 x 13mm plasterboard with nominal board weight of 10.5 kg/m^2 to finish, or equivalent) • Wall insulation (R2.7 90mm thick) • Resilient mount to isolate wall lining and stud	• As per Category 1 treatments • >4mm secondary window with nominally 100mm gap, or equivalent • Re-sheet wall lining (1x 6mm fibre cement sheeting with nominal board weight of 11 kg/m^2 and 1 x 13mm plasterboard with nominal board weight of 10.5 kg/m^2 to finish, or equivalent) • Wall insulation (R2.7 90mm thick) • Resilient mount to isolate wall lining and stud	• As per Category 1 treatments • >6mm secondary window with nominally 100mm gap, or equivalent • Re-sheet wall lining (1x 6mm fibre cement sheeting with nominal board weight of 11 kg/m^2 and 1 x 13mm plasterboard with nominal board weight of 10.5 kg/m^2 to finish, or equivalent) • Wall insulation (R2.7 90mm thick) • Resilient mount to isolate wall lining and stud

Note 1: Ceiling fans should have Direct Current (DC) electric motors to minimise noise.

Note 2: Mechanical ventilation (MV) should be installed so that fresh air is ducted from an unaffected building facade. Mechanical fan noise should meet the recommended noise levels in AS2107.