Noise and Vibration Management Sub-plan

Western Sydney Airport – Surface and Civil Alignment Works

Project Name	Sydney Metro – Western Sydney Airport, Surface and Civil Alignment Works
Project Number	N81150
Revision Date	19/06/2024
Revision	04
Document Number	SMWSASCA-CPU-1NL-NL000-NV-PLN-000001

Document Approval

Rev.	Date	Prepared by	Reviewed by	Approved by	Remarks
A	20/06/2022	[redacted]			First Draft
B	09/08/2022				See Revision Table
C	05/09/2022				See Revision Table
D	16/09/2022				See Revision Table
E	18/10/2022				See Revision Table
01	04/11/2022				Issued for Construction
02	06/09/2023				See Revision Table
03	13/12/2023				See Revision Table
04	19/06/2024				See Revision Table

Distribution and Authorisation

Document Control

The CPBUI JV Project Director is responsible for ensuring this plan is reviewed and approved. The Project Director is responsible for updating this plan to reflect changes to the project, legal and other requirements, as required.

The controlled master version will be maintained on TeamBinder. All circulated hard copies are deemed to be uncontrolled.

Amendments

The implementation of this Plan is under the authority of the CPBUI Delegated Authority Matrix. All Contract personnel will perform their duties in accordance with this Plan, supporting plans, and related procedures.

Revision Details

Rev.	Details
A	First Draft
B	In response to Sydney Metro, Independent Certifier and ER comments
C	In response to Sydney Metro and ER comments
D	In response to final ER comments prior to endorsement
E	In response to DPE comments
01	Issued for Construction. All review comments closed by Sydney Metro.
02	Review following 6-Month CEMP Audit
03	In response to Sydney Metro and ER comments
04	Revised following internal audit.

Table of contents

List of figures

List of tables

Abbreviations and definitions

Refer to Definitions, Abbreviations and Acronyms, Sydney Metro – Western Sydney Airport Surface Civil and Alignment Works Package, Schedule C1 General Specification.

Table 1 – Abbreviations and definitions

Abbreviation	Description
CAP	Construction Area Plan
CEMF	Sydney Metro Construction Environmental Management Framework
CEMP	Construction Environmental Management Plan
CNVS	Sydney Metro Construction Noise and Vibration Standard
Condition	Planning Minister's Conditions of Approval
CPB	CPB Contractors Pty Ltd
CPBUI JV	CPB Contractors Pty Limited and United Infrastructure Pty Limited Joint Venture
CSSI	Critical State Significant Infrastructure
dB (A)	A-weighted decibels is an expression of the relative loudness of sounds in the air as perceived by the human ear.
dB (C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
DNVIS	Detailed Noise and Vibration Impact Statement
DPE	Department of Planning and Environment
ECM	Environmental Control Maps
EIS	Environmental Impact Statement
EM	Environment Manager
EMS	Environmental Management System
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
ER	Environmental Representative nominated by the Proponent and approved by the Planning Secretary in accordance with CoA A27
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Hold point	A verification point that prevents work from commencing prior to approval from the appointed authority.
IC	Independent Certifier
ICNG	Interim Construction Noise Guideline
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.

Abbreviation	Description
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{Max}	The maximum sound pressure level measured over a given period.
L_{Min}	The minimum sound pressure level measured over a given period.
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Minister	Minister of the NSW Department for Planning and Public Spaces
NCA	Noise Catchment Area
NML	Noise Management Level
NPI	NSW EPA's *Noise Policy for Industry*
Non-compliance	Failure to comply with the requirements of the Infrastructure Approval or any applicable licence, permit or legal requirements.
Non-conformance	Failure to conform to the requirements of Project system documentation including this CEMP or supporting documentation.
OOH	Out of Hours, i.e. outside of standard construction hours
OOHW	Out of Hours Work
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
Principal, the	Sydney Metro
Project, the	Sydney Metro Western Sydney Airport
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
REMM	Revised Environmental Mitigation Measure
ROL	Road Occupancy Licence
SAP	Sensitive Area Plan
SBT	Station Boxes and Tunnelling
SCAW	Western Sydney Airport Surface and Civil Alignment Works
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L_{eq} sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.

Abbreviation	Description
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
SSI	State Significant Infrastructure
SWMS	Safe Work Method Statement
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.
UI	United Infrastructure Pty Limited
WSI	Western Sydney International

Part A Overview

1. Introduction

1.1 Purpose and application

This Construction Noise and Vibration Management Sub-plan (this Sub-plan) forms part of the Construction Environmental Management Plan (CEMP) within the NSW state jurisdiction for the Sydney Metro - Western Sydney Airport Surface Civil and Alignment Works (SCAW). CPB Contractors and United Infrastructure Joint Venture (herein referred to as CPBUI JV) were awarded the design and construction of the SCAW project by Sydney Metro in March 2022.

This Sub-plan describes how CPBUI will minimise and manage impacts from noise and vibration throughout the delivery of SCAW off-airport project. These potential impacts will require management and mitigation in accordance with relevant legislation and government policies.

This Sub-plan and Monitoring Program are to be endorsed by the project Environmental Representative (ER) and submitted to the Planning Secretary for approval no later than one (1) month before the commencement of construction. Construction is not to commence until the CEMP and all required Sub-plans and Monitoring Programs have been endorsed by the ER and/or approved by DPE.

This Sub-plan has been prepared to address the requirements of the:

- Critical State Significant Infrastructure (CSSI) 10051 Planning Approval (dated 23 July 2021)
- Sydney Metro Western Sydney Airport – CSSI Staging Report (Revision 6.0) (Staging Report)
- *AS/NZS ISO 14001:2016 Environmental Management Systems – Requirements with guidance for use*
- Sydney Metro Construction Environmental Management Framework (CEMF)
- Sydney Metro Construction Noise and Vibration Standard (CNVS)
- Environmental Impact Statement (EIS) and Revised Environmental Mitigation Measures (REMMs) from Section 7 of the Submissions Report
- Contractual requirements, including the SCAW Design and Construction Deed and General and Particular Specifications
- Applicable legislation.

1.2 Background

The Sydney Metro Western Sydney Airport will become the transport spine for Greater Western Sydney, connecting communities and travellers with the new Western Sydney International (Nancy-Bird Walton) Airport (referred to as Western Sydney International) and the growing region.

The Sydney Metro Western Sydney Airport EIS was prepared in October 2020 to assess the impacts of construction and operation of the Project and was placed on public exhibition between 21 October 2020 and 2 December 2020. The Project was declared a Critical State Significant Infrastructure (CSSI) Project and is listed in Schedule 5 of *State Environmental Planning Policy (State and Regional Development) 2011*.

The Sydney Metro Western Sydney Airport was approved by the Minister for Planning and Public Spaces on 23 July 2021 (SSI 10051) under section 5.19 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.3 Project description

The Project will be undertaken on Darug Country and will form part of the future Western Parkland City. The Project involves the construction and operation of a new 23 km metro rail line that extends from the existing Sydney Trains suburban T1 western line (at St Marys) in the north to the Aerotropolis (at Bringelly) in the south. The alignment includes a combination of tunnels and civil structures, including viaducts, bridges, and surface and open-cut troughs between the two tunnel sections. The Project also includes six new metro stations, and a stabling and maintenance facility and operational control centre at

Orchard Hills. The SCAW package is the second major contract package to be procured for the Project. The successful and timely completion of the SCAW package is critical to the subsequent construction activities and ultimate completion of the entire Project.

1.3.1 SCAW scope of works

The scope for the SCAW package includes approximately 10.6 km of alignment up to the underside of track formation from Orchard Hills to the Western Sydney International (WSI) airport. This includes approximately:

- 3.6 km of viaduct
  - 400 m of viaduct over Blaxland Creek
  - 660 m of viaduct over the Patons Lane area and un-named creek
  - 2.5 km of viaduct in the Luddenham Road area including across the Warragamba pipeline, at Luddenham Station, across Luddenham Road and across Cosgrove Creek
- 209 metres of bridges
  - A bridge, approximately 187 m long, over the proposed M12 Motorway
  - A bridge, approximately 22 m long, over the drainage swale on the WSI airport site
- 6.9 km of at-grade alignment
  - 600 m at Orchard Hills, south of Lansdowne Road
  - 1.6 km alongside the stabling maintenance facility in Orchard Hills
  - 900 m to the north of the Warragamba pipelines
  - 1.1 km north of the proposed M12 motorway
  - 1.4 km south of the proposed M12 Motorway on Elizabeth Derive
  - 1.3 km within the Airport site from the northern boundary to the Airport Business Park Station
- Temporary and permanent access roads.

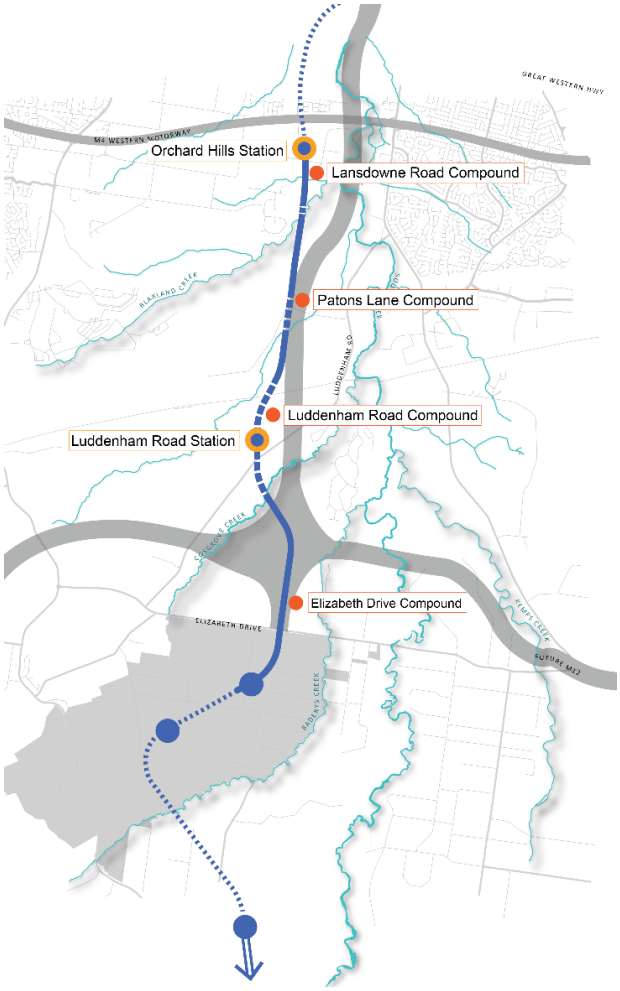


Figure 1 – SCAW Project scope

1.3.2 SCAW construction methodology

Activities that will be undertaken during construction are summarised in Table 2.

Table 2 – Activities during construction

Works	Activities
Early works	▪ Investigation works – survey, geotechnical, contamination and utilities ▪ Establishment of temporary ancillary facilities, construction site fencing, signage and lighting ▪ Pre-clearing vegetation surveys and setting up environmental 'no-go' zones ▪ Temporary stockpiling of imported spoil for the stabling and maintenance facility
Earth works	▪ Installation of environmental controls ▪ Vegetation clearing ▪ Stripping, temporary stockpiling and management of topsoil and unsuitable material ▪ Embankment and cutting construction, including the improvement layers/treatments, general fill, structural fill zone and capping layers ▪ Importation and reuse of fill materials ▪ Placing, compacting and finishing of rail alignment sub-base and base layers ▪ Dewatering and backfilling farm dams ▪ Preparation of piling pads.
Bridge works	▪ 400 metres of viaduct over Blaxland Creek ▪ 660 metres of viaduct over the Patons Lane area and unnamed creek ▪ 2.5 kilometres of viaduct in the Luddenham Road area including across the Warragamba Pipeline, at Luddenham Station, across Luddenham Road and across Cosgrove Creek ▪ 205 metres of bridges
Drainage works	▪ Construction of table drains ▪ Installation of culverts and other drainage structures ▪ Construction of temporary diversion channels ▪ Construction of temporary watercourse crossings such as causeways ▪ Installation of scour protection measures.

2. Structure of this Plan

2.1 Plan Purpose and Objectives

This CEMP Sub-plan forms part of the Project Management System (PMS). It is part of a suite of plans that together outline how the SCAW package will manage noise and vibration during construction to ensure an integrated approach to meeting contract requirements.

In addition to the Project Management Plan, other Project Plans that interface with this Sub-plan include:

- CEMP
- Quality Management Plan
- Community Communication Strategy
- Non-Aboriginal Heritage Management Sub-plan

This plan has the following structure:

Part A: Overview	This section clearly defines: ▪ Section 1: Purpose, Background/Context, Project Description and SCAW scope ▪ Section 2: Objectives and Targets, Approval and Agency Consultation, Related Documents ▪ Section 3: Legal and Other Requirements ▪ Section 4: Existing Environment ▪ Section 5: Working Hours ▪ Section 6: Construction Noise and Vibration Criteria ▪ Section 7: Aspects and Impacts ▪ Section 8: Environmental Control Measures ▪ Section 9: Compliance Management
Part B: Implementation Plan	This section outlines in detail the key processes and systems to support implementation of environmental management outcomes for the project: ▪ Element 1: Training ▪ Element 2: Monitoring and Reporting ▪ Element 3: Auditing, Review and Improvement ▪ Element 4: Project Specific Requirements
Part C: Appendices	This section includes appendices and annexures providing additional detail that support this Sub-plan and includes: ▪ Out of Hours Works Protocol ▪ Land Use Survey ▪ Noise and Vibration Construction Monitoring Program ▪ Consultation Records

2.1.1 Other Related Documents

As a sub-plan to the CEMP, Table 3 shows the interrelationships with other project plans and documents.

Table 3 – Interaction with other project documents

Document	Description
Community Consultation Strategy	Details the community and stakeholder consultation including enquiry and complaints management requirements for the project based on the Sydney Metro Overarching Community Consultation Strategy developed to address Condition B1. The CCS will detail how CPBUI will coordinate and consult with key stakeholders to identify interfaces, share construction program and develop mitigation strategies to manage cumulative impacts in accordance with the SM-WSA Construction Cumulative Impacts Management Plan (developed to address REMM CL1).
On Airport CEMP and Sub-plans	Details requirements for environmental management on the Western Sydney Airport. This is a Sydney Metro document produced for the works being undertaken on Commonwealth Land
Detailed Noise and Vibration Impact Statement (DNVIS)	Detail the predicted construction noise and vibration impacts and provide site-specific mitigation measures where Noise Management Levels are predicted to be exceeded at any residence during out of hours works and/or highly noise affected
Non-Aboriginal Heritage Management Sub-plan	Details of the heritage structures and items in and around the SCAW worksites and management measures
Site Environmental Plan/s	SEPs will identify adjacent receivers and Noise Catchment Areas and will be progressively updated

2.1.2 Objectives and Targets

CPBUI JV's objectives for management of noise and vibration during the delivery of the SCAW package are aligned with those established through the EIS and set out in the CEMF and CNVS.

The environmental performance outcomes in relation to noise and vibration in the EIS and Staging Report, as amended are:

- Construction noise and vibration impacts on local communities (including airborne noise and ground-borne noise and vibration) are managed in accordance with the Construction Noise and Vibration Standard, the Interim Construction Noise Guideline, and the Airports (Environment Protection) Regulations 1997
- Structural damage to buildings, heritage items and public utilities and infrastructure, including the Warragamba to Prospect Water Supply Pipelines, from construction vibration to be avoided
- Impacts on non-Aboriginal heritage items and archaeology are minimised or where possible avoided
- Impacts on areas of archaeological sensitivity and significance are avoided or minimised, where practical.
- Cumulative impacts are managed through coordination of construction activities and communication processes with nearby projects (Western Sydney International, M12 Motorway, The Northern Road, St Marys Intermodal and St Marys Commuter Car Park Expansion)

Section 8.1 of the CEMF sets out management objectives for noise and vibration management and they are addressed in Table 4.

Table 4 – CEMF objectives and targets

Objective	Target	Measurement Tool
Minimise unreasonable noise and vibration impacts on residents and businesses;	Noise and vibration controls are implemented throughout the site in accordance with this Sub-plan and any DNVIS and 100% of inspections are completed on the following basis: ▪ Daily during visual surveillance ▪ Weekly during environmental inspection ▪ Monitoring in accordance with the Noise and Vibration Construction Monitoring Program.	Monitoring records Observations and site inspection records
Avoid structural damage to buildings or heritage items as a result of construction vibration;	Undertake 100% of condition surveys of surface and subsurface structure including heritage items that are assessed to be at risk from vibration and document in a Pre- Construction Condition Survey Report. Undertake 100% of monitoring prior to vibration generating works if works are to be undertaken with the minimum safe working distance of buildings/structures and heritage items and undertake 100% of inspections on the following basis: ▪ Daily during visual surveillance ▪ Weekly during environmental inspection.	Condition surveys Pre and post condition reports Monitoring records Observation and site inspection records
Undertake active community consultation;	Undertake 100% of community notifications and consultation requirements and respond to all complaints within the specified timeframe. Zero incidents in relation to community consultation on noise and vibration.	Consultation records Complaints register
Maintain positive, cooperative relationships with schools, childcare centres, local residents and building owners; and	Undertake 100% of community notifications and consultation requirements and respond to all complaints within the specified timeframe. Investigate 100% of complaints and respond within timeframes in accordance with the complaints management system.	
For on-airport works, the Sydney Metro Western Sydney Airport Noise and Vibration CEMP will detail all the noise and vibration management objectives and will be consistent with the WSA Noise and Vibration CEMP, including all appendices to the CEMP.	Undertake works in accordance with the Sydney Metro Western Sydney Airport Noise and Vibration CEMP where applicable	Monitoring records Site inspections

2.2 Approval and consultation

Agencies to be consulted for this Sub-plan, incorporating the construction noise and vibration monitoring program are detailed in Table 5.

Table 5 – Sub Plan and Monitoring Program Agency Consultation

Subject	Agency Consultation
Noise and Vibration Management Sub-plan (Condition C5)	Relevant Councils (Penrith City Council and Liverpool City Council) and Water NSW (in relation to its assets)
Noise and Vibration Monitoring Program (Condition C13)	Relevant Councils (Penrith City Council and Liverpool City Council) and Water NSW (in relation to its assets)

CPBUI JV have engaged with these agencies in developing and finalising this Sub-plan and Monitoring Program. Records of consultation in accordance with Condition A6 are provided in Table 6 and Appendix C4 – Records of Consultation.

Table 6 – Log of engagement or attempted engagement with relevant stakeholders Condition A6(b)

Agency	Date	Person Contacted	Comment	Status
Penrith City Council	24/06/2022	Penrith City Council representative	CPBUI JV emailed the Noise and Vibration Management Sub-plan requesting comment	Closed
	22/07/2022	CPBUI JV representative	Response received from Water NSW via email providing comment on the Sub-plan. Comments addressed by CPBUI JV.	
Liverpool City Council	24/06/2022	Liverpool City Council representative	CPBUI JV emailed the Noise and Vibration Management Sub-plan requesting comment	Closed
			No written response received from Liverpool City Council as of 22/07/2022. A meeting held with representatives of Liverpool City Council, CPBUI and Sydney Metro was held on 28/06/2022 to discuss the SCAW project and environmental management. No issues were raised during the meeting that required addressing in this Sub-plan.	
Water NSW	24/06/2022	Water NSW representative	CPBUI JV emailed the Noise and Vibration Management Sub-plan requesting comment	Closed
	12/07/2022	CPBUI JV representative	Response received from Water NSW via email providing comment on the Sub-plan. Comments addressed by CPBUI JV.	

In accordance with the SMWSA Staging Report (Revision 6) this Sub-plan and Noise and Vibration Monitoring Program has been endorsed by the ER in accordance with Condition C7 and Condition C19, and submitted to the Planning Secretary for approval no later than one month prior to the commencement of construction. This Sub-plan will be implemented for the duration of construction and revisions to this Sub-plan will be undertaken in accordance with the process outlined in Element 11 of the CEMP.

3. Legal and other requirements

3.1 Legislation

Key legislation relevant to noise and vibration management includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Protection of the Environment Operations Act 1997* (POEO Act)

Refer to Section 4 of the CEMP for further details of the relevant legislation.

3.2 Project Compliance Requirements

All works to be delivered for SCAW have been assessed and approved under the EP&A Act for the Critical State Significant Infrastructure (CSSI) application number 10051. The on-airport works are a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999 (*Cth*)* (EPBC Act) relating to approval EPBC 2019/8541.

There are three (3) principal statutory schemes that govern the planning and assessment process for the SM-WSA project:

- Commonwealth:
  - SCAW works have been assessed and approved under the *Airports Act 1996* for works located on Commonwealth land within the boundary of the Western Sydney International Airport (on-airport).
  - SCAW works have been assessed and approval as a controlled action by the Department of Agriculture, Water and the Environment (DAWE) under Part 9 of the EPBC Act was obtained by Sydney Metro on 3 June 2021 (EPBC2020/8687) for the impacts on threatened species and communities and Commonwealth Land (off-airport).
- State:
  - SCAW works have been assessed and approved via number of applications under Division 5.2 of the EP&A Act and are classified as Critical State Significant Infrastructure (SSI 10051) (off-airport).

Detailed environmental assessments have been carried out to gain the necessary Commonwealth and State planning approvals.

Element 4: Project Specific Requirements contains a summary of the key compliance requirements relevant to noise and vibration management which are applicable to SCAW. This includes relevant Condition, REMMs, CEMF requirements, EPBC Act, EIS performance outcomes and contractual requirements.

3.2.1 Environmental Protection Licence

CPB has obtained an Environment Protection Licence (EPL) (21695) for SCAW in accordance with the POEO Act. The EPL includes conditions applicable to noise and vibration management which will be applied in accordance with this Sub-Plan.

3.3 Guidelines and Standards

Guidelines and standards relating to the management of noise and vibration include:

- Interim Construction Noise Guideline (ICNG) (Department of Environment and Climate Change (DECC, 2009).
- 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.
- Sydney Metro Construction Noise and Vibration Standard (CNVS)
- Noise Policy for Industry, Environment Protection Authority 2017
- EPA's 'Assessing Vibration; a technical guideline' (DECC, 2006)
- NSW Road Noise Policy (DECCW 2011)
- Guidelines for Development Adjacent to the Upper Canal and Warragamba Pipelines (WaterNSW, 2020) (Water NSW Guideline)

4. Existing environment

4.1 Noise Catchment Areas

Noise Catchment Areas (NCAs) are groups of receivers that are likely to experience similar impacts from the project and are reflective of the land use of each area. The NCAs are based on the EIS and predicted impacts for each NCA are considered to represent typical noise and vibration impacts at each individual receiver within that NCA. Table 7 describes the location of the NCAs adopted for the Project, applicable to the SCAW scope and are presented in Figure 2.

Table 7 – Noise catchment areas (NCA) applicable to SCAW

NCA	Description
NCA07	Predominantly medium density single-storey residential dwellings, located to the east of the project. Ambient noise conditions are dominated by traffic along Mamre Road.
NCA08	Predominantly low density single storey residential dwellings. East of the project is mostly open land with scattered receivers along Samuel Marsden Road and Lansdowne Road. Ambient noise conditions are dominated by traffic along the M4 Western Motorway.
NCA09	Open farmland and a grouping of low density single storey residential dwellings within 1200 metres east of the project along Luddenham Road.
NCA10	Open farmland with low density single storey and multi-storey residential dwellings within the Twin Creeks area east of the project, and scattered residential dwellings along Luddenham Road.

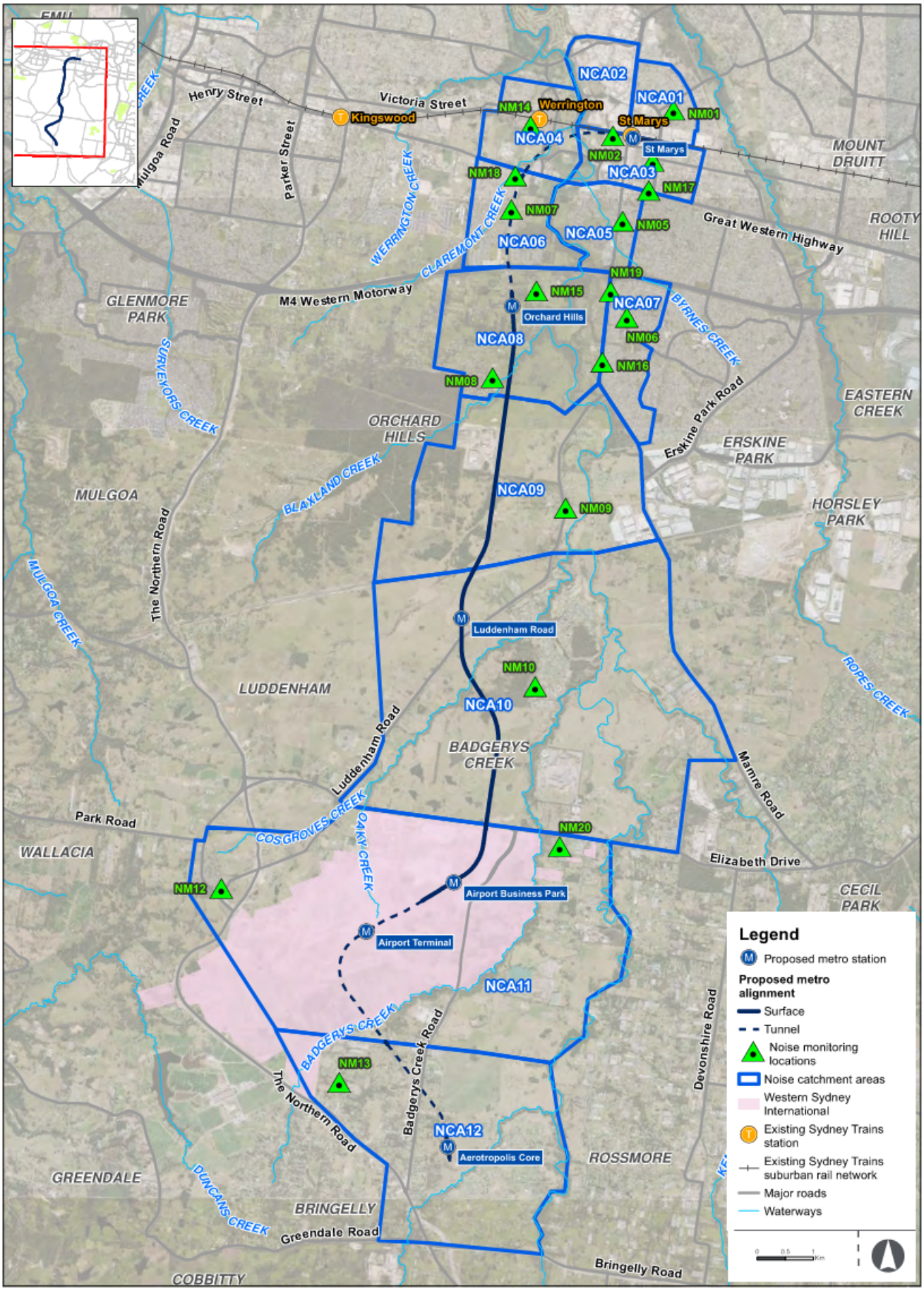


Figure 2 – Noise catchment areas and noise monitoring locations

4.2 Sensitive Receivers

In accordance with Condition E37 a detailed land use survey was undertaken to confirm sensitive land use(s) (including critical working areas such as operating theatres and precision laboratories) potentially exposed to construction noise and vibration and construction ground-borne noise. The survey will be undertaken on a progressive basis during construction as required and will be undertaken in any one area before the commencement of work which generates construction noise, vibration or ground-borne noise in that area. The land use survey is provided in Appendix C2 – Land use Survey. The results of the survey will be included in the Detailed Noise and Vibration Impact Statements required under Condition E47.

4.3 Ambient Noise Environment

The prevailing background (existing) noise levels in the study area were determined in the EIS through unattended noise monitoring. The measured Rating Background Levels (RBLs) and ambient noise levels are summarised in Table 8 (locations applicable to SCAW are shown in bold). Refer to Figure 2 for an illustration of the noise monitoring locations. .

Table 8 – Summary of unattended noise monitoring results

Noise monitoring location	Rating Background Level (RBL) dB(A)[1]			Ambient Noise Level $L_{eq,\ 15\ minute}$		
	Day	Evening	Night	Day	Evening	Night
NM01	38	(41) 38[3]	(40) 38[3]	53	53	50
NM02	37	(40) 37[3]	36	55	59	51
NM03	38	32	31	50	41	46
NM04[1]	-	-	-	-	-	-
NM05	40	(44) 40[3]	(44) 40[3]	54	51	50
NM06	42	(44) 42[3]	38	59	57	52
NM07	37	37	36	48	49	45
NM08	31	(32) 31[3]	30	52	48	40
NM09	40	39	34	61	57	54
NM10	(30) 35[2]	30	30	47	42	37
NM11[1]	-	-	-	-	-	-
NM12	(34) 35[2]	32	(24) 32[2]	58	60	48
NM13	38	35	34	58	52	51
NM14	35	32	31	48	47	43
NM15	44	(47) 44[3]	40	55	53	50
NM16	47	42	(28) 30[2]	59	56	54
NM17	54	50	36	63	62	59
NM18	42	(43) 42[3]	39	55	53	52
NM19	53	48	36	62	59	57
NM20	39	37	(28) 30[2]	49	47	42

(1) Time periods defined as – Day: 7am to 6pm Monday to Saturday, 8am to 6pm Sunday; Evening, 6pm to 10pm; Night 10pm to 7am Monday to Saturday, 10pm to 8am Sunday

(2) Where background levels are below the minimum assumed rating background noise levels outlined in the NPI, they have been adjusted to 35 dB(A) during the day period, and 30 dB(A) during the evening and night periods in accordance with the NPI

(3) Where evening or night background noise levels exceed that of the previous period, they have been set at the background noise level of the previous period, in line with the NPI, to reflect community's expectation for greater noise control during more sensitive periods

5. Working Hours

5.1 Approved Construction Hours

The approved construction hours for SCAW are in accordance with Condition E38 and E39, the CNVS and the EPL and are summarised in Table 9. Refer to Section 5.2 for detail on the works permitted to be undertaken outside of approved construction hours (out of hours work (OOHW)).

Table 9 – Approved Construction Hours

Source	Activity	Approved Construction Hours		
		Monday to Friday	Saturday	Sunday / Public Holiday
Condition E38	Standard construction hours	7:00am to 6:00pm	8:00am to 1:00pm	At no time
Condition E39	Except as permitted by an EPL or approved in accordance with the Out-of-Hours Works Protocol required by Condition E42, highly noise intensive work that result in an exceedance of the applicable NML at the same receiver must only be undertaken during the following times:	8:00am to 6:00pm	8:00am to 1:00pm	At no time
		If continuously, then not exceeding three (3) hours, with a minimum cessation of work of not less than one (1) hour.		
		'continuously' includes any period during which there is less than one (1) hour between ceasing and recommencing any of the work		
EPL L5.1	Standard construction hours	7:00am to 6:00pm	8:00am to 1:00pm	At no time
EPL L5.2	High Noise Impact Activities and Works	8:00am to 6:00pm	8:00am to 1:00pm	At no time

5.2 Working Outside of Standard Construction Hours

In accordance with Condition E41 works may be carried out outside the standard construction hours (detailed in Section 5.1) in the following circumstances:

a) Safety and Emergencies
   i) for the delivery of materials required by the NSW Police 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

b) Low Impact
   i) construction that causes LAeq(15 minute) noise levels:
      - no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and
      - no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s); and
   ii) construction that causes:
      - continuous or impulsive vibration values, measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), or
      - intermittent vibration values measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006); or

c) By Approval, including:
   i) where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or

ii) works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E42; or

iii) negotiated agreements with directly affected residents and sensitive land user(s); or

d) By Prescribed Activity, including:

i) tunnelling and ancillary support activities (excluding cut and cover tunnelling and surface works not directly supporting tunneling) are permitted 24 hours a day, seven days a week; or

ii) grout batching at the Orchard Hills construction site is permitted 24 hours per day, seven days per week; or

iii) delivery of material that is required to be delivered outside of standard construction hours in Condition E38 to directly support tunnelling activities, except between the hours 10:00 pm and 7:00 am to / from the Orchard Hills ancillary facility; or

iv) haulage of spoil generated through tunnelling is permitted 24 hours per day, seven days per week except between the hours of 10:00 pm and 7:00 am to / from the Orchard Hills construction site; or

v) works within an acoustic enclosure are permitted 24 hours a day, seven days a week where there is no exceedance of noise levels or intermittent vibration levels under Low impact circumstances identified in Condition E41(b), unless otherwise agreed with the Planning Secretary; or

vi) tunnel and underground station box fit out works are permitted 24 hours per day, seven days per week.

On becoming aware of the need for emergency works in accordance with (a)(ii) above, CPBUI JV will notify the ER, the Planning Secretary and the EPA of the need for the emergency works. The CPBUI JV will notify all noise and/or vibration affected sensitive receivers of the likely impact and duration of the emergency works, where possible.

In accordance with Condition E42, and as required by Condition E41(c)(i) an Out of Hours Work Protocol has been prepared (**Appendix C1 – Out of Hours Work Protocol**) that identifies the process for the consideration, management and approval of work (not subject to an EPL) that is outside the hours defined in Condition E38 and E39.

Where possible, works will be completed during the standard day time construction hours as per Condition E38. CPBUI would endeavour to schedule out of hours works in accordance with the CNVS being:

- Lower Impact: 6:00pm till 10:00pm weekdays, 1:00pm till 10:00pm Saturdays and 8:00am till 6:00pm Sundays or Public Holidays
- Moderate Impact: 10.00 pm to 7.00 am Weekday Nights 10.00 pm to 8.00 am Saturdays.
- High Impact: 6.00 pm to 7.00 am Sundays and Public Holidays.

Approval from the EPA via the Environment Protection Licence (EPL) will be obtained for out of hours works (OOHW) in accordance with Condition E41(c)(i).

6. Construction Noise and Vibration Management Levels

6.1 Airborne Noise

The CNVS identifies the ICNG as the reference document for the determination of construction Noise Management Levels (NMLs). Table 10 sets out the application of the management levels for noise at residential receivers.

Table 10 – ICNG noise management levels for residential receivers

Time of Day	Noise Management Level, $L_{Aeq(15\ min)}$	Application
Recommended standard hours: ▪ Monday to Friday 7am to 6pm ▪ Saturday 8am to 1pm ▪ No work on Sundays or public holidays	Noise affected RBL + 10 dB	CPBUI will apply feasible and reasonable work practices to meet the noise affected level where the predicated or measured LAeq (15 min) is greater than the noise affected level.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would be required for works undertaken outside of the recommended standard hours. CPBUI will apply feasible and reasonable work practices to meet the noise affected level.

NMLs have been derived for the identified land uses, and representative RBLs for residential receivers as described in Table 8. presents the adopted NMLs for residential receivers within each NCA are derived from EIS Tech Paper 2 (Table 4-9) and are provided in Table 11

Table 11 – Noise Management Levels and Sleep Disturbance Screening Criteria by NCA and period

NCA	Noise Management Level – dB(A)				
	Standard hours	OOH - Day	OOH - Evening	OOH - Night	Sleep Disturbance
NCA07	57	52	47	35	45
NCA08	54	49	49	45	55
NCA09	50	45	44	39	49
NCA10	45	40	35	35	45

6.1.1 Sleep disturbance

Construction noise during the night (10pm to 7am Monday to Saturday, 10pm to 8am Sunday) has the potential to awaken residents from sleep. In line with the CNVS, the approach to managing events that cause sleep disturbance shall be consistent with the Noise Policy for Industry (EPA, 2017).

A detailed maximum noise level event is to be undertaken when nigh time noise levels at a residential receiver are predicted to exceed:

- $L_{eq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- L_{fmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater.

Sleep disturbance and awakening external noise level screening levels of RBL+15 dB and Lmax 65 dB(A), whichever is most conservative (lowest) within each NCA, has been adopted and provided for each NCA in Table 11.

6.1.2 Other receivers

Table 12 presents the NMLs for non-residential sensitive receivers derived from the criteria in the ICNG. In accordance with Condition E45, noise generating work in the vicinity of potentially-affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise levels above the NMLs will not be timetabled within sensitive periods, unless other reasonable arrangements have been made with the affected institution.

Table 12 – Noise management levels for non-residential receivers

Land Use	Noise Management Level (External) $L_{eq,\ 15\ min}$ – dB(A)
Educational	55[1]
Commercial (offices, retail outlets)	70
Commercial (industrial)	75
Active recreation	65
Passive recreation	60
Place of worship	55[1]
Child care centres	55[1]

(1) An internal to external correction of +10 dB has been applied as per the ICNG

6.2 Ground-borne Noise

Ground-borne noise is generated by vibration transmitted through the ground and into a structure. The CNVS refers to guidance in the ICNG, which specifies ground-borne noise management levels for residences. Mitigation measures will be applied when residential ground-borne NMLs are exceeded in accordance with Condition E44. Table 13 provides the NML for residential receivers. These levels are applicable when ground-borne noise levels are higher than airborne noise levels during the evening and night periods.

Table 13 – Ground-borne NML – Residential

Period	Time of Day	NML $L_{eq,15min}$
Evening	6pm to 10pm	40 dB(A) internal
Night	10pm to 7am	35 dB(A) internal

6.3 Construction Traffic

The CNVS outlines guidance for the assessment of road traffic noise generated by construction vehicles be taken from the Road Noise Policy (RNP) (NSW EPA, 2011). As the RNP provides guidance with relation to operational noise impacts, and noise from construction traffic is non-permanent, further

guidance has been taken from the *Construction Noise and Vibration Guideline* (CNVG) (Roads and Maritime, 2016).

The RNP provides guidance on the assessment of noise impacts on sensitive receivers from additional road traffic generated by the project operating on a public road network. Where vehicles operate within the boundaries of a construction site, noise impacts generated by these vehicles are included in the overall Leq,15min construction site noise emissions undertaken in line with the ICNG.

The RNP makes a distinction between the assessment of freeway/arterial/sub-arterial roads and local roads. Freeway/arterial/sub-arterial roads are assessed over day (7 am to 10 pm) and night (10 pm to 7 am) periods. Table 14 presents a summary of the applicable road traffic criteria for residential receivers.

The CNVG states that 'an initial screening test should first be applied by evaluating whether noise levels will increase by more than 2 dB(A) due to construction traffic or a temporary reroute due to a road closure. Where increases are 2 dB(A) or less then no further assessment is required'.

Therefore, if the road traffic noise levels increase by more than 2 dB(A) as a result of the proposed construction traffic, and the criteria in Table 14 are exceeded, investigation of mitigation options would be required.

Table 14 – Road traffic noise criteria for residential receivers on existing roads affected by additional traffic from land use developments

Road type	Road traffic noise criteria	
	Day (7am to 10pm)	Night (10pm to 7am)
Freeway/Arterial/Sub-arterial	60 $L_{eq,15hr}$ dB(A)	55 $L_{eq,9hr}$ dB(A)
Local roads	55 $L_{eq,1hr}$ dB(A)	50 $L_{eq,1hr}$ dB(A)

6.4 Construction Vibration Criteria

Condition E43 requires that the project be constructed with aim of achieving the following vibration criteria:

- Assessing vibration: a technical guideline (DEC, 2006) – for human exposure
- BS 7385 Part 2-1993 'Evaluation and measurement for vibration in buildings Part 2'as they are applicable to Australian conditions, and
- The vibration limits set out in the German Standard DIN 4150-3: Structural Vibration – effects of vibration on structures (for structural damage).

The following sections provide detail on each criterion.

6.4.1 Cosmetic building damage

The CNVS refers to the EPA's Assessing Vibration – A technical guideline (AVTG) which recommends the use of British Standard BS 7385-2: Evaluation and measurement for vibration in buildings, Guide to damage levels from ground-borne vibration (BS7385-2) in defining frequency dependent guideline values and assessment methods as they "are applicable to Australian conditions". However, the SEARs specify German Standard DIN 4150-3: Structural vibration – Effects of vibration on structures (DIN 4150). DIN 4150 provides the more conservative guidance, and hence, adoption of DIN 4150 as recommended results in compliance with the CNVS. Table 15 summarises the recommended limits outlined in DIN 4150 to ensure minimal risk of cosmetic damage to residential and industrial buildings.

On this basis, conservative general vibration screening levels (Peak Particle Velocity (PPV)) is provided for intermittent vibration sources as follows:

- reinforced or framed structures: 10 mm/s
- unreinforced or light framed structures 5 mm/s.

At locations where the predicted and/or measured vibration levels are greater than shown above, monitoring should be performed during construction. A more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would also be performed to determine the applicable safe vibration level.

Table 15 – Recommended vibration limits for cosmetic damage

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

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

6.4.2 Human comfort

With regards to assessing loss of amenity due to perceptible vibration, the CNVS requires the assessment of vibration impacts on human comfort in accordance with Assessing Vibration – A technical guideline (DEC, 2006) (AVTG). AVTG presents preferred and maximum vibration values (vibration dose values), above which there is considered to be a risk that the amenity and comfort of people occupying buildings would be adversely affected by construction work. The preferred vibration values are not mandatory limits but should be sought to be achieved through application of all feasible and reasonable mitigation measures.

Intermittent vibration is expected to be generated from most construction works, and can be defined as interrupted periods of continuous vibration (e.g. a drill), or repeated periods of impulsive vibration (e.g. a pile driver). The applicable criteria for intermittent vibration are shown in Table 16 as vibration dose value ($m/s^{1.75}$).

The vibration guideline also specifies limits for continuous and impulsive vibration. These summarised vibration limits are expressed in acceleration (m/s^2) and PPV (mm/s) as presented in Table 2.2 and Appendix C of the AVTG and summarised in Table 17. When short-term works such as piling, demolition and construction give rise to impulsive vibrations, undue restriction on vibration values may significantly prolong these operations and result in greater annoyance. Where work is short term, feasible and reasonable mitigation measures have been applied, then higher vibration values may apply.

Table 16 – Vibration limits for human exposure from intermittent vibration

Location	Assessment period[1]	Vibration dose value ($m/s^{1.75}$)	
		Preferred value	Maximum value
Residences	Daytime	0.2	0.4
	Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	Anytime	0.4	0.8
Workshops	Anytime	0.8	1.6

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

Table 17 – Preferred maximum values for continuous and impulsive vibration

Location	Assessment period	[1]RMS acceleration m/s^2				[2]Peak Particle Velocity mm/s	
		Preferred values		Maximum values		Preferred values	Maximum values
		Z-Axis	X and Y axis	Z-axis	X and Y axis		
Continuous vibration							
Critical areas	Day or night-time	0.0050	0.0036	0.010	0.0072	0.14	0.28
Residences	Daytime[3]	0.010	0.0071	0.020	0.014	0.28	0.56
	Night-time	0.007	0.005	0.014	0.010	0.20	0.40
Offices, schools, educational institutions, and places of worship	Day or night-time	0.020	0.014	0.040	0.028	0.56	1.1
Workshops	Day or night-time	0.04	0.029	0.080	0.058	1.1	2.2
Impulsive vibration							
Critical areas	Day or night-time	0.0050	0.0036	0.010	0.0072	0.14	0.28
Residences	Daytime[3]	0.3	0.21	0.60	0.42	8.6	17.0
	Night-time	0.10	0.071	0.20	0.14	2.8	5.6
Offices, schools, educational institutions, and places of worship	Day or night-time	0.64	0.46	1.28	0.92	18.0	36.0
Workshops	Day or night-time	0.64	0.46	1.28	0.92	18.0	36.0

(1) Values derived from z-axis critical frequency range
(2) Values given for the most critical frequency range >8 Hz assuming sinusoidal motion. Where required, a more detailed analysis can be conducted as per AS 2670.2-1990.
(3) Sufficient justification should accompany the use of a peak velocity approach if used in an assessment.
(4) Specific values depend on social and cultural factors, psychological attitudes and expected degree of intrusion.

6.4.3 Vibration sensitive structures – Heritage

Heritage listed structures should not be assumed to be more sensitive to vibration unless they are structurally unsound, which is unlikely for a regularly maintained structure. Where a historic structure is deemed to be sensitive to damage from vibration following inspection by qualified structural and/or civil engineers, more conservative superficial cosmetic damage criterion (2.5 mm/s PPV) should be considered, as noted in Table 15.

Buildings that are potentially at risk of threshold or cosmetic damage would be identified by the contractor prior to the commencement of construction works. Management at these locations will include building condition surveys before the commencement of construction activities and after construction is completed in accordance with Condition E84 and E85.

In accordance with REMM NAH8, a dilapidation survey of the Warragamba to Prospect Water Supply Pipelines would be undertaken prior to construction commencing in the vicinity of this item. In accordance with Condition E121 and REMM HR4, CPBUI will consult with WaterNSW where SCAW interacts with the Warragamba to Prospect Water Supply Pipeline to ensure that design and construction methodology is consistent with *Guidelines for Development Adjacent to the Upper Canal and Warragamba Pipelines.*

6.4.4 Utilities and other vibration sensitive structures

In accordance with Condition E82 the SCAW must be designed and constructed with the objective of minimising impacts to, and interference with third party property, and that such infrastructure and property is protected ruing construction.

Where structures and utilities sensitive to vibration are encountered, or where that asset provides an essential service for the community, a vibration goal, which is more stringent than structural damage goals may need to be adopted. Examples of such structures and utilities include:

- tunnels
- pipelines[1]
- fibre optic cables.

Specific vibration criteria would be determined on a case-by-case basis. In accordance with Condition E83, the services potentially affected by construction will be identified to determine requirements for diversion, protection and / or support. In consideration of proposed civils activities works are likely to be required in close proximity to existing utilities and services. In all cases, protection requirements or alterations to services will be determined by negotiation with the service providers. This will be managed in accordance with the specific process of the asset owner, and as identified in the Project Interface Management Plan. Disruption to services resulting from construction will be avoided, wherever possible, and advised to customers where it is not possible. In lieu of specific vibration criteria being provided by the asset owner, screening criteria would be adopted from guidance provided in DIN 4150-3 for buried pipework. The screening criteria is outlined in Table 18.

Table 18 – Guideline values for vibration velocity to be used when evaluating the effects of vibration on buried pipework

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

[1] Excluding the Warragamba to Prospect Water Supply Pipeline

6.4.5 Safe working distance

Where vibration intensive works are required to be undertaken within the specific minimum working distances, vibration monitoring should be undertaken to ensure acceptable levels of vibration are satisfied. In relation to human comfort, the minimum working distances relate to continuous vibration. For most construction activities, vibration emissions would be intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods may be allowed. Table 19 presents the recommended minimum working distances for vibration intensive plant.

Table 19 – Recommended minimum working distances for vibration intensive plant

Plant item	Rating / description	Minimum working distance – cosmetic damage (BS7385)	Minimum working distance – human response (DECC 2006)
Vibratory roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Handheld	1 m (nominal)	2 m

7. Aspects and impacts

7.1 Construction activities

The SCAW scope of works and construction methodology is detailed in Section 1.3. The construction activities associated with delivery of SCAW that that have the potential to have impacts associated with noise and vibration include:

- Stage 1: Early works including:
  - Investigation works - survey, geotechnical, contamination and utilities
  - Establishment of temporary ancillary facilities, construction site fencing, signage and lighting
  - Stockpiling of imported spoil for the stabling and maintenance facility
- Stage 2: Earthworks and excavation
  - Installation of environmental controls
  - Vegetation clearing
  - Stripping, stockpiling and management of topsoil and unsuitable material
  - Embankment and cutting construction, including the improvement layers/treatments, general fill, structural fill zone and capping layers
  - Importation and reuse of fill materials
  - Placing, compacting and finishing of rail alignment sub-base and base layers
  - Dewatering and backfilling farm dams
  - Preparation of piling pads.
- Stage 3: Bridge and viaduct construction
  - 400 metres of viaduct over Blaxland Creek
  - 660 metres of viaduct over the Patons Lane area and unnamed creek
  - 2.5 kilometres of viaduct in the Luddenham Road area including across the Warragamba Pipeline, at Luddenham Station, across Luddenham Road and across Cosgrove Creek, and
  - 205m of bridge construction.
- Stage 4: Drainage works including the:
  - Construction of table drains
  - Installation of culverts and other drainage structures
  - Construction of temporary diversion channels
  - Construction of temporary watercourse crossings such as causeways
  - Installation of scour protection measures.

Where a DNVIS is required, a detailed description of the construction activities will be included, and a more detailed program. An indicative construction program from the EIS identifying start and end dates for the SCAW is provided in Table 20.

Table 20: Indicative construction program

Stage / Activity	2022		2023			
	Q3	Q4	Q1	Q2	Q3	Q4
Stage 1						
Stage 2						
Stage 3						
Stage 4						

7.2 Noise and vibration impacts

Realistic worst case and typical scenarios for noise emissions have been assessed in the EIS. Section 7.2.1 and Section 7.2.2 provide a summary of the key noise and vibration generating activities, based on the construction scenarios assessed in the EIS, that have the potential to impact on surrounding residential receivers.

7.2.1 Construction noise assessment

7.2.1.1 Highly noise affected

Table 21 outlines the highest noise levels predicted at a residential receiver in each NCA that may potentially be impacted by SCAW activities. The predicted noise levels are representative of the 'typical' expected noise levels. The predicted noise levels representative of the 'worst case' expected noise levels are presented in brackets in Table 21. During standard hours, all NCAs, during construction scenarios identified in Section 7.1,are predicted to experience some exceedances of NMLs during most scenarios. NCA08 was predicted to include highly noise affected receivers.

Table 21 – Highest predicted noise levels

NCA	Standard Hours – NML (dBA)	Highest predicted noise levels (dB) typical (worst-case)				Additional Mitigation Measures (AMM)
		Stage 1	Stage 2	Stage 3	Stage 4	
NCA07	57	59 (61)	61 (64)	64 (69)	62 (66)	(LB)
NCA08	54	75 (77)	74 (77)	83 (88)	78 (82)	LB, M, SN
NCA09	50	65 (70)	68 (71)	68 (70)	65 (68)	LB
NCA10	45	68 (69)	66 (70)	70 (72)	68 (72)	LB, M, SN

Refer to Table 27 for Additional Mitigation Measures (AMM)

An extract from Appendix B of the Planning Approval is provided in Figure 3. Residential receivers that are identified as potentially exceeding the highly noise affected during typical activities adjacent to the SCAW construction boundary are circled on Figure 3.

Construction noise levels will be predicted, assessed and managed to align with the requirements of the CNVS and this Sub-plan. In accordance with Condition E49 mitigation measures will be implemented with the aim of reducing typical case construction noise below the highly noise affected criteria at each relevant receiver. Construction noise levels will be predicted for all works in accordance with the requirements of the CNVS. In accordance with Condition E47, a Detailed Noise and Vibration Impact Statement (DNVIS) would be prepared where predictions indicate noise levels would be above the highly noise affected level or where works are required to be undertaken outside of standard construction hours. Refer to Section 7.3.2 for more detail regarding the DNVIS process.

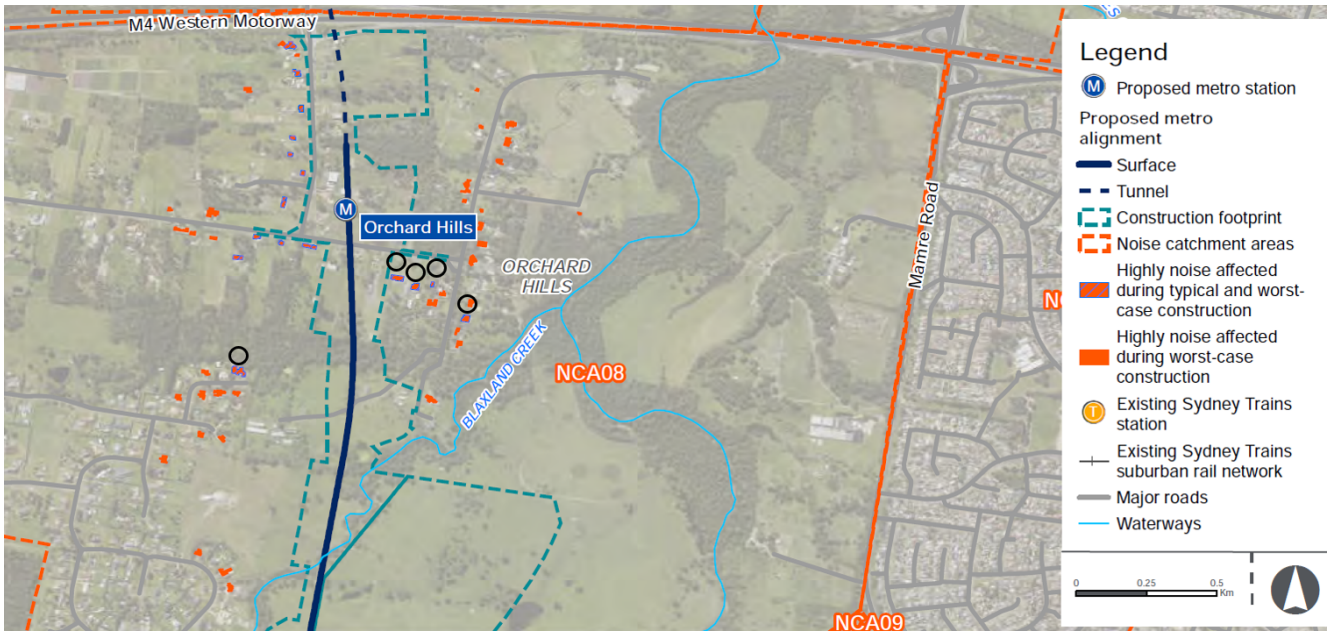


Figure 3 – Project Planning Approval – Extract of Appendix B (the black circles represent the residential receivers that are identified as potentially exceeding highly noise affected during typical activities applicable to SCAW)

7.2.1.2 Construction traffic

The results of the construction traffic assessment presented in Table 4-31 of the EIS Tech Paper 2, and shown in Figure 4 indicate that construction road traffic noise levels are predicted to comply with relevant RNP noise criteria at the majority of project affected roads. SCAW construction traffic will access worksites via the designated heavy vehicle routes illustrated in Figure 4. Therefore, no additional noise mitigation or management measures would be required at these locations.

Where local roads are used to access compounds, CPBUI JV will 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 CPBUI 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.

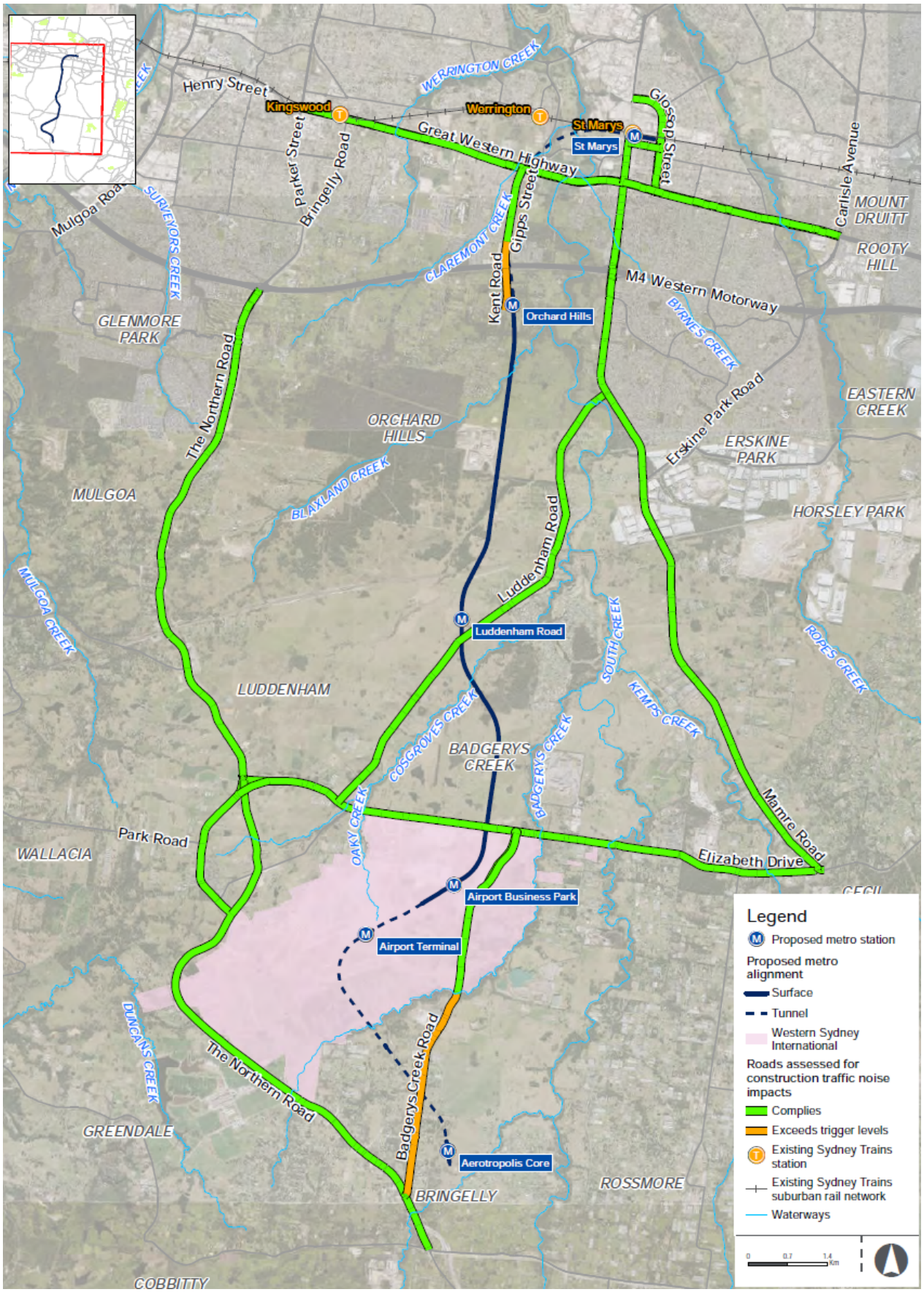


Figure 4 – Roads considered for EIS construction traffic noise assessment

7.2.1.3 Ground-borne noise

Ground-borne noise results from the transmission of vibration rather than the direct transmission of noise through the air. Ground-borne (or regenerated) construction noise is often of primary concern on tunnelling projects when vibration from activities such as rock-breaking, road heading, rotary cutting, tunnel boring and rock drilling/sawing can be transmitted through the ground and into the habitable areas of nearby buildings. Ground-borne noise occurs when this vibration in the ground and/or building elements is regenerated as audible noise within areas of occupancy inside the building.

The ICNG defines internal ground-borne noise goals for residential receivers of 40 dB(A) Leq(15min) during the evening (6 pm to 10 pm) and 35 dB(A) Leq(15min) during the night-time (10 pm to 7 am). These goals are only applicable when ground-borne noise levels are higher than airborne noise levels.

Due to the distance between construction works and receivers, ground-borne noise impacts are expected to be negligible in comparison to airborne noise impacts. For this reason, ground-borne noise is not anticipated to be the controlling factor for these proposed works and therefore further assessment is not warranted. As identified in the EIS, the application of standard mitigation measures (refer to Section 8) for the control of airborne noise emissions and vibration is expected to adequately address ground-borne noise.

7.2.2 Construction vibration assessment

Vibration impacts to residents and buildings are expected during construction of the SCAW. 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 SCAW will be associated with viaduct construction and the use of pile boring rig and excavators. 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.

Where vibration intensive works are required to be undertaken within the specific minimum working distances (identified in Section 0), vibration monitoring should be undertaken to ensure acceptable levels of vibration are satisfied. In relation to human comfort, the minimum working distances relate to continuous vibration. For most construction activities, vibration emissions would be intermittent in nature and for this reason, higher vibration levels, occurring over shorter periods may be allowed.

Considering the distance of the typical nearest residential receivers to the SCAW worksites, vibration represents a low risk of impact to the surrounding community. Vibration monitoring would be undertaken where works are required to be conducted within the minimum working distances as identified in the Noise and Vibration Construction Monitoring Program (Appendix C3)

7.2.2.1 Heritage receivers

Heritage listed structures should not be assumed to be more sensitive to vibration unless they are structurally unsound, which is unlikely for a regularly maintained structure.

The EIS (Tech Paper 2) identified heritage receivers relevant to noise and vibration impacts associated with SCAW which are summarised in Table 22. Buildings that are potentially at risk of threshold or cosmetic damage would be identified prior to the commencement of construction works.

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.

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.

Where the SCAW interacts with the Warragamba to Prospect Water Supply Pipelines and in accordance with Condition E121 and REMM HR4, CPBUI will consult with WaterNSW regarding design and construction including agreement on vibration velocity limits, and ensure that proposed construction methodology is consistent with the WaterNSW Guideline. In accordance with REMM NV2 a DNVIS would be undertaken in accordance with the WaterNSW Guideline to avoid the potential for vibration impacts upon the Warragamba to Prospect Water Supply Pipeline. Viaduct support structures may not be constructed within 6 metres from the pipelines. Construction of these support structures would involve the use of a pile boring rig and excavators. Pile boring rigs and excavators have a nominal minimum working distance of 4 metres to align with the nominated criterion of 2.5 mm/s.

In accordance with REMM NAH6 McMaster Farm (an identified heritage item in the Tech Paper 2 of the EIS) would be monitored for potential vibration impacts during construction. Vibration monitoring in accordance with Appendix C3 – Noise and Vibration Construction Monitoring Program would be undertaken where works are required to be conducted within the minimum working distances and where works are required in the vicinity of the heritage items.

Table 22 – EIS identified heritage receivers relevant to SCAW

Item	Listing	Significance	Approximate distance to construction footprint
Warragamba to Prospect Water Supply Pipelines	WaterNSW s170 Register	State	Located within the construction footprint
McGarvie-Smith Farm	Penrith LEP 2010 I857	Local	Located within the construction footprint
McMasters Farm	Potential items	Local	Located within the construction footprint

7.3 Risk assessment

A Project Preliminary Environmental Risk Assessment was undertaken to inform the preparation of the CEMP, Sub-plans and procedures; and to provide input into the project Risk Register. The initial risk assessment is provided in Appendix C5 of the CEMP. Informed by the EIS, Submissions Report, and the SSI 10051 Planning Approval, the initial risk assessment included the identification of mitigation measures and standard controls for management of noise and vibration. The project Risk Register is a dynamic document that will be reviewed and updated as the project progress.

7.3.1 Ongoing Environmental Risk Identification and Management

Environmental risk assessments are completed at each stage of project planning and delivery, and each level of risk assessment is periodically reviewed. The key documents and activities underpinning ongoing environmental risk assessment are:

- Construction Area Plan (CAP) Risk Assessments
- Work Pack Risk Assessments
- Environmental Work Method Statements (EWMS)
- Pre-start Meetings
- DNVIS and Out-of-Hours Work Permit process.

The ongoing identification and management of environmental risks and opportunities is a key consideration during all project risk assessment activities and is further described in Section 6 of the CEMP.

7.3.2 Detailed Noise and Vibration Impact Statements

In accordance with Condition E47, a DNVIS will be prepared for any work that may exceed the NMLs, vibration criteria and / or ground-borne noise levels specified in Conditions E43 and E44 at any residence outside construction hours identified in Condition E38, or where receivers will be highly noise affected or subject to vibration levels above those otherwise determined as appropriate by a suitably qualified structural engineer under Condition E87.

The DNVIS will supplement this Sub-Plan (as identified in Section 2.1.1) and will refine impact predictions provided in the EIS considering actual construction methodology, plant and equipment, location and duration. The DNVIS will include specific mitigation measures identified through engagement with affected sensitive receivers, to be implemented for the duration of the activity.

The DNVIS will be prepared by a suitably qualified and experienced noise and vibration specialist in accordance with the CNVS (refer to Section 9.1). The DNVIS will be provided to the ER prior to the works and will be provided to the Planning Secretary and the EPA upon request. In accordance with Condition E49, activities that would exceed highly noise affected criteria during typical case construction must not commerce until the DNVIS has been implemented, unless otherwise agreed with the Planning Secretary. In accordance with Condition E51, where a DNVIS is triggered for receivers who will be highly noise affected and the DNVIS determines that at-property treatment (temporary or permanent) is the appropriate measure to reduce noise impacts, the at-property treatment will be offered to the landowners of residential properties for habitable living spaces, unless other mitigation measures are agreed to by the landowner. The offer for at-property treatment does not expire until the noise impacts affecting the property are completed, even if the landowner refuses the offer. The implementation of at-property treatment will not preclude the application of other noise and vibration management measures including temporary and long-term accommodation. Community consultation will be undertaken in accordance with the Community Communications Strategy.

The DNVIS will be a key site management tool for high impact works and out-of-hours works to provide clear instructions for managing noise and vibration by providing activity specific noise and vibration predictions and specific, and reasonable and feasible mitigation measures identified through consultation with affected sensitive land user(s) to be implemented for the duration of the works.

The DNVIS will also provide data for the Out-of-Hours Work Permit in accordance with the Out-of-Hours Work Protocol which will demonstrate compliance regarding the assessment of Out-of-Hours Work activities.

Further detail is provided in the Out-of-Hours Work Protocol, including the Out-of-Hours Work Permit process (**Appendix C1 – Out of Hours Work Protocol**). Monitored noise and vibration levels will be analysed against the predictions made in the relevant DNVIS, incorporating standard project mitigation measures as described in Section 8.

8. Environmental control measures

In accordance with Condition E43 mitigation measures will be implemented with the aim of achieving he NMLs identified in Section 6 of this Sub-Plan. The proposed mitigation has been developed in accordance with the Project Planning Approval and the CNVS and are provided in Table 23.

Mitigation measures have been developed considering the SMART principles, being specific with measurable outcomes. They are all achievable (notwithstanding the assessment of reasonable and feasible) and realistic. Each measure is also time-based, applicable before or during construction as indicated in Table 23.

Table 23 – Standard noise and vibration controls

ID	Management Measure	When to implement	Responsibility	Source	Evidence of implementation
MMNV1	All employees, contractors and subcontractors are to receive an environmental induction prior to commencing work on site involving (but not limited to): ▪ The requirements of this Sub-plan ▪ Relevant legislation and guidelines ▪ Project specific requirements ▪ Approved construction hours ▪ The process for seeking approval for out-of-hours works, including consultation ▪ Location of NCAs ▪ Complaints management ▪ 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 ▪ Incident notification procedures ▪ The requirements of the Monitoring Program.	Construction	Environment Manager	Best practice CNVS	Induction records
MMNV2	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	Environment Manager Environmental Coordinator	Best practice	Training records
MMNV3	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	Site Supervisor	Best practice	Observations/diary entries Training records

ID	Management Measure	When to implement	Responsibility	Source	Evidence of implementation
MMNV4	A Construction Noise and Vibration Monitoring Program will be developed and implemented.	Prior to construction	Environment Manager Noise and vibration specialist	Condition C13(a) Condition C15	Noise and Vibration Construction Monitoring Program Inspection and monitoring records
MMNV5	Monitoring will be carried out at the start of high noise and vibration activities (such as piling, rock-breaking, vibratory rolling and concrete sawing) when required as per a DNVIS, within nominated safe working distances or within 150m of sensitive receivers to confirm that actual noise and vibration levels are consistent with the noise and vibration impact predictions, NML's or nominated vibration criteria	Construction	Environment Manager	Condition E43 CNVS	Noise and Vibration Construction Monitoring Program Inspection and monitoring records
MMNV6	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	Plant Manager	Condition E46 CNVS	Plant inspection records
MMNV7	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 maximum noise levels the following will occur where reasonable and feasible: ▪ Selection of quieter plant or equipment ▪ On-site mitigation (e.g. noise blankets) will be reviewed; and /or The noise assessment will be repeated to verify the noise level of the plant / equipment.	Construction	Site Supervisor Plant Manager Environment Manager	Condition E46 CNVS	Plant inspection records Site inspection records Inspection records Observations/diary entries

ID	Management Measure	When to implement	Responsibility	Source	Evidence of implementation
MMNV8	All construction plant and equipment used on the site will be operated in a proper and efficient manner.	Construction	Site Supervisor	Condition E46 CNVS	Inspection reports
MMNV9	Non-tonal (white noise) movement alarms will be used in place of tonal reversing alarms for all plant and machinery	Construction	Site Supervisor	Condition E46	Inspection records Observations/diary entries
MMNV10	Plant and machinery will be switched off when it is not in use for more than 15 minutes	Construction	Site Supervisor	Condition E46	Inspection records Observations/diary entries
MMNV11	Appropriate respite periods for out-of-hours work will be identified in consultation with the community at each affected location on a regular basis. For out-of-hours work, appropriate respite periods would be identified in consultation with the community at each affected location on a regular basis in accordance with Condition E57. Consultation would 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 NMLs under Condition E43 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers). The outcomes of the community consultation, identified respite periods and scheduling of the likely out-of-hour work will be provided to the ER, EPA and the Planning Secretary.	Construction	Environment Manager Stakeholder and Community Engagement Manager	Condition E56 ConditionE57	Consultation records Monitoring and inspection records

ID	Management Measure	When to implement	Responsibility	Source	Evidence of implementation
MMNV12	A DNVIS will be prepared for any work that may exceed the NMLs, vibration criteria and / or ground-borne noise levels specified in Conditions E43 and E44 at any residence outside construction hours identified in Condition E38, or where receivers will be highly noise affected or subject to vibration levels above those otherwise determined as appropriate by a suitably qualified structural engineer under Condition E87.	Construction	Environment Manager	Condition E47	DNVIS
MMNV13	Construction works will be scheduled in consultation with managers of other nearby 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	Environment Manager Construction Manager Stakeholder and Community Engagement Manager	CEMF 3.8b Environmental Performance Objective	Consultation records

ID	Management Measure	When to implement	Responsibility	Source	Evidence of implementation
MMNV14	Work, including those by third-parties, will be coordinated to ensure respite periods are provided.	Construction	Environment Manager Construction Manager Community and Stakeholder Manager	Condition E56	Consultation records
MMNV15	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.	Construction	Environment Manager Construction Manager Community and Stakeholder Engagement Manager	Condition E45	Consultation records Monitoring
MMNV16	Industry best practice construction methods must be implemented where reasonably practicable to ensure that noise and vibration levels are minimised around sensitive land use(s). Practices may include, but are not limited to: (a) use of regularly serviced low sound power equipment; (b) at source control, temporary noise barriers (including the arrangement of plant and equipment) around noisy equipment and activities such as rock hammering and concrete cutting; (c) use of non-tonal reversing alarms; and (d) use of alternative construction and demolition techniques	Construction	Environment Manager Construction Manager	Condition E46	DNVS Monitoring reports/records

ID	Management Measure	When to implement	Responsibility	Source	Evidence of implementation
MMNV17	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	Environment Manager	Condition E48	Consultation records
MMNV18	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	Environment Manager Construction Manager	Condition E54	Monitoring records Construction documentation
MMNV19	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	Environment Manager	Condition E55	Inspection report/s
MMNV20	Prior to the commencement of vibration generating works that could impact on the structure/asset, 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).	Pre-Construction	Environment Manager	Condition E84 ConditionE85	Pre-Construction Survey Report

ID	Management Measure	When to implement	Responsibility	Source	Evidence of implementation
MMNV21	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 twelve (12) months following the completion of construction activities that have the potential to impact on the structure/asset.	Post-Construction	Environment Manager	Condition E86	Post-Construction Survey Report
MMNV22	Undertake a detailed construction vibration assessment on the potential vibration impacts to the Warragamba to Prospect Water Supply Pipeline.	Pre-construction	Environment Manager	REMM NV2	Construction Vibration Assessment
MMNV23	Air brake silencers would be used on heavy vehicles that access construction sites multiple times per night or over multiple nights, noting that site speed restrictions are likely to prevent the triggering of air brakes.	Construction	Plant Manager Site Supervisor	CNVS	Inspection records Observations/diary entries Training register
MMNV24	Implement community consultation measures (including notification of upcoming works) using the following tools: ▪ Periodic Notification (letterbox drop) ▪ Website ▪ Project information and construction response ▪ Telephone line ▪ Email distribution list ▪ Place Managers	Construction	Community and Stakeholder Engagement Manager Environment Manager	Best practice CNVS	Community Communication Strategy Consultation records
MMNV25	Out-of-hours deliveries will be minimised where possible and will be carried out in accordance with the OOHW protocol and/or the EPL	Construction	Environment Manager	CNVS	Out of Hours Work Protocol Training records Inspection records

ID	Management Measure	When to implement	Responsibility	Source	Evidence of implementation
			Construction Manager		
MMNV26	Noise will be considered when selecting construction methods and quieter methods substituted where reasonable and feasible. Appropriately sized equipment will be used, avoiding over-powered plant in accordance with Table 12 of the CNVS where appropriate.	Construction	Construction Manager Site Supervisor	CNVS	Inspection records
MMNV27	Noise levels of plant and equipment will have operating Sound Power Levels compliant with the maximum noise levels detailed in Table 13 of the Sydney Metro CNVS. This also identifies defective silencing equipment on the items of plant	Construction	Construction Manager Site Supervisor	CNVS	Inspection records
MMNV28	Traffic flow, parking and loading/unloading areas will be planned to minimise reversing within the Site	Construction	Site Supervisor	CNVS	Inspection records
MMNV29	Site sheds and other structures will be used within the site to provide noise barriers to receivers where practicable.	Construction	Site Supervisor Environmental Coordinator	CNVS	Inspection records Monitoring records
MMNV30	Loading and unloading of materials/deliveries will occur as far as possible from noise sensitive receivers.	Construction	Site Supervisor Environmental Coordinator	CNVS	Inspection records Training records
MMNV31	Dedicated loading/unloading areas will be shielded if located close to noise sensitive receivers.	Construction	Site Supervisor Environmental Coordinator	CNVS	Inspection records Training records

ID	Management Measure	When to implement	Responsibility	Source	Evidence of implementation
MMNV32	No blasting will be undertaken	Construction	Site Supervisor Construction Manager	Condition E40	Inspection records Site inspections

8.1 Out of Hours Work Protocol

The Out-of-Hours Work Protocol (OOHW Protocol) is provided in Appendix C1 – Out of Hours Work Protocol. This addresses the requirements of Condition E42. In accordance with Condition E47, a DNVIS would be prepared where works are required to be undertaken outside of standard construction hours.

Approval from the EPA via the EPL will be obtained for out of hours works in accordance with Condition E41(c).

8.2 Respite

There is no requirement for respite periods during the approved construction hours identified in Section 5.1. Appropriate respite periods for out-of-hours work will be identified in consultation with the community at each affected location on a regular basis in accordance with Condition E56 and Condition E57. Respite for out-of-hours work will be detailed in the DNVIS for the activity (refer to Section 7.3.2). Refer to Section 8.4 for further detail relating to community engagement and notification.

8.3 Additional Noise and Vibration Mitigation Measures

The implementation of the standard management measures, compliance with maximum sound power levels for plant and equipment, construction hour management and standard community consultation measures should significantly reduce the noise and vibration impacts on nearby sensitive receivers. After standard noise mitigation measures have been applied noise levels may still exceed NMLs where construction noise and vibration levels are still predicted to exceed the noise and vibration objectives.

The additional mitigation measures matrix described in Table 24, Table 25 and Table 26 will be used to determine additional measures and implementation where reasonable and feasible. Further detail regarding the measures and the implementation of them can be found in the CNVS and the Out-of-Hours Work Protocol in **Appendix C1 – Out of Hours Work Protocol**.

There may be personal circumstances among the sensitive receivers where the approach to specific additional mitigation measures is not best suited. The Stakeholder and Community Engagement Manager has the authority to amend the below approach taking into account personal circumstances that may apply. Refer to Section 8.4 for further detail relating to community engagement and notification.

Table 24 – Additional mitigation measures – Airborne construction noise

Time Period		Mitigation Measures Predicted $L_{Aeq(15\ minute)}$ noise level above NML			
		0 - 10 dB	10 - 20 dB	20 - 30 dB	> 30 dB
Approved construction hours	Mon-Fri (7.00 am - 6.00 pm)	-	LB	LB, M, SN	LB, M, SN
	Sat (8.00 am - 1.00 pm)				
	Sun/Pub Hol (Nil)				
OOHW (Evening)	Mon-Fri (6.00 pm - 10.00 pm)	LB	LB, M	LB, M, SN, RO	LB, M, SN, IB, PC, RO
	Sat (1.00 pm - 10.00 pm)				
	Sun/Pub Hol (8.00 am - 6.00 pm)				
OOOHW (Night)	Mon-Fri (10.00 pm - 7.00 am)	LB	LB, M, SN, RO	LB, M, SN, IB, PC, RO, AA	LB, M, SN, IB, PC, RO, AA
	Sat (10.00 pm - 8.00 am)				
	Sun/Pub Hol (6.00 pm - 7.00 am)				

Note: Phone calls (PC), Monitoring (M), Individual briefings (IB), alternative accommodation (AA), specific notification (SN), letterbox drop (LB), duration reduction (DR), Project specific respite offer (RO)

Table 25 – Additional mitigation measures – Ground-borne construction noise

Time Period		Mitigation Measures Predicted LAeq(15 minute) noise level above NML		
		0 - 10 dB	10 - 20 dB	>20 dB
Approved construction hours	Mon-Fri (7.00 am - 6.00 pm)	No NML for GBN during standard hours, refer to Table 26		
	Sat (8.00 am - 1.00 pm)			
	Sun/Pub Hol (Nil)			
OOHW (Evening)	Mon-Fri (6.00 pm - 10.00 pm)	LB	LB, M, SN	LB, M, SN, IB, PC, RO
	Sat (1.00 pm - 10.00 pm)			
	Sun/Pub Hol (8.00 am - 6.00 pm)			
OOOHW (Night)	Mon-Fri (10.00 pm - 7.00 am)	LB, M, SN	LB, M, SN, IB, PC, RO, AA	LB, M, SN, IB, PC, RO, AA
	Sat (10.00 pm - 8.00 am)			
	Sun/Pub Hol (6.00 pm - 7.00 am)			
Note: Phone calls (PC), Monitoring (M), Individual briefings (IB), alternative accommodation (AA), specific notification (SN), letterbox drop (LB), duration reduction (DR), Project specific respite offer (RO)				

Table 26 – Additional mitigation measures – Ground-borne vibration

Time Period		Mitigation Measures for Predicted $L_{Aeq(15\ minute)}$ noise level above NML
Standard	Mon-Fri (7.00 am - 6.00 pm)	LB, M, RO
	Sat (8.00 am - 1.00 pm)	
	Sun/Pub Hol (Nil)	
OOHW (Evening)	Mon-Fri (6.00 pm - 10.00 pm)	LB, M, IB, PC, RO, SN
	Sat (1.00 pm - 10.00 pm)	
	Sun/Pub Hol (8.00 am - 6.00 pm)	
OOOHW (Night)	Mon-Fri (10.00 pm - 7.00 am)	LB, M, IB, PC, RO, SN, AA
	Sat (10.00 pm - 8.00 am)	
	Sun/Pub Hol (6.00 pm - 7.00 am)	
Note: Phone calls (PC), Monitoring (M), Individual briefings (IB), alternative accommodation (AA), specific notification (SN), letterbox drop (LB), duration reduction (DR), Project specific respite offer (RO)		

8.4 Consultation and notification

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

Notification providing progress on construction and updates of any out of hours works will be provided to the local community in accordance with the CPBUI Community Communications Strategy (SMWSASCA-CPU-1NL-NL000-CY-PLN-000001) prepared in accordance with the Sydney Metro Overarching Community Communication Strategy.

The consultation would involve consideration of appropriate mitigation and management options to be implemented where feasible and reasonable to minimise impacts.

In accordance with Condition E45, noise generating work in the vicinity of potentially affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise

levels above the NMLs will be timetabled so as to avoid sensitive periods, unless other reasonable arrangements have been made with the affected institutions.

In accordance with Condition E48, owners and occupiers of properties identified in the DNVIS as at risk of exceeding the screening criteria for cosmetic damage will be notified before commencement of vibration generating works in the vicinity of that property. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owners and occupiers will be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier.

For out-of-hours work, appropriate respite periods would be identified in consultation with the community at each affected location on a regular basis in accordance with Condition E57. Consultation would 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 NMLs under Condition E43 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers).

The outcomes of the community consultation, identified respite periods and scheduling of the likely out-of-hour work will be provided to the ER, EPA and the Planning Secretary prior to the out of hours working commencing.

8.4.1 Cumulative impact management

CPBUI will manage the potential for cumulative impacts via coordination and engagement with key stakeholders and other SSI projects in accordance with the Sydney Metro Construction Cumulative Impacts Management Plan (developed in accordance with REMM C1) and the SCAW Community Communications Strategy.

In accordance with Condition E56 out-of-hours work undertaken by third parties (such as utility relocations), will be coordinated to the greatest extent possible to ensure respite periods are provided, this includes:

a) reschedule any work to provide respite to impacted noise sensitive receivers so that the respite is achieved in accordance with Condition E57 (refer to Section 8.4), or
b) consider the provision of alternative respite or mitigation to impacted noise sensitive receivers.

9. Compliance management

9.1 Training

All employees, subcontractors and staff working on site will undergo site induction training that includes construction noise and vibration management issues. The induction training will address elements related to project specific noise and vibration management including:

- Requirements of this Sub-Plan
- Approved construction hours and out of hours works including consultation
- Out of hours work approval process
- Location of noise sensitive receivers
- Noise and vibration management measures
- Complaints management
- Specific responsibilities across the project team, to minimise impacts on the community and the built environment.

A specialist noise and vibration consultant will be engaged by CPBUI to support the implementation of this Sub-plan and Noise and Vibration Construction Monitoring Program. Refer to Section 5 of the CEMP for further detail regarding the project specialist consultants.

Training will occur during induction, onsite before works and during toolbox talks. Further details regarding staff induction and training are outlined in Element 7 of the CEMP.

9.2 Monitoring and inspections

Inspection of work activities with the potential for noise and vibration impacts will occur for the duration of construction. Weekly and other routine inspections by the Sydney Metro Environment Manager (or delegate) and project ER will occur throughout construction. Refer to Element 3 of the CEMP for further detail regarding the environmental inspections that will be undertaken during delivery of SCAW.

Noise and vibration monitoring will occur in accordance with the Noise and Vibration Construction Monitoring Program (Appendix C3).

The project requirements for inspection and monitoring are detailed in Section 6 of the CEMP and contained in Table 27.

Table 27 – Monitoring and inspections relevant noise and vibration management

Monitoring/inspection	Frequency	Responsibility
Site inspections	Weekly	Environment Manager
Noise and Vibration Monitoring Program	As required	Environment Manager
Visual surveillance of site activities	Daily	Site Supervisors

9.3 Reporting and record keeping

Reporting requirements relevant to this Sub-Plan are detailed in Element 2: Monitoring and Reporting and in the Noise and Vibration Construction Monitoring Program (Appendix C3)

Further details relating to reporting requirements and record keeping are provided in Element 11 of the CEMP. Refer to Element 6 of the CEMP for details of the complaints management process.

9.4 Hold points

The internal hold points applied to noise and vibration management for the SCAW are identified in Table 28

Table 28 – Noise and vibration hold points

Hold Point	Release of Hold Point	Source	Where Addressed	Released By
Noise and vibration impact	Land use survey - Progressive completion before the commencement of work in each location which generates construction noise, ground-borne noise or vibration in that area.	Condition E37	Appendix C2 – Land Use Survey	Environment Manager (or delegate)
Out of Hours Work	Prior to out of hours work - Approved OOHW Application Form in accordance with the Out of Hours Works Protocol	Condition E41(c), Condition E42	Appendix C1 – Out of Hours Work Protocol Section 7.3.2	Environment Manager (or delegate)
Vibration impact that may be subject to vibration levels above those determined appropriate by a suitably qualified structural engineer	Pre-construction condition survey report Must be provided to the relevant owners of the items (buildings, structures, utilities and the like) surveyed in the vicinity of the proposed work, and no later than one month before the commencement of the work that could impact on the subject surface / subsurface structure	Condition E84	Appendix C3 – Noise and Vibration Construction Monitoring Program	Construction Manager / specialist structural engineer
Prior to commencement of construction	Noise and Vibration Construction Monitoring Program	Condition C13	Appendix C3 – Noise and Vibration Construction Monitoring Program	Endorsed by ER Approved by Planning Secretary
Prior to undertaking any work that may exceed the NML, vibration criteria and/or ground borne noise levels specified in Condition E43 and E44 at any residence outside construction hours specified in Condition E38	DNVIS	Condition E47	Section 7.3.2	Environment Manager, or ER, or Planning Secretary
Noise impact where receivers will be highly noise affected	DNVIS	Condition E47	Section 7.3.2	Environment Manager, or ER, or Planning Secretary

Part B Implementation Plan

Elements and Expectations

Part B of this Sub-plan explains how potential noise and vibration impacts during the SCAW Works will be minimised and managed. Compliance with all elements is required at all times to minimise the likelihood of causing unauthorised environmental harm and maximise the uptake of opportunities to reduce environmental impact.

Part B contains the following:

- **Environmental Elements and Expectations:** These describe what is required of CPBUI JV to implement the objectives of the Environment and Sustainability Policy Statement and system requirements:
- **Element** – Key aspects for managing this function in delivering the SCAW Works
- **Expectation** – The outcomes achieved as part of each Element.
- **Requirements:** These are the specific actions required to demonstrate compliance with the Elements and Expectations.
- **Responsibility and Key Contributor:** Designation of responsibility for achieving compliance with the stated Expectation. Key contributors assist/contribute to achieving compliance.
- **Deliverables:** Tangible outcomes produced to demonstrate compliance with the environmental Elements and Expectations.

Element 1: Training

CPBUI JV will ensure that SCAW project personnel can competently perform their duties and meet environmental obligations

Expectations		How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Deliverables
1.1	All personnel have completed an induction containing relevant environmental information before they are authorised to work on the project	Induction presentation will include (but not limited to): ▪ The requirements of this Sub-plan ▪ Approved construction hours and out-of-hours ▪ Out-of-hours work processes and protocol ▪ Location of noise sensitive receivers ▪ Standard mitigation measures ▪ Noise and vibration monitoring ▪ Complaints management	**Senior HR Advisor** Environment Manager Environmental Coordinators	Induction presentation Induction records
1.2	Toolbox talks are used to reinforce key management requirements and lessons learnt	Toolbox talks will be held regularly during site establishment and throughout construction. They will reinforce and reiterate information from inductions. Toolbox talks will be undertaken with key site people on the following procedures: ▪ Noise and vibration monitoring ▪ OOHW Management ▪ Complaints	**Environment Manager** Site Supervisors Environmental Coordinators	Toolbox presentations Toolbox records
1.3	Noise and Vibration training for personnel responsible for the installation and maintenance of noise and vibration controls installed as required by a DNVIS.	Training will be provided to key personnel regarding noise and vibration management. This training will include: ▪ Legislation as it applies to noise and vibration. ▪ Basics of noise and vibration principles and theory relevant to construction including monitoring. ▪ Appropriate use, installation and maintenance of relevant noise and vibration controls, such as noise blankets and hoardings. ▪ Monitoring and maintenance of controls including condition of hoardings and plant specific noise controls such as silencers. ▪ Reading and interpreting Noise and Vibration monitoring results.	**Acoustic Consultant** Environment Manager **Environmental Coordinators**	Training packages and presentations Training records

Element 2: Monitoring and Reporting

All staff, employees and subcontractors will actively drive compliant environmental performance of SCAW.

Expectations		How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Deliverables
2.1	Worksites are regularly inspected to ensure the adequacy of controls and compliance with the requirements of this Sub-plan	CPBUI JV will regularly review SCAW to ensure compliance with legal and contract requirements and to identify potential non-compliances before they occur, as below: ▪ Site inspection checklist will include reference to noise and vibration controls ▪ Details of inspections undertaken by the Site Supervisor will be logged in their respective site diaries and on Synergy ▪ ER inspections will include review of implementation of noise and vibration management and mitigation measures. Refer to Section 6 of the CEMP for further details of the monitoring and inspection regime for the SCAW.	**Environment Manager** Site Supervisors Environmental Coordinators ER	Environment and Sustainability Inspection Checklists Site Diary entries ER Reports
2.2	Noise and Vibration Monitoring	Noise and vibration monitoring will be undertaken throughout construction in accordance with the requirements of a DNVIS and the Noise and Vibration Construction Monitoring Program (Appendix C3 – Noise and Vibration Construction Monitoring Program).	**Environment Manager** Environmental Coordinators Site Engineers and supervisors	DNVIS Construction Monitoring Report
2.3	Noise and Vibration Reporting	Noise and vibration data will be collected to facilitate rleporting and compliance management. The following compliance records would be retained: ▪ Records of noise and vibration monitoring results against appropriate NMLs and vibration criteria, and ▪ Records of community enquiries and complaints, and the Contractor's response. Further details of record keeping and documentation can be found in Part B Element 11 of the CEMP.	Environment Manager **Environmental Coordinators**	Monthly Reports EPL Validation Monitoring 6-Monthly Construction Monitoring Report

Element 3: Auditing, Review and Improvement

CPBUI JV will continually improve its environmental systems and performance by monitoring and reviewing their effectiveness

Expectations		How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Deliverables
3.1	Audits are undertaken to ensure compliance with the requirements of this Sub-plan	Procedures for corrective actions are addressed in Element 3 of the CEMP. Audits will be performed in accordance with Element 12 of the CEMP. Associated documents or procedures will be updated if required. The ER may participate in or conduct audits to ensure the implementation of this Sub-plan and related documents is compliant with what is stated in the documents and the terms of the Planning Approval.	**Environment Manager** Environmental Coordinators Sustainability Manager ER	Audit Reports Corrective Action Reports
3.2	All non-compliances are reported and actioned	A noise and vibration non-compliance can generally be defined as a failure to comply with the Project Planning Approval and/or the EPL. Where a non-compliance is raised as part of an audit or an incident or complaint investigation the audit, incident or complaint report may be used to close out the non-compliance and it is not necessary to raise a separate non-compliance reporting process. Corrective and Preventative Actions may also be raised in accordance with Element 3 of the CEMP. Reporting protocols are identified in Element 3 of the CEMP.	**Environment Manager** Sustainability Manager Environmental Coordinators Quality Manager	Audit Reports Corrective Action Reports

Element 4: Project Specific Requirements

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
Condition C1	Construction Environmental Management Plans (CEMPs) and CEMP Sub-plans must be prepared in accordance with the Construction Environmental Management Framework (CEMF) included in the documents listed in Condition A1 to detail how the performance outcomes, commitments and mitigation measures specified in the documents listed in Condition A1 will be implemented and achieved during construction.	This Sub-plan	**Environment Manager**	Pre-construction
Condition C5	Of the CEMP Sub-plans required under Condition C1, the following CEMP Sub-plans must be prepared in consultation with the relevant government agencies identified for each CEMP Sub-plan. Details of issues raised by a government agency during consultation (as required by Condition A6) must be provided as part of the relevant CEMP Sub Plan when submitted to the Planning Secretary / ER (whichever is applicable). Where a government agency(ies) request(s) is not included, the Proponent must provide the Planning Secretary / ER (whichever is applicable) justification as to why. **Noise and Vibration - Relevant Councils and Water NSW**	This Sub-plan Section 0	**Environment Manager**	Pre-construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
Condition C6	The CEMP Sub-plans must state how: (a) the environmental performance outcomes identified in the documents listed in Condition A1 will be achieved,	Section 2.1.2	**Environment Manager**	Pre-Construction
	(b) the mitigation measures identified in the documents listed in Condition A1 will be implemented,	Section 8	**Environment Manager**	Pre-Construction
	(c) the relevant terms of this approval will be complied with; and	Element 4: Project Specific Requirements	**Environment Manager**	Pre-Construction
	(d) issues requiring management during construction (including cumulative impacts), as identified through ongoing environmental risk analysis, will be managed through SMART principles.	Section 7.3 Section 8	**Environment Manager**	Pre-Construction
Condition C7	With the exception of any CEMP sub-plans expressly nominated by the Planning Secretary to be endorsed by the ER, all CEMP Sub-plans must be submitted to the Planning Secretary for approval.	Section 1.1 Section 0	**Environment Manager**	Pre-construction
Condition C9	Any of the CEMP Sub-plans to be approved by the Planning Secretary must be submitted to the Planning Secretary with, or subsequent to, the submission of the CEMP but in any event, no later than one (1) month before construction, or where construction is staged no later than one (1) month before the commencement of that stage.	Section 1.1 Section 0	**Environment Manager**	Pre-construction
Condition C10	Construction must not commence until the CEMP and all CEMP Sub-plans have been approved by the Planning Secretary or endorsed by the ER (whichever is applicable), unless otherwise agreed by the Planning Secretary. The CEMP and CEMP Sub-plans, as approved by the Planning Secretary or endorsed by the ER (whichever is applicable), including any minor amendments approved by the ER, must be implemented for the duration of construction.	Section 0	**Environment Manager**	Pre-construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
Condition C13	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies (as required by Condition A6) 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. Where a government agency(ies) request(s) is not included, the Proponent must provide the Planning Secretary / ER (whichever is applicable) justification as to why. Required Construction Monitoring Programs Relevant government agencies to be consulted for each Construction Monitoring Program (a) Noise and Vibration - Relevant Councils and Water NSW (in relation to its assets)	Appendix C3 – Noise and Vibration Construction Monitoring Program Appendix C4 – Records of Consultation	Environment Manager	Pre-Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
Condition C14	Each Construction Monitoring Program must provide:			
	(a) details of baseline data available including the period of baseline monitoring;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	(b) details of baseline data to be obtained and when;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	(c) details of all monitoring of the project to be undertaken;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	(d) the parameters of the project to be monitored;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	(e) the frequency of monitoring to be undertaken;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	(f) the location of monitoring;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	(g) the reporting of monitoring results and analysis results against relevant criteria;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	(h) details of the methods that will be used to analyse the monitoring data;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	(i) procedures to identify and implement additional mitigation measures where the results of the monitoring indicated unacceptable project impacts;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	(j) a consideration of SMART principles;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	(k) any consultation to be undertaken in relation to the monitoring programs; and	Appendix C3 – Noise and Vibration Construction Monitoring Program Appendix C4 – Records of Consultation	**Environment Manager**	Pre-Construction
	(l) any specific requirements as required by Conditions C15 to C16	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
Condition C15	The Noise and Vibration Construction Monitoring Program must include:			
	(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;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Construction
	(b) monitoring undertaken during the day, evening and night-time periods throughout the construction period and cover the range of activities being undertaken;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	(c) method and frequency for reporting monitoring results; and	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	(d) a process to undertake real time noise and vibration monitoring.	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	The results of the monitoring must be readily available to the construction team, the Proponent and **ER**. The Planning Secretary and EPA must be provided with access to the results on request.	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
Condition C17	With the exception of any Construction Monitoring Programs expressly nominated by the Planning Secretary to be endorsed by the ER, all Construction Monitoring Programs must be submitted to the Planning Secretary for approval.	Section 1.1	**Environment Manager**	Pre-construction
Condition C19	Any of the Construction Monitoring Programs which require Planning Secretary approval 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 or where construction is staged no later than one (1) month before the commencement of that stage.	Section 0	**Environment Manager**	Pre-construction
Condition C20	Unless otherwise agreed with the Planning Secretary, construction must not commence until the Planning	Section 0	**Environment Manager**	Pre-construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	Secretary has approved, or the ER has endorsed (whichever is applicable), all of the required Construction Monitoring Programs and all relevant baseline data for the specific construction activity has been collected.	Appendix C3 – Noise and Vibration Construction Monitoring Program		
Condition C21	The Construction Monitoring Programs, as approved by the Planning Secretary or the ER has endorsed (whichever is applicable), 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 or the ER (whichever is applicable), whichever is the greater.	Section 0	**Environment Manager**	Pre-construction
Condition C22	The results of the Construction Monitoring Programs must be submitted to the Planning Secretary, ER and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program. Note: Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Construction
Condition E37	A detailed land use survey must be undertaken to confirm sensitive land use(s) (including critical working areas such as operating theatres and precision laboratories) potentially exposed to construction noise and vibration and construction ground-borne noise. The survey may be undertaken on a progressive basis but must be undertaken in any one area before the commencement of work which generate construction noise, vibration or ground-borne noise in that area. The results of the survey must be included in the Detailed Noise and Vibration Impact Statements Required Under Condition E47	Section 4.2 Section 7.3.2 Section 9.4 Appendix C2 – Land Use Survey	**Environment Manager**	Pre-Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
Condition E38	Work must only be undertaken during the following hours: (a) 7:00am to 6:00pm Mondays to Fridays, inclusive; (b) 8:00am to 1:00pm Saturdays; and (c) at no time on Sundays or public holidays.	Section 5.1	**Environment Manager**	Construction
Condition E39	Except as permitted by an EPL or approved in accordance with the Out of Hours Works Protocol required by Condition E38, highly noise intensive work that result in an exceedance of the applicable NML at the same receiver must only be undertaken: (a) between the hours of 8:00 am to 6:00 pm Monday to Friday; (b) between the hours of 8:00 am to 1:00 pm Saturday; and (c) if continuously, then not exceeding three (3) hours, with a minimum cessation of work of not less than one (1) hour. For the purposes of this condition, 'continuously' includes any period during which there is less than one (1) hour between ceasing and recommencing any of the work.	Section 5.1	**Environment Manager**	Construction
Condition E40	This approval does not permit blasting.	Section 1.3.2	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
Condition E41	Notwithstanding Conditions E35 and E36 work may be undertaken outside the hours specified in 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 (b) Low impact, including: (i) construction that causes LAeq(15 minute) noise levels: ▪ no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and ▪ no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s); and (ii) construction that causes: ▪ continuous or impulsive vibration values, measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), or ▪ intermittent vibration values measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006). (c) By Approval, including: (i) where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or	Section 5.2	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	(ii) works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E42; or (iii) negotiated agreements with directly affected residents and sensitive land user(s). (d) By Prescribed Activity, including: (i) tunnelling and ancillary support activities (excluding cut and cover tunnelling and surface works not directly supporting tunnelling) are permitted 24 hours a day, seven days a week; or (ii) grout batching at the Orchard Hills ancillary facility is permitted 24 hours a day, seven days a week; or (iii) delivery of material that is required to be delivered outside of standard construction hours in Condition E38 to directly support tunnelling activities, except between the hours 10:00 pm and 7:00 am to / from the Orchard Hills ancillary facility; or (iv) haulage of spoil except between the hours of 10:00 pm and 7:00 am to / from Orchard Hills ancillary facility; or (v) work within an acoustic shed are permitted 24 hours a day, seven days a week where there is no exceedance of noise levels or intermittent vibration levels under Low impact circumstances identified in Condition E41(b), unless otherwise agreed with the Planning Secretary; or (vi) tunnel and underground station box fit out works are permitted 24 hours per day, seven days per week. On becoming aware of the need for emergency work in accordance with (a)(ii) above, the ER, the Planning Secretary and the EPA must be notified of the reasons for such work. The Proponent must use best endeavours to notify as soon as practicable all noise and/or vibration			

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	affected sensitive land user(s) of the likely impact and duration of those work. Notes: 1. Tunnelling does not include station box excavation. 2. Tunnelling ancillary support activities includes logistics support and material handling and delivery			
Condition E42	An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of work (not subject to an EPL) which are outside the hours defined in Conditions E38 and E39. The Protocol must be approved by the Planning Secretary before commencement of the out-of-hours work. The Protocol must be prepared in consultation with the ER. The Protocol must provide: (a) justification for why out-of-hours work need to occur; (b) identification of low and high-risk activities and an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where: (i) the ER review 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; (c) a process for the consideration of out-of-hours work against the relevant NML and vibration criteria; (d) 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 E56. The measures must take into account the predicted noise levels and the likely frequency and duration of the	Section 5.2 Appendix C1 – Out of Hours Work Protocol	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	out-of-hours works that sensitive land user(s) would be exposed to, including the number of noise awakening events; (e) 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 (f) notification arrangements for affected receivers for all approved out-of-hours works and notification to the Planning Secretary of approved low risk out-of-hours works. This condition does not apply if the requirements of Condition E41 are met. Note: Out-of-hours work is any work that occurs outside the construction hours identified in Condition E38 and E39.			
Condition E43	Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration criteria: (a) construction 'Noise affected' noise management levels established using the Interim Construction Noise Guideline (DECC, 2009); (b) preferred vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure); (c) Australian Standard AS 2187.2 - 2006 "Explosives - Storage and Use - Use of Explosives" (for human exposure); (d) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and	Section 8	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	(e) the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage). Any work identified as exceeding the noise management levels and / or vibration criteria must be managed in accordance with the Noise and Vibration CEMP Sub-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 Noise Management Level.			
Condition E44	All reasonable and feasible mitigation measures must be applied when the following residential ground-borne noise levels are exceeded: (a) evening (6:00 pm to 10:00 pm) — internal LAeq(15 minute): 40 dB(A); and (b) night (10:00 pm to 7:00 am) — internal LAeq(15 minute): 35 dB(A). The mitigation measures must be outlined in the Noise and Vibration CEMP Sub-plan, including in any Out-of-Hours Work Protocol, required by Condition E42.	Section 8	**Environment Manager**	Construction
Condition E45	Noise generating work in the vicinity of potentially-affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise levels above the NMLs must not be timetabled within sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	Section 8.4	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
Condition E46	Industry best practice construction methods must be implemented where reasonably practicable to ensure that noise and vibration levels are minimised around sensitive land use(s). Practices may include, but are not limited to: (a) use of regularly serviced low sound power equipment; (b) at source control, temporary noise barriers (including the arrangement of plant and equipment) around noisy equipment and activities such as rock hammering and concrete cutting; (c) use of acoustic sheds to minimise tunnelling and station box exactions noise impacts; (d) use of non-tonal reversing alarms; and (e) use of alternative construction and demolition techniques.	Section 8	**Environment Manager**	Construction
Condition E47	Detailed Noise and Vibration Impact Statements (DNVIS) must be prepared for any work that may exceed the NMLs, vibration criteria and / or ground-borne noise levels specified in Conditions E43 and E44 at any residence outside construction hours identified in Condition E38, or where receivers will be highly noise affected or subject to vibration levels above those otherwise determined as appropriate by a suitably qualified structural engineer under Condition E87. The DNVIS 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 works. A copy of the DNVIS must be provided to the ER before the commencement of the associated works. The Planning Secretary and the EPA may request a copy(ies) of the DNVIS.	Section 7.3.2 Section 8.1	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
Condition E48	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before works that generate vibration commences in the vicinity of those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owners and occupiers are to be provided a schedule of potential exceedances 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.	Section 8 Section 8.4	**Environment Manager**	Construction
Condition E49	Where sensitive land use(s) are identified in Appendix B as exceeding the highly noise affected criteria during typical case construction, mitigation measures must be implemented with the objective of reducing typical case construction noise below the highly noise affected criteria at each relevant sensitive landuse(s). Activities that would exceed highly noise affected criteria during typical case construction must not commerce until the measures identified in this condition have been implemented, unless otherwise agreed with the Planning Secretary. Note: Mitigation measures may include path barrier controls such as acoustic sheds and/or noise walls, at-property treatment, or a combination of path and at-property treatment.	Section 7.2.1.1 Section 7.3.2 Section 8	**Environment Manager**	Construction
Condition E51	Where Condition E49 determines that at-property treatment (temporary or permanent) is the appropriate measure to manage noise impacts, this at-property treatment must be offered to landowners of residential properties for habitable living spaces, unless other mitigation or management measures are agreed to by the landowner.	Section 7.3.2 Section 8.4	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	Landowners must be advised of the range of options that can be installed at or in their property and given a choice as to which of these they agree to have installed. A copy of all guidelines and procedures that will be used to determine at-property treatment at their residence must be provided to the landowner.			
Condition E52	Any offer for at-property treatment or the application of other noise mitigation measures in accordance with Condition E51, does not expire until the noise impacts specified in Condition E49, affecting that property are completed, even if the landowner initially refuses the offer. Note: If an offer has been made but is not accepted, this does not preclude the commencement of construction under Condition E49.	Section 7.3.2 Section 8.4	**Environment Manager**	Construction
Condition E53	The implementation of at-property treatment does not preclude the application of other noise and vibration mitigation and management measures including temporary and long term accommodation.	Section 8.3 Section 8.4	**Environment Manager**	Construction
Condition E54	Vibration testing must be conducted during vibration generating activities that have the potential to impact on Heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures. Such measures must include, but not be limited to, review or modification of excavation techniques	Section 8 Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Construction
Condition E55	The Proponent must seek the advice of a heritage specialist on methods and locations for installing	Section 8	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	equipment used for vibration, movement and noise monitoring at Heritage items.			
Condition E56	All work undertaken for the delivery of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. The Proponent must: (a) reschedule any work to provide respite to impacted noise sensitive land use(s) so that the respite is achieved in accordance with Condition E57; or (b) consider the provision of alternative respite or mitigation to impacted noise sensitive land use(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 approved Critical SSI, SSI and SSD projects which may cause cumulative and / or consecutive impacts at receivers affected by the delivery of the CSSI.	Section 8.4	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
Condition E57	In order to undertake out-of-hours work outside the work hours specified under Condition E35, appropriate respite periods for the out-of-hours work must be identified 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 NMLs under Condition E43 (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 prior to the out-of-hours work commencing. Note: Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the RBL at any residence.	Section 8.4	**Environment Manager**	Construction
Condition E84	A suitably qualified and experienced person must undertake condition surveys of all buildings, structures, utilities and the like identified in the documents listed in Condition A1 and the further assessment carried out under mitigation measure GW1 of the Submissions Report as being at risk of damage before commencement of any work that could impact on the subject surface / subsurface structure. The results of the surveys must be	Section 8	**Environment Manager**	Pre-Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	documented in a Pre-construction Condition Survey Report for each item surveyed. Copies of Pre-construction Condition Survey Reports must be provided to the relevant owners of the items surveyed in the vicinity of the proposed work, and no later than one (1) month before the commencement of the work that could impact on the subject surface / subsurface structure.			
Condition E85	Condition surveys of all items for which condition surveys were undertaken in accordance with Condition E84 must be undertaken by a suitably qualified and experienced person after completion of the work identified in Condition E84. The results of the surveys must be documented in a Post-construction Condition Survey Report for each item surveyed. Copies of Post-construction Condition Survey Reports must be provided to the landowners of the items surveyed, and no later than three (3) months following the completion of the work that could impact on the subject surface / subsurface structure.	Section 8	**Environment Manager**	Pre-Construction
Condition E87	Appropriate equipment to monitor areas in proximity of ancillary facilities and the tunnel route must be installed during construction with particular reference to at risk buildings, structures and utilities identified in the condition surveys required by Condition E84 and / or geotechnical analysis as required. If monitoring during construction indicate exceedance of the vibration criteria identified in the DNVIS prepared under Condition E47, or levels otherwise determined as appropriate by a suitably qualified structural engineer, then all construction affecting settlement must cease immediately and must not resume until fully rectified or a revised method of construction is established that will ensure protection of affected buildings.	Section 7.3.2	**Sydney Metro** Environment Manager	Pre-Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
REMM NV2	To avoid potential vibration impacts to the Warragamba to Prospect Water Supply Pipelines, a detailed construction vibration assessment would be undertaken in accordance with the *Guidelines for Development Adjacent to the Upper Canal and Warragamba Pipelines* (WaterNSW, 2020) and would consider the following requirements: ▪ velocity limits for construction activities and the impact the works will have on WaterNSW assets ▪ excavation methods in accordance with German Standard DIN 4150-3:2016 ▪ vibration monitoring prior to and during construction for high risk construction activities ▪ vibration monitoring reports would be provided to WaterNSW	Section 7.2.2.1 Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
REMM NAH6	The following heritage items would be monitored for potential vibration impacts during construction: ▪ McGarvie Smith Farm ▪ McMaster Farm	Section 0 Appendix C2 – Land Use Survey Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Construction
REMM NAH8	A dilapidation survey of the Warragamba to Prospect Water Supply Pipelines would be undertaken prior to construction commencing in the vicinity of this item.	Section 0 Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
REMM HR4	Where the project crosses or is adjacent to the Warragamba to Prospect Water Supply Pipelines, construction planning, and approached to minimising risks of damage or rupture to the Pipelines, would be developed in consultation with WaterNSW, and in accordance with the *Guidelines for development Adjacent to the Upper Canal and Warragamba Pipelines* (Water NSW, 2020)	Section 7.2.2.1 Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
CEMF 5.1a	Standard working hours are between 7am – 6pm on weekdays and 8am – 1pm on Saturdays.	Section 5.1	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
CEMF 5.1b	Works which can be undertaken outside of standard construction hours without any further approval include:		**Environment Manager**	
	i. Those which have been described and assessed in the environmental assessments. For example, tunnelling and underground excavations and supporting activities or works within Western Sydney International	Section 5.2	**Environment Manager**	Construction
	ii. Works which are determined to comply with the relevant Noise Management Level at sensitive receivers;	Section 5.2	**Environment Manager**	Construction
	iii. The delivery of materials outside of approved hours as required by the Police or other authorities (including Transport for NSW) for safety reasons;	Section 5.2	**Environment Manager**	Construction
	iv. Where it is required to avoid the loss of lives, property and / or to prevent environmental harm in an emergency; and	Section 5.2	**Environment Manager**	Construction
	v. Where written agreement is reached with all affected receivers.	Section 5.2	**Environment Manager**	Construction
CEMF 5.1c	Where off-airport works are being undertaken under an Environmental Protection Licence, Principal Contractors may apply for EPA approval to undertake works outside of normal working hours.	Section 5.2	**Environment Manager**	Construction
CEMF 8.2 a	On-airport management of noise and vibration will be achieved through the implementation of the SMWSA Noise and Vibration CEMP and Principal Contractors will develop and implement a Construction Noise and Vibration Management Plan for all off-airport works consistent with the Interim Construction Noise Guidelines (Department of Environment and Climate Change, 2009). Both plans will include as a minimum:	This Sub-Plan	**Environment Manager**	Pre-Construction
	i. Identification of work areas, site compounds and access points;	Section 2.1.1 (Site Environmental Plan/s)	**Environment Manager**	Pre-Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	ii. Identification of sensitive receivers and relevant construction noise and vibration goals;	Section 2.1.1 (Site Environmental Plan/s) Section 4.2	**Environment Manager**	Pre-Construction
	iii. Be consistent with, and include the requirements of the noise and vibration mitigation measures as detailed in the planning approval documentation and the Sydney Metro Construction Noise and Vibration Standard (CNVS), including the provision of respite;	Section 8	**Environment Manager**	Pre-Construction
	iv. Details of construction activities and an indicative schedule for construction works, including the identification of key noise and/or vibration generating construction activities (based on representative construction scenarios) that have the potential to generate noise or vibration impacts on surrounding sensitive receivers, in particular residential areas;	Section 7	**Environment Manager**	Pre-Construction
	v. Identification of feasible and reasonable procedures and mitigation measures to ensure relevant vibrations and blasting criteria are achieved, ~~including a suitable blast program~~;	Section 7.3.2 Section 8 Note: The SCAW scope does not involve blasting	**Environment Manager**	Pre-Construction
	vi. The requirements of any applicable licence or approval (for example EPL);	Section 3.2.1	**Environment Manager**	Pre-Construction
	vii. Additional requirements in relation to activities undertaken 24 hours of the day, 7 days per week;	Section 5.2	**Environment Manager**	Pre-Construction
	viii.Pre-construction compliance requirements and hold points;	Section 8 Section 9.4	**Environment Manager**	Pre-Construction
	ix. The responsibilities of key project personnel with respect to the implementation of the plan;	Section 8	**Environment Manager**	Pre-Construction
	x. Noise monitoring requirements;	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Pre-Construction
	xi. Compliance record generation and management; and	Section 9	**Environment Manager**	Pre-Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	xii. An Out of Hours Works Protocol applicable to all construction methods and sites.	Appendix C1 – Out of Hours Work Protocol	**Environment Manager**	Pre-Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
CEMF 8.3 a	All feasible and reasonable mitigation measures would be implemented in accordance with the CNVS. The on-airport Noise and Vibration CEMP and the off-airport Noise and Vibration Management Plan will include the following noise and vibration mitigation measures as well as relevant Conditions:		**Environment Manager**	
	i. Construction hours will be in accordance with the working hours specified in Section 5.1;	Section 5.1	**Environment Manager**	Construction
	ii. Hoarding and enclosures will be implemented where required to minimise airborne noise impacts; and	Section 8	**Environment Manager**	Construction
	iii. The layout of construction sites will aim to minimise airborne noise impacts to surrounding receivers	Section 8	**Environment Manager**	Construction
	iv. Provision of respite periods.	Section 5.1 Section 8.2	**Environment Manager**	Construction
EPL L3.1	The licensee must minimise noise and vibration impacts at residences and other sensitive land uses. To meet the requirements of this condition the licensee must: a) implement the guidance in the Interim Construction Noise Guideline (DEC, 2009) and the Assessing Vibration: a technical guideline (DEC, 2006); b) implement all reasonable and feasible measures to minimise noise impacts in accordance with the Interim Construction Noise Guideline (DEC, 2009); and c) implement vibration mitigation in accordance with the Assessing Vibration: a Technical Guideline (DEC, 2006). In this condition, 'reasonable' and 'feasible', in relation to noise management, have the same meaning as defined in the Interim Construction Noise Guideline (DEC, 2009).	Section 6	**Environment Manager**	Construction
EPL L3.2	When construction activities include 'High Noise Impact Activities and Works' as defined in the special dictionary in this licence, quantitative construction noise	Section 7.3.2	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	assessments must apply a +5dB correction to the measured or predicted level of construction noise at the nearest Noise Sensitive Receiver location before assessment against the Interim Construction Noise Guideline (DECC, 2009) noise management levels.			
EPL L5.1	Unless permitted by another condition of this licence, works and activities must: a) only be undertaken between the hours of 7:00 am and 6:00 pm Monday to Friday; b) only be undertaken between the hours of 8:00 am and 1:00 pm Saturday; and c) not be undertaken on Sundays or Public Holidays.	Section 5.1	**Environment Manager**	Construction
EPL L5.2	Unless permitted by another condition of this licence, any High Noise Impact Activities and Works that exceed the applicable Noise Management Level (NML) at a Noise Sensitive Receiver must only be undertaken: a) between 8:00 am and 6:00 pm Monday to Friday; b) between 8:00 am and 1:00 pm Saturday; and c) if high noise impact works are to be conducted continuously and the location of the works means that it is likely to impact the same receivers, then the works must be conducted in continuous blocks of no more than 3 hours, with at least a 1-hour respite between each block of continuous high noise impact work; except as expressly permitted by another condition of this licence	Section 5.1	**Environment Manager**	Construction
EPL L5.3	Works and activities may be carried on outside of standard construction hours specified in condition L5.1 if the works and activities do not cause, when assessed at the boundary of the most affected Noise Sensitive Receiver: a) LAeq(15 minute) noise levels greater than 5dB above the day, evening and night Rating Background Level (RBL) as applicable; b) LAmax noise levels greater than 15dB above the night RBL for night works; c) the preferred continuous or impulsive vibration values greater	Section 5.2	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	than those for human exposure to vibration, set out for residences in Table 2.2 in Assessing Vibration: a technical guideline (DEC, 2006); and d) the preferred intermittent vibration values greater than those for human exposure to vibration, set out for residences in Table 2.4 in Assessing Vibration: a technical guideline (DEC, 2006). For the purposes of this condition, the RBLs are those contained in an environmental assessment for the activities subject to this licence prepared under the Environmental Planning and Assessment Act 1979. Alternatively, the licensee may use another RBL determined in accordance with the Noise Policy for Industry (EPA, 2017) and provided to the EPA prior to carrying out any works or activities under this condition. The notification requirements under condition L5.5 do not apply to this condition.			
EPL L5.4	Exemptions to standard construction hours in exceptional circumstances a) The licensee may undertake works and activities outside of standard construction hours specified in condition L5.1 for: i. emergency works required to avoid the loss of life or property, or to prevent material harm to the environment; and ii. the delivery of oversized plant, structures or materials determined by the police or other authorised authorities to require special arrangements to transport along public roads. b) The licensee must, on becoming aware of the need to undertake emergency works under this condition notify the EPA's Environment Line as soon as practicable and submit a report to the EPA by 4:00 pm on the next business day after the emergency works commenced that describes: i. the cause, time and duration of the emergency; ii. action taken by or on behalf of the licensee in relation to the emergency; and iii. details of any measures taken or	Section 5.2	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	proposed to be taken by the licensee to prevent or mitigate against a recurrence of the emergency. For the purposes of this condition, 'material harm to the environment' has the same meaning as in section 147 of the POEO Act. Emergency works do not require a notification under condition L5.5.			
EPL L5.5	Works outside of standard construction hours - Notification The licensee must notify potentially affected Noise Sensitive Receivers of works outside of standard construction hours unless notification under this condition is not required as specified in another condition of this licence. a) The notification must: i. be given not less than 5 calendar days and not more than 14 calendar days before those works are to be undertaken, unless otherwise agreed with the affected community and notified to the EPA; ii. be undertaken by letterbox drop, email, text message or other targeted and equivalent method; and iii. be detailed on the project website or other relevant website notified to the EPA. b) The notification required by this Condition must: i. clearly outline the reason that the work is required to be undertaken outside the hours specified in condition L5.1; ii. include a diagram that clearly identifies the location of the proposed works in relation to nearby cross streets and local landmarks; iii. include details of the date, timing and relevant time restrictions that apply to the proposed works; iv. clearly outline in plain English, the location, nature, scope and duration of the proposed works;	Section 5.2 Section 8.4	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	v. detail the expected noise impact of the works on Noise Sensitive Receivers; vi. clearly state how complaints may be made and additional information obtained; vii. include the number of the telephone complaints line required by condition M7.1,an after hours contact phone number specific to the works undertaken outside the hours specified in condition L5.1, and the project website address; and viii. include consideration of culturally and linguistically diverse Noise Sensitive Receivers where required.			

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
EPL L5.6	The licensee must make all reasonable and feasible efforts to coordinate all works outside of standard construction hours with any neighbouring concurrent construction works that have the potential to impact the same Noise Sensitive Receivers. The licensee must ensure Respite Periods are being achieved as much as is reasonably practicable. Note: This condition does not apply to low impact noise work permitted by condition L5.3 or emergency works permitted by L5.4 of this licence	Section 8.4.1	**Environment Manager**	Construction
EPL L5.7	Under this condition, works and activities may be undertaken outside of standard construction hours specified in condition L5.1 and L5.2, but only if they are required in relation to one or more of the following: a) carrying on those works and activities during standard construction hours would result in a high risk to construction personnel or public safety, based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2018 "Risk Management"; b) the Relevant Road Network Operator has advised the licensee in writing that carrying out the works and activities during standard construction hours would result in a high risk to road network operational performance; c) a relevant utility service operator has advised the licensee in writing that carrying out the works and activities during standard construction hours would result in a high risk to the operation and integrity of the utility network; d) the TfNSW Transport Management Centre (or other road authority) have refused to issue a road occupancy licence during standard construction hours; or e) Sydney Trains (or other rail authority) requires a rail possession	Section 5.2	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	for the activities to be performed outside of standard construction hours.			
EPL L5.8	In undertaking any works and activities outside of standard construction hours under condition L5.7, the licensee must comply with the following: a) Prepare a construction noise and vibration impact assessment in accordance with the Interim Construction Noise Guideline (DEC, 2009) that is to include: i. a description of the proposed works and activities outside of standard construction hours; ii. predictions of LAeq (15 minute) dB noise levels at noise sensitive receivers from these works and activities, where noise levels are predicted to be greater than those permitted under condition L5.3; and iii. a monitoring plan to validate the noise predictions, based on monitoring at the boundary of representative sensitive receivers during noise generating activities that are representative of the works and activities, including during the period/s predicted to have the highest noise level impacts. b) Undertake noise monitoring in accordance with the monitoring plan required by condition L5.8(a)(iii). c) Only undertake activities between the hours of 6:00pm on Mondays, Tuesdays, Wednesdays, Thursdays, Fridays and 7:00am the following day (unless permitted by another condition of this licence). d) Activities are not to be undertaken between the hours of 6:00pm on Saturdays, Sundays or Public Holidays and 7:00am the following day (unless permitted by another condition of this licence). e) Ensure that works and activities do not result in noise levels exceeding those specified in condition L5.3 at the	Section 5.2 DNVIS	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	same noise sensitive receivers (unless specified in another condition of this licence) on more than: i. 2 consecutive evenings and/or nights at any time; and ii. 3 evenings and/or nights per week; and iii. 10 evenings and/or nights per month. f) Undertake any high noise impact works before 12:00 am (midnight) where reasonable and feasible. g) Where high noise impact activities are undertaken, the respite provisions as per the requirements of condition L5.2(c) do not apply provided that all High Noise Impact Activities and Works are undertaken prior to 12:00 am (midnight). h) Where high noise impact activities are undertaken after 12:00 am (midnight), the respite provisions in condition L5.2(c) apply. i) Upon request of an authorised officer, the licensee must provide within 5 business day: i. the construction noise and vibration impact assessment required by condition L5.8(a); ii. noise monitoring results required by condition L5.8(b); iii. written evidence demonstrating the works are necessary and permitted under condition L5.7; and/or iv. any other relevant information or records requested by the EPA. i) the notification requirements under condition L5.5 apply to this condition			
EPL M2.1	All noise and vibration monitoring for the purposes of determining compliance with the conditions of this licence must be undertaken by a Competent Person as defined in the special dictionary of this licence.	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Construction
EPL M2.2	All noise monitoring for the purposes of determining compliance with the conditions of this licence must	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Construction

No	Requirement	How we will meet the Expectations (minimum requirements)	**Responsibility** Key Contributor	Timing
	consider and be generally undertaken in accordance with; (a) Australian Standard AS 1055: 2018 Acoustics - Description and measurement of environmental noise; and (b) the compliance monitoring guidance provided in the chapter 7 'Monitoring Performance' of the Noise Policy for Industry (EPA, 2017).			
EPL M2.3	All vibration monitoring must be: a) undertaken in accordance with the technical guidance provided in the Assessing Vibration: a technical guideline (DEC, 2006); and b) assessed and reported against the acceptable and maximum values of human exposure to vibration set out in Tables 2.2 and 2.4 of this guideline.	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Construction
EPL M2.4	The licensee must undertake noise and vibration monitoring as directed by an authorised officer of the EPA. Where the monitoring is requested to take place on private land (for example a residential property) the licensee must request permission to access the premises in advance and keep a record of permission requests and responses. If a licensee is unable to obtain permission, the licensee must undertake the monitoring at an indicative location where possible and they must provide the response (including any nil response) to the EPA.	Appendix C3 – Noise and Vibration Construction Monitoring Program	**Environment Manager**	Construction

Part C Appendices

Appendix C1 – Out of Hours Work Protocol

Sydney Metro Western Sydney Airport Out-of-hours Work Protocol

SM-21-00306108

Sydney Metro Integrated Management System (IMS)

Applicable to:	Sydney Metro Western Sydney Airport
Document Owner:	Environment Manager
System Owner:	Director Environment, Sustainability & Planning – Sydney Metro - Western Sydney Airport
Status:	Final
Version:	2.0
Date of issue:	8 November 2021
Review date:	

Table of contents

1. Definitions and acronyms

All terminology in this document is taken to mean the generally accepted or dictionary definition. Other terms and jargon specific to this document are defined within the SM-17-00000203 Sydney Metro glossary. Acronyms and terminology specifically used throughout this document are listed below.

	Definitions
CEMF	Construction Environment Management Framework https://icentral.tdocs.transport.nsw.gov.au/otcs/cs.exe/app/nodes/272123288
CNVS	Construction and Noise Standard https://icentral.tdocs.transport.nsw.gov.au/otcs/cs.exe/app/nodes/272123288
CNVMP	Construction Noise and Vibration Management Plan
CoA	Conditions of Approval
CSSI	Critical State Significant Infrastructure
DNVIS	Detailed Noise and Vibration Impact Statement
DPIE	Department of Planning, Industry and Environment (formerly DPE)
EIS	Environmental Impact Statement
EPA	Environment Protection Authority (of New South Wales)
EPL	Environment Protection Licence
ER	Environmental Representative
ICNG	*Interim Construction Noise Guideline* (DECC, 2009)
MOD	Modification (to a planning approval)
OOH	Out-of-hours (i.e. outside of the standard construction hours stipulated in planning approval conditions)
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
REMM	Revised Environmental Mitigation Measure
SBOEP	Small Business Owners Engagement Plan
Secretary	The Secretary of the New South Wales Department of Planning, Industry and Environment
SM-WSA	Sydney Metro - Western Sydney Airport

2. Introduction

This document outlines the process for preparing, considering, assessing, managing and approving work on the Sydney Metro - Western Sydney Airport project that is undertaken outside of standard construction hours (i.e. Out-of-hours) that are subject to the following Critical State SignificantInfrastructure (CSSI) planning approvals:

- Sydney Metro - Western Sydney Airport (SSI_10051)

2.1. Purpose

This document has been developed to comply with various CSSI Conditions of Approval (CoAs)). Table 1 indicates where these requirements have been addressed.

Table 1: Out-of-hours Work CSSI CoAs

Condition Number	Condition	Where this condition is addressed
E37	A detailed land use survey must be undertaken to confirm sensitive land use(s) (including critical working areas such as operating theatres and precision laboratories) potentially exposed to construction noise and vibration and construction ground-borne noise. The survey may be undertaken on a progressive basis but must be undertaken in any one area before the commencement of work which generates construction noise, vibration or ground-borne noise in that area. The results of the survey must be included in the Detailed Noise and Vibration Impact Statements required under Condition E47.	Section 2.3.2.3 Detailed Noise and Vibration Impact Statement Construction Noise and Vibration Standard
E38	Work must only be undertaken during the following hours: (a) 7:00am to 6:00pm Mondays to Fridays, inclusive; (b) 8:00am to 1:00pm Saturdays; and (c) at no time on Sundays or public holidays.	Section 3.0 Standard hours
E39	Except as permitted by an EPL or approved in accordance with the Out-of-Hours Works Protocol required by Condition E42, highly noise intensive work that result in an exceedance of the applicable NML at the same receiver must only be undertaken: (a) between the hours of 8:00 am to 6:00 pm Monday to Friday; (b) between the hours of 8:00 am to 1:00 pm Saturday; and (c) if continuously, then not exceeding three (3) hours, with a minimum cessation of work of not less than one (1) hour. For the purposes of this condition, 'continuously' includes any period during which there is less than one (1) hour between ceasing and recommencing any of the work.	Construction Noise and Vibration Standard
E40	This approval does not permit blasting.	Section 4.0 OOH Work
E41	Notwithstanding Conditions E38 and E39 work may be undertaken outside the hours specified in 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	Section 4.0 OOH Work Construction Noise and Vibration standard

	(b) Low impact, including: (i) construction that causes LAeq(15 minute) noise levels: • no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and • no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s); and (ii) construction that causes: • continuous or impulsive vibration values, measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), or • intermittent vibration values measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006); or (c) By Approval, including: (i) where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or (ii) works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition E42; or (iii) negotiated agreements with directly affected residents and sensitive land user(s); or (d) By Prescribed Activity, including: (i) tunnelling and ancillary support activities (excluding cut and cover tunnelling and surface works not directly supporting tunneling) are permitted 24 hours a day, seven days a week; or (ii) grout batching at the Orchard Hills construction site is permitted 24 hours per day, seven days per week; or (iii) delivery of material that is required to be delivered outside of standard construction hours in Condition E38 to directly support tunnelling activities, except between the hours 10:00 pm and 7:00 am to / from the Orchard Hills ancillary facility; or (iv) haulage of spoil generated through tunnelling is permitted 24 hours per day, seven days per week except between the hours of 10:00 pm and 7:00 am to / from the Orchard Hills construction site; or (v) works within an acoustic enclosure are permitted 24 hours a day, seven days a week where there is no exceedance of noise levels or intermittent vibration levels under Low impact circumstances identified in Condition E41(b), unless otherwise agreed with the Planning Secretary; or (vi) tunnel and underground station box fit out works are permitted 24 hours per day, seven days per week. On becoming aware of the need for emergency work in accordance with (a)(ii) above, the ER, the Planning Secretary and the EPA must be notified of the reasons for such work. The Proponent must use best endeavours to notify as soon as practicable all noise and/or vibration affected sensitive land user(s) of the likely impact and duration of those work. Notes: 1. Tunnelling does not include station box excavation. 2. Tunnelling ancillary support activities includes logistics support and material handling and delivery	
E42	An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of work (not subject to an EPL) that is outside the hours defined in Conditions E38 and E39. The Protocol must be approved by the Planning Secretary before commencement of the out-of-hours	This document Section 4.0 OOH Work Construction Noise and Vibration Standard

	work. The Protocol must be prepared in consultation with the ER. The Protocol must provide: (a) justification for why out-of-hours work need to occur; (b) identification of low and high-risk activities and an approval process and the section within this protocol ss that considers the risk of activities, proposed mitigation, management, and coordination, including where: (i) the ER reviews all proposed out-of-hours activities and confirms their risk levels; (ii) low risk activities that can be approved by the ER; and (iii) high risk activities that are approved by the Planning Secretary; (c) a process for the consideration of out-of-hours work against the relevant NML and vibration criteria; (d) 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 E56. 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) would be exposed to, including the number of noise awakening events; (e) 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 (f) notification arrangements for affected receivers for all approved out-of-hours works and notification to the Planning Secretary of approved low risk out-of-hours works. This condition does not apply if the requirements of Condition E41 are met ***Note:*** *Out-of-hours work is any work that occurs outside the construction hours identified in Condition E38 and E39.*	4.2.2.6 Approval Notification Arrangements
E44	All reasonable and feasible mitigation measures must be applied when the following residential ground-borne noise levels are exceeded: (a) evening (6:00 pm to 10:00 pm) — internal LAeq(15 minute): 40 dB(A); and (b) night (10:00 pm to 7:00 am) — internal LAeq(15 minute): 35 dB(A). The mitigation measures must be outlined in the **Noise and Vibration CEMP Sub-plan**, including in any **Out-of-Hours Work Protocol**, required by **Condition E42.**	Section 2.3 Governance Section 4.5 Ground-borne noise level exceedance Construction Noise and Vibration Standard
E45	Noise generating work in the vicinity of potentially-affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise levels above the NMLs must not be timetabled within sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	Section 2.3 Governance Construction Noise and Vibration Standard
E47	Detailed Noise and Vibration Impact Statements (DNVIS) must be prepared for any work that may exceed the NMLs, vibration criteria and / or ground-borne noise levels specified in Conditions E43 and E44 at any residence outside construction hours identified in Condition E38, or where receivers will be highly noise affected or subject to vibration levels above those otherwise determined as appropriate by a suitably qualified structural engineer under Condition E87. The DNVIS must include specific mitigation measures identified through consultation with affected sensitive land user(s) and the mitigation measures must be implemented for	Section 2.3.2.3 Detailed Noise and Vibration Impact Statements Construction Noise and Vibration Standard

	the duration of the works. A copy of the DNVIS must be provided to the ER before the commencement of the associated works. The Planning Secretary and the EPA may request a copy (ies) of the DNVIS.	
E49	Where sensitive land use(s) are identified in Appendix B as exceeding the highly noise affected criteria during typical case construction, mitigation measures must be implemented with the objective of reducing typical case construction noise below the highly noise affected criteria at each relevant sensitive landuse(s). Activities that would exceed highly noise affected criteria during typical case construction must not commerce until the measures identified in this condition have been implemented, unless otherwise agreed with the Planning Secretary. Note: Mitigation measures may include path barrier controls such as acoustic sheds and/or noise walls, at-property treatment, or a combination of path and at-property treatment.	Section 2.3 Governance Construction Noise and Vibration Standard
E57	In order to undertake out-of-hours work outside the work hours specified under Condition E38, appropriate respite periods for the out-of-hours work must be identified 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 NMLs under **Condition E43** (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 prior to the out-of-hours work commencing. **Note:** Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the RBL at any residence.	Section 4.2.2 and 4.3 Communications Construction Noise and Vibration Standard

2.2. Document Requirements

The Out-of-hours Work Protocol needs to meet the following consultation, endorsement and approval requirements in accordance with the Sydney Metro - Western Sydney Airport CoAs

- Be prepared in consultation with the Environmental Representative (ER); and
- Be approved by the Planning Secretary of the NSW Department of Planning, Industry and Environment (the Secretary).

These requirements were complied with as demonstrated in Sections 2.2.1.

2.2.1. ER Endorsements and Approval

This document has been prepared in consultation with and reviewed and endorsed by the ER. Copies of the ER endorsements are provided in Appendix A.

2.2.2. Secretary Approval

In accordance with CSSI 10051 CoA E42, construction will not commence for OOH works that are not subject to an EPL prior to this document's preparation and submission to the Secretary for approval.

2.3. Governance

This document should be used in conjunction with the Construction Environmental Management Framework, https://icentral.tdocs.transport.nsw.gov.au/otcs/cs.exe/app/nodes/272116977 Construction Noise and Vibration Strategy and any applicable EPLs. These documents establish minimum requirements for managing noise and vibration impacts on the SM-WSA project.

2.3.1. Construction Environment Management Framework

The CSSI planning approval includes SM-21-00279320 Construction Environment Management Framework https://icentral.tdocs.transport.nsw.gov.au/otcs/cs.exe/app/nodes/272116977 in its documentation. The CEMF represents Sydney Metro's minimum requirements for environmental management and specifies a standard framework that each contractor must establish and document in their Construction Environmental Management Plan and sub-plans. These requirements, including those relating to construction noise and vibration management, are specified in Chapter 9.

2.3.2. Construction Noise and Vibration Standard

The Construction Noise and Vibration Standard (CNVS) https://icentral.tdocs.transport.nsw.gov.au/otcs/cs.exe/app/nodes/272123288 establishes a framework for managing construction noise and vibration impacts andadopting appropriate mitigation measures (including minimum requirements);

- Is included in the CSSI planning approval documentation;
- Forms part of the contract requirements that contractors must comply with;

- Defines a minimum standard for managing noise and vibration impacts that considers current best practice guidelines and other regulatory requirements; and
- Sets minimum requirements for all OOH work, including the need for and development of Construction Noise and Vibration Management Plans, Construction Noise and Vibration Impact Statements and Detailed Noise and Vibration Impact Statements.

2.3.2.1. Construction Noise and Vibration Management Plans

A Construction Noise and Vibration Management Plan (CNVMP) sets out how noise and vibration impacts will be mitigated and managed. These may also include a Noise & Vibration Monitoring Program, which typically outlines how noise and vibration monitoring will be undertaken, how the results of monitoring will be reported and procedures to identify and implement additional mitigation measures as necessary.

2.3.2.2. Detailed Noise and Vibration Impact Statement

A Detailed Noise and Vibration Impact Statement (DNVIS) is a document developed by Contractors which assesses and documents the anticipated noise and vibration impacts at receivers of proposed construction activities. In accordance with the CSSI planning approvals, a DNVIS is to be prepared for each construction site before construction noise and vibration impacts commence for any work that may exceed the NMLs, vibration criteria and / or ground-borne noise levels specified in Conditions E43 and E44 at any residence outside construction hours identified in Condition E38, or where receivers will be highly noise affected or subject to vibration levels above those otherwise determined as appropriate by a suitably qualified structural engineer under Condition E87.

The DNVIS must include specific mitigation measures identified through consultation with affected sensitive receivers. It also clarifies assumptions made in the EIS and allowsthe Contractor to provide more detailed quantitative assessments of the EIS due to their better understanding of the exact equipment list and construction methodology they will be using to complete the scope of works.

2.3.3. Environment Protection Licence

An Environment Protection Licence (EPL) is a regulatory approval issued to strategically control the localised, cumulative and acute impacts of pollution. The NSW Environment Protection Authority (EPA) is responsible for issuing EPLs for ‘scheduled activities’ under the Protection of the Environment Operations (POEO) Act 1997 (NSW).

Some aspects of the SM-WSA construction and operation works will constitute ‘scheduled activities’ under the POEO Act and therefore need to be subject to an EPL. SM-WSA contractors are required to either comply with Sydney Trains’ EPL or obtain and comply with any EPLs as applicable to their scope of works.

The process for approving OOH work outside of those already permitted in accordance with an EPL, is governed by the conditions of the EPL. In order for these types of OOH work to be approved, an application to vary the EPL is to be prepared and submitted to the EPA for approval. The application is to be in accordance with the CNVS and EPL requirements.

OOH work that is subject to an EPL does not require an ‘OOH approval’ prior to the

commencement of the proposed OOH works in accordance with the CSSI planning approval conditions.

2.4. Roles and Responsibilities

2.4.1. Sydney Metro - Western Sydney Airport Director of Sustainability, Environment& Planning

The Sydney Metro - Western Sydney Airport Director of Sustainability, Environment & Planning is accountable for this document. Accountability includes authorising the document, monitoring its effectiveness and performing a formal document review.

Roles reporting to the Director are accountable for ensuring the requirements of this document are implemented within their area of responsibility. The roles that are accountable for specific projects/programs are accountable for ensuring associated contractors comply with the requirements of this document.

2.4.2. Sydney Metro Environment Manager

A Sydney Metro Environment Manager will be allocated to each contract package on the Sydney Metro - Western Sydney Airport project. The Environment Manager is responsible for ensuring that all environmental management requirements associated with their contract package are being complied with.

2.4.3. Place manager

Either a Sydney Metro or contractor Place Manager will be allocated to each site on the Sydney Metro - Western Sydney Airport project. The Place Manager is responsible for ensuring that all project communication requirements with the surrounding community are being complied with.

2.4.4. Independent Environmental Representative

The CSSI planning approval conditions under CoA A32 requires an Environmental Representative (ER) to be appointed to the project prior to work commencing. The ER is to act as an independent point of contact for all environmental and planning approval compliance matters. Refer to A32 for a comprehensive list of the ER's responsibilities under CSSI 10051.

Section 4.2.2 includes descriptions of the ER's responsibilities with respect to reviewing and approving OOH work.

3. Standard Hours

The SM-WSA CSSI planning approval conditions define standard construction hoursas:

- 7:00am to 6:00pm Mondays to Fridays, inclusive;
- 8:00am to 1:00pm Saturdays for works and
- At no time on Sundays or public holidays.

Construction activity on the SM-WSA project must only be undertaken within these standard hours, unless otherwise permitted in accordance with this document or the conditionsof an applicable EPL.

3.1. Covid Health Orders

Due to the Covid-19 pandemic affecting Sydney, the NSW Government has issued a number of Health Orders to assist in the population living through Covid. In order to assist infrastructure projects, the Government has issued the COVID Infrastructure Construction Work Days Order (2020-2020-75). This Order allows an infrastructure Project to work the following hours as Normal Hours:

- 7:00am to 6:00pm, Saturdays, Sundays or public holidays for works inclusive.

These Orders are subject to updates, with the latest update being:

Environmental Planning and Assessment (COVID-19 Development—Infrastructure Construction Work Days No. 2) Order 2020.

Condition 6 of this Order specifies the following for Infrastructure construction work days:

(1) The carrying out of any building work or work, or the demolition of a building or work, on a Saturday, Sunday or public holidays is development specified for this Order.

(2) The conditions specified for the development are that the development must—

(a) be the subject of an approval, and

(b) comply with all conditions of the approval other than any condition that restricts the hours of work or operation on a Saturday, Sunday or public holiday, and

(c) for work or operation on a Saturday, Sunday or public holiday—

(i) comply with the conditions of the approval that restrict the hours of work or operation on any other day as if the conditions applied to work or operation on a Saturday, Sunday or public holiday, and

(ii) not involve the carrying out of rock breaking, rock hammering, sheet piling, pile driving or similar activities during the hours of work or operation that would not be permitted but for this Order, and

(iii) take all feasible and reasonable measures to minimise noise.

These orders are for a finite time and may be updated again. The Project is to work to the conditions of any updates as they are issued.

4. OOH Work

Out-of-hours (OOH) work is defined as any work that is undertaken outside of standard construction hours.

CoA E40 applies to OOH work and is not allowed during normal or OOH.

In accordance with CoA E41 any type of OOH work is permittedto be undertaken on the SM-WSA project provided that it is subject to this document.

A list of work activities that may typically be undertaken OOH is provided below:

(a) Work which could result in a high risk to construction personnel or public safety, based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2009 “Risk Management Principles and Guidelines”; or

(b) where the relevant road authority has advised the Proponent in writing that carrying out the activities could result in a high risk to road network operational performance; or

(c) where the relevant utility service operator has advised the Proponent in writing that carrying out the activities could result in a high risk to the operation and integrity of the utility network; or

(d) where the Transport for NSW Transport Management Centre (or other road authority) has advised the Proponent in writing that a road occupancy licence is required and will not be issued for the activities during the hours specified in Conditions E19 and E20; or

(e) where Sydney Trains (or other rail authority) has advised the Proponent in writing that a Rail Possession is required.

Allworks that are proposed to be undertaken OOH and are subject to this document must be supported by a clear statement justifying the reason(s) why the work is being proposed to be undertaken OOH. Furthermore, this statement must demonstrate how the works are being scheduled in accordance with the following OOH work period prioritisation list:

1. Standard Hours.
2. Daytime OOH.
3. Evening OOH.
4. Night Time OOH.

Further guidance on the provision of justification is provided in the Out-of-hours application form (refer to Section 4.2.2). Normally, program acceleration is normally not a justifiable reason to undertake works OOH, however in these times of Covid, with health restrictions, program acceleration may be acceptable.

4.1. OOH Work Endorsement and Approval

In accordance with CoA E42 and with the exception of OOH work that is subject to an EPL, all OOH work subject to the planning approval requires approval by either the ER, or in the case of ‘high risk’ works approval by the Secretary.

In accordance with CoA E42(b) OOH work that is subject to the planning approval and not subject to an EPL only require approval from the ER, or in the case of ‘high risk’ works approval by the Secretary.

4.2. OOH Work Approval Process

Figure 1 provides the OOH work approval process for the Sydney Metro - Western Sydney Airport project. This includes a requirement to prepare an application that covers the assessment of noise and vibration impacts, mitigation measures (including community notification requirements) and review and approval for all proposed OOH work.

All OOH work applications that are not subject to an EPL will be submitted to the Place Manager, Sydney Metro Environment Manager and ER for review and comment. These reviews will take into consideration a range of aspects,including reviewer experience and expert understanding, local knowledge of the area, current understanding of sensitive receiver requirements and other relevant documents (for example,the applicable SBOEP Plan detailing predicted impacts to affected businesses,key issues and appropriate mitigation measures for implementation). This review process is further explained in Section 4.2.2.

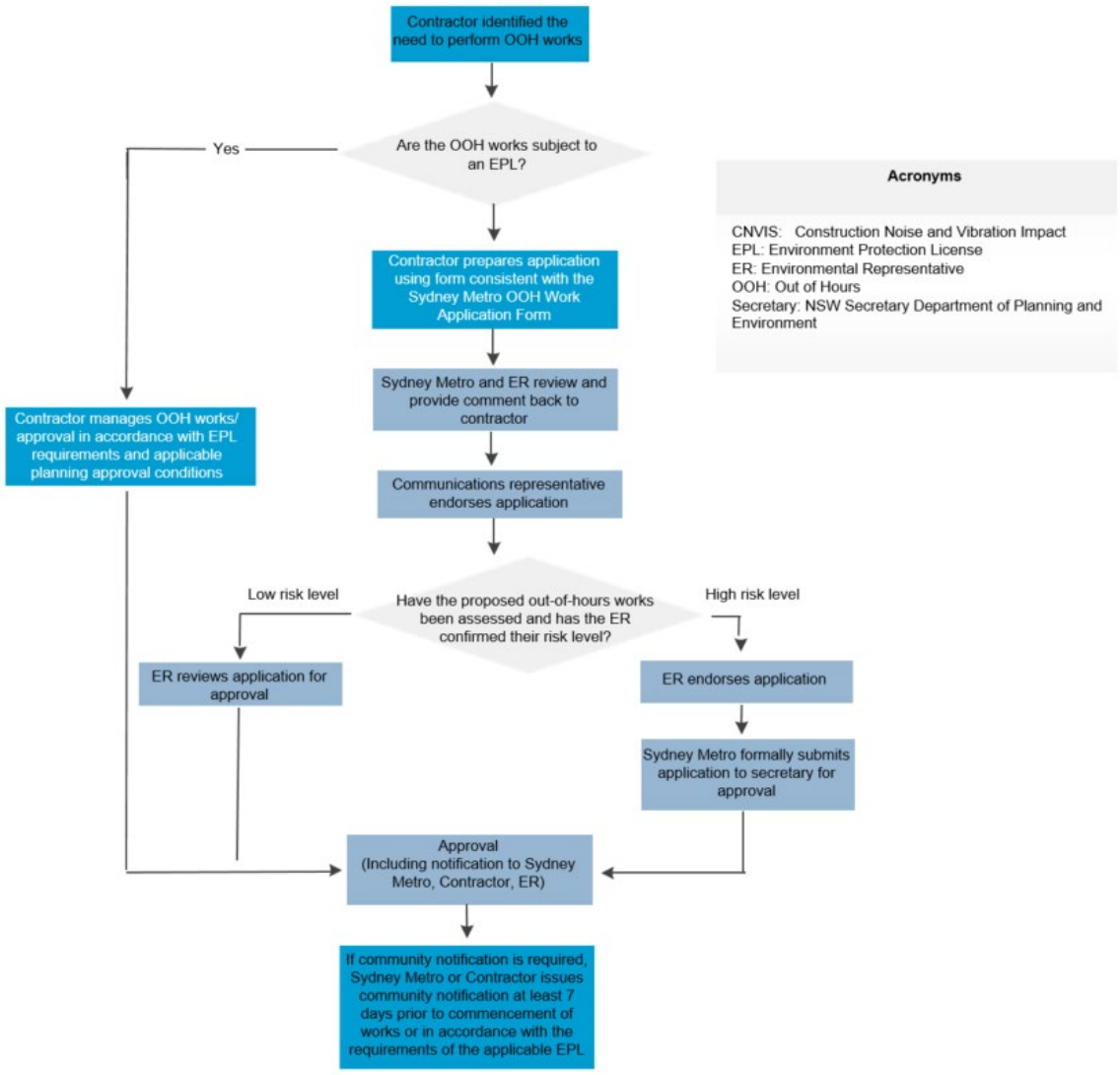


Figure 1: OOH Work Approval Process

4.2.1. OOH Work subject to an EPL

For OOH work that is subject to an EPL, the EPL conditions will dictate the approval process. As a minimum however, for proposed OOH work that is not approved within the EPL and a license variation is required, the contractor is expected to:

- Prepare an application to the EPA in accordance with the CNVS and EPL requirements;
- Submit the revised application to the EPA for approval and submit the application to the Place Manager, Sydney Metro Environment Manager and the ER for information;
- Notify Sydney Metro and ER upon receiving EPA approval; and
- Ensure any required community notifications have been issued (by either Sydney Metro or the contractor directly) within the timeframe(s) specified and in accordance with any relevant conditions of the EPL.

For individual OOH work applications that are subject to an EPL (including Sydney Trains' EPL), endorsement/approval from the ER is not required. However, Sydney Metro may request the ER's endorsement prior to approval and commencement of the proposed OOH works (at Sydney Metro's discretion).

4.2.2. OOH Work not subject to an EPL

For OOH work that is not subject to an EPL, the approval process is dictated by CoA E42.

Contractors are required to prepare an OOH application using a form consistent with Out-of-hours Work application form. This form requires a noise and vibration impact assessment to be undertaken and contains a consolidated and conservative version of Table 14 from the CNVS. This facilitates simpler consideration of applicable additional mitigation measures to implement. The form also requires demonstration of how a range of additional noise and vibration mitigation measures have been considered for implementation,including community notifications and respite offers. The applicant is also required to indicateits risk level for the proposed OOH work within the application.

Where Third Party permits (e.g. Road Occupancy Licences and/or rail possessions) require works to be undertaken OOH, these works will be exempt from classification as 'high risk' (described under section 4.2.2.3) and will be subject to approval by ER as required under CoA E42 in accordance with the 'Low Risk' approval pathway. Evidence of Third Party approval applicable to the works, specifying the time that the works must be undertaken must be included as partof application.

4.2.2.1. Respite

Respite offers for impacted receivers will be considered in accordance with the CNVS. Respite may be offered in the form of a reduction or absence of noise emissions for a period of time, or by removing the affected receiver from the noise emission point source (e.g. dinner/movie tickets and/or alternative accommodation offers).

The CNVS requires respite offers to be considered for all OOH works that are predicted to generate impacts higher than the applicable exceedance criteria for the applicable OOH period. Proposed OOH works must be coordinated to avoid the same receiver being affected over consecutive nights as much as is reasonable. OOH works must be staggered as much as is reasonable in order to maximise the respite period between OOH works.

If consideration of respite offers is required, a decision to implement respite offers will be determined on a case-by-case basis and considering, but not limited to, the following factors:

- The predicted maximum exceedance level;
- The predicted exceedance levels and associated duration and timings of those exceedance levels;
- The overall duration of the predicted exceedance levels;
- Surrounding land uses;
- Community feedback provided by Place Managers; and
- Any other OOH works (Sydney Metro or otherwise) that have affected or will affect the same receivers concurrently or within three days of either the start or end of the proposed OOH works.

In the event that respite is determined to be implemented for works that are subject to the planning approval, respite will be implemented to meet the intent of CoA E39 as applicable and so far is reasonable and practicable.

4.2.2.2. Review

Once the contractor has prepared an OOH work application, the application is submitted to the Place Manager, Sydney Metro Environment Manager, and ER for review. Any of the reviewers may provide comments on the application,which need to be adequately addressed by the contractor in a resubmitted application to the satisfaction of the comment provider(s).

4.2.2.3. Communications Endorsement and Default Risk Level Identification

The first endorsement of an OOH application is from the applicable communications representative (from Sydney Metro). This endorsement represents an agreement from the communications representative that the OOH works have been proposed in accordance with the relevant communications requirements and that the community's interests have been addressed as much as is reasonable (including appropriate consideration and implementation of additional mitigation measures, such as respite). This person may also add any comments and/or conditions that need to be complied with.

Following this person's endorsement, the ER is required to consider the applicant's risk level for the proposed OOH work and determine whether this risk level is appropriate. Once the ER has considered the applicant's risk level, the ER indicates the risk level of the proposed OOH work in its own professional judgement in accordance with CoA E42. This risk level will be categorised as either 'Low risk' or 'High risk'.

As a default risk level, OOH work will be categorised as 'high risk' if all of the following three criteria apply:

- The type and sensitivity of the affected noise sensitive receivers is categorised as either Moderate Impact receivers (e.g. standard residential/typical density) or High Impact receivers (e.g. elderly/high density/persistent complainers/residents experiencing construction noise fatigue); and
- The predicted noise level of the OOH work has a likelihood for potential sleep disturbance (i.e. Rating Background Level + 15 dB or more); and
- The type of and intensity of noise emitted from the OOH work is categorised as High Impact (e.g. prolonged high noise and/or vibration intensive activities), and

These criteria are based on Section 3.1 of the CNVS.

For non-residential receivers, OOH work may be considered as 'high risk' if undertaken during trading hours and in close proximity to their place of business (for example, during Saturday evening trading hours). Since each non-residential receiver has different business needs, it is imperative that the Place Manager and ER discuss each OOH work application to better understand how the proposed OOH work would impact the business.

4.2.2.4. Modification of Default Risk Level

Using the default risk level as a 'starting point', the ER will consider all other relevant factors in order to identify a final risk level. These relevant factors include:

- Those identified in Section 3.1 of the CNVS (noting that the reference to 'impact levels' is different from the 'risk level' with respect to CoA E42(b));
- Those listed in Table 2 of this document;
- Third Party permits; and
- Any other factors the ER considers relevant in their professional opinion.

These factors may cause the default risk level to be modified from either 'high risk' to 'low risk' (or vice-versa), as the ER deems appropriate in their professional opinion.

Once the ER has identified a final risk level for the OOH work application, the ER indicates the risk level on the application (including any risk identification commentary). Depending on the risk level that has been determined, the ER either signs and dates the OOHs application if works are determined to be low risk, or endorses the OOH application for Sydney Metro to formally submit the OOH application to the Planning secretary for approval.

4.2.2.5. Other Endorsements and Approval

Following the identification of risk level by the ER, the ER endorses the OOH work application and provides any conditions or comments. This endorsement represents an agreement from the ER that the OOH works have been proposed in accordance with the relevant requirements (as applicable to their respective roles) and that additional mitigation measures (including respite) have been appropriately considered and proposed for implementation.

If the ER identifies that the OOH work application is high risk, the application is forwarded to the Secretary for approval. This endorsement represents an agreement from the ER that the OOH works have been proposed in accordance with the relevant requirements and that additional mitigation measures (including respite) have been appropriately considered and proposed for implementation. Following the ER's endorsement, the application is then formally submitted by Sydney Metro to the Secretary for approval in accordance with CoA E42.

For all other applications, the ER indicates their approval (or otherwise) on the application, including any conditions or comments, and forwards directly to Sydney Metro and the contractor.).

4.2.2.6. Approval Notification Arrangements

Community notifications for approved OOH applications (which include low risk OOHW) will be made available to the Secretary, the EPA and the community through the Sydney Metro website within five (5) daysand not more than fourteen (14) days of the works commencing. The community will also be issued with hard-copy community notifications.

Table 2: Risk Level Considerations

	Risk Level Considerations
Predicted Noise Exceedance	Degree of predicted noise level exceedance above the Rating Background Level or Noise Management Level as appropriate
Certainty	Rating background levels, noise management levels or predicted noise impactsare not well understood
Past Experience	Nature of works are new, in a new location or have not been undertaken by thecontractor on the project already
Negotiated Agreement with Sensitive Receivers	No negotiated agreement with sensitive receivers has been obtained in accordance with CoA E41
Exceeding residential ground-borne noise levels	Addressing potential evening and night-time exceedance levels of 40 and 35 dB (A) respectively
Potential Sleep Disturbance	Likely to generate potential sleep disturbance (Rating Background Level +15dB or greater)
Non-Residential Receivers	Impacted non-residential receivers operating during the same period of proposed OOH work
Special Events	The timing and location of special events in the area of the proposed OOH workmay be scheduled at the same time or immediately before or after the special event (e.g. festivals, public gatherings, etc.)

Place Manager Feedback	Feedback from the Place Manager for the area will provide the AA and ER an understanding of the types and requirements of surrounding sensitive receivers.
Sensitive Receivers	Moderate impact sensitive receivers (e.g. standard residential, medium density receivers) or high impact sensitive receivers (e.g. residential home for the elderly, high density unit blocks, persistent complainers, residents deemed to have 'construction noise fatigue')
Timetabling noisy activities	Timetabling works with high noise levels to avoid sensitive times for receptors such as hospitals, community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas
High Impact Works	Prolonged high noise or vibration intensive activities
Other Impacts	Impacts other than noise and vibration impacts are likely to be generated (e.g. lighting, traffic, etc.)

4.3. Community Notifications

Community notifications are used as a mitigation measure for receivers of noise and vibration impacts from OOH work.

Community notifications usually comprise of letterbox-dropped or hand-distributed notification letters to identified stakeholders prior to the commencement of works. Communities are more likely to understand and accept the impacts from noise and vibration if they are provided with honest detailed information and commitments on mitigation measures to be implemented that are adhered to by the project prior to the works commencing.

Community notification requirements are included in the CNVS and outlined in the Community Communications Strategy for the SM-WSA project.

Community notification is an example of an additional mitigation measure that may be considered for implementation in accordance with the CNVS and the additional mitigation measure tables contained in SM-21-00306108 Out-of-hours work application form.

4.3.1. Negotiated Agreements with Sensitive Receivers

A negotiated agreement for particular OOH work may be formed with the potentially affected sensitive receivers in accordance with CoA E41 (c) (iii). These negotiated agreements would be undertaken and documented by either the contractor or Sydney Metro as part of an OOH application.

The negotiated agreement needs to reach a minimum 65% acceptance rate of those sensitive receivers that are contactable. 'Contactable' is defined as having received correspondence (either verbal or written) from receivers within a two week timeframe. The preparation of a DNVIS and the Place Manager will advise of potentially affected sensitive receivers to be contacted.

Upon ER approval of any OOH applications containing negotiated agreements, Sydney Metro will forward the negotiated agreement documentation to the Secretary for information at least one week prior to the OOH work commencing. In the event that community notification is required as a mitigation measure prior to the OOH work commencing, this would be undertaken at the same time (i.e. at least five days and not more than fourteen days prior to the works commencing).

4.4. Emergency Works

Occasionally there may be a need to undertake emergency works outside of standard work hours. In this situation, the works are permitted to proceed without prior approval, provided that the works were:

- Unforeseen, and
- Required to avoid injury or the loss of life, damage or loss of property or to prevent environmental harm.

Work 'over-runs' (i.e. work activities that have taken longer to complete than expected) are not emergency works, unless the continuation of the activity is required to 'avoid injury or theloss of life, damage or loss of property or to prevent environmental harm'.

Figure 2 outlines the emergency work process.

On becoming aware of the need to undertake emergency works, contractors must notify Sydney Metro, the Planning Secretary, the ER and the EPA (if it is required under an EPL if relevant) of the need to undertake the works. This notification should be in the form of a written email or text message to Sydney Metro and the ER. The requirements for notifying the EPA will be dictated in the conditions of the EPL if relevant.

As a form of mitigation, community notification is to be undertaken within two hours of the commencement of emergency works. These notifications will generally be prepared by the contractor using a small hand-written Sydney Metro template card for distribution to the immediate surrounding community. These cards will include the following details as a minimum:

- Scope;
- Location;
- Hours;
- Duration;
- Types of equipment to be used; and
- Likely impacts.

Within 24 hours of any emergency works commencing, the applicant is to provide a written emergency works report to Sydney Metro. The emergency works report is to include as a minimum:

- Date, time, duration and cause of the emergency;
- Description of emergency works undertaken;
- Mitigation measures implemented to address the impacts of the emergency works; and
- Actions/Measures taken or to be taken to prevent or mitigate recurrence of the emergency. If there are no appropriate actions/measures to be taken, explanation is to be provided as to why.

The emergency works report will be used by Sydney Metro to determine whether the works qualified as emergency works under the applicable planning approval. If Sydney Metro determines that the works did not qualify as emergency works, the works may be considered an incident and/or non-compliant dependent on the applicable planning approval conditions.

ACRONYMS	
EPA:	Environment Protection Authority (NSW)
EPL:	Environment Protection Licence
ER:	Environmental Representative
OOH:	Out of Hours

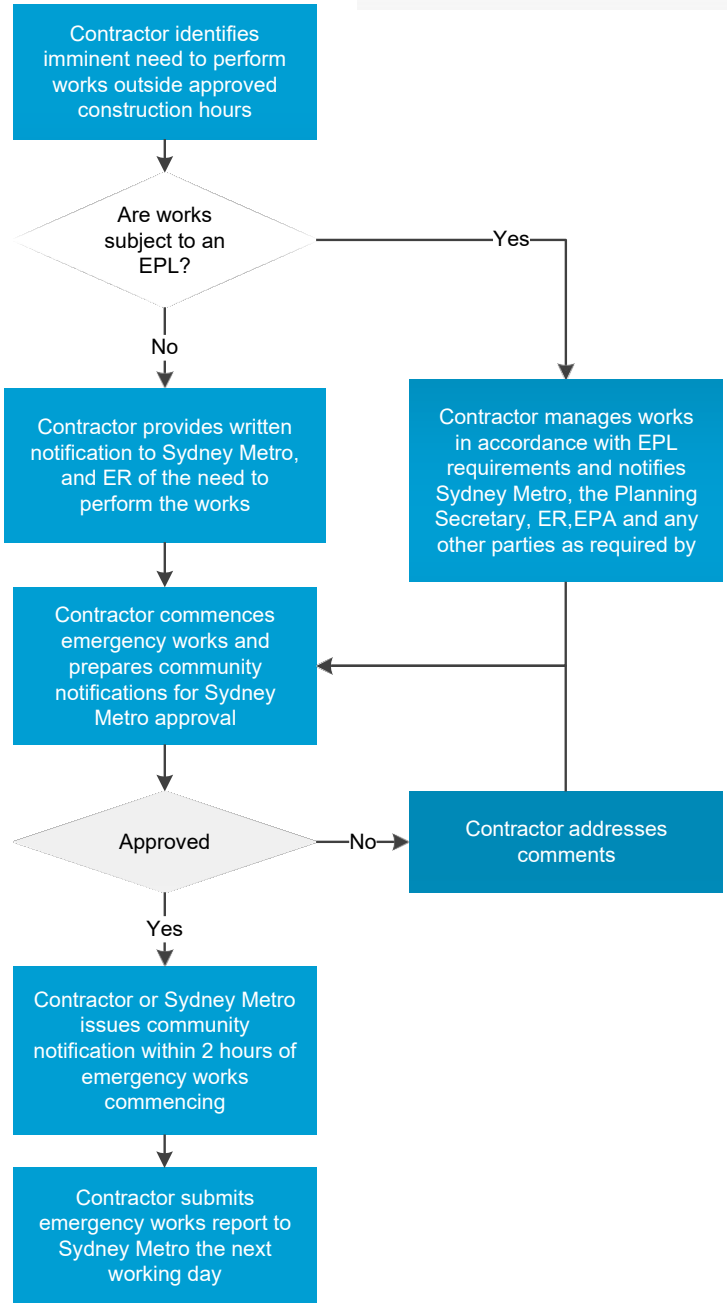


Figure 2: Emergency Works Process

4.5. Ground-borne noise level exceedance

4.5.1. Ground-borne regenerated noise condition

All reasonable and feasible mitigation measures must be applied when the following residential ground-borne noise levels are exceeded:

(a) evening (6:00 pm to 10:00 pm) — internal LAeq(15 minute): 40 dB(A); and

(b) night (10:00 pm to 7:00 am) — internal LAeq(15 minute): 35 dB(A).

4.5.2. Ground-borne regenerated noise condition assessment

The evening and night-time criteria are only applicable to residential receivers.

The internal noise levels are to be assessed at the centre of the most-affected habitable room. For a limited number of discrete, ongoing ground-borne noise events, such as drilling or rock-hammering, The LAmax noise descriptor using a slow response on the sound level meter may be better than the LAeq noise descriptor (15 min) in describing the noise impacts. The level of mitigation of ground-borne noise would depend on the extent of impacts and also on the scale and duration of works. Any restriction on the days when construction work is allowed would take into account whether the community:

- Has identified times of day when they are more sensitive to noise (for example Sundays or public holidays).
- Is prepared to accept a longer construction duration in exchange for days of respite.

4.5.3. Mitigation measures

Due to the highly variable nature of construction activities and the likelihood of work outside the standard construction hours on Sydney Metro projects, some exceedances of the construction noise and vibration management levels are likely to be unavoidable. Where there is a potential exceedance of the construction noise and vibration management levels, a number of additional measures to mitigate such exceedances – primarily aimed at pro-active engagement with affected sensitive receivers – would be explored and have been included in below. The additional mitigation measures to be applied are outlined in Table 3 below.

Table 3: Additional Mitigation Measures

Measure	Description	Abbreviation
Alternative accommodation	Alternative accommodation options may be provided for residents living in close proximity to construction works that are likely to incur unreasonably high impacts over an extended period of time. Alternative accommodation will be determined on a case-by-case basis.	AA
Monitoring	Where it has been identified that specific construction activities are likely to exceed the relevant noise or vibration goals, noise or vibration monitoring may be conducted at the affected receiver(s) or a nominated representative location (typically the nearest receiver where more than one receiver have been identified). Monitoring can be in the form of either unattended logging or operator attended surveys. The purpose of monitoring is to inform the relevant personnel when the noise or vibration goal has been exceeded so that additional management measures may be implemented.	M
Individual briefings	Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Communications representatives from the contractor would visit identified stakeholders at	IB

	least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project.	
Letter box drops	For each Sydney Metro project, a newsletter is produced and distributed to the local community via letterbox drop and the project mailing list. These newsletters provide an overview of current and upcoming works across the project and other topics of interest. The objective is to engage and inform and provide project-specific messages. Advanced warning of potential disruptions (e.g. traffic changes or noisy works) can assist in reducing the impact on the community. Content and newsletter length is determined on a project-by-project basis. Most projects distribute notifications on a monthly basis. Each newsletter is graphically designed within a branded template.	LB
Project specific respite offer	The purpose of a project specific respite offer is to provide residents subjected to lengthy periods of noise or vibration respite from an ongoing impact.	RO
Phone calls and emails	Phone calls and/or emails detailing relevant information would be made to identified/affected stakeholders within 7 days of proposed work. Phone calls and/or emails provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs etc.	PC
Specific notifications	Specific notifications would be letterbox dropped or hand distributed to identified stakeholders no later than 7 days ahead of construction activities that are likely to exceed the noise objectives. This form of communication is used to support periodic notifications, or to advertise unscheduled works.	SN

4.5.4. Applying additional mitigation measures

Prior to the commencement of OOHW a detailed noise impact assessment shall be carried out. Mitigation measures shall be determined based on potential exceedances of the relevant NML.

In circumstances where following application of the standard mitigation measures, the LAeq(15minute) construction noise and vibration levels are still predicted to exceed the Noise Management Level, including ground-borne noise levels, the relevant Additional Mitigation Measures (AMM) are considered to determine any offset strategies for these impacts (Tables 4-6).

The following steps need to be carried out to determine the Additional Mitigation Measures to be implemented:

- Determine the duration (time period) when the work is to be undertaken.
- Determine the level of exceedance above the NML.

From the AMM table, identify the additional mitigation measures to be implemented (abbreviation codes are explained in Table 3).

Table 4: Additional Mitigation Measures – Airborne Construction Noise

Mitigation Measures					
Time Period		Predicted LAeq (15minute) noise level Above NML			
		0 to 10 dB	10 to 20 dB	20 to 30 dB	> 30 dB
Standard	Mon-Fri (7.00 am - 6.00 pm)	-	LB	LB, M, SN	LB, M, SN
	Sat (8.00 am - 1.00 pm)				
	Sun/Pub Hol (Nil)				
OOHW (Evening)	Mon-Fri (6.00 pm - 10.00 pm)	LB	LB, M	LB, M, SN, RO	LB, M, SN, IB, PC, RO
	Sat (1.00 pm - 10.00 pm)				
	Sun/Pub Hol (8.00 am - 6.00 pm)				
OOHW (Night)	Mon-Fri (10.00 pm - 7.00 am)	LB	LB, M, SN, RO	LB, M, SN, IB, PC, RO, AA	LB, M, SN, IB, PC, RO, AA
	Sat (10.00 pm - 8.00 am)				
	Sun/Pub Hol (6.00 pm - 7.00 am)				

Table 5: Additional Mitigation Measures – Ground Borne Construction Noise

Time Period		Mitigation Measures		
		Predicted LAeq (15minute) noise level Above NML		
		0 to 10 dB	10 to 20 dB	> 20 dB
Standard	Mon-Fri (7.00 am - 6.00 pm)	No NML for GBN during standard hours, refer to Table 18		
	Sat (8.00 am - 1.00 pm)			
	Sun/Pub Hol (Nil)			
OOHW (Evening)	Mon-Fri (6.00 pm - 10.00 pm)	LB	LB, M, SN	LB, M, SN, IB, PC, RO
	Sat (1.00 pm - 10.00 pm)			
	Sun/Pub Hol (8.00 am - 6.00 pm)			
OOHW (Night)	Mon-Fri (10.00 pm - 7.00 am)	LB, M, SN	LB, M, SN, IB, PC, RO, AA	LB, M, SN, IB, PC, RO, AA
	Sat (10.00 pm - 8.00 am)			
	Sun/Pub Hol (6.00 pm - 7.00 am)			

Table 6: Additional Mitigation Measures - Ground-borne Vibration

Time Period		Mitigation Measures
		Predicted Vibration Levels Exceed Maximum Levels
Standard	Mon-Fri (7.00 am - 6.00 pm)	LB, M, RO
	Sat (8.00 am - 1.00 pm)	
	Sun/Pub Hol (Nil)	
OOHW (Evening)	Mon-Fri (6.00 pm - 10.00 pm)	LB, M, IB, PC, RO, SN
	Sat (1.00 pm - 10.00 pm)	
	Sun/Pub Hol (8.00 am - 6.00 pm)	
OOHW (Night)	Mon-Fri (10.00 pm - 7.00 am)	LB, M, IB, PC, RO, SN, AA
	Sat (10.00 pm - 8.00 am)	
	Sun/Pub Hol (6.00 pm - 7.00 am)	

5. Related documents and references

Related documents and references
• SM-17-00000022 Environment & Sustainability Management Manual • SM-21-00279320 Construction Environmental Management Framework https://icentral.tdocs.transport.nsw.gov.au/otcs/cs.exe/app/nodes/272116977 • SM-21-00279321 Construction Noise and Vibration Standard https://icentral.tdocs.transport.nsw.gov.au/otcs/cs.exe/app/nodes/272123288 • SM-21-00306108 Out-of-hours Work Application Form • Overarching Community Communications Strategy https://www.sydneymetro.info/sites/default/files/document-library/Sydney_Metro_Overarching_Community_Communication_Strategy.pdf • EPA Interim Construction Noise Guideline

6. Superseded documents

Superseded documents
There are no documents superseded as a result of this document.

7. Document history

Version	Date of approval	Notes
1.0	14 October 2021	New document
2.0	8 November 2021	DPIE RFI Review

5. Appendix A: OOH Work Strategy/Protocol Endorsements and Approval(s)

Out-of-hours work application form- SM-WSA

This form is to be used for formal review and approval of Out-of-hours (OOH) work as it may affect residential and non-residential receivers. This form can be used in accordance with the Sydney Metro - Western Sydney Airport out-of-hours works protocol. Each OOH application and all applicable appendices must be submitted to Sydney Metro as one PDF file at least 15 business days prior to the commencement of the proposed OOH work.

1. OOH Application	
Sydney Metro Project: Western Sydney Airport	
Contract:	
Contractor:	
Application Title: E.g. 'Smith St service relocation works'.	
Application Number: E.g. 1, 2, 3, etc.	
Application Date: Original submission date (resubmission date in parentheses if applicable).	
Relevant Planning Approval:	
Environment Protection Licence (EPL): If subject to an EPL, state title and number.	

2. Proposed OOH Work Details	
Description of works, including: • Work methodologies. • List of plant/equipment to be used (worst case scenario). • Location Map (and/or Environmental Control Map) attached as Appendix 1, indicating location of works, plant/equipment locations and receivers (including distance to nearest receiver for noisiest plant/equipment). • Traffic Management Plan and/or Traffic Control Plan if applicable as Appendix 2.	
Timing of works: Including proposed dates/times works are planned to be undertaken outside standard hours.*	
Worst-case number of consecutive occasions affecting the same receiver: Refer to Section 4 for definition of 'occasion'.	
Justification: Demonstrate how the proposed OOH work has been scheduled in accordance with the OOH work period prioritisation list.* Program acceleration is generally not accepted as a justification.	

* Unless specified otherwise in project-specific documentation, the prioritisation of work time periods is as follows:
- **Standard Hours:** 7am to 6pm weekdays and 8am to 1pm Saturdays.
- **Daytime OOH:** 1pm to 6pm Saturdays and 8am to 6pm Sundays and Public Holidays.
- **Evening OOH:** 6pm to 10pm every day.
- **Night Time OOH:** 10pm to 7am weekday mornings and 9pm to 8am weekend and Public Holiday mornings.

3. Assessed Noise and Vibration Impacts and Standard Mitigation Measures	
Are the proposed works consistent with a prepared Detailed Noise & Vibration Impact Statement (DNVIS)? (Y/N)	
If 'N', skip this section and move to Section 4.	
State the title of the DNVIS and attach the section(s) describing the noise and vibration impacts of the proposed works as Appendix 3.	
Quantitatively summarise the worst-case predicted noise and vibration impacts specific to the proposed OOH work for each OOH period on the nearest receivers and compare these against the respective management levels. **For Night Time OOH Period works, include a review of potential sleep disturbance impacts in accordance with Section 4.3 of the ICNG.**	Worst-case predicted noise impact summary: • • • Worst-case predicted vibration impact summary: • Potential sleep disturbance summary (for night time OOH periods only): •
Using Table 4 and Table 5, indicate in Table 6: • Which Additional Mitigation Measures (AMMs) are applicable for consideration, • Which of those applicable for consideration are planned to be implemented, • For AMMs that are applicable for consideration but not being implemented, justify why the AMM is not being implemented. • For AMMs that are being implemented, provide details on how the AMM is being implemented (e.g. which receivers being offered respite, alternative accommodation, etc.).	

4. Non-Assessed Noise and Vibration Impacts

Skip this section if Section 3 has been completed in full.

A quantitative noise assessment for OOH work is to be carried out in accordance with the *Interim Construction Noise Guideline* (DECC, 2009). This section allows applicants to address these requirements through the following steps:

1) Establishing Rating Background Levels (RBLs) and Noise Management Levels (NMLs).
2) Predicting the anticipated noise levels using a quantitative noise assessment:
   a. Works that are not likely to generate high noise impacts for a significant duration may use a preliminary quantitative noise assessment (facilitated within this form). This ensures that all applications, as a minimum, include a preliminary quantitative noise assessment in accordance with the *Interim Construction Noise Guideline* (ICNG).
   b. Works that are likely to generate high noise impacts for a significant duration may require a detailed quantitative noise assessment (e.g. Construction Noise and Vibration Impact Statement) to be undertaken.
   c. Works that are likely to generate ground-borne or structure-borne vibration and/or noise require specialist advice and assessment.
3) Comparing predicted noise levels against RBLs/NMLs and applying standard mitigation measures as appropriate (i.e. implementing 'all feasible and reasonable' mitigation measures in accordance with the ICNG).
4) Considering additional mitigation measures when predicted noise levels exceed RBLs/NMLs.

The need for a detailed quantitative noise and vibration assessment will be considered by Sydney Metro, the contractor and the Environmental Representative (if applicable) collectively when the predicted noise levels are anticipated to:

- Exceed an RBL at a residential receiver or an NML at a non-residential receiver by more than 10dBA, **AND**
- Affect the same receiver on 10 or more consecutive **occasions**. An occasion is anytime works are carried out:
  - Between 6pm on a weekday and the start of standard hours the next day, **OR**
  - Between 1pm on a Saturday and 8am on a Sunday), **OR**
  - Between 8am on a Sunday or public holiday and the start of standard hours the next day.

A detailed quantitative noise and vibration assessment should generally include:

- Derivation of RBLs for residential receivers and/or derivation of NMLs for non-residential receivers based on noise monitoring at representative locations and local sensitivities.
- Detailed noise predictions for daytime, evening and night time OOH periods (as applicable) in accordance with Section 4.5 of the ICNG (including an outline of timing, duration and predicted noise levels for each OOH period).
- For Night Time OOH Period works, a review of potential sleep disturbance impacts in accordance with Section 4.3 of the ICNG.
- Detailed predictions of vibration levels for sensitive receivers.

Please complete the following Steps 1 to 4.

Step 1: RBLs/NMLs	If RBLs for residential receivers or NMLs for non-residential receivers have already been established (e.g. in an Environmental Impact Statement, Review of Environmental Factors, detailed quantitative noise assessment or Construction Noise and Vibration Impact Statement for other work activities), enter into Table 3 and attach the supporting evidence as Appendix 3. If no RBLs/NMLs have been established, use Table 1 to estimate and enter into Table 3.
Step 2: Predicted Anticipated Noise Levels	If predicted anticipated noise levels have already been established (e.g. in an Environmental Impact Statement, Review of Environmental Factors, detailed quantitative noise assessment), enter the predicted anticipated noise levels into Table 3 and attach the supporting evidence as Appendix 3. If predicted anticipated noise levels have not already been established, use Table 2 to estimate anticipated noise aspects for the noisiest plant/equipment and enter into Table 3. In Table 3, use these values to calculate the anticipated predicted noise levels.
Step 3: Exceedances and Mitigation Measures	Compare the anticipated predicted noise levels to the applicable RBLs/NMLs, calculate the exceedances and enter into Table 3. In Section 5, provide a description of the standard mitigation measures that are planned to be implemented in order to mitigate the noise impacts (and vibration impacts if relevant) as much as 'feasible and reasonable' in accordance with the ICNG.
Step 4: Consideration of Additional Mitigation Measures	Use Table 4 and the exceedances in Table 3 to determine the applicable Additional Mitigation Measures for consideration. Use Table 6 to indicate which of these measures are applicable for consideration, which will be implemented and provide justification/details accordingly.

5. Standard Mitigation Measures	
Outline the standard noise mitigation measures that will be implemented during the proposed OOH work: I.e. Implementation of all 'feasible and reasonable' mitigation measures in accordance with the ICNG):	• • • •
Outline the standard vibration mitigation measures that will be implemented during the proposed OOH work: I.e. Implementation of all 'feasible and reasonable' mitigation measures in accordance with the ICNG):	•

Table 1: Noise RBLs and NMLs

Skip this section RBLs and NMLs have already been established in other documentation.			
Sensitive Receiver Category	**Estimated RBLs (dBA)**		
Residential	**Daytime OOH**	**Evening OOH**	**Night Time OOH**
Urban (e.g. city hubs, near busy roads, near industrial activity)	**55**	**50**	**45**
Suburban	**45**	**40**	**35**
Quiet, rural or isolated	**40**	**35**	**30**
Non-Residential	**ICNG NMLs (dBA)**		
Industrial facilities	**75** (only applicable when in use)		
Offices or retail	**70** (only applicable when in use)		
Health and educational facilities	**55** (only applicable when in use)		

Table 2: Predicted Noise Level Aspects

Skip this section if predicted noise levels have already been established in other documentation.		
Noise Aspect	**Select the most applicable value for each noise aspect below and enter into Table 3.**	**dBA**
1. Plant/Equipment Noise Level at 10m Including non-continuous use reduction (-5dBA) and annoying activity penalty (+5dBA) for as per ICNG (refer to ICNG Appendix B for predicted noise level data) Underline indicates vibratory generating plant/equipment	Impact sheet piling rig	100
	Hand-held tamper, excavator with hammer, rock-breaker, driven/vibratory piling, concrete saw, diamond saw, air track drill, large dozer, hand-held rail grinder	95
	Jackhammer, rock crusher, angle grinder, pneumatic hammer, medium dozer, tracked loader, impact wrench	90
	Mainline tamper, ballast regulator, dynamic track stabiliser, vibratory roller, mainline rail grinder, ballast train (pour/fill ballast), chainsaw, tub grinder/large mulcher, scraper, grader, super-sucker/vacuum truck, large backhoe/wheeled front-end loader, bored piling, pavement profiler, fixed crane, tracked excavator	85
	Small bulldozer, small excavator, tower crane, truck-mounted crane, forklift, bobcat, skid-steer front-end loader, road truck/truck and dog, dump truck, concrete truck/pump/mixer, compressor, non-vibratory/large pad foot roller, whacker packer/compactor, water cart, pavement laying machine, asphalt truck and sprayer, line marking truck, standard penetration testing, welder, pin puller	80
	Concrete vibrator, cherry-picker scissor lift/elevated work platform/Franna crane, small backhoe, front end loader, fence post driver, electric drill rig, hand held rattle gun, generator (diesel/petrol), spreader	75
	Lighting tower, medium-rigid truck/semi-trailer, welding equipment, small front end loader	70
	Light vehicle, hand-tools (no impact), small cement mixer, attenuated generator (inside housing)	65

2. Multiple Plant	More than one of the noisiest plant being used simultaneously at roughly the same location	+5
3. Local Screening	Existing screening between site and receiver (buildings, cuttings, canopies, etc.)	- 5
	Temporary screening to be implemented near work site	- 10
	Acoustic shed or enclosure	- 25
4. Distance Attenuation	< 10 metres	0
	10 to 20 metres	- 5
	20 to 35 metres	- 10
	35 to 60 metres	- 15
	60 to 100 metres	- 20
	100 to 180 metres	- 25
	180 to 350 metres	- 30
	350 to 1,000 metres	- 40

Table 3: Predicted Noise Levels and Exceedances of RBLs and/or NMLs (dBA)

Skip this section if Section 3 has been completed in full.										
Period (only complete as applicable for each period)	**Noisiest Plant/Equipment** (state the noisiest plant/equipment to be used during each applicable OOH period)	**Receiver Type** (state 'Res' or 'Non-Res' as applicable for closest receiver to noisiest plant/equipment)	Enter the most applicable values from Table 2, then add to determine the Predicted Noise Level				**Predicted Noise Level** (1 + 2 + 3 + 4)	**RBL** (for Res)	**NML** (for Non-Res)	**Exceedance** (Predicted Noise Level minus RBL for Res or NML for Non-Res)
			1. Plant/Equipment Noise Level	**2. Multiple Plant/Equipment**	**3. Local Screening**	**4. Distance Attenuation**				
Daytime OOH *										
Evening OOH *										
Night Time OOH *										

* Refer to OOH period timings under Section 2 of this form.

Table 4: Additional Mitigation Measures (AMM) requiring Consideration for Implementation

OOH Period	**AMMs that must be considered for implementation** (apply the exceedances from Table 3 to the two OOH period categories below as applicable)			
	0 to 10 dBA Exceedance	**>10 to 20 dBA Exceedance**	**>20 to 30 dBA Exceedance**	**>30 dBA Exceedance**
Daytime OOH Period	–	LB	M, LB	M, IB, LB, PC, RO, SN
Evening and Night Time OOH Periods	–	M, LB	M, IB, LB, PC, SN, RO	M, IB, LB, PC, SN, RO, AA*

* AA is only applicable to Night Time OOH periods.

Table 5: List of Additional Mitigation Measures (AMM)

AMM Abbrev.	AMM	AMM Descriptions and Guidance
LB	Letterbox-drop (generic to the project)	A newsletter is generally produced and distributed to the local community via letterbox-drop and the project mailing list. These newsletters provide an overview of current and upcoming works across the project and other topics of interest. The objective is to engage, inform and provide project-specific messages. The geographic extent of letterbox-drops is generally centred on the immediate surrounding community within 200 metres from the works site.
M	Monitoring	Where it has been identified that specific construction activities are likely to exceed the relevant Rating Background Levels (RBL) and/or Noise Management Levels (NMLs), monitoring may be conducted at the affected receiver(s) or a nominated representative location (typically the nearest receiver where more than one receiver have been identified). Monitoring can be in the form of either unattended logging or operator attended surveys. The purpose of monitoring is to inform the relevant personnel when the RBL/NML has been exceeded so that additional management measures may be implemented.
IB	Individual Briefings	Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Communications representatives would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project.
PC	Phone calls (and/or emails)	Phone calls and/or emails (with specific notifications attached) detailing relevant information would be made to identified/affected stakeholders within seven days of proposed work. The objective of the phone calls and/or emails is to support letterbox-drop and specific notifications. Phone calls and/or emails provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs.
SN	Specific Notifications (specific to the OOH work)	Specific notifications are letterbox-dropped to identified stakeholders no later than 7 days prior to out of hour construction activities commencing that are likely to exceed the RBLs/NMLs. Specific notifications may be produced by Sydney Trains or by Sydney Metro (or on behalf of Sydney Metro by a contractor as approved by Sydney Metro): - Sydney Trains specific notifications cover all works being undertaken by various parties (including Sydney Metro) during designated rail possession periods. These specific notifications are delivered 14 days prior to works commencing and are delivered to all properties located within 250m of the proposed works. - Sydney Metro specific notifications focus on proposed Sydney Metro works being undertaken outside of designated rail possession periods and are only produced in the absence of any Sydney Trains notifications covering the proposed works. These notifications are delivered 7 days prior to works commencing and are delivered to all properties located within 100m of day works and within 200m of night works. All notifications are emailed to all registered stakeholders on site-specific email distribution lists.
RO	Respite Offer	The purpose of a project specific respite offer is to provide residents subjected to lengthy periods of noise and/or vibration impacts respite during OOH periods. Respite offers are offers made to affected receivers to provide a period of either no or limited noise impacts. This can be in the form of stopping or limiting works onsite or offering affected receivers dinner/movie vouchers. The first priority is to implement a period of no or limited noise impacts. If this cannot be achieved, dinner/movie vouchers may be offered on a case-by-case basis.
AA	Alternative Accommodation *(residential only)*	Alternative accommodation options may be provided for residents living in close proximity to construction works that are likely to incur unreasonably high impacts during night time OOH periods. Alternative accommodation will be considered on a case-by-case basis.

Table 6: Consideration of Additional Mitigation Measures (AMM)

Additional Mitigation Measures	Applicable for Consideration? Y/N (refer to Table 4)	To be Implemented? Y/N	Justification/Details For AMMs that are applicable for consideration but not being implemented, justify why the AMM is not being implemented. For AMMs that are being implemented, provide details on how the AMM is being implemented (e.g. which receivers being offered RO, AA, etc.).
LB			
M			
IB			
PC			
SN			
RO *			
AA			

*If RO is being implemented, include how community consultation influenced the manner in which RO is being implemented.

6. Consideration Against Relevant Vibration Criteria		
Using Table 2, indicate whether any vibratory plant/equipment is planned to be used for the proposed works (Y/N)		
If 'N', skip this section and move to Section 7.		
'People' Criterion	Are the proposed works anticipated to have any perceptible sleep disturbance impacts? (Y/N)	
'Structures' Criterion	Are the proposed works anticipated to generate greater than 7.5mm/s vibration impacts on surrounding structures (generally within 25 metres of works)? (Y/N)	
'Sensitive Equipment' Criterion	Are the proposed works anticipated to impact sensitive equipment located in surrounding non-residential receivers? (Y/N)	
If 'Y' is answered to ANY of the above criteria AND the impacts affect the same receiver for more than one consecutive occasion (refer to Section 4 for 'occasion' definition), the need to prepare a detailed quantitative assessment will be considered collectively by Sydney Metro, the contractor and the Environmental Representative (if applicable).		

7. Cumulative Impacts	
Document the relevant details of <u>any</u> other OOH work (Sydney Metro or otherwise) that will impact the same receivers as those being impacted by these proposed works either concurrently or within 3 days of the start or end of these proposed works.	
If other works have been identified in the row above, how have the proposed works been coordinated to ensure appropriate respite is provided?	

8. Community Consultation	
What community consultation has been undertaken already?	
What community consultation is planned to be undertaken?	
If drafted already, attach applicable Community Notification as Appendix 4.	

9. Contractor's Signature				
Contractor's Identification of Risk Level: If subject to Western Sydney Airport Sydney Metro planning approval and not subject to an EPL, provide Contractor's Identification of Risk Level (refer to the *Western Sydney Airport Sydney Metro Protocol* for guidance).	Circle:	LOW	or	HIGH
Contractor's Signature:				
Name:				
Title:				
Contact Number:				
Date:				

10. Contractor's Contact Details		
Contractor Personnel	**Name**	**Mobile**
Manager Environment:		
Manager Communications:		
Contractor's Representative:		
Contractor's 24hr contact person:		

Planning Approval Determination Page

	Step 1 – Endorsement from Sydney Metro Director Project Communications or Contractor's Communications Manager	Step 2 – Risk Identification/Endorsement from ER under the Planning Approval	Step 3 – If works are under Sydney Trains EPL, approval from Sydney Metro Director of Planning, Environment and Sustainability. If works are not under an EPL, approval from either the ER or the Secretary of the NSW Department of Planning & Environment
Risk Level:	*N/A*	*If not subject to an EPL, circle Risk Level as: **LOW** or **HIGH*** *If works are HIGH Risk Level Sydney Metro submits application to the Secretary of the NSW Department of Planning & Environment for approval.*	*N/A*
Signature:	*Approved Road Occupancy Licence/Road Opening Permit (if applicable) must be sighted prior to endorsement.*		
Name:			
Role:			
Date:			
Comments: (including ER Risk Level comments if applicable)			
Conditions:			

Generic Determination Page (i.e. not subject to SM-WSA planning approvals)

	Step 1 – Sydney Metro Director of Project Communications	Step 2 – Environmental Representative (may be optional depending on planning approval or contract requirements)	Step 3 –Sydney Metro Director of Planning, Environment & Sustainability (only required if not approved already)
Action:	Endorsement	Circle: Endorsement or Approval	Approval
Signature:	*Approved Road Occupancy Licence/Road Opening Permit (if applicable) must be sighted prior to endorsement.*		
Name:			
Date:			
Comments:			
Conditions:			

Appendix 1: Location Map (and/or Environmental Control Map)

Appendix 2: Traffic Management Plan and/or Traffic Control Plan

(if applicable)

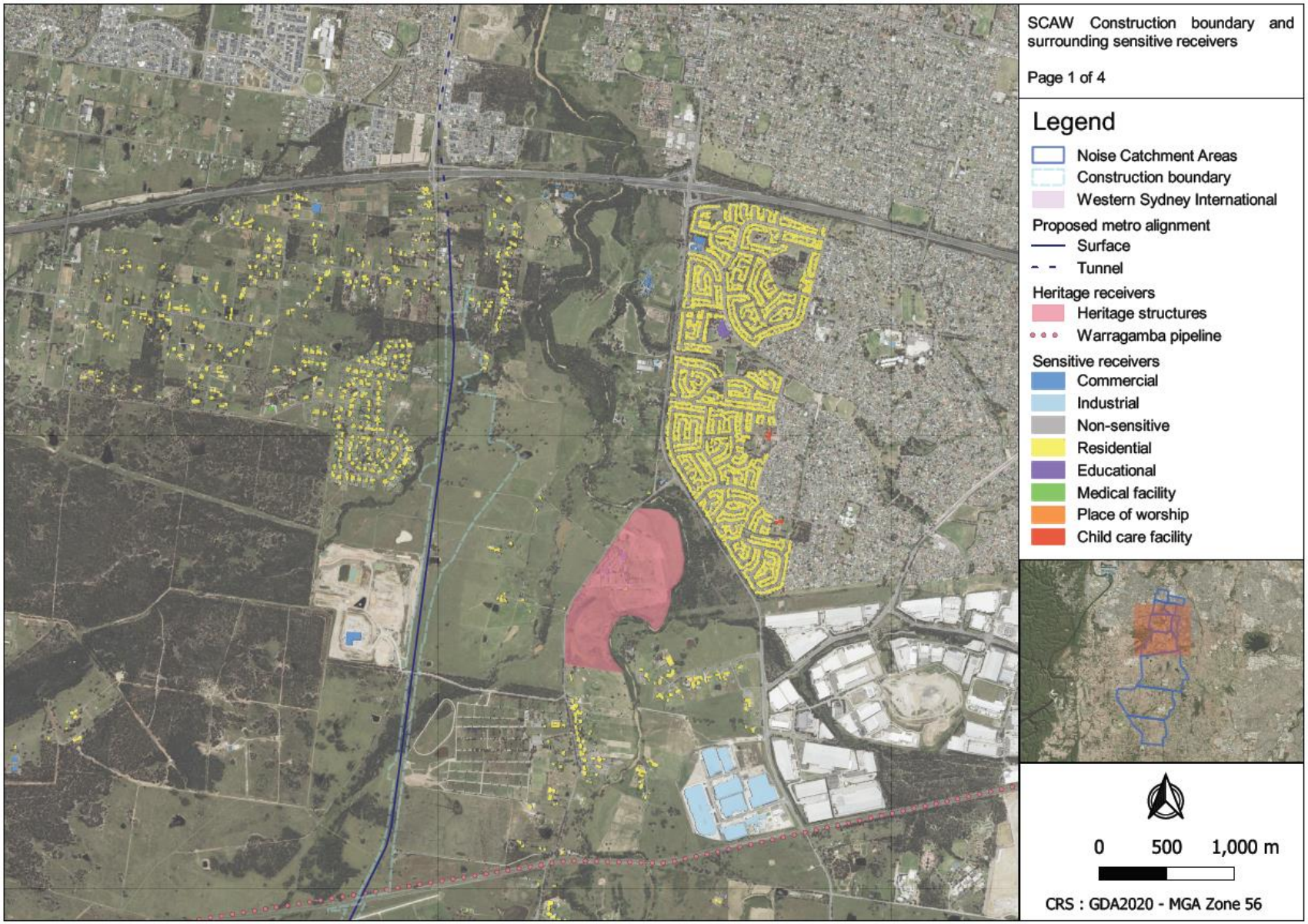
Appendix 3: Supporting Evidence for Noise & Vibration Impacts (e.g. Construction Noise & Vibration Impact Statement, noise assessment, etc.)

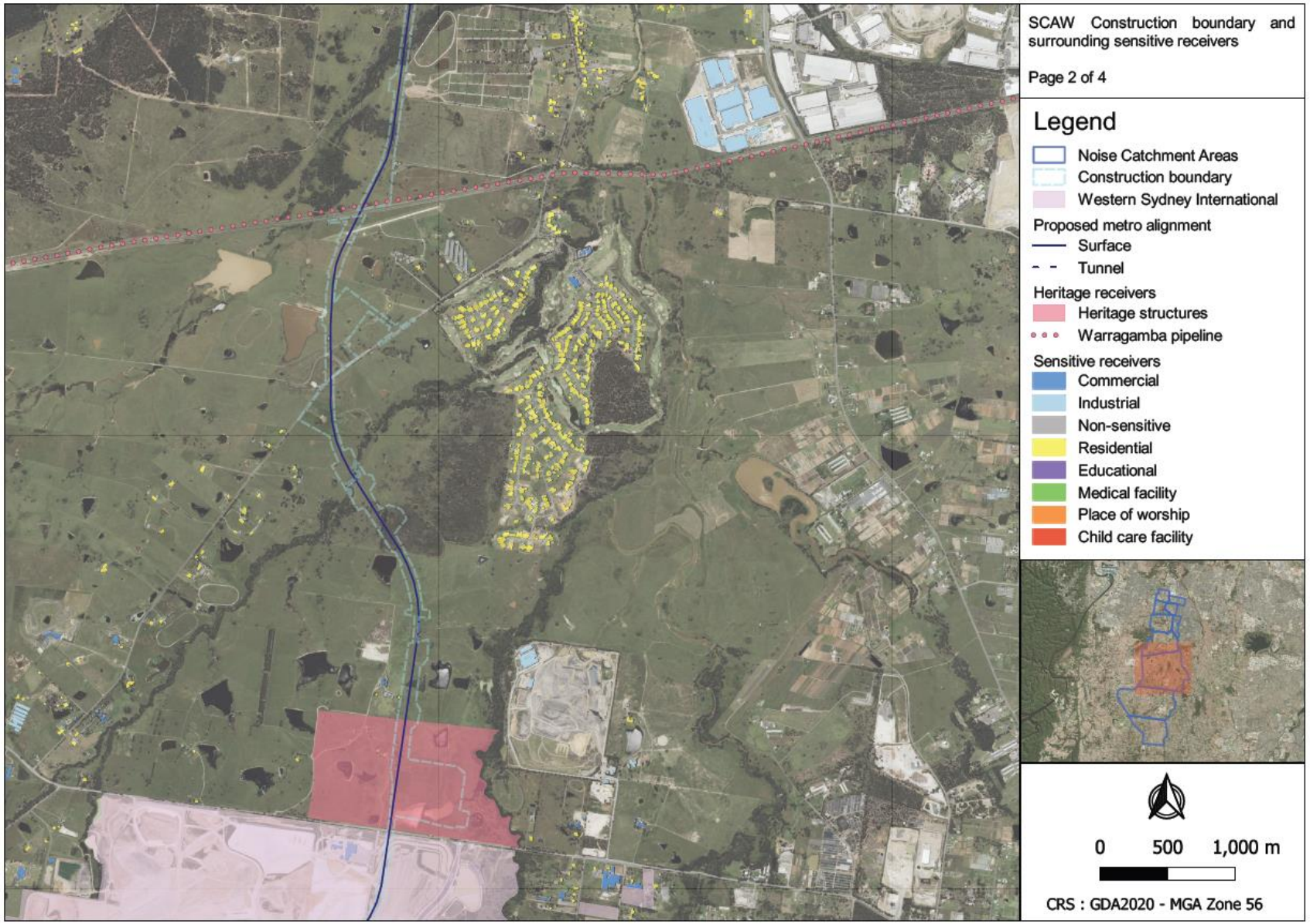
(if applicable)

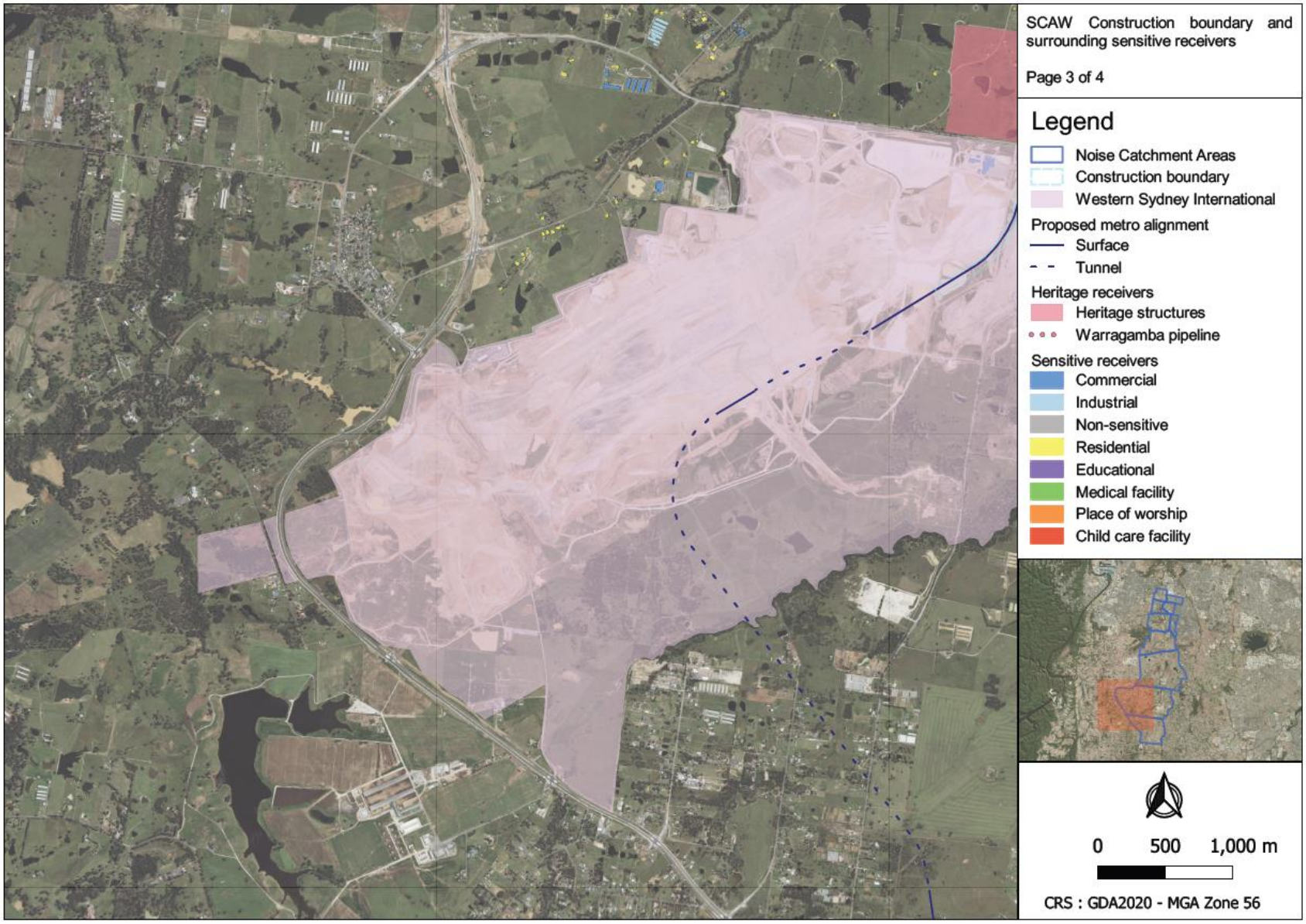
Appendix 4: Community Notification

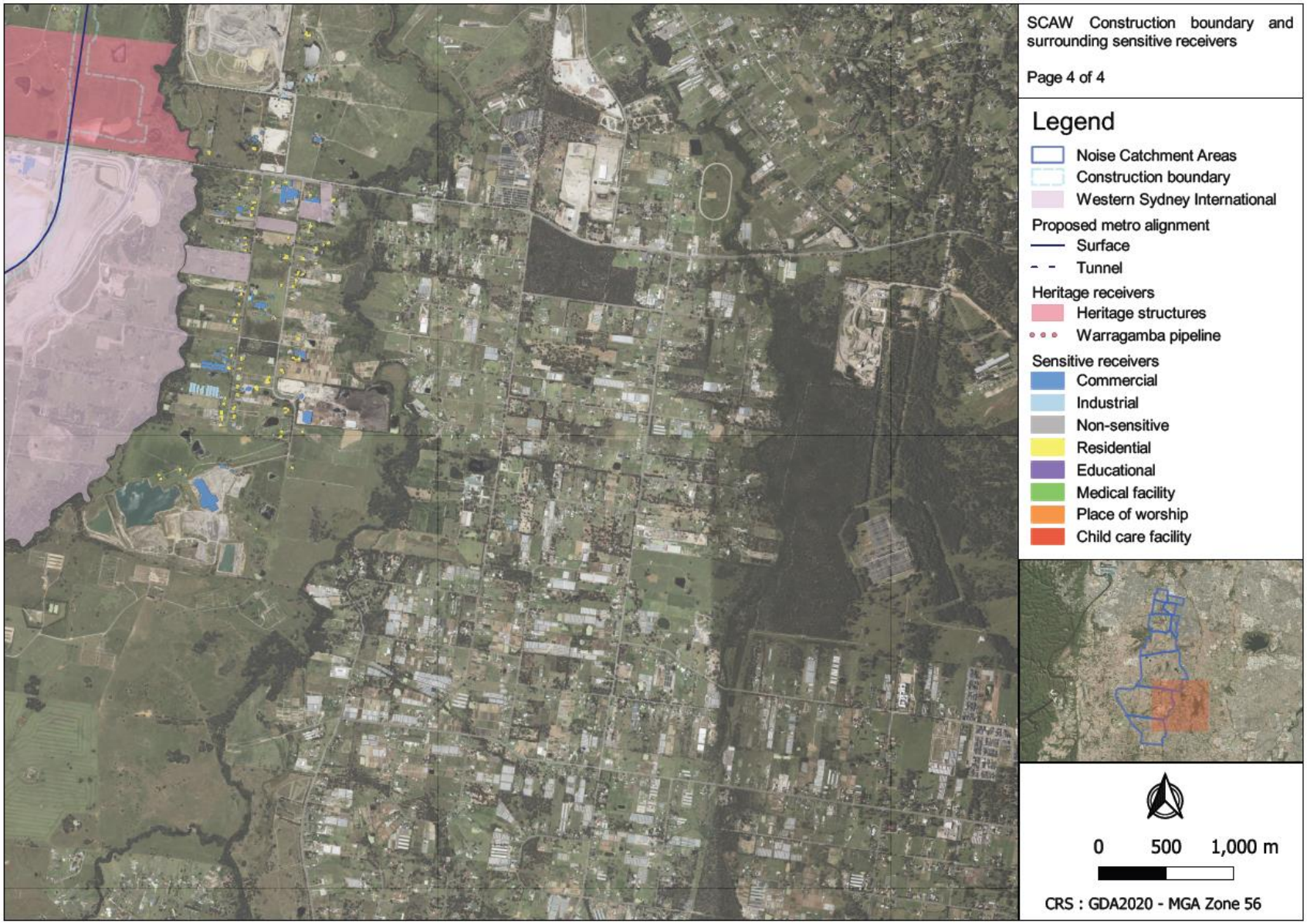
(if applicable and already drafted)

Appendix C2 – Land Use Survey


SCAW Construction boundary and surrounding sensitive receivers
Page 1 of 4
Legend
Noise Catchment Areas
Construction boundary
Western Sydney International
Proposed metro alignment
Surface
Tunnel
Heritage receivers
Heritage structures
Warragamba pipeline
Sensitive receivers
Commercial
Industrial
Non-sensitive
Residential
Educational
Medical facility
Place of worship
Child care facility
0
500
1,000 m
CRS : GDA2020 - MGA Zone 56


SCAW Construction boundary and surrounding sensitive receivers
Page 2 of 4
Legend
Noise Catchment Areas
Construction boundary
Western Sydney International
Proposed metro alignment
Surface
Tunnel
Heritage receivers
Heritage structures
Warragamba pipeline
Sensitive receivers
Commercial
Industrial
Non-sensitive
Residential
Educational
Medical facility
Place of worship
Child care facility
0
500
1,000 m
CRS : GDA2020 - MGA Zone 56


SCAW Construction boundary and surrounding sensitive receivers
Page 3 of 4
Legend
Noise Catchment Areas
Construction boundary
Western Sydney International
Proposed metro alignment
Surface
Tunnel
Heritage receivers
Heritage structures
Warragamba pipeline
Sensitive receivers
Commercial
Industrial
Non-sensitive
Residential
Educational
Medical facility
Place of worship
Child care facility
0
500
1,000 m
CRS : GDA2020 - MGA Zone 56



SCAW Construction boundary and surrounding sensitive receivers

Legend

- Noise Catchment Areas
- Construction boundary
- Western Sydney International

Proposed metro alignment
- Surface
- Tunnel

Heritage receivers
- Heritage structures
- Warragamba pipeline

Sensitive receivers
- Commercial
- Industrial
- Non-sensitive
- Residential
- Educational
- Medical facility
- Place of worship
- Child care facility

0 500 1,000 m

CRS : GDA2020 - MGA Zone 56

Appendix C3 – Noise and Vibration Construction Monitoring Program

Noise and Vibration Construction Monitoring Program

Western Sydney Airport – Surface and Civil Alignment Works

1. Purpose

The Noise and Vibration Construction Monitoring Program (Monitoring Program) been prepared to outline how CPBUI propose to undertake noise and vibration monitoring during delivery of the SCAW Project. The Monitoring Program has been developed considering the SMART principles, being specific with measurable outcomes. The Monitoring Program has been developed to address Condition C13 and has been prepared in accordance with Conditions C13, C14 and C15 (refer to *Table 1*). In accordance with Condition C19 and the SM-WSA Staging Report (Revision 6), the Monitoring Program will be endorsed by the ER and submitted to the Planning Secretary for approval at least one month before the commencement of construction. The Monitoring Program will be implemented for the duration of construction.

The Monitoring Program will be appended to the Noise and Vibration Management Sub-Plan which forms part of the Construction Environmental Management Plan (CEMP).

2. Objectives

This Monitoring Program identifies how CPBUI will comply with and implement noise and vibration monitoring requirements including:

- The Project Planning Approval (Condition)
- The EIS and Submissions Report
- The Sydney Metro Construction Environmental Management Framework (CEMF).

The objectives and targets applicable to the management of noise and vibration impacts applicable to the SCAW package are outlined in Section 2.1.2 of the Noise and Vibration Management Sub-plan. In accordance with Condition C13, this Monitoring Program is the key measurement tool and has been prepared to compare actual performance of the SCAW against the predicted performance the EIS.In addition, the Sydney Metro Construction Noise and Vibration Standard (CNVS) requires the implementation of a monitoring program including:

- Ongoing noise monitoring during construction at affected receivers during critical periods (i.e. times when noise emissions are expected to be at their highest) to identify and assist in managing high risk noise events
- Monitoring will be undertaken inform the relevant personnel when the noise or vibration goal has been exceeded so that additional management measures may be implemented
- Regular compliance checks on the noise emissions of all plant and machinery used for the project to:
    - indicate whether noise emissions from plant items were higher than predicted
    - identify defective silencing equipment on the items of plant
    - assist in determining where additional management measures should be implemented.

2.2 Project Planning Approval

Condition relevant to the preparation of the Monitoring Program are identified in *Table 1*.

Table 1 – Compliance table – Requirements related to preparation of this Monitoring Program

Ref	Requirement	Document Reference
C13	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies (as required by Condition A6) 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. Where a government agency(ies) request(s) is not included, the Proponent must provide the Planning Secretary / ER (whichever is applicable) justification as to why. Required Construction Monitoring Programs Relevant government agencies to be consulted for each Construction Monitoring Program **(a) Noise and Vibration - Relevant Councils and Water NSW (in relation to its assets)**	This Monitoring Program Section 3
C14	Each Construction Monitoring Program must provide:	
	(a) details of baseline data available including the period of baseline monitoring;	Section 4
	(b) details of baseline data to be obtained and when;	Section 4
	(c) details of all monitoring of the project to be undertaken;	Section 5
	(d) the parameters of the project to be monitored;	Section 5
	(e) the frequency of monitoring to be undertaken;	Section 5
	(f) the location of monitoring;	Section 5
	(g) the reporting of monitoring results and analysis results against relevant criteria;	Section 7
	(h) details of the methods that will be used to analyse the monitoring data;	Section 5
	(i) procedures to identify and implement additional mitigation measures where the results of the monitoring indicated unacceptable project impacts;	Section 6
	(j) a consideration of SMART principles;	Specific targets Section Measurable outcomes Achievable outcomes Relevant outcomes Time bound requirements
	(k) any consultation to be undertaken in relation to the monitoring programs; and	Section 3
	(l) any specific requirements as required by Conditions C15 to C16	This Monitoring Program

Ref	Requirement	Document Reference
C15	The Noise and Vibration Construction Monitoring Program must include:	
	(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
	(b) monitoring undertaken during the day, evening and night-time periods throughout the construction period and cover the range of activities being undertaken;	Section 5
	(c) method and frequency for reporting monitoring results; and	Section 7
	(d) a process to undertake real time noise and vibration monitoring.	Section 7
	The results of the monitoring must be readily available to the construction team, the Proponent and ER. The Planning Secretary and EPA must be provided with access to the results on request.	Section 7

2.3 Construction Environmental Management Framework

The CEMF requirements relevant to the preparation of this Monitoring Program are identified in *Table 2*.

Table 2. The CEMF requires that the Monitoring Program be consistent with the CNVS. As such, compliance with the CNVS is also demonstrated in *Table 2*.

Table 2 – Compliance table

Ref	Requirement	Document reference
CEMF 3.16a	Issue specific environmental monitoring will be undertaken as required or as additionally required by any approval, permit or licence conditions.	This Monitoring Program
CEMF 3.16b	The results of any monitoring undertaken as a requirement of a license or permit that is required to be published will be published on the Principal Contractor's, or a project specific, website within 14 days of obtaining the results.	Section 7
CEMF 8.2c	Noise and vibration monitoring would be undertaken for construction as specified in the CNVS.	Section 5
CEMF 8.2d	The following compliance records would be kept by Principal Contractors: i. Records of noise and vibration monitoring results against appropriate NMLs and vibration criteria; and ii. Records of community enquiries and complaints, and the Contractor's response.	Section 7
CNVS 6.1	Measurements of sound power level	Section 5.1.5
CNVS 6.2	Monitoring to be undertaken where a DNVIS predicts NMLs will be exceeded	Section 5.1
CNVS 6.3	Vibration monitoring at affected receiver where exceedance of cosmetic damage criteria and/or human response criteria is expected to be exceeded.	Section 5.2
CNVS 5.1 Table 16	Where it has been identified that specific construction activities are likely to exceed the relevant noise or vibration goals, noise or vibration monitoring may be conducted at the affected receiver(s) or a nominated representative location (typically the nearest receiver where more than one receiver have been identified). Monitoring can be in the form of either unattended logging or operator attended	Section 5.1.1 Section 6

Ref	Requirement	Document reference
	surveys. The purpose of monitoring is to inform the relevant personnel when the noise or vibration goal has been exceeded so that additional management measures may be implemented.	
REMM NV2	To avoid potential vibration impacts to the Warragamba to Prospect Water Supply Pipelines, a detailed construction vibration assessment would be undertaken in accordance with the *Guidelines for Development Adjacent to the Upper Canal and Warragamba Pipelines* (WaterNSW, 2020) and would consider the following requirements: velocity limits for construction activities and the impact the works will have on WaterNSW assets. excavation methods in accordance with German Standard DIN 4150-3:2016	Addressed in Noise and Vibration Management Sub-plan
	vibration monitoring prior to and during construction for high-risk construction activities	Section 5.2
	vibration monitoring reports would be provided to WaterNSW	Section 7.2
EPL M2.1	All noise and vibration monitoring for the purposes of determining compliance with the conditions of this licence must be undertaken by a Competent Person as defined in the special dictionary of this licence	Section 5.1.4
EPL M2.2	All noise monitoring for the purposes of determining compliance with the conditions of this licence must consider and be generally undertaken in accordance with; (a) Australian Standard AS 1055: 2018 Acoustics - Description and measurement of environmental noise; and (b) the compliance monitoring guidance provided in the chapter 7 'Monitoring Performance' of the Noise Policy for Industry (EPA, 2017).	Section 5.1
EPL M2.3	All vibration monitoring must be: a) undertaken in accordance with the technical guidance provided in the Assessing Vibration: a technical guideline (DEC, 2006); and b) assessed and reported against the acceptable and maximum values of human exposure to vibration set out in Tables 2.2 and 2.4 of this guideline.	Section 5.2
EPL M2.4	The licensee must undertake noise and vibration monitoring as directed by an authorised officer of the EPA. Where the monitoring is requested to take place on private land (for example a residential property) the licensee must request permission to access the premises in advance and keep a record of permission requests and responses. If a licensee is unable to obtain permission, the licensee must undertake the monitoring at an indicative location where possible and they must provide the response (including any nil response) to the EPA.	Section 5.1

2.4 Revised Environmental Management Measure

REMM NV2 applies to vibration monitoring and is addressed in Section 0 of the Noise and Vibration Management Sub-plan and in the Non-Aboriginal Heritage Management Sub-plan. The requirements of REMM NV2 this Monitoring Program are identified in *Table 2*.

2.5 Environmental Protection Licence

CPB has obtained an Environment Protection Licence (EPL) (21695) for SCAW in accordance with the POEO Act. The EPL conditions relevant to noise and vibration monitoring are included in *Table 2*.

3. Approval and consultation

Agencies consulted during the preparation of this Monitoring Program are detailed in Table 5.

Table 3 – Monitoring Program Agency Consultation

Subject	Agency Consultation
Noise and Vibration Construction Monitoring Program (Condition C13)	Relevant Councils (Penrith City Council and Liverpool City Council) and Water NSW (in relation to its assets)

CPBUI JV have engaged with these agencies in developing and finalising this Monitoring Program. Records of consultation in accordance with Condition A6 are provided in Table 6 and the Noise and Vibration Management Sub-plan Appendix C4 – Records of Consultation.

In accordance with Condition C17 and the SM-WSA Staging Report (Revision 6), the ER will endorse the Monitoring Program prior to it being submitted to the Planning Secretary for approval at least one month prior to the commencement of construction in accordance with Condition C19.

Table 4 – Log of engagement or attempted engagement with relevant stakeholders

Agency	Date	Person Contacted	Comment	Status
Penrith City Council	24/06/2022	Penrith City Council representative	CPBUI JV emailed the Noise and Vibration Management Sub-plan requesting comment	Open
	22/07/2022	CPBUI JV representative	Response received from Penrith City Council via email. No comments made on the Monitoring Program.	Closed
Liverpool City Council	24/06/2022	Liverpool City Council representative	CPBUI JV emailed the Noise and Vibration Management Sub-plan requesting comment	Open
			No written response received from Liverpool City Council as of 22/07/2022. A meeting held with representatives of Liverpool City Council, CPBUI and Sydney Metro was held on 28/06/2022 to discuss the SCAW project and environmental management. No issues were raised during the meeting that required addressing in this Sub-plan.	Closed
Water NSW	24/06/2022	Water NSW representative	CPBUI JV emailed the Noise and Vibration Management Sub-plan requesting comment.	Open
	12/07/2022	CPBUI JV representative	Response received from Water NSW via email. No comments made on the Monitoring Program.	Closed

4. Baseline data

Baseline noise data was collected for the EIS from February 2020 up until March 2020 at 18 locations for the purpose of obtaining noise data for each Noise Catchment Area (NCA). The methodology and sampling locations are provided in Section 4 of the Noise and Vibration Management Sub-plan. The background noise monitoring data was used to establish the Rating Background Level (RBL) which represents the minimum background sound level for each measurement period. The RBL for each NCA applicable to SCAW, and each period is provided in Table 5.

Table 5: Background noise monitoring results

Noise monitoring location	Rating Background Level (RBL) dB(A)[1]			Ambient Noise Level $L_{eq,\ 15\ minute}$		
	Day	Evening	Night	Day	Evening	Night
NM04[1]	-	-	-	-	-	-
NM06	42	(44) 42[3]	38	59	57	52
NM08	31	(32) 31[3]	30	52	48	40
NM09	40	39	34	61	57	54
NM10	(30) 35[2]	30	30	47	42	37
NM15	44	(47) 44[3]	40	55	53	50
NM16	47	42	(28) 30[2]	59	56	54
NM19	53	48	36	62	59	57

Baseline noise monitoring locations from the EIS are provided in Figure 1 below.

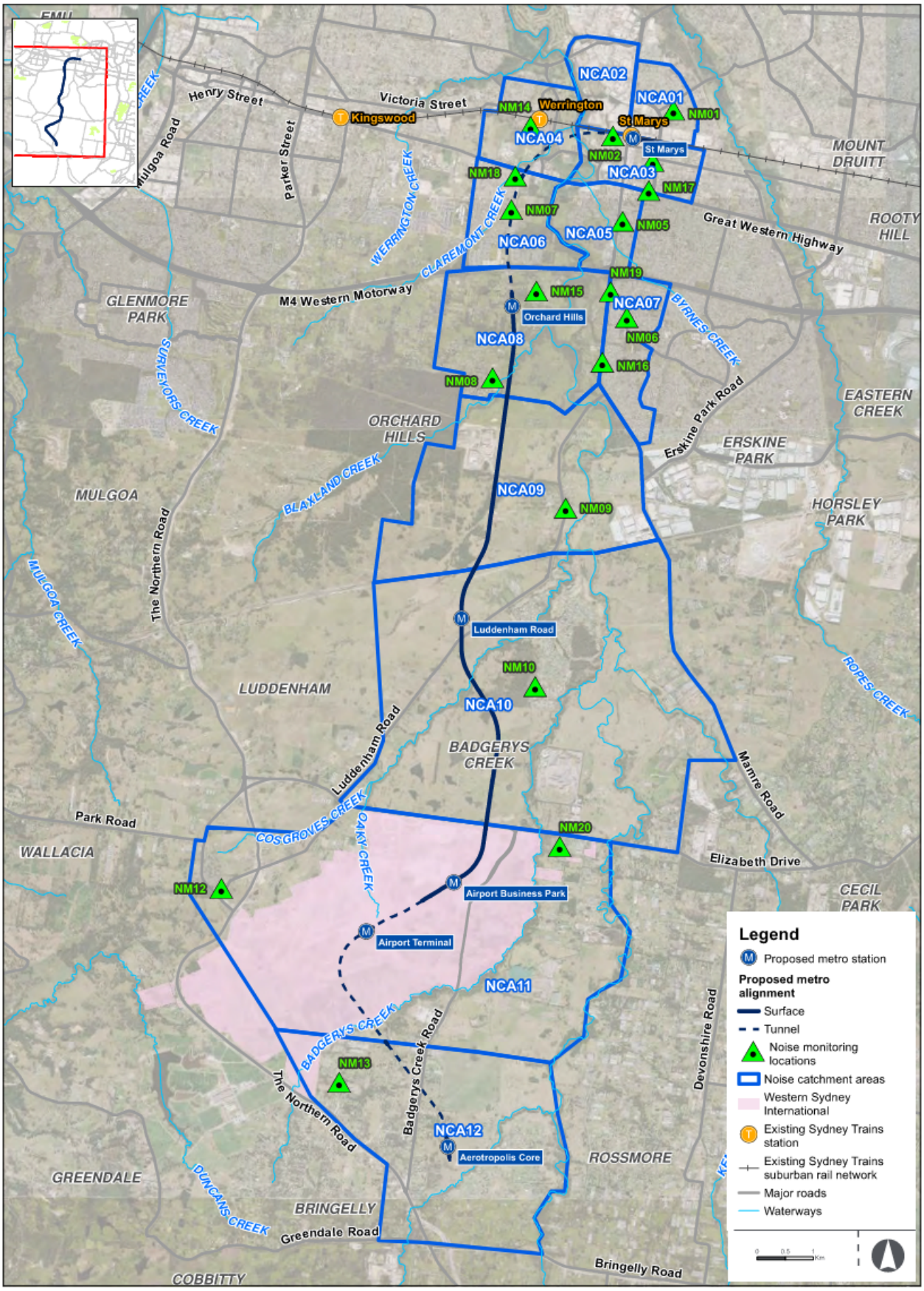


Figure 1: Baseline noise monitoring locations

5. Monitoring

The Monitoring Program has been developed as the key measurement tool to compare actual performance of the SCAW against the predicted performance the EIS and DNVIS's. The Monitoring Program is specific with measurable outcomes and time-based.

5.1 Noise monitoring

5.1.1 Attended airborne noise monitoring

The following attended noise monitoring will be undertaken:

- Within 1 week of the commencement of activities where noise monitoring is required in accordance with a DNVIS at sensitive receiver locations that are considered relevant based on the current construction works to determine the effectiveness of mitigation measures and compliance with predicted impacts;
- At the start of high noise and vibration activities (such as piling, rock-breaking, vibratory rolling and concrete sawing) when required as per a DNVIS, within nominated safe working distances or within 150m of sensitive receivers,
- Where a noise related complaint is received (determined on a case by case basis),
- Ongoing spot checks of noise intensive plant and equipment when identified during inspection as not operating optimally or involved in activities where noise monitoring is required as a mitigation measure in accordance with a DNVIS,
- As required by the EPL;
- If requested by an authorized officer of the EPA;

5.1.2 Unattended airborne noise monitoring

In accordance with Condition C15(d) the process to undertake real-time (unattended) noise monitoring will be as required by a DNVIS. Real-time noise monitoring would be used as a backup for attended noise monitoring. In accordance with the ICNG the duration and amount of noise monitoring will depend on the scale of the construction activities and extent of expected noise impacts. Noise monitoring will cover a representative period of the particular construction activity.

If unattended noise monitors (with the ability to provide levels in real time) are used, they will be installed by a suitably qualified person. Monitoring will also be undertaken by a suitably qualified person who is appropriately trained in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures. Refer to Section 9.1 of the Noise and Vibration Management Sub-plan for further detail regarding the project noise and vibration specialist.

Outside of monitoring required by a DNVIS, unattended real-time monitoring will be utilised as a management tool on an as needs basis to identify trends and confirm site conditions. For this reason, unattended real-time monitoring not undertaken as required by a DNVIS is not included in the noise monitoring reporting outlined in Section 7.2.

5.1.3 Noise monitoring locations

Noise monitoring locations during construction will be identified on a case by case basis and will likely vary throughout the construction period as monitoring is undertaken in accordance with Section 5.1.1. Where possible noise monitoring locations will be selected as per the *Interim Construction Noise Guidelines,* as detailed below.

When conducting noise monitoring, monitoring would be conducted at:

- a height of 1.5m above ground level;
- the affected receiver(s) property boundary most exposed to construction noise (If the property boundary is more than 30m from the residence, the location for monitoring should be at the most noise-affected point within 30m of the residence); or
- if more than one affected receiver has been identified, at the nearest affected receiver; or
- where the nearest affected receiver refuses noise monitoring on their property, at the near point to that receiver within the site boundary.
- If it can be demonstrated that direct measurement of noise from the construction site is impractical, alternative means of determining construction noise levels may be adopted in accordance with Chapter 7 of the Noise Policy for Industry.

5.1.4 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.

Acoustic instrumentation employed in the noise monitoring surveys will comply with the requirements of AS1259.2-1990 Acoustics – Sound Level Meters, Part 2: Integrating – Averaging and carry appropriate NATA (or manufacturer) calibration certificates.

A summary of all noise monitoring to be undertaken and the methodology is provided in Table 6.

5.1.5 Plant noise auditing

Plant or equipment operating on the Project shall have an operating SWL which is no higher than the corresponding SWL presented in Table 13 of the CNVS unless otherwise justified. Items of plant will have noise audits conducted to determine compliance with the operating SWL identified in the CNVS where:

- Identified during inspection to not be operating in optimal condition,
- Where associated with a daytime activity identified in a DNVIS to require noise monitoring as a mitigation measure in accordance with the CNVS,
- During OOHW where an exceedance of DNVIS predicted values is identified and deemed attributable to the works being monitored, or
- As a result of a complaint.

Monitoring will be undertaken in accordance with the following standards:

- Measurements of Sound Pressure Level (SPL) at 7 m (with plant or equipment stationary) shall be undertaken using procedures that are consistent with the requirements of Australian Standard AS2012–1990 Acoustics – Measurement of Airborne Noise Emitted by Earthmoving Machinery and Agricultural Tractors – Stationary Test Condition Part 1: Determination of Compliance with Limits for Exterior Noise.
- Measurements of SWL shall be determined using procedures that are consistent with the requirements of International Standard ISO 9614-2 1996 Acoustics – Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scanning.
- If measuring the SPL at 7m of moving plant, compliance measurements would be guided by the requirements of Australian Standard AS2012–1977 Method for Measurement of Airborne Noise from Agricultural Tractors and Earthmoving Machinery.

For all measurements, the plant or equipment under test would be measured while operating under typical operating conditions. If this is not practical, it may be appropriate to conduct a stationary test at high idle. In the case of an exceedance in SWL the item of plant would either be replaced, or the advice of the noise and vibration specialist would be sought to provide suitable mitigation measures, which may include:

- Undertaking appropriate maintenance
- implementing additional or upgrading existing muffling devices
- building enclosures around items of stationary plant (e.g. pumps or generators).

A register of measured sound power levels for each item of plant would be kept for reference where future noise audits are conducted. The register would be reviewed annually in conjunction with the CNVS and corresponding revisions made to the SWL will be made where applicable presented to represent contemporary plant noise emission levels.

5.1.6 Ground-borne noise monitoring

As identified in the EIS, the application of standard mitigation measures provided in Section 8 of the Noise and Vibration Management Sub-plan for the control of airborne noise emissions and vibration is expected to adequately manage ground-borne noise impacts. It is not anticipated that ground-borne NMLs would be exceeded. Ground-borne noise monitoring will be undertaken as required by a DNVIS where an exceedance of the NML detailed in Section 6.2 of the Noise and Vibration Management Sub-plan is identified.

5.2 Vibration monitoring

5.2.1 Attended vibration monitoring

The following attended vibration monitoring will be undertaken:

- At the commencement of operation for each plant or activity which:
    - has the potential to generate significant vibration levels and vibration trigger value (PPV) criteria are likely to be exceeded (i.e., works are within the nominated safe working distances outlined in the CNVMP),
    - as determined by a vibration assessment.
- For the protection of buildings, monitoring will be carried out at the commencement of vibratory compaction work and any rock-breaking within the nominated safe working distances specified in Table 19 of the Noise and Vibration Management Sub-plan to confirm safe working distances
- Vibration monitoring may be carried out in response to a complaint an exceedance, or for the purpose of refining construction methods or techniques to minimise vibration impacts
- Vibration monitoring will continue throughout construction, where appropriate, at nominated sensitive receiver locations identified within the minimum working distances to prevent cosmetic damage;
- As required by a DNVIS and/or the EPL;
- As required by the CNVS (AMM);
- As requested by an authorised officer of the EPA;
- Prior to and during construction for high risk[2] construction activities that has the potential to impact on the Warragamba to Prospect Water Supply Pipeline (in accordance with a DNVIS)
- At the commencement to confirm vibration limits to prevent cosmetic damage and during vibration generating activities that has the potential to impact the following heritage items:
    - McGarvie Smith Farm
    - McMaster Farm

Where the SCAW Project interacts with the Warragamba to Prospect Water Supply Pipelines and in accordance with Condition E121 and REMM HR4, CPBUI will consult with WaterNSW regarding agreement on vibration velocity limits, and ensure that proposed construction methodology is consistent with the WaterNSW Guideline to avoid the potential for vibration impacts upon the Warragamba to Prospect Water Supply Pipeline. In accordance with REMM NV2 a DNVIS would be prepared in accordance with the WaterNSW Guideline to assess the potential impacts associated with SCAW works.

Where vibration is found to exceed safe levels, impacts will be avoided 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 would be undertaken and an interim building condition survey prepared.

Vibration monitoring would be undertaken in accordance with the relevant measurement requirements in the applicable standard (refer to Section 3.3 of the Noise and Vibration Management Sub-plan) and as follows:

- Human comfort - Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- Property damage - British Standard 7385: Part 2-1993 'Evaluation and measurement of vibration in buildings Part 2 (BSI, 1993)
- German Standard DIN 4150 (Heritage sensitive receivers).

5.2.2 Unattended vibration monitoring

[2] High risk construction activities defined as the use of vibration intensive plant (refer to Table 19 of the Noise and Vibration Management Sub-plan) within the prescribed safe working distance (as identified in a DNVIS)

Longer-term unattended monitoring in real time may be conducted in the following situations:

- where there is a requirement to work within safe working distances for a longer period of time, and/or
- where attended monitoring has demonstrated that there is a reasonable risk of exceeding the established vibration criteria at sensitive receivers or structures.

Minimum working distances and vibration criteria is identified in Section 6.4 of the Noise and Vibration Management Sub-plan. Vibration monitoring will be carried out in accordance with:

- For structural damage vibration – German Standard DIN 4150 and BS 7385: Part 2 – 1993
- For human exposure to vibration – the evaluation criteria presented in the Environmental Noise Management Assessing Vibration: A Technical Guideline (DECC 2006).

Monitoring would be automated, and the monitor would have the capability to send alerts or include audible or visual alarms.

Advice from a heritage specialist will be sought on methods and locations for installing equipment used for vibration monitoring at heritage-listed structures. All heritage items are included in the Site Environmental Plan/s and will be identified in the DNVIS (if required), with the relevant vibration triggers appointed to that location/structure so that potential exceedances can be clearly identified and addressed prior to works commencing.

5.3 Pre and Post Construction Surveys

Pre-construction surveys will be completed by a suitably qualified and experienced engineer and/or building survey of surface and subsurface structures that are identified at risk from vibration in accordance with Condition E84 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. Copies of Pre-construction Condition Survey Reports will be provided to the owner of the structures/assets surveyed no later than one month prior to the commencement 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 survey of the structure / asset in accordance with Condition E85. 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 three months following the completion of construction activities that have the potential to impact on the structure / asset.

5.4 Warragamba to Prospect Water Supply Pipeline

In accordance with REMM NAH8, a dilapidation survey of the Warragamba to Prospect Water Supply Pipelines would be undertaken prior to construction commencing in the vicinity of this item. In accordance with Condition E121 and REMM HR4, CPBUI will consult with WaterNSW where SCAW interacts with the Warragamba to Prospect Water Supply Pipeline to ensure that design and construction methodology is consistent with *Guidelines for Development Adjacent to the Upper Canal and Warragamba Pipelines.*

Table 6 – Noise and Vibration Monitoring Summary

Monitoring details	Record	Frequency	Responsibility	Test procedures/ Methods
Inspections				
Inspection of works to ensure that noise and vibration mitigation measures are being implemented on site.	Environmental Inspection Checklist	Weekly	Environment Manager	Nil
Attended noise monitoring				
Attended noise monitoring	Noise Monitoring Record	As defined in Section 5.1.1	Environment Manager	If monitoring cannot be undertaken at the nearest relevant sensitive receiver, a suitable representative location will be selected. The testing method includes: ▪ Sound Level Meter set to "Fast" time weighting and "A" frequency weighting. ▪ Test environment free from reflecting objects where possible. Where noise monitoring is conducted within 3.5metres of large walls or a building facade, then a reflection correction of up to -2.5dB(A) will be applied to remove of increased noise due to sound reflections. ▪ Tests will not be carried out during rain or when wind speed > 5m/s. ▪ Conditions such as wind velocity and direction, temperature, relative humidity and cloud cover will be recorded from the nearest Bureau of Meteorology station or on-site weather station/observations.
Where verification is required in accordance with CNVS	Noise Monitoring Record		Environment Manager	
Where complaint is received and monitoring is considered an appropriate response to determine if noise levels exceed predicted construction noise levels documented in this Noise and Vibration Management Sub-plan.	Noise Monitoring Record		Environment Manager	

Monitoring details	Record	Frequency	Responsibility	Test procedures/ Methods
If requested by an authorised officer of the EPA				▪ The monitoring period should be sufficient such that measured noise levels are representative of noise over a 15-minute period. ▪ At a minimum Leq, Lmax, L10 and L90 levels will be reported. The observations of the person undertaking the measurements will be reported including audibility of construction noise, other noise in the environment and any discernible construction activities contributing to the noise at the receiver.
Spot checks of noise intensive plant where it is required to check noise emission against manufacturer's specifications.	Noise Monitoring Record	As defined in Section 5.1.4.	Environment Manager	Stationary test procedures according to AS 2012.1 Acoustics – Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors – Stationary test condition (superseded by AS ISO 6393:2019 Earth-moving machinery- Determination of sound power level- Stationary test conditions). The testing method includes: ▪ 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 wind speed exceeds 5m/s. In accordance with AS 2012.1 / AS ISO 6393:2019, a minimum of three (3) measurement points will be defined at locations on the hemispherical surface around the plant with the radius determined by the basic length of the machine. ▪ The A-weighted Leq background noise at the measurement locations will be at least 6 dB
Spot checks for worst-case noise impact scenarios or when new predicted high noise impact activities commence	Noise Monitoring Record	As defined in Section 5.1.1	Environment Manager	
Where required for the purposes of refining construction methods or techniques to reduce noise levels.	Noise Monitoring Record	As required	Environment Manager	

Monitoring details	Record	Frequency	Responsibility	Test procedures/ Methods
				and preferably 10 dB below the level with the plant operating. Both L_{eq} and L_{10} levels will be measured and reported.
Attended and unattended vibration monitoring				
At start of vibratory work or rock-breaking within the nominated safe working distances	Vibration Monitoring Record	As required	Environment Manager	Attended vibration monitoring will be undertaken when checking the safe working distances from construction plant (e.g. compaction plant) or in response to a complaint. Attended monitoring includes: ▪ Monitoring to be conducted at a representative distance for the nearest sensitive structures and/or receivers to obtain a suitable representation of the range of vibration levels expected to be experienced at that receiver as a result of the works. ▪ 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. Continuous vibration monitoring will be undertaken when there is a requirement to work within safe working distances for a longer period of time (>1 day) and attended monitoring has demonstrated that there is a reasonable risk of exceeding the
Where verification is required in accordance with CNVS and mitigation measures in Section 8.	Vibration Monitoring Record	As required	Environment Manager	
Where a complaint is received and monitoring is considered an appropriate response. If requested by an authorised officer of the EPA	Vibration Monitoring Record	As required	Environment Manager	
Prior to and during construction for high risk[3] construction activities that has the potential to impact on the Warragamba to Prospect Water Supply Pipeline (in accordance with a DNVIS)	Vibration Monitoring Record	As required	Environment Manager	
At the commencement to confirm vibration limits to prevent cosmetic damage and during vibration generating activities that has the potential to impact the following heritage items: o McGarvie Smith Farm	Vibration Monitoring Record	As required	Environment Manager	

[3] High risk construction activities defined as the use of vibration intensive plant (refer to Table 19 of the Noise and Vibration Management Sub-plan) within the prescribed safe working distance (as identified in a DNVIS)

Monitoring details	Record	Frequency	Responsibility	Test procedures/ Methods
○ McMaster Farm				nominated vibration criteria at sensitive receivers or structures. Continuous monitoring include(s): ▪ Vibration logger to continuously measure vibration while 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 including one or both of an audible and/or visual warning alarm, and/or SMS and/or email alerts to site staff. Peak (PPV) vibration levels and the dominant frequency of the vibration will be recorded for assessment against the structural and cosmetic damage criteria. In situations in which human comfort is also of concern then the rms vibration level should also be recorded.
Dilapidation surveys of buildings and structures where construction works occurs within the safe working distance for cosmetic damage. At a minimum, this will include all buildings where buffer distances will be less than those identified in Section 6.4.5 of the Noise and Vibration Management Sub-plan in areas where vibratory compaction and/or rock-breaking will occur.	Dilapidation Survey Report	As required	Environment Manager	At a minimum, dilapidation surveys and reports will comprise: ▪ Inspector's qualifications and expertise ▪ 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 report outlining condition of internal and external components of each property. ▪ A series of photographs of each identified defect/crack.

Monitoring details	Record	Frequency	Responsibility	Test procedures/ Methods
				▪ A sketched floor plan showing exact locations of 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)

6. Adaptive management

The following procedure would be applied in the event that additional mitigation measures are required in accordance with the CNVS, where monitoring indicates noise and/or vibration levels in excess of noise and vibration criteria.

Should noise and vibration monitoring results directly attributable to SCAW activities be found to exceed the predicted worst-case levels (i.e. an exceedance of more than 3 dB) or the nominated vibration criteria, the following steps will be undertaken:

1. Analysis of the results by the CPBUI Environmental Coordinator/Advisor in more detail with a view of determining possible causes for the exceedance
2. Site inspection by the CPBUI Environmental Coordinator/Advisor
3. Advising relevant personnel of the problem
4. Identifying and agreeing on actions and/or additional mitigation measures to resolve or mitigate the exceedance (At a minimum, the noise mitigation measures detailed in Section 8 of the Noise and Vibration Management Sub-plan for the measured exceedance of the relevant NML will be applied)
5. Implementing actions to rectify or mitigate the exceedance, including stop work arrangements where necessary or if directed by the ER
6. Monitoring to review the performance of any specific mitigation measures, if required.

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.

CPBUI will verify and document the effectiveness of any management measures or preventative / corrective actions implemented to avoid further exceedances.

The timing for any improvement will be agreed between the relevant CPBUI Project Engineer/Superintendent, CPBUI Environment Manager (or delegate) and Sydney Metro Project Manager and/or ER based on the level of risk or risk of reoccurrence of the exceedance (e.g. a significant risk will require immediate action).

6.1 Verification monitoring

Where a DNVIS is triggered (refer to Section 7.3.2 of the Noise and Vibration Management Sub-plan), the noise assessment will use a noise prediction tool. As detailed in Section 7.3.2 of the Noise and Vibration Management Sub-plan the DNVIS will incorporate a quantitative prediction of the noise level and extent of noise impact that activities will have on potentially affected sensitive receivers, based on inputs including location, and the types and number of construction machinery operating at any one time.

Verification of the prediction tool used to undertake these noise assessments (during the preparation of DNVISs) will occur throughout construction via monitoring. Noise and vibration monitoring data will be collected in accordance with this Monitoring Program and compared to the outcomes of the noise prediction tool (in cases where model descriptors, such as plant numbers, type and proximity, have been accurately met during the model). Where there are notable inconsistencies between noise model/tool predictions and monitoring results, further investigation will be undertaken to understand the cause. This may include additional site specific background monitoring and plant noise output spot checks.

7. Compliance Management

7.1 Monitoring Records

The following information will be recorded for each monitoring event:

- Date and time of measurement
- Name of person taking the measurement
- Type and model of instrument/equipment
- Sample times, measurement time intervals and time of day
- Map illustrating the measurement location, source location and sensitive receivers
- Operation and load conditions of plant
- Measured noise parameters including Leq, Lmax, L10 and L90

- An estimate of the SCAW noise contribution versus other sources.

These results would then be evaluated in comparison to relevant predictions and criteria. The data along with the information recorded about each event (time, weather, type of work etc.).

In accordance with the CEMF, records of noise and vibration monitoring results against appropriate NMLs and vibration criteria will be recorded and kept. Records will be made available to Sydney Metro and the ER and will also be made available to the EPA and the Planning Secretary upon request.

Refer to Element 6 of the CEMP for information relating to complaints management and records.

7.2 Reporting

During Construction monitoring reports will be submitted to the Planning Secretary, ER and relevant authorities or regulatory agencies (nominally EPA or WaterNSW in accordance with REMM NV2).

Reporting requirements and submission timeframes associated with this Monitoring Program for the construction phase are presented in Table 7 below.

Table 7 – Reporting requirements

Report	Requirements	Recipient	Timing
Monthly Progress Report	Information to be detailed in the reports include: ▪ Results summary and analysis of environmental monitoring conducted in accordance with this Program.	Sydney Metro ER	Monthly
6-Monthly Construction Monitoring Report	Information to be detailed in the report 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 ▪ Tabulations of monitoring data ▪ Compliance monitoring results with the noise and vibration criteria as identified in the Noise and Vibration Management Sub-plan ▪ Identification of exceedances of the nominated criteria and descriptions of the causes of these exceedances ▪ Summary of any complaints received regarding noise and vibration. ▪ Details of any alteration to the monitoring program.	Planning Secretary ER Water NSW (where applicable in accordance with REMM NV2) EPA	Within 60 days of the end of the 6 – monthly reporting period.

7.3 Non-conformances and exceedances

In the event that an exceedance of the predicted noise and/or vibration criteria in a DNVIS or CNVS attributed to SCAW activities is identified, CPBUI will implement the adaptive management procedure outlined in Section 6 of this Monitoring Program.

Following the implementation of the Adaptive Management procedure if exceedances continue to be identified the exceedance will be classified in accordance with the Sydney Metro Environmental Incident Classification and Reporting Procedure and reported in accordance with Element 9 of the CEMP.

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 Condition A41 and A42.

Details of exceedances not classified as incidents will be provided in the Monthly Environmental Reports and Six-monthly Construction Monitoring Reports.

Appendix C4 – Records of Consultation

CPB CONTRACTORS | UNITED INFRASTRUCTURE

Meeting Minutes – SCAW Liverpool City Council CEMP Consultation

Location	Microsoft Teams	Project	Surface and Civil Alignment Works (SCAW)
Chair	[redacted]		
Date			
Attendees			

Item	Meeting notes	Actions
Acknowledgment of Country	Acknowledged that the SCAW Project will be undertaken on the traditional lands of the Cabrogal People of the Dhurag Nation.	Nil
CPBUI overview	**CPB Contractors:** Australasian construction company of the CIMIC Group. Launched in January 2016 following the merger of the CIMIC Group construction businesses of Leighton Contractors and Thiess Construction **United Infrastructure:** A joint venture between Western Sydney Contractors Burton Contractors, JK Williams and Mulgoa Quarries **Recent Projects in Western Sydney** • Western Sydney Airport (Early Earthworks, Bulk Earthworks, Airside Pavements) • The Northern Road Stage 5 &6 • SUEZ Kemps Creek	Nil
SCAW project overview	• The Project forms part of the broader Sydney Metro network. It involves the construction and operation of a 23km new metro rail line that extends from the	Nil

Item	Meeting notes	Actions

	existing Sydney Trains suburban T1 Western Line (at St Marys) in the north and the Aerotropolis (at Bringelly) in the south. The alignment includes a combination of tunnels and civil structures, including viaduct, bridges, surface and open-cut troughs between the two tunnel sections.
	• The scope for the SCAW package includes approximately 10.6km of alignment up to the underside of track formation from Orchard Hills to the Western Sydney International (WSI) airport. This includes approximately:
	  • 3.6 kilometre of viaduct
	  • 205 metres of bridges
	  • 6.9km of at-grade alignment
	  • Temporary and permanent access roads
	• Key Major Project Interfaces are:
	  • Station Box and Tunnels (SBT) at Orchard Hills and WSI airport
	  • M12 Motorway at Elizabeth Drive
	  • WSI airport (on Commonwealth land)	

Planning approvals/ CEMP	• **Project Approvals**
	  • SSI 10051 approved by the Minister for Planning and Public Spaces on 23 July 2021
	  • EPBC Approval 2020/8687 by the Minister of Environment on 3 June 2021
	  • CPBUI Awarded project by Sydney Metro on 1 March 2022
	  • Staging Report (current revision 6)
	• **CEMP**
	  • Two staged approach
	• **Preparatory Works CEMP (commence in August 2022)**
	  • establishment of ancillary facilities for the stabling and maintenance facility (SMF) compound and the off-airport construction corridor compound at Elizabeth Drive
	  • temporary access road construction
		Nil

Item	Meeting notes	Actions
	• delivery of materials and equipment to site • stockpiling of imported material (sandstone) • **Main Excavation and Viaduct Works CEMP (commence in October 2022)** • viaducts and bridges construction • works within riparian zones • bulk excavation	
Overview of project risks to be managed on the SCAW Project:	○ **Erosion and sediment control** ○ Blaxland, Unnamed and Cosgroves Creek crossings ○ Viaduct crossings limit disturbance footprint ○ Water reuse strategy to reuse sediment basin water with construction – successful management on TNR 5&6 ○ **Dust** ○ Stockpiling activities ○ Successful management of bulk import of material on SM-WSA project ○ **Waste management** ○ Strategy to retain all onsite ○ **Traffic** ○ Cumulative impacts of traffic with other projects ○ **OOHW (viaduct crossing over roads)** ○ Key areas of proposed OOHW ○ Viaduct over Patons Lane (nearest sensitive receivers > 500m) ○ Viaduct over Luddenham Road (nearest sensitive receivers > 500m) ○ Bridge over the M12 (project safety considerations) (nearest sensitive receivers > 500m) ○ Bridge over Elizabeth Drive (nearest sensitive receivers > 500m)	Nil

Item	Meeting notes	Actions
CEMP Sub-plans and Monitoring Programs	**Details of CoA C5/C13: CEMP Sub-plans required to be prepared in consultation with Relevant Councils** ○ **Noise and Vibration** ○ Noise and Vibration Monitoring Plan (C13) ○ **Flora and Fauna** ○ **Soil and Water** ○ Surface water quality monitoring program (C13) ○ **Non-Aboriginal Heritage** ○ **Air quality monitoring program (C13)**	Nil
Consultation Questions Raised by Council	*1: Site Establishment Management Plan (Condition A18 and A22 including information as to how performance outcomes under Condition A1 are achieved)* **S. Williams (CPBUI)** – a site establishment management plan is not proposed to be used as part of the SCAW scope. The Preparatory CEMP will cover aspects of site establishment of compounds at Patons Lane and Elizabeth Drive. Other compounds would be established under the main CEMP	Nil
	2: If the proposal is to be staged, details as to how the staging is proposed (Condition A35) **S. Williams (CPBUI)** – A staging report prepared by Sydney Metro and provided to DPE. Is publicly available **T. Solomon (SM)** – Staging report is prepared and structured to address the Staging Report requirements of SSI 10051 conditions A10 to A16 and outlines how each of the packages (Advanced Enabling Works, SBT, SCAW and SSTOM) will be constructed. The SM-WSA Staging Report is publicly available on the Sydney Metro Document Library: https://www.sydneymetro.info/sites/default/files/2022-03/SMWSA-Staging-Report.pdf	Nil
	3. Construction Environmental Management Plan (Condition C5 a – Noise and Vibration, b – Flora and Fauna, c – Soil and Water, d – Non-aboriginal heritage) **S. Williams (CPBUI)** – note that these have all been provided for reference to LCC	Nil
	4. Construction Monitoring Programs (Condition C13 a – Noise and Vibration, b – Surface Water Quality and d – Air Quality)	Nil

Item	Meeting notes	Actions
	S. Williams (CPBUI) – note that these have all been provided within their relevant sub-plans for reference to LCC	
	5. OEMP – Flood Emergency Management Plan (Condition D3) **S. Williams (CPBUI)** – these are for operation of the SM-WSA project and not applicable to the scope of works for SCAW being undertaken by CPBUI. These would be prepared at a later date by others	Nil
	6. Reuse of timber (Condition E12) **S. Williams (CPBUI)** – the SCAW project will aim to reuse timer where ever practical within the project footprint to allow for fauna crossings. If required during construction, the CPBUI team would reach out to Councils and other agencies if other beneficial reuse options are required	Nil
	7. Critical State Significant Infrastructure flood impact management (Condition E17) **S. Williams (CPBUI) –** this condition is subject to detailed design and consultation with LCC would be undertaken at a later date if/when required by this condition.	Nil
	8. Noise mitigation - Operational Noise and Vibration Mitigation Measures, including both an Operational Noise and Vibration Review and provision of information relating to the design of noise barriers (Condition E58) **S. Williams (CPBUI) –** these are for operation of the SM-WSA project and not applicable to the scope of works for SCAW being undertaken by CPBUI. These would be prepared at a later date by others	Nil
	9. Place, Urban Design and Corridor Landscape Plan (PUDCLP) **J. Ross (CPBUI) –** Consultation is still being set up as the design progresses for the PUDCLP	Nil
	10. Detailed Site Investigation Report(s), Remediation Action Plan(s), Validation Report(s), Site Audit Statement(s) (Condition E97) **S. Williams (CPBUI)** – any consultation regarding this condition would be limited to providing Site Audit Statement if contamination is identified on land within the LCC LGA.	Nil at this stage.
Any other questions	**S. Tuntevski (LCC)** – who is the appropriate regulatory authorities for issues if Council or the community want to raise them during the project.	Nil

Item	Meeting notes	Actions
	S. Williams (CPBUI) – depending on the type of compliant and the location it will differ. NSW EPA will regulate all works on state jurisdiction for pollution complaints under an EPL. The Department of Planning and Environment (DPE) are also the regulatory authority for the CSSI. On-Airport the regulator will be the Airport Environment Officer (AEO) under the *Airports (Environment Protection) Regulations 1997* Site compounds will be set up with appropriate hording and details of the SCAW project with a 1800 number for community to make complaints/enquiries.	
	S. Qu (LCC) – will the SCAW project cover station fitouts and work around Bringelly and the Aerotropolis? **S. Williams (CPBUI)** – no these scopes would be covered in the SBT and SSTOM contracts	Nil

Agency	Document	Reviewer Initials	Plan Section	Comment / Feedback
WaterNSW	*Noise & Vibration Management Sub-plan*	JC	7.4.3	**WaterNSW Guidelines for Development** Please note that a more current version of the WaterNSW Guideline is available for design and construction purposes (WaterNSW, September 2021). This section references the older version, dated 2020. WaterNSW requests that the most current version of the Guideline be utilised (see below link) https://www.waternsw.com.au/__data/assets/pdf_file/0011/55973/Guideline-for-development-adjacent-to-the-Upper-Canal-and-Warragamba-Pipelines-2021.pdf
				CPBUI response: CPBUI acknowledges that the most current version of the Guideline is 2022. However, for the purposes of the Noise and Vibration Management Sub-plan, the 2020 version of the guideline is referenced in accordance with Condition A8, as it is the applicable guideline as at the date of the Planning Approval and as it is specifically referenced in the EIS (REMM NV2). The Noise and Vibration Management Sub-plan provides that a separate assessment, being the DNVIS, will set construction methodology, confirm velocity limits and manage impacts specific to the pipeline in consultation with Water NSW in which the most current version of the Guideline will be considered.
WaterNSW	*Noise & Vibration Management Sub-plan*	JT	7.4.3	**Table 18 – Guideline values for vibration velocity to be used when evaluating the effects of vibration on buried pipework** *In lieu of specific vibration criteria being provided by the asset owner, screening criteria would be adopted from guidance provided in DIN 4150-3 for buried pipework. The screening criteria is outlined in Table 18.* Table 18 references buried pipework. This does not apply to the Warragamba Pipelines. The document should be amended to state that this table or requirement does not relate to the Warragamba Pipelines.

Agency	Document	Reviewer Initials	Plan Section	Comment / Feedback
				CPBUI have amended the Noise and Vibration Management Sub-plan to provide a reference excluding the Warragamba to Prospect Water Supply Pipeline from the provisions of Table 18 for clarity.
WaterNSW	*Noise & Vibration Management Sub-plan*	JT	7.4.4 Note: Now Section 7.2.2	**High vibration levels over shorter periods** WaterNSW do not look favourably on allowing higher vibration levels over shorter periods. WaterNSW request that this section be amended or that WaterNSW's position be noted and in the separate assessment and plan of management for construction works adjacent to the pipelines (in relation to the construction methodology in accordance with Condition E121), that high vibration levels over shorter periods not be allowed.
				CPBUI acknowledge WaterNSW's position, and reiterate that the Noise and Vibration Management Sub-plan provides that a separate assessment being the DNVIS, as required under E121, will set construction methodology, confirm velocity limits and manage impacts specific to the pipeline and in accordance with the Guideline, in consultation with Water NSW and this is where WaterNSW's position will be formalised. Furthermore, Element 4 further confirms that the Noise and Vibration Management Sub-plan has addressed, and CPBUI will implement Condition E121 and REMM NV2.
WaterNSW	*Noise & Vibration Management Sub-plan*	JC	8.4.2	**Re allowable construction distances to the pipelines** The first sentence is incorrect, as it relates to the WaterNSW Warragamba Pipelines. Viaduct support structures may not be constructed within 6m of the WaterNSW Pipelines, anchor blocks and supports. WaterNSW requests that the sentence be revised. While also being explicit that it relates to the WaterNSW Warragamba Pipelines and not any pipeline.
				CPBUI have revised the Noise and Vibration Management Sub-plan (now Section 7.2.2.1) to ensure consistency with the Water NSW Interface Agreement. The Sub-plan now reads '*Viaduct support structures may not be constructed within approximately 6 metres from the pipelines.'*