Appendix B3

Noise and Vibration Management Sub-Plan

Parramatta Light Rail – Stage 1

Package 2: Westmead Precinct Works

PLR-HAC-HRW-NV-PLN-000001: Revision 7

February 2020

NSW GOVERNMENT

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Contents

Appendices

Document control

Approval and certification

Title	Parramatta Light Rail – Stage 1, Package 2 Construction Noise and Vibration Management Sub - Plan
Endorsed by Environment Representative	[redacted]
Signed	
Dated	
Approved on behalf of Transport for NSW by	[redacted]
Signed	
Dated	
Approved on behalf Ford Civil Contracting (Activity A: Hawkesbury Road Widening Works) by	[redacted]
Signed	
Dated	
Approved on behalf Renascent (Activity B: Cumberland Hospital (East Campus) Demolition) by	[redacted]
Signed	
Dated	

Approved on behalf of Donnelley Construction (Activity C: Cumberland Hospital (West Campus) Demolition) by	[redacted]
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Version control

Revision	Date	Description	Approval
0	March 2019	DPIE to review	ER endorsement provided for Activity A on 26 March 2019
1	May 2019	Updated to DPIE comments	
2	July 2019	Updated to DPIE comments	
2.1	July 2019	Updated to ER comments to Rev 2	ER endorsement for Activity A provided 23 July 2019
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5	November 2019	Issued to DPIE	
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Distribution of controlled copies

This CNVMP as part of the CEMP is available to all personnel and sub-contractors via the Project document control management system. An electronic copy can be found on the Project website.

The document is uncontrolled when printed. One controlled hard copy of the CNVMP as part of the CEMP and supporting documentation will be maintained by the Quality Manager at the Project office and on the Project website.

Copy number	Issued to	Version

Glossary/Abbreviations

Abbreviations	Expanded Text
AA	Acoustics Advisor
Activity A	Parramatta Light Rail – Stage 1, Package 2, Activity A: Hawkesbury Road Widening Works Contractor for Activity A works is Ford Civil Contracting (FCC).
Activity B	Parramatta Light Rail – Stage 1, Package 2, Activity B: Cumberland Hospital (East Campus) Demolition Contractor for Activity B works is Renascent.
Activity C	Parramatta Light Rail – Stage 1, Package 2, Activity C: Cumberland Hospital (West Campus) Demolition Contractor for Activity C works is Donnelley Constructions.
AltA	Alternative Accommodation
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Annoying Activities	Referred to as Special Audible Characteristics in the Transport for NSW Construction Noise and Vibration Strategy
Attenuation	The reduction in the level of sound or vibration.
AVTG	NSW Assessing Vibration – a technical guideline
CASB	Westmead Clinical Acute Services Building
CBD	Central Business District
CCMP	Construction Compound Management Plan
CEMP	Construction Environmental Management Plan
CMRI	Children's Medical Research Institute
CNS	Transport for NSW Construction Noise Strategy (superseded by CNVS)
CNVMP	Construction Noise and Vibration Management Sub-Plan
CNVIS	Construction Noise and Vibration Impact Statement
CNVS	Construction Noise and Vibration Strategy
CoA	Condition of Approval
Contractor, The	The company engaged to undertake the Project work. Activity A: Ford Civil Contracting Pty Ltd

Abbreviations	Expanded Text
	Activity B: Renascent Australia Pty Ltd Activity C: Donnelley Constructions Pty Ltd
CoPC	City of Parramatta Council
CSSI	Critical State Significant Infrastructure
dBA	Decibels using the A-weighted scale measured according to the frequency response of the human ear.
DPE	NSW Department of Planning and Environment Where reference in the planning approval/ this document and consultation has been made to DPE it should be noted that it has been abolished from 1 July 2019. References made to the Department of Planning and Environment is construed as a reference to the Department of Planning, Industry and Environment (DPIE).
DPIE	NSW Department of Planning, Industry and Environment
Donnelley Construction	Donnelley Construction Pty Ltd (Contractor for Activity C)
'Eat' Street	The section of Church Street between Palmer and George Streets [in Parramatta]
ECM	Environmental Control Map
ECRTN	NSW Environmental Criteria for Road Traffic Noise
ED	Emergency Driveway
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMS	Environmental management system
Emergency Works	Defined in the OOHW protocol as follows: • An emergency (i.e. an unforeseen occurrence; a sudden and urgent occasion for action); and • Required to avoid injury, loss of life, damage or loss of property or prevent environmental harm
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment.
Environmental impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects.

Abbreviations	Expanded Text
Environmental objective	Defined by AS/NZS ISO 14001:2015 as an overall environmental goal, consistent with the environmental policy, that an organisation sets itself to achieve.
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	NSW Environment Protection Authority
EPL	Environmental Protection Licence under the POEO Act
EPO	Environmental Performance Outcome
ER	Environmental Representative
ERG	Environmental Review Group
ECM	Environmental Control Map
FCC	Ford Civil Contracting (Contractor for Activity A)
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
GHFF	Grey-headed Flying fox
HAC	Health Administration Corporation
Highly Noise Intensive Works	Rock breaking, rock hammering, sheet piling, pile driving and any similar activity. Referred to as Special Audible Characteristics in the Transport for NSW Construction Noise and Vibration Strategy
IB	Individual Briefings
ICNG	NSW Interim Construction Noise Guideline
ICPMR	Institute for Clinical Pathology and Medical Research
Infrastructure Works	Parramatta Light Rail – Stage 1 (Westmead to Carlingford)
KR	Kids Research

Abbreviations	Expanded Text
LA (max)	the A-weighted maximum noise level only from the construction works under consideration, measured using the fast time weighting on a sound level meter.
LAeq (15min)	The A-weighted equivalent continuous (energy average) A-weighted sound pressure level of the construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail and the community.
LAmax (15min)	the A-weighted maximum noise level only from the construction works under consideration, measured using the fast time weighting on a sound level meter.
NCAs	Noise Catchment Areas
NM	Nuclear Medicine
NML	Noise Management Levels
NSR	Noise and Vibration Sensitive Receivers
OEH	Office of Environment and Heritage Where reference in the planning approval/ this document and consultation has been made to OEH it should be noted that it has been abolished from 1 July 2019. The Environment section is construed as a reference to Department of Planning, Industry and Environment and the heritage component is construed as a reference to Department of Premier and Cabinet (DPC).
OOH	Out-of-Hours (i.e. outside of the standard construction hours stipulated in planning approval conditions)
OOHW	Out-of-Hours Work
PLR	Parramatta Light Rail
POEO Act	Protection of the Environment Operations Act
Project, the	Activity A, Activity B and Activity C
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
REMMM	Revised Environmental Mitigation and Management Measure
Renascent	Renascent Australia Pty Ltd (Contractor for Activity B)
RNP	Road Noise Policy
RO	Project-Specific Respite Offer

Abbreviations	Expanded Text
Secretary	Secretary of the NSW Department of Planning, Industry and Environment (or delegate)
Sensitive receiver	As defined in the Instrument of Approval. Includes residences, temporary accommodation such as caravan parks and camping grounds, and health care facilities (including nursing homes, hospitals). Also includes the following, when in use: educational institutions (including preschools, schools, universities, TAFE colleges), religious facilities (including churches), child care centres, passive recreation areas, commercial premises (including film and television studios, research facilities, entertainment spaces, restaurants, office premises and retail spaces), and others as identified by the Secretary.
SN	Specific Notifications
SPIR	Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report (incorporating Preferred Infrastructure Report) dated February 2018
SPL	Sound Pressure Level
Special audible characteristics	Refers to noise with characteristics that can cause annoyance and disturbance, containing noticeable factors such as tonality, low frequency noise, impulsive or intermittent noise events. These characteristics may not be considered noisy in quantitative sense. Example of plant and equipment identifies as having special audible characteristics include chainsaw, rock crusher, excavator + hydraulic hammer, grinder, vibratory pile driving, impact piling, vibratory roller, concrete say, concrete vibrator.
SWL	Sound Power Level
TMC	Traffic Management Centre
VDV	Vibration Dose Values
WIMR	Westmead Institute of Medical Research
WSLHD	Western Sydney Local Health District (Westmead Adults Hospital)

1 Introduction

1.1 Context

This Construction Noise and Vibration Management Sub-Plan (CNVMP or Sub-Plan) forms part of the Construction Environmental Management Plan (CEMP) for the Parramatta Light Rail – Stage 1 (Infrastructure Works).

A description of the overall Parramatta Light Rail – Stage 1 (Westmead to Carlingford) (PLR) is provided in Section 1.2. There are three activities to be carried out as part of Package 2:

- Activity A: Hawkesbury Road Widening Works
- Activity B: Cumberland Hospital (East Campus) Demolition
- Activity C: Cumberland Hospital (West Campus) Demolition

The scope of works for each of these activities is listed in Section 1.2.2, 1.2.3 and 1.2.4 respectively. These activities are enabling works which need to be carried out prior to the Main Infrastructure Works for PLR.

This CNVMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA) and the revised environmental mitigation and management measures (REMMMs) listed in the Parramatta Light Rail – Stage 1 Environmental Impact Statement (EIS) as amended by the Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report (incorporating Preferred Infrastructure Report) (February 2018) (the SPIR) and all applicable legislation.

1.2 Background description

1.2.1 Parramatta Light Rail- Stage 1

Parramatta Light Rail is one of the NSW Government's major infrastructure projects being delivered to serve a growing Sydney.

Parramatta Light Rail Stage 1 ('Infrastructure Works') will connect Westmead to Carlingford via Parramatta Central Business District (CBD) and Camellia. Stage 1 is expected to be operational in 2023.

The project will create new communities, connect great places and help both local residents and visitors move around and explore what the region has to offer. The route will link Parramatta's CBD and train station to a number of key locations, including the Westmead Precinct, the Parramatta North Growth Centre, the new Western Sydney Stadium, the Camellia Town Centre, the new Powerhouse Museum and Riverside Theatre arts and cultural precinct, the private and social housing redevelopment at Telopea, the Rosehill Gardens Racecourse and the three Western Sydney University campuses.

In summary, the key features of the project include:

- A new dual track light rail network of about twelve (12) kilometres in length, including around seven (7) kilometres within the existing road corridor and around five (5) kilometres within the existing Carlingford Line and Sandown Line, replacing current heavy rail services
- Sixteen (16) Stops that are fully accessible and integrated into the urban environment including a terminus stop at each end of Westmead and Carlingford
- High frequency 'turn-up-and-go' services operating seven days a week from 5am to 1am. Weekday services will operate about every 7.5 minutes in the peak period between 7am and 7pm

- Intermodal interchanges with existing public transport services at Westmead terminus, Parramatta CBD and the Carlingford terminus
- Alterations to the existing road network including line marking, additional traffic lanes and turning lanes, new traffic signals, and changes to traffic flows
- Relocation and protection of existing utilities
- Public domain and urban design works along the corridor and at Stop precincts
- Active transport corridors and additional urban design features along sections of the alignment and within Stop precincts
- Integration with the Opal Electronic Ticketing System
- Real time information in light rail vehicles and at Stops via visual displays and audio.

An overview of Parramatta Light Rail Stage 1 route is shown in Figure 1-1.

Figure 1-1: Parramatta Light Rail Stage 1 route

1.2.2 Package 2, Activity A: Hawkesbury Road Widening

The Hawkesbury Road Widening Works (HRW) (located between Darcy Road and Jessie Street) (shown in Figure 1-2) will be carried out as the first activity under Package 2 of the PLR.

These works are necessary due to the identified potential conflicts between the PLR works and the planned NSW Health development on Hawkesbury Road, within the Westmead Hospital Property Boundary. The Hawkesbury Road Widening Works includes services relocations to suit the new road and footpath alignment, new road and footpath construction on the western side of Hawkesbury Rd, with a provision of a retention piled wall with a cantilevered footpath that caters for the proposed National Particle Therapy Research Centre development. By providing the widening of the western side of Hawkesbury Road, the disruptions on Hawkesbury Road during the main PLR works would be minimised.

The Contractor undertaking this work is Ford Civil Contracting Pty Ltd.

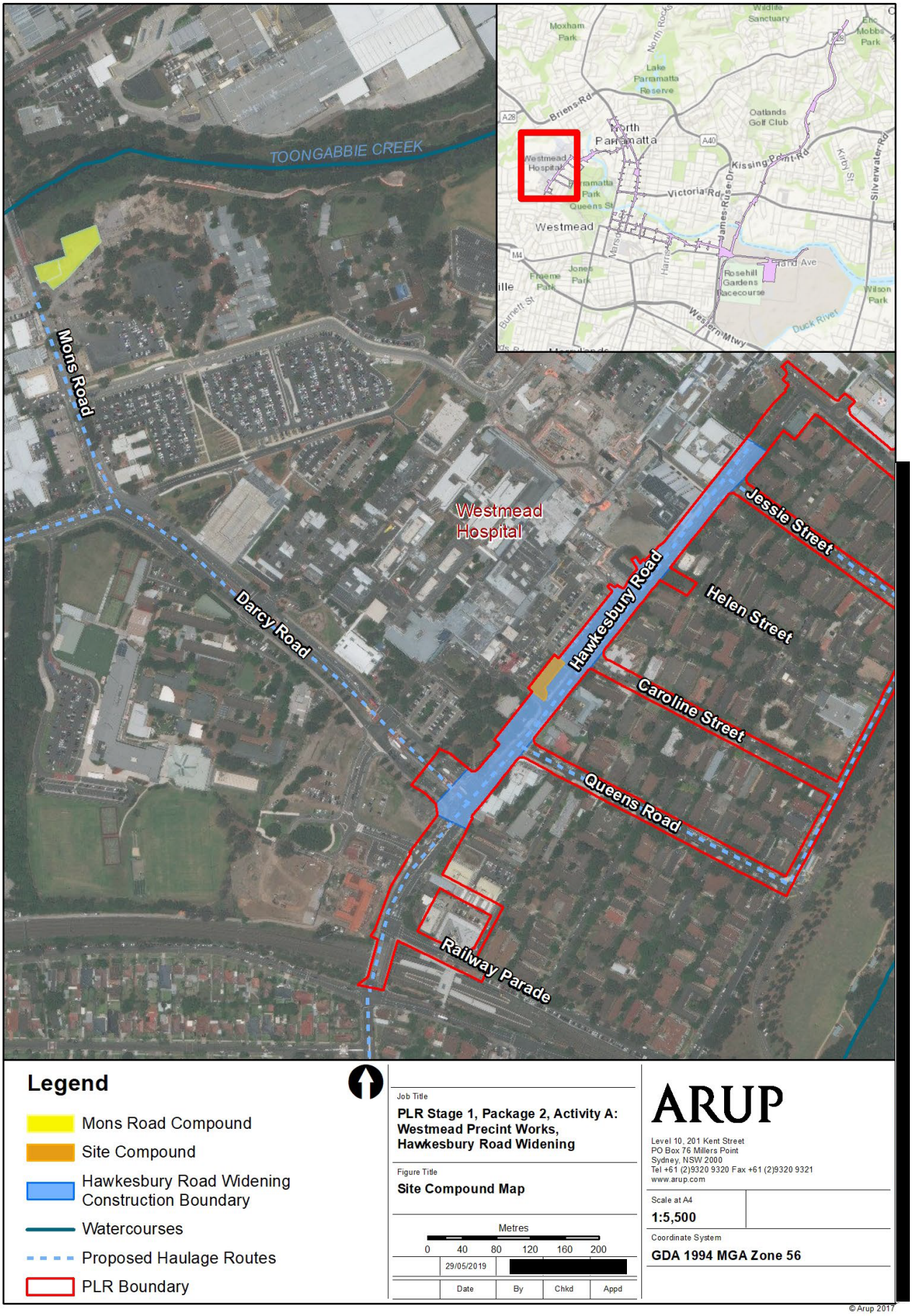

Figure 1-2: Hawkesbury Road Widening works area

1.2.3 Package 2, Activity B: Cumberland Hospital (East Campus) Demolition

The Cumberland Hospital (East Campus) Demolition (shown in Figure 1-3) will be carried out as the second activity under Package 2 of the PLR.

The Cumberland Hospital (East Campus) demolition includes demolition of five buildings down to slab along the alignment of the PLR through Cumberland Hospital (East Campus). The works will also include capping of utilities and services to these buildings, including Jemena gas pipelines, and reconnection of IT services to remaining building 52 where required.

The Contractor undertaking this work is Renascent Australia Pty Ltd.

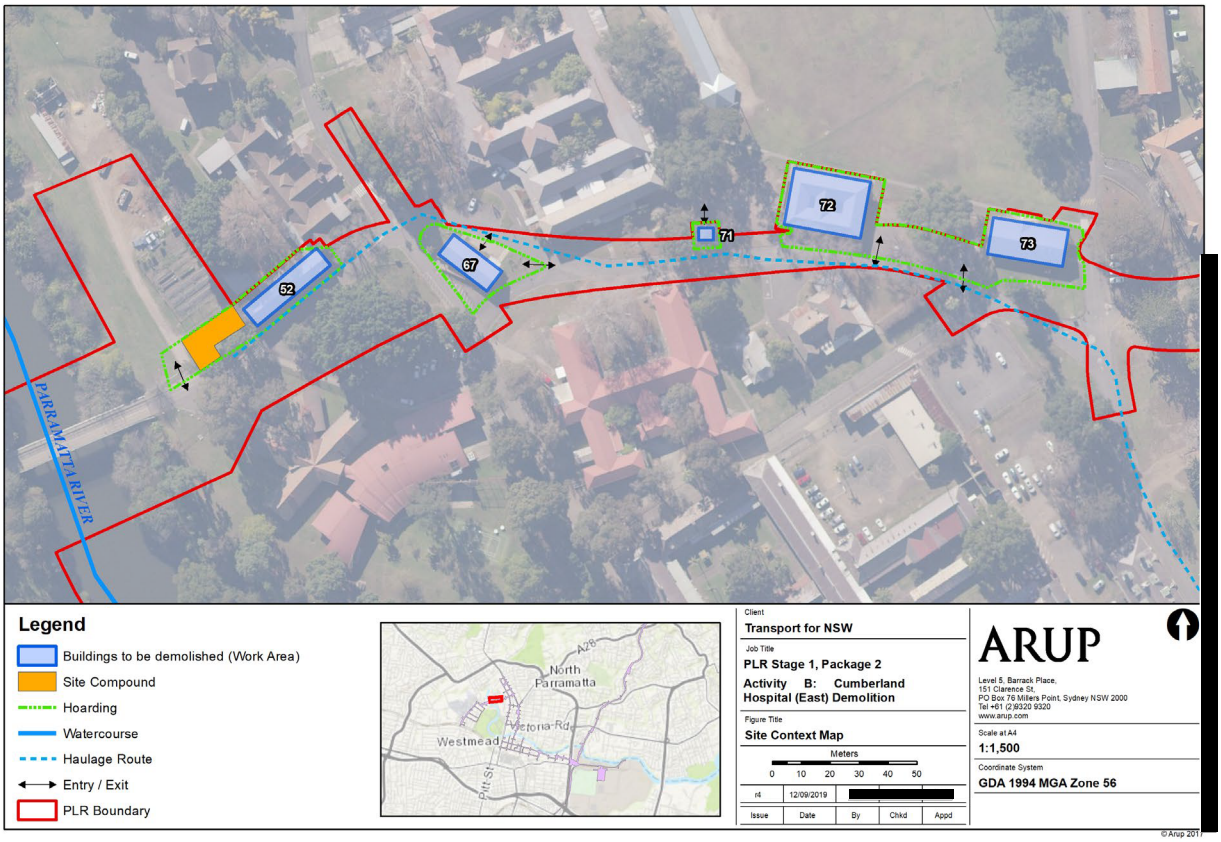

Figure 1-3: Cumberland Hospital (East Campus) Demolition works area

1.2.4 Package 2, Activity C: Cumberland Hospital (West Campus) Demolition

The Cumberland Hospital (West Campus) Demolition (shown in Figure 1-4) will be carried out as the third activity under Package 2 of the PLR.

These works are necessary due to identified potential conflicts between the PLR works and planned NSW Health development within the Cumberland Hospital (West Campus).

The Cumberland Hospital (West Campus) demolition includes demolition of six buildings down to slab along the alignment of the PLR through Cumberland Hospital (West Campus). These buildings include five cottages adjacent to Hainsworth Street and the Boronia Ward which is close to the Parramatta River. Demolition of the cottages will be carried out during stage one, the Boronia Ward will be demolished as a second stage of works as the ability to demolish the Boronia Ward relies on a new ward being constructed by NSW Health on adjacent land. Unlike the Cumberland Hospital (East Campus), this activity does not include capping of utilities and services to buildings.

Both stages of work will be completed prior to the construction of the main infrastructure works. The Contractor undertaking this work is Donnelley Constructions Pty Ltd.

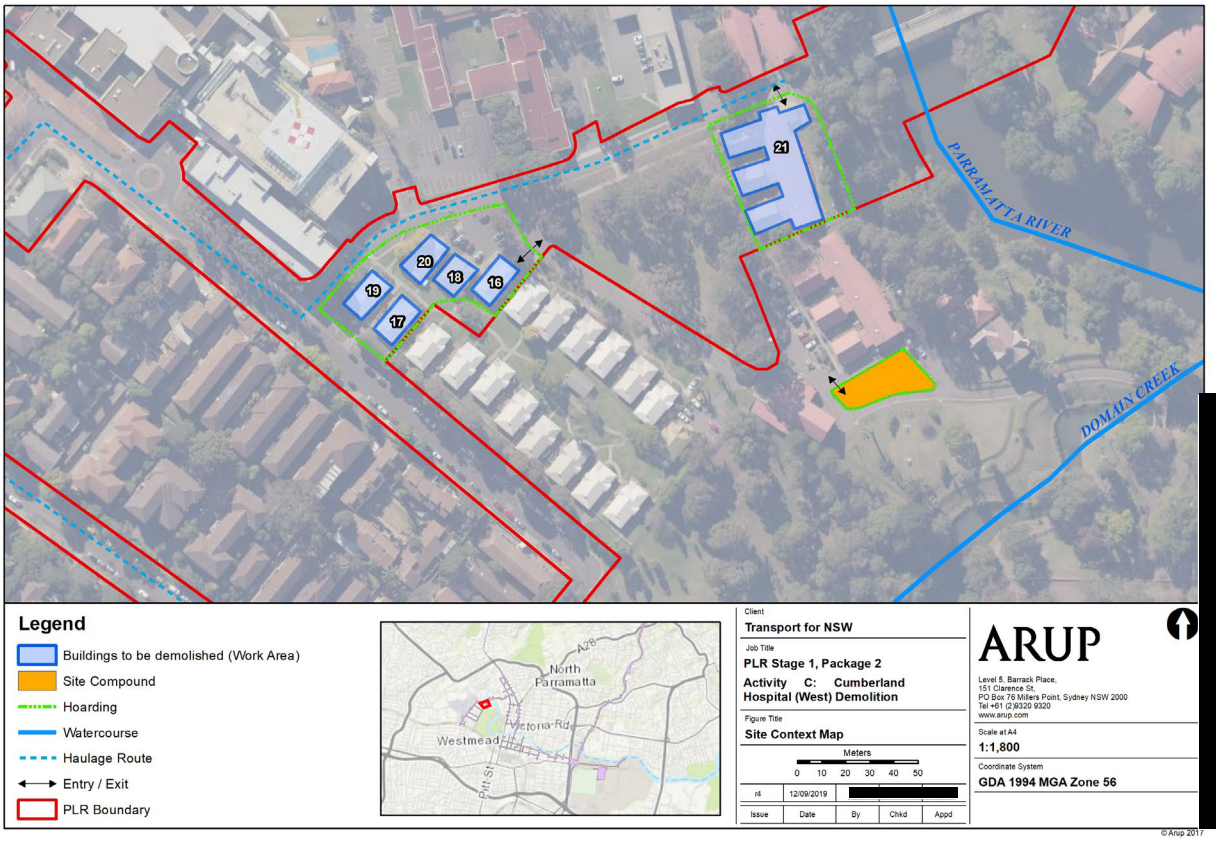

Figure 1-4: Cumberland Hospital (West Campus) Demolition works area

1.3 Statutory context

The PLR is subject to environmental impact assessment under the *Environmental Planning and Assessment Act 1979* (EP&A Act). It is classified as Critical State Significant Infrastructure (CSSI).

Before work can commence on the project, detailed environmental impact assessments have been carried out and approved by the Minister for Planning. The Planning Approval for the project is described below in Section 1.4.

1.4 Parramatta Light Rail planning approval

The Environmental Impact Statement (EIS) assessed impacts for Parramatta Light Rail Stage 1 (Westmead to Carlingford). This covered the light rail and associated works including road enabling work. It was approved by the Minister for Planning on 29 May 2018.

The planning approval (Infrastructure approval SSI 8285) and related environmental assessment documents are located at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8285

1.5 Scope of the sub-plan

This Sub-Plan applies to the Works as described in Sections 1.2.2, 1.2.3 and 1.2.4, relating to Activity A, Activity B and Activity C. These activities will be undertaken over an extended program, currently scheduled to run for periods between from July 2019 to April 2021. It is noted that there is

the potential for the scope of works and program for these activities to develop with time and as such this Sub-Plan will be updated as necessary (e.g. if additional conditions are triggered or if additional management measures are required). The scope of this Sub-Plan is to manage the enabling and construction/demolition works to minimise Noise and Vibration impacts. This document forms one of several pre-construction works packages to be undertaken prior to the main PLR infrastructure construction commencing.

1.6 Environmental management systems overview

The environmental management system overview is described in Section 1.6 of the CEMP.

2 Purpose and objectives

2.1 Purpose

The purpose of this Sub-Plan is to describe how The Contractors propose to manage potential noise and vibration impacts during construction of the following package Activities (as defined in the Glossary):

- Activity A: Hawkesbury Road Widening
- Activity B: Cumberland Hospital (East Campus) Demolition
- Activity C: Cumberland Hospital (West Campus) Demolition

2.2 Objectives and requirements

The key objective of the CNVMP is to ensure all CoA, REMMMs and licence/permit requirements relevant to noise and vibration are described, scheduled and assigned responsibility as outlined in:

- Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement dated August 2017 (referred to in this checklist as the EIS)
- Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report (incorporating Preferred Infrastructure Report) dated February 2018 (referred to in this checklist as the SPIR)
- Infrastructure approval SSI 8285 dated 29 May 2018 (referred to in this checklist as the Conditions of Approval (CoA))
- Administrative modification 1, approved on 21 December 2018.
- Administrative modification 2, approved on 25 January 2019
- Transport for NSW's Construction Noise and Vibration Strategy

All legislation relevant to this CNVMP is included in Appendix A2 of the CEMP.

2.2.1 Conditions of Approval

The list of relevant CoAs and where they have been addressed in this Sub-Plan are outlined in Appendix A1.

2.2.2 Revised Environmental Mitigation and Management Measures

The list of relevant REMMMs where they have been addressed in this Sub-Plan are outlined in Appendix A2.

2.3 Continuous improvement of sub-plan

Continuous improvement of this Sub-Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement. The Sub-Plan shall also be updated based on consultation outcomes as per the conditions of approval.

The process for update will involve:

- Identification of areas of opportunity for improvement of environmental management and performance
- Determining the cause or causes of non-conformances and deficiencies

- Developing and implementing a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verifying the effectiveness of the corrective and preventative actions
- Documenting any changes in procedures resulting from process improvement
- Making comparisons with objectives and targets

The processes described in Chapter 3.12 of the CEMP may result in the need to update or revise this Sub-Plan.

Only the Environment Manager, or delegate, has the authority to change any of the environmental management documentation. These changes must be approved by the Environmental Representative (ER), Acoustics Advisor (AA) or Department of Planning, Industry and Environment. The ER has the authority to approve minor amendments to plans in consultation with Acoustic Advisor and Department of Planning, Industry and Environment. Only the Department of Planning, Industry and Environment has the authority to approve major amendments to plans.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure (refer to Section 3.11.3 of the CEMP).

3 Existing environment

3.1 Land use survey

In accordance with CoA E20, the surrounding land uses, categorised regarding their sensitivity to noise and vibration, have been identified.

Heritage buildings identified to be sensitive to vibration have also been identified (CoA E43).

3.1.1 Activity A: Hawkesbury Road Widening

The Land Use Survey is presented graphically in Appendix B1 and Appendix B2 and non-residential noise and vibration sensitive receivers have been summarised in Table 3-1 and Table 3-2 below. Names of the noise catchment areas identified in the EIS in the vicinity of the project have been kept for consistency.

Identification of noise and vibration sensitive receivers (Land Use Survey) was undertaken following a review of the receivers identified in the EIS supplemented by further desktop review and in conjunction with information provided by Westmead hospital.

Noise and vibration sensitive receivers located in the project assessment area to the east of Hawkesbury Road are predominantly residential with the inclusion of a motel and a church located between Queens Road and Caroline Street, a medical centre and commercial receivers located between Railway Parade and Queens Road.

Noise and vibration sensitive receivers located in the project assessment area to the west of Hawkesbury Road includes Westmead hospital, Westmead Children's Hospital and Cumberland's Hospital buildings between Darcy Road and Hainsworth Street and Western Sydney University located between Railway Parade and Darcy Road.

Table 3-1: Non-residential noise and vibration sensitive receiver locations

Receiver type	NCA	Description	Address
Educational	NCA02	Western Sydney University (Westmead)	[redacted]
Child Care	NCA05	Westmead Day Care Centre	Westmead Hospital, Westmead
Medical	NCA01	Westmead Family Medical Practice	[redacted]
	NCA02	Westmead Hospital	Hawkesbury Road, Westmead
	NCA05	The Children's Hospital at Westmead	Redbank Road, Westmead
	NCA03	Specialist Medical Centre	[redacted]
	NCA02	Westmead Institute of Medical Research	[redacted]
	NCA05	Children's Medical Research Institute	[redacted]

Receiver type	NCA	Description	Address
	NCA05	Kids Research Institute	Cnr Hawkesbury Rd & Hainsworth St, Westmead
Places of Worship	NCA04	Westmead Church – Parramatta Mission	[redacted]
Hotel[1]	NCA04	175 One Hotels and Apartments	[redacted]
Note 1: Identified as non-residential receiver but assessed with reference to residential receiver criteria.			

Table 3-2: Vibration sensitive receiver locations

Facility	Space
WIMR/KR/CMRI	Biological Science Facility
CMRI	General Laboratories
WIMR/KR	General Laboratories
WIMR	Special Laboratories
WIMR	Microscopy Laboratories
CMRI	Microscopy Laboratories
Westmead Adults Hospital	Nuclear Medicine Imaging Suite
Westmead Adults Hospital	Cancer Centre - Radiation Oncology LINAC Bunker
Westmead Adults Hospital	Operating Theatres

The nearest heritage building in the vicinity of the project has been identified as the University of Western Sydney and is shown in Appendix B1. The heritage structure is located approximately 120m away from the construction zone.

3.1.2 Activity B: Cumberland Hospital (East Campus) Demolition

The Land Use Survey is presented graphically in Appendix B3 and noise and vibration sensitive receivers have been summarised in Table 3-3 below. Table 3-3 identifies near sensitive receivers potentially impacted by noise and vibration due to works in Cumberland East Campus (Note that due to the proximity of the works to the Cumberland West Campus, Table 3-4 includes therefore receivers from the West Campus). Names of the noise catchment areas identified in the EIS in the vicinity of the project have been kept for consistency.

Identification of noise and vibration sensitive receivers (Land Use Survey) was undertaken following a review of the receivers identified in the EIS supplemented by further desktop review and in conjunction with information provided by Cumberland Hospital.

Sensitive noise and vibration receivers were confirmed during consultation and the land use survey has been updated accordingly. Unless buildings have been identified as wards, operating theatres, laboratories or residential, the commercial classification has been adopted within the Hospital East Campus.

Table 3-3: Noise and vibration sensitive receiver locations

Receiver type	NCA	Description	Address
Residence	NCA06	Residences	[redacted]
	NCA05	Cottages (rehabilitation units)	[redacted]
Educational	NCA05	Within Cumberland Hospital West Campus: • Education centre/library/consumers representative (building 29)	[redacted]
Place of Worship	NCA05	Within Cumberland Hospital West Campus: • Chapel (building 23)	[redacted]
Medical[1]	NCA06	Within Cumberland Hospital East Campus: • Bunya (building 51) • Mental Health Science Building (building 112)	[redacted]
	NCA05	Within Cumberland Hospital West Campus: • Acacia (building 22) • Boronia (building 21) • Riverview (building 31) • Yaralla (building 32) • Paringa (building 33) • Hainsworth (building 34)	[redacted]
Commercial[1]	NCA05	Cumberland Hospital West Campus	[redacted]
	NCA06	Cumberland Hospital East Campus	[redacted]
Hotel	NCA06	Hope Hostel	[redacted]

Receiver type	NCA	Description	Address
	NCA06	The Community Housing Implementation Program (CHIP) Hostel – currently vacant	[redacted]
Aged Care	NCA06	Southern Cross Car Marian Nursing Home	[redacted]
	NCA06	Uniting Lilian Wells North Paramatta	[redacted]
GHFF Colony	N/A	Grey-headed Flying fox Colony	[redacted]
Note 1: Unless buildings have been identified as wards, operating theatres, laboratories or residential, the commercial classification has been adopted within the Hospital East Campus - Sensitive noise and vibration receivers have been confirmed during consultation			

The East Campus is part of the Cumberland Hospital Heritage Precinct which is listed on the State Heritage Inventory as a place of national significance. There are a number of heritage listed buildings within the precinct.

3.1.3 Activity C: Cumberland Hospital (West Campus) Demolition

The Land use Survey is presented graphically in Appendix B3 and noise and vibration sensitive receivers have been summarised in Table 3-4 below. Table 3-4 identifies near sensitive receivers potentially impacted by noise and vibration due to works in Cumberland West Campus (Note that due to the proximity of the works to the Cumberland East Campus, Table 3-4 includes therefore receivers from the East Campus). Names of the noise catchment areas identified in the EIS in the vicinity of the project have been kept for consistency.

Identification of noise and vibration sensitive receivers (Land Use Survey) was undertaken following a review of the receivers identified in the EIS supplemented by further desktop review and in conjunction with information provided by Cumberland Hospital.

Sensitive noise and vibration receivers were confirmed during consultation and land use survey has been updated accordingly. Unless buildings have been identified as wards, operating theatres or laboratories the commercial classification has been adopted within the Hospital West Campus.

Table 3-4: Noise and vibration sensitive receiver locations

Receiver type	NCA	Description	Address
Residence	NCA04	Residences	To the south of Hainsworth street, Westmead
	NCA05	Cottages (rehabilitation units)	Within the Cumberland Hospital West Campus to the north of Hainsworth street
Educational	NCA05	Within Cumberland Hospital West Campus: • Education centre/library/consumers representative (building 29)	Hainsworth Street, Westmead
Place of Worship	NCA05	Within Cumberland Hospital West Campus: • Chapel (building 23)	Hainsworth Street, Westmead
Medical	NCA05	The Children's Hospital of Westmead	Redbank Road, Westmead
	NCA05	Within Cumberland Hospital West Campus: • Acacia (building 22) • Boronia (building 21) • Riverview (building 31) • Yaralla (building 32) • Paringa (building 33) Hainsworth (building 34)	Hainsworth Street, Westmead
	NCA06	Within Cumberland Hospital East Campus: • Bunya (building 51)	Hainsworth Street, Westmead
Commercial[1]	NCA05	Cumberland Hospital West Campus	Hainsworth Street, Westmead
	NCA06	Cumberland Hospital East Campus	Fleet Street Westmead
GHFF Colony	N/A	Grey-headed Flying fox Colony	Near 1C Fleet Street, North Parramatta

Note 1: Unless buildings have been identified as wards, operating theatres, laboratories or residential, the commercial classification has been adopted within the Hospital East Campus - Sensitive noise and vibration receivers have been confirmed during consultation

The West Campus is part of the Cumberland Hospital Heritage Precinct which is listed on the State Heritage Inventory as a place of national significance. While there are no heritage listed buildings, Wisteria Gardens hold heritage significance.

Relevant to both Activity B and C, the GHFF colony in Parramatta Park is located approximately 195 m south of Activity B and approximately 255 m east south east from Activity C (and approximately 188 m from Activity C site compound). Data regarding the extent of the GHFF colony was provided by TfNSW on the 6 March 2019 and is based on continuous monitoring undertaken at the GHFF colony undertaken since 2007 (Refer to the TfNSW Ecosure document, 'Grey-headed Flying-fox Construction Monitoring Program', October 2019).

3.2 Baseline noise environment

Baseline noise monitoring is utilised to quantify and characterise the existing ambient noise environment and established noise targets in accordance with the project requirements at residential premises potentially affected by the works. Other receivers are assessed against fixed noise criteria.

Long-term noise monitoring included in the EIS has been referred to in this Sub-Plan.

Relevant locations of baseline noise monitoring surveys for the project areas from the EIS are reproduced in Table 3-5. Those noise monitoring locations were selected to be representative of receivers potentially affected by the construction works. The locations are marked on figures in Appendix B1 for Activity A and Appendix B2 for Activities B and C.

With the exception of the [redacted] Hawkesbury Road Widening, the monitoring undertaken for the EIS has been deemed [redacted] characterise the areas potentially affected by the subject works. For the [redacted], the lower background noise levels of BG03 have been adopted for this assessment.

The EIS baseline data, as presented in Table 3-6, is suitably representative of sensitive receivers potentially affected by the project and no further baseline monitoring is proposed as part of this project.

Table 3-5: Baseline noise survey locations

ID	PLR Precinct	NCA	Noise Monitoring Location Address
BG02	Westmead	NCA03	[redacted]
BG03[1]		NCA04	[redacted]
BG04		NCA06	Cumberland Hospital East
BG05	Parramatta North	NCA06 and NCA07	[redacted]

Notes

1: BG03 is used for residences (Including Aged Care and Hotel) in NCA04 and NCA05

2. BG05 is used for residences (Including Aged Care and Hotel) in NCA06 (East of Cumberland Hospital East Campus)

Table 3-6: Summary of noise monitoring results

ID	Measured Noise Level – dB(A)[1]					
	RBL			$L_{Aeq(period)}$		
	Daytime	Evening	Night	Daytime	Evening	Night
BG02	51	48	43	63	63	57
BG03	49	48	47	60	60	55
BG04[2]	42	41	44[2]	53	50	49
BG05	45	39	37	59	58	54

Notes

1: ICNG Governing periods – Day 7:am to 6pm Monday to Saturday, 8am -6pm Sunday; Evening 6pm-10pm; Night 10pm to 7am Monday to Saturday, 10pm to 8am Sunday

2: Monitored night time level was found to be higher than the evening and daytime level, therefore the INP requires that the night-time level used for assessment purposes be reduced to match the evening level.

The SPIR C-115 Table C.3 for the project indicates that ambient noise levels ranging from 43 dBA to 72 dBA might currently occur in the area of the GHFF colony at Parramatta Park. Ambient noise includes light vehicle activity (ignition, door slamming, idling engine etc), aeroplanes and helicopters (likely associated predominantly with the operation of Westmead Health Precinct).

Additional noise monitoring was conducted following exhibition of the EIS at the Balgowlah GHFF colony to provide some information as to what noise levels GHFF colony might be accustomed to or disrupted by. This monitoring identified ambient noise levels ranging from 61 to 72 dBA. The Balgowlah GHFF camp is currently stable and does not appear to be disrupted by existing ambient noise levels.

The monitoring of the Balgowlah GHFF colony displays adaptation to a similar noise range to the Parramatta GHFF colony and similar ambient noise levels which are predicted to occur during operation of the PLR project.

4 Noise and vibration criteria

Criteria applicable to the project are defined in the Project Requirements in Appendix A. The Project Requirements are derived with reference to the Department of Planning, Industry and Environment (DPIE) then the Department of Environment and Climate Change NSW Interim Noise Construction Guideline (ICNG) and the Transport for NSW Construction Noise and Vibration Strategy (CNVS).

It is noted that CoAs and REMMs include criteria and management requirements, along with referring to the ICNG and CNVS, which also outline criteria and management requirements. The CoAs refer to the REMMs as requirements and also require the CNVS recommendations to be implemented. All requirements and relevant recommendations have therefore been applied.

4.1 Construction noise assessment objectives

The ICNG focuses on applying a range of work practices to minimise construction noise impacts rather than focusing on achieving numeric noise levels.

The main objectives of the ICNG are to:

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

4.2 Construction periods

CoAs E21 to E24 identifies the hours of work for all Package 2 activities, as shown in Table 4-1. Note that no OOHW is proposed for Activity B or Activity C.

Table 4-1: Construction hours

Period	Days and hours	
Standard hours	Day	Monday to Friday – 7:00 am to 7:00 pm Saturdays – 8:00 am to 6:00 pm
OOHW Period 1	Day	Sundays and public holidays – 8:00 am to 6:00 pm Saturday – 7:00 am to 8:00 am
	Evening	Monday to Friday – 7:00 pm to 10:00 pm Saturday - 6:00 pm to 10:00 pm

Period	Days and hours	
OOHW Period 2	Evening	Sunday and public holidays - 6:00 pm to 10:00 pm
	Night	Monday to Saturday – 10:00 pm to 7:00 am Saturday to Sunday – 10:00 pm to 8:00 am

4.2.1 Respite periods

Respite periods are a specific management measure, however are outlined here for reference.

Respite periods are a time when 'noisy' works are stopped to provide respite for nearby sensitive receivers. There are several conditions that refer to the provision of respite periods, the primary being, CoA E27, E36 and E33 (which references CNVS Table 5).

CoA E36 requires respite where the Highly Noise Affected Target of $L_{Aeq(15minute)}$ 75 dB at sensitive receivers is exceeded. While the Highly Noise Affected Target does not apply to 'other sensitive receivers' in the ICNG, the Instrument of Approval (CoA E20 and CoA E31) defines 'sensitive receivers' as receivers potentially exposed to construction noise and vibration, construction ground-borne noise and operational noise and vibration (which includes places of worship, educational institutions and noise and vibration-sensitive businesses and critical working areas such as operating theatres, precision laboratories housing sensitive equipment, mental health services and accommodation and drama theatres) and therefore the Highly Affected Target has been applied to these receivers.

E27 differs, by requiring respite for 'Highly Noise Intensive Works', defined in the Instrument of Approval as 'Rock breaking, rock hammering, sheet piling, pile driving and any similar activity', when only the Noise Management Level is exceeded. Similar wording is outlined in the CNVS regarding application to types of noise source, however without any reference to a quantitative measure. Both E27 and the CNVS impose more onerous requirements for respite, as use of such equipment are unlikely to satisfy the NMLs.

As E36 does not outline recommended periods for respite, initial guidance is based on the requirements of E27(c).

Table 4-2 below summarises the type of respite periods for clarification. The application of respite periods is outlined in Table 6-1, as informed by the noise impact assessments (Appendix C).

Table 4-2: Respite periods

Equipment Type/works	Trigger level[1]	Time period	Respite definition	CoA
Highly noise intensive works: Defined as Rock breaking, rock hammering, sheet piling, pile driving and any similar activity)'	When exceed NML at the same receiver	Specific time during Standard Hours[3]: 8:00 am to 6:00pm Monday to Friday, 8:00 am to 1:00pm Saturday	Works to be undertaken in continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block.[2]	E27

Equipment Type/works	Trigger level[1]	Time period	Respite definition	CoA
Any construction activity (noise sources other than listed above)	When exceed the Highly Noise Affected Level of 75 dBA $L_{Aeq(15minute)}$	Standard Hours[3]	Not defined	E36
Any construction activity (other noise sources listed above)	When exceed 65 dBA $L_{Aeq(15minute)}$ at the façade of the building of a residential receiver	OOHW Period 2[4]	The proponent must only work 4 nights in any 7-day period. The 4 nights worked must be informed by community consultation (E39)	E37

Notes:

1: Note, ICNG applies Highly Affected Target to residential receivers only.

2: Except as permitted by an EPL, or through the Out-of-Hours Work Protocol

3: Standard hours are defined as 7:00am to 7:00pm Mondays to Fridays inclusive, 8:00am to 6:00pm Saturdays, no work on Sundays and Public Holidays

4: OOHW Period 2 are defined as 10:00pm to 7:00am Mondays to Saturdays (nights), Sundays and Public Holidays 6:00pm to 8:00am (nights)

4.3 Project Noise Management Levels (Project NMLs)

Project NMLs for receivers near Activity A, B and C are outlined below in Table 4-3 for residential receivers (including Aged Care, Hotel and Hostels) and in Table 4-4 for all other non-residential sensitive receivers.

Table 4-3: Project NMLs – residential receivers (including Aged Care and Hotel)

		Standard Hours[1]		Out of Hours Work Periods[1]				
		Noise Affected	Highly Noise Affected	Noise Affected Day[1]	Noise Affected Evening[1]	Noise Affected Night[1]	Trigger for respite periods Day / Evening / Night[1]	Sleep Disturbance Night
NCA	Logger ID	$L_{Aeq15min}$ > RBL+10 dB	$L_{Aeq15min}$ >	$L_{Aeq15min}$ > RBL+5 dB	$L_{Aeq15min}$ > RBL+5 dB	$L_{Aeq15min}$ > RBL+5 dB	$L_{Aeq15min}$ >	L_{Amax} > RBL+15 dB
NCA02	BG02	61	75	56	53	48	65	58
NCA03	BG02	61	75	56	53	48	65	58
NCA04	BG03	59	75	54	53	52	65	62
NCA05	BG03	59	75	54	53	52	65	62
NCA06	BG05	55	75	50	44	42	65	52
Mons Road	BG03	59	75	54	53	52	65	62

NCA	Logger ID	Standard Hours[1]		Out of Hours Work Periods[1]				
		Noise Affected	Highly Noise Affected	Noise Affected Day[1]	Noise Affected Evening[1]	Noise Affected Night[1]	Trigger for respite periods Day / Evening / Night[1]	Sleep Disturbance Night
		$L_{Aeq15min}$ > RBL+10 dB	$L_{Aeq15min}$ >	$L_{Aeq15min}$ > RBL+5 dB	$L_{Aeq15min}$ > RBL+5 dB	$L_{Aeq15min}$ > RBL+5 dB	$L_{Aeq15min}$ >	L_{Amax} > RBL+15 dB

Note 1 – Refer to Table 4-1

Note 2 – Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Table 4-4: Project NMLs – other sensitive receivers (when in use)

Sensitive Land Use	Management level, $L_{Aeq,15min}$ (as defined in the ICNG)	Highly Noise Affected target (as defined in CoA E36)[2]
Educational (Classrooms at schools and other educational institutions)	Internal noise level – 45 dB External noise level – 65 dB[1]	External noise level – 75 dB
Medical (Hospital wards and operating theatres)	Internal noise level – 45 dB External noise level – 65 dB [1]	External noise level – 75 dB
Places of Worship	Internal noise level – 45 dB External noise level – 65 dB [1]	External noise level – 75 dB
Commercial premises	External noise level 70 dB	External noise level – 75 dB
Industrial premises	External noise level 75 dB	N/A
Child Care Facilities	Internal noise level – 45 dB External noise level – 65 dB [1]	External noise level – 75 dB

Note 1: For predictive assessment and where noise monitoring is required, it is often more practical to assess at external locations. For purpose, external management levels have been established assuming premises have closed windows with a nominal noise reduction of 20 dB(A). Where monitoring occurs, this noise reduction will be verified on site.

Note 2: Apply to all "other sensitive receivers": sensitive receivers are defined in the instrument of approval and reproduced in the glossary of this Sub-Plan

4.3.1 Grey-headed Flying-Fox (GHFF)

Measures to mitigate potential noise impacts from construction activities are listed in the TfNSW/Ecosure Grey-headed Flying-fox Construction Monitoring Program (GHFF Construction Monitoring Program) dated October 2019.

When a colony is located within 300 m of a construction site, and that construction activities includes the following noise characteristics:

- High frequency (e.g. cutting steel) or impulsive (e.g. rock breaker)
- Highly noise intensive works or activities with special audible characteristics
- Construction noise audible at camp (as determined through noise assessment)

the GHFF Monitoring Program identifies mitigation measures to be adopted for activities based on risk level and noise type. (Refer to GHFF Mitigation Application Procedure in Section 7.3 of the GHFF Construction Monitoring Program).

4.4 WHS noise criteria for nearby workers

In accordance with Condition E41, at no time can noise generated by construction exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of $L_{Aeq,8h}$, of 85dB(A) for any employee working at a location near the CSSI.

4.5 Construction traffic noise criteria

Noise emission from construction traffic when travelling on the public roads are considered as additional road traffic noise and are assessed against the NSW Road Noise Policy (RNP).

When assessing noise impact from construction vehicles using the existing road network, an initial screening test is first undertaken by evaluating whether noise levels are expected to increase by more than 2 dBA due to construction traffic or a temporary reroute due to a road closure.

Where noise levels are predicted to increase by more than 2 dBA (i.e. 2.1 dBA or greater) further assessment is required to be conducted in accordance with the RNP. The relevant section of the RNP is given below in Table 4-5.

If a road's functional class changes during construction (for example during rerouting of traffic from an arterial road temporarily to a local road) then the functional class of the local road changes to a new road class (item 1 in Table 4-5) for the duration of the temporary reroute.

Table 4-5: RNP criteria for assessing construction vehicles on public roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am - 10 pm)	Night-time (10 pm - 7 am)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	$L_{Aeq(15hour)}$ 55 (external)	$L_{Aeq(9hour)}$ 50 (external)
	2. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

4.6 Vibration criteria

Criteria for construction vibration must address:

- the potential for disturbance and annoyance to building occupants (Human comfort vibration, Section 4.6.1)
- the potential damage to contents within a building
- the potential for damage to buildings and other structures
- Effects on sensitive equipment and spaces

Ground vibration is assessed in accordance with the NSW '*Assessing Vibration; a technical guideline*' regarding human comfort and to BS 7385 and DIN 4150 for damage to buildings.

Effects on sensitive equipment and spaces within Westmead Hospital and Cumberland Hospital have referenced AS 2670.2 and ASHRAE Vibration Curves (VC).

4.6.1 Human comfort

Potential vibration disturbance to human occupants of buildings is made in accordance with the NSW DEC '*Assessing Vibration; a technical guideline*'. The criteria outlined in the guideline is based on the British Standard BS 6472-1992 '*Evaluation of human exposure to vibration in buildings (1-80Hz)*'.

Sources of vibration are defined as either 'Continuous', 'Impulsive' or 'Intermittent', as described in Table 4-6.

Table 4-6: Types of vibration – definition

Type of vibration	Definition	Examples
Continuous vibration	Continues uninterrupted for a defined period (usually throughout the day-time and/or night-time)	Machinery, steady road traffic, continuous construction activity
Impulsive vibration	A rapid build-up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.
Intermittent vibration	Can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers, crushing. Where the number of vibration events in an assessment period is three or fewer, this would be assessed against impulsive vibration criteria.

Table 4-7 reproduces the 'Preferred' and 'Maximum' values for continuous and impulsive vibration from Table 2.2 of the Guideline.

Table 4-7: Preferred and maximum vibration acceleration levels for human comfort, m/s^2

Location	Assessment period[1]	Preferred values		Maximum values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Critical areas[2]	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028
Workshops	Day- or night-time	0.04	0.029	0.080	0.058
Impulsive vibration (weighted RMS acceleration, m/s^2, 1-80Hz)					
Critical areas[2]	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92
Workshops	Day- or night-time	0.64	0.46	1.28	0.92

1: Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am

2: Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Alternative criteria are outside the scope of the policy and other guidance documents will be referred to.

Table 4-8 reproduces the ‘Preferred’ and ‘Maximum’ values for intermittent vibration from Table 2.4 of the Guideline.

The VDV is dependent upon the level and duration of the vibration episode and the number of vibration episodes occurring during the assessment period; a higher vibration level is permitted if the total duration of the vibration event(s) is small.

Table 4-8: Acceptable vibration dose values (VDV) for intermittent vibration (m/s$^{1.75}$)

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

1: Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am

2: Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous of impulsive criteria for critical areas.
Source: BS 6472-1992

4.6.2 Structural damage

Potential structural or cosmetic damage to buildings as a result of vibration is typically assessed in accordance with BS7385-2. BS7385-1, defines different levels of structural damage as:

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

Table 1 and Section 7.4.2 of BS7385-2 sets limits for the protection against the different levels of structural damage and those levels are reproduced below.

Table 4-9: BS 7385-2 structural damage criteria

Group	Type of structure	Damage level	Peak component particle velocity, mm/s[1]		
			4 Hz to 15 Hz	15 Hz to 40 Hz	40 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	Cosmetic	50		
		Minor[2]	100		
		Major[2]	200		
2	Un-reinforced or light framed structures	Cosmetic	15 to 20	20 to 50	50
		Minor[2]	30 to 40	40 to 100	100

Group	Type of structure	Damage level	Peak component particle velocity, mm/s[1]		
			4 Hz to 15 Hz	15 Hz to 40 Hz	40 Hz and above
	Residential or light commercial type buildings	Major[2]	60 to 80	80 to 200	200

Notes:

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

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

The guide values in Table 4-9 relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 4-9 may need to be reduced by up to 50%.

Monitoring shall be undertaken at strategic locations before and during construction to measure the Peak Particle Velocity at the structure and to check that the Peak Particle Velocity remains below the guide values in Table 4-9. Exceedances of those guide values might indicate that resonance has been activated in the structure. Reduction of the guide value and potential further investigations would then be required.

4.6.3 Heritage buildings

Regarding heritage buildings, British Standard 7385 Part 2 (1993, p.5) notes that heritage buildings shall be assessed on a case by case basis and that "*a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive*".

If a heritage building has been identified as potentially sensitive to vibrations, the German Standard DIN 4150 - Part 3 '*Structural vibration in buildings - Effects on Structure'* (DIN 4150-3), which is more conservative than BS 7385 criteria, shall be applied.

The DIN 4150 criteria for short term vibration are presented in Table 4-10. For heritage buildings, criteria associated with group 3 shall be used.

Table 4-10: DIN 4150-3 structural damage criteria – short term vibration

Group	Type of Structure	Vibration velocity, mm/s			
		At foundation at frequency of			Vibration at horizontal plane of highest floor
		1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	All frequencies
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 or 2 and have intrinsic value (e.g. buildings under a preservation order)	3	3 to 8	8 to 10	8

Note that short-term vibration is defined as vibration which does not occur often enough to cause structural fatigue and which does not produce resonance in the structure being evaluated.

4.6.4 Buried services

DIN 4150-2:1999 sets out guideline values for vibration effects on buried pipework and reproduced below.

Table 4-11: Guideline values for short-term vibration impacts on buried pipework

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

For gas and water supply pipes within 2 m of buildings, the levels given in DIN4150-3 shall be applied. Consideration must also be given to pipe junctions with the building structure as potential significant changes in mechanical loads on the pipe must be considered.

The guideline values above may be reduced by 50% without further analysis when evaluating the effects of long-term vibration on buried pipework.

Note that short-term vibration is defined as vibration which does not occur often enough to cause structural fatigue and which does not produce resonance in the structure being evaluated.

In addition, specific limits for vibration affecting high-pressure gas pipelines is provided in the UK National Grid's *Specification for Safe Working in the Vicinity of National Grid High Pressure Gas Pipelines and Associated Installations – Requirements for Third Parties* (report T/SP/SSW/22, UK National Grid, Rev 10/06, October 2006). This specification states that no piling is allowed within 15 m of a pipeline without an assessment of the vibration levels at the pipeline. The PPV at the pipeline is limited to a maximum level of 75 mm/s, and where PPV is predicted to exceed 50 mm/s the ground vibration is required to be monitored.

Other services that maybe encountered include electrical cables and telecommunication services such as fibre optic cables. While these may sustain vibration velocity levels from between 50 mm/s and 100 mm/s, the connected services such as transformers and switchgear, may not. Where encountered, site specific vibration assessment in consultation with the utility provider shall be carried out to identify and manage impacts on potentially vibration sensitive infrastructure.

4.6.5 Sensitive laboratory and medical spaces

4.6.5.1 Sensitive spaces to Activity A works

Vibration sensitive laboratory or medical facilities that may be impacted by the Activity A: Hawksbury Road Widening Works were identified within the Westmead Research Zone. They include the Westmead Institute of Medical Research (WIMR), Kids Research (KR), Children's Medical Research Institute (CMRI) and the Nuclear Medicine (NM) facility in Westmead Hospital.

The location of the sensitive areas with respect to the current proposed construction on Hawkesbury Road is provided in Appendix B2. These sites were identified by Westmead Hospital and have previously been identified and vibration criteria specified as part of the CNVMP for the Westmead Clinical Acute Services Building (CASB) construction.

A summary of the vibration criteria for the sensitive spaces in these facilities is provided in Table 4-12. The vibration criteria were developed based on manufacturer's criteria for the equipment installed within the spaces or generic vibration criteria for this type of equipment. However, where the measured floor vibration levels were higher than these criteria, then the vibration criteria have been relaxed to be the measured floor vibration levels that the facility currently successfully operates experiencing.

[redacted]

Table 4-12: Sensitive spaces within the Westmead Hospital - vibration criteria summary

Facility	Space	Vibration criterion
WIMR/KR/CMRI	[redacted]	AS2670.2 Curve 1 (3rd octave band RMS velocity < 0.1mm/s) And Transient vibration limit of 1.0mm/s
CMRI	[redacted]	AS2670.2 Curve 2
WIMR/KR	[redacted]	AS2670.2 Curve 1
WIMR	[redacted]	ASHRAE VC-A
WIMR	[redacted]	ASHRAE VC-B
CMRI	[redacted]	ASHRAE VC-C
Westmead Adults Hospital	[redacted]	AS2670.2 Curve 1
Westmead Adults Hospital	[redacted]	AS2670.2 Curve 1
Westmead Adults Hospital	[redacted]	AS2670.2 Curve 1

Note: Criteria defined on the basis of not exceeding measured vibration levels within facility in normal use.

Figure 4-1 below plots these vibration criteria in terms of root mean square velocity and vibration frequency.

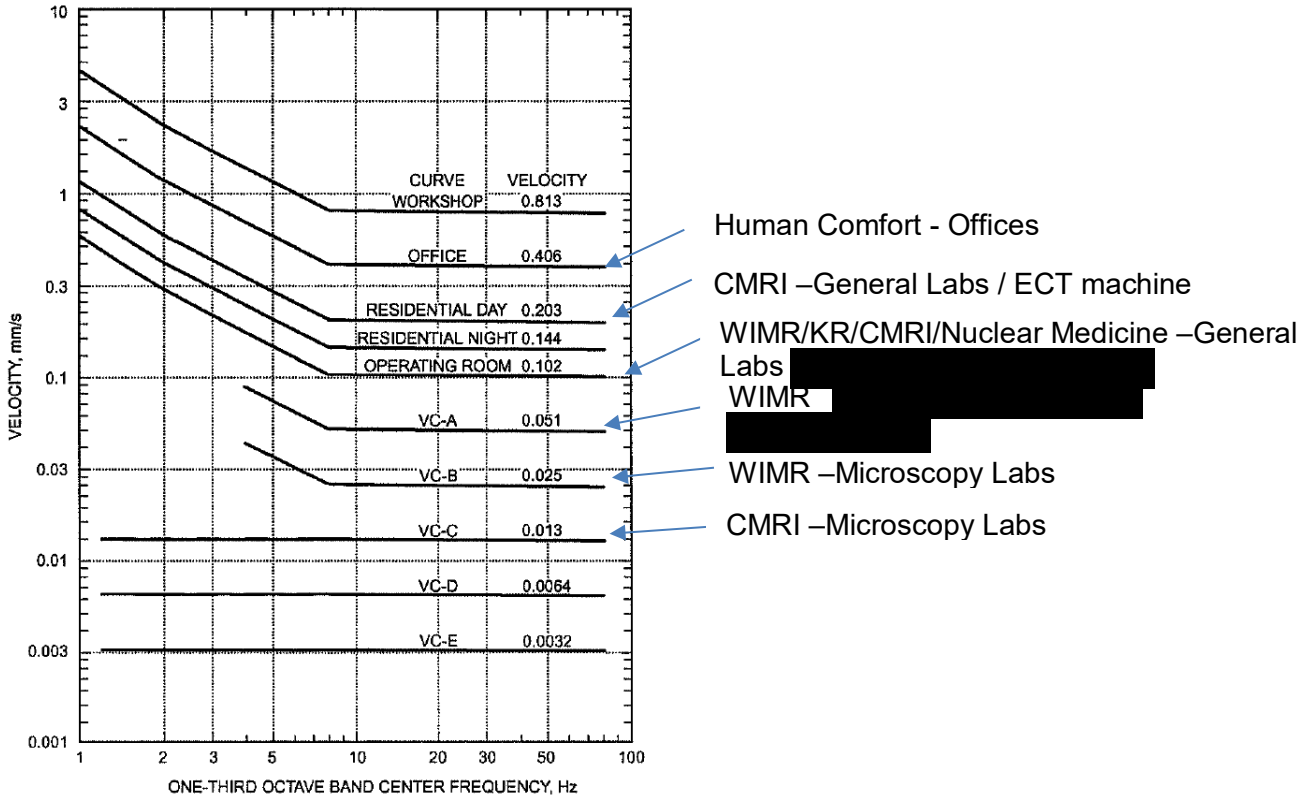

Figure 4-1: Vibration criteria curves, ref: Fig 37, ASHRAE - HVAC Applications (2007).

4.6.5.2 Sensitive spaces to Activity B works

No vibration sensitive laboratory and medical spaces were identified for Activity B, within the Cumberland Hospital East Campus.

4.6.5.3 Sensitive spaces to Activity C works

One vibration sensitive space that may be impacted by Activity C has been identified within the Cumberland West Campus. Location of the sensitive space is shown in Appendix B3.

The vibration criterion was developed based on generic vibration criteria for this type of equipment.

Table 4-13: Sensitive space within Cumberland West Campus - vibration criterion

Facility	Space	Vibration criterion
ECT machine Space	General Laboratories	AS2670.2 Curve 2

5 Construction noise and vibration assessment

Proposed construction activities and associated equipment are listed in Section 5.1. Construction staging for the three Package 2 Activities are listed in Section 5.2. Detailed assessment is presented Appendix C.

5.1 Construction activities

5.1.1 Activity A: Hawkesbury Road Widening

Construction works are anticipated to take place mostly within standard construction hours as shown in Table 4-1, however, some construction works will be required to be undertaken during OOHW periods.

Justification for OOHW are outlined in the detailed assessment in Appendix C1.2.

The OOHW Protocol would be used when required for these works and the form in Appendix D shall support the protocol.

Proposed construction activities and associated equipment for Activity A: Hawkesbury Road Widening have been provided for the area of works by FCC for the project. Table 5-1 provides a summary of proposed construction scenarios and associated plant and equipment and areas of works. The area of works locations can be found in Figure 5-1 and Figure 5-2.

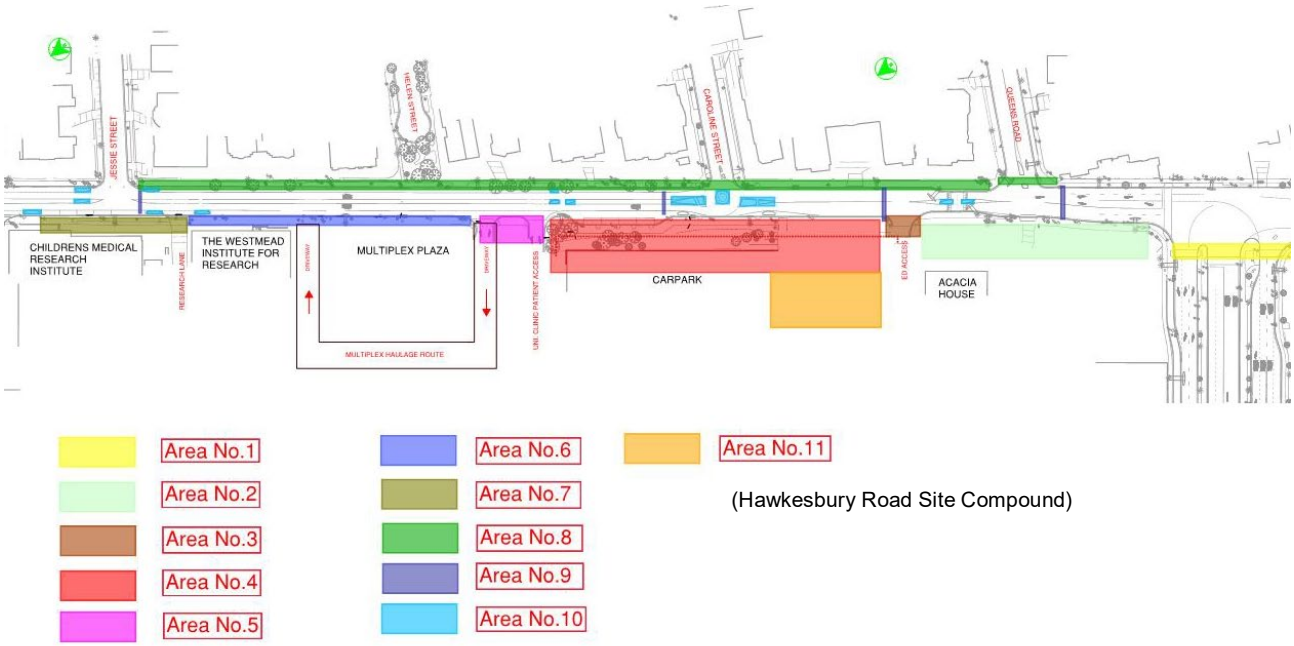

Figure 5-1: Construction areas of works for Activity A: Hawkesbury Road Widening (provided by FCC)

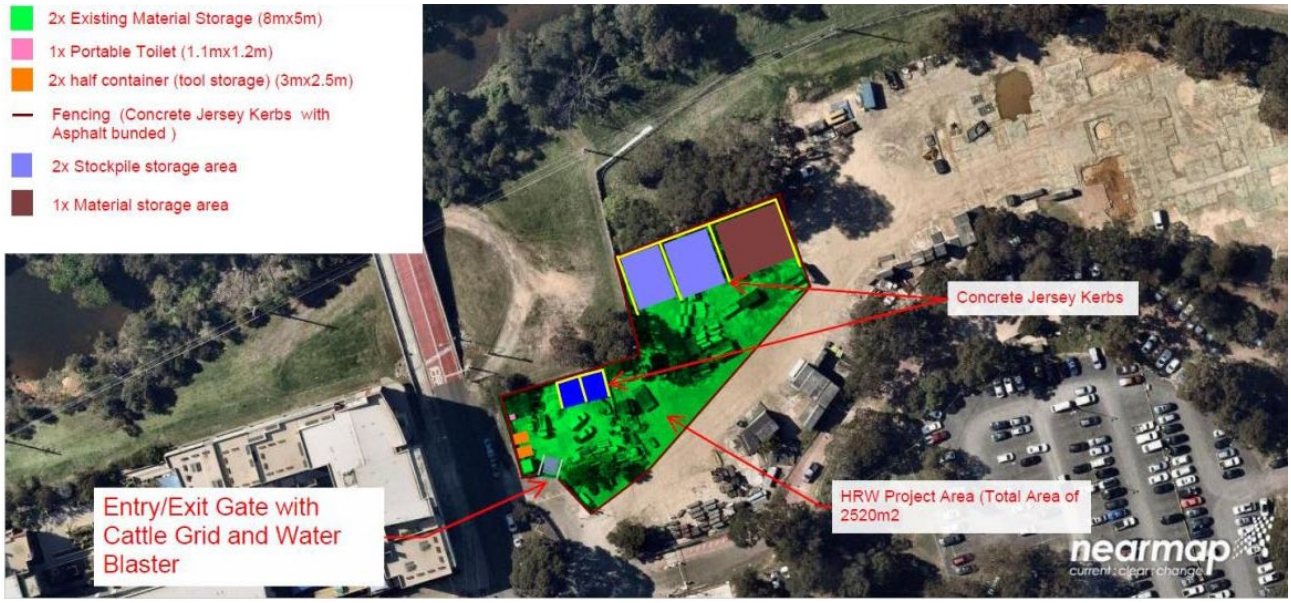

Figure 5-2: Mons Road stockpile compound (Area 12 works)

Table 5-1 is based on information provided by The Contractor and is understood to be the primary equipment used that will determine the level of noise impact. Any cumulative impact from additional ancillary equipment is expected to be minor and not alter the mitigation and management response.

Table 5-1: Activity A: Construction scenarios and associated plant and equipment

Construction Work Area	Scenario	Construction scenario	Scenario reference no.	Scenario Description	Typical plant and equipment required
Area No 1	Sc 1	Service Investigation	A1 Sc1	Potholing for services	Non-destructive excavator
	Sc 2	Telstra Service Crossing Installation	A1 Sc2.1	Saw-cut existing road	Road saw
			A1 Sc2.2	Demolition of existing road	5T-8T Excavator Hammer
			A1 Sc2.3	Backfill and Compaction	Jumping Jack & Plate Compactor
Area No 2	Sc 1	Service Investigation	A2 Sc1	Potholing for services	Non-destructive excavator
	Sc 2	General Demolition	A2 Sc2.1	Saw-cut existing road/footpath	Road Saw
			A2 Sc2.2	Road and Footpath Demolition	5T - 8T Excavator Hammer
	Sc 3	Retaining Wall	A2 Sc3	Backfill of retaining wall fill	2T Smooth Drum Roller
	Sc 4	Comms Services – Elec/ Telstra/Optus	A2 Sc4	Backfill and compaction	Jumping Jack & Plate Compactor

Construction Work Area	Scenario	Construction scenario	Scenario reference no.	Scenario Description	Typical plant and equipment required
	Sc 5	Stormwater Installation	A2 Sc5.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer
			A2 Sc5.2	Backfill and compaction	1T Trench Roller
	Sc 6	Earthworks	A2 Sc6	Compaction of road/footpath pavement	2T - 10T Roller
Area No 3	Sc 1	Service Investigation	A3 Sc1	Potholing for services	Non-destructive excavator
	Sc 2	General Demolition	A3 Sc2.1	Saw-cut existing road	Road Saw
			A3 Sc2.2	Road and Footpath Demolition	5T - 8T Excavator Hammer
	Sc 3	Comms Services – Elec /Telstra/Optus	A3 Sc3	Backfill and compaction	Jumping Jack & Plate Compactor
	Sc 4	Stormwater Installation	A3 Sc4.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer
			A3 Sc4.2	Backfill and compaction	1T Trench Roller
	Sc 5	Earthworks	A3 Sc5	Compaction of road/footpath pavement	2T - 10T Roller
Area No 4	Sc 1	Service Investigation	A4 Sc1	Potholing for services	Non-destructive excavator
	Sc 2	General Demolition	A4 Sc2.1	Saw-cut existing road	Road Saw
			A4 Sc2.2	Road and Footpath Demolition	8T – 13T Excavator Hammer
			A4 Sc2.3	General cutting	Demo Saw
	Sc 3	Clearing & Grubbing	A4 Sc3	Tree Removal	Chain Saw Wood Chipper Stump Grinder
	Sc 4	Piling works	A4 Sc4.1	Piling Pad Preparation	12T Roller
			A4 Sc4.2	Piling Installation	Bauer Drill Rig BG24-01

Construction Work Area	Scenario	Construction scenario	Scenario reference no.	Scenario Description	Typical plant and equipment required
					Soilmec R620 Drill Rig
	Sc 5	Stormwater Installation	A4 Sc5.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer
			A4 Sc5.2	Backfill and compaction	1T Trench Roller
	Sc 6	Earthworks	A4 Sc6	Compaction of road/footpath pavement	2T - 10T Roller
Area No 5	Sc 1	Service Investigation	A5 Sc1	Potholing for services	Non-destructive excavator
	Sc 2	General Demolition	A5 Sc2.1	Saw-cut existing road	Road Saw
			A5 Sc2.2	Road and Footpath Demolition	5T – 8T Excavator Hammer
	Sc 3	Services – Elec/Watermain	A5 Sc3	Backfill and compaction	Jumping Jack & Plate Compactor
	Sc 4	Stormwater Installation	A5 Sc4.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer
			A5 Sc4.2	Backfill and compaction	1T Trench Roller
	Sc 5	Earthworks	A5 Sc5	Compaction of road/footpath pavement	2T - 10T Roller
Area No 6	Sc 1	Service Investigation	A6 Sc1	Potholing for services	Non-destructive excavator
	Sc 2	General Demolition	A6 Sc2.1	Saw-cut existing road	Road Saw
			A6 Sc2.2	Road and Footpath Demolition	5T – 8T Excavator Hammer
	Sc 3	Services – Elec/Watermain	A6 Sc3.1	Backfill and compaction	Jumping Jack & Plate Compactor
			A6 Sc3.2	Watermain pipe cutting to suite alignment	Demo saw
	Sc 4	Stormwater Installation	A6 Sc4.1	Hammer existing rock in	8T – 13T Excavator Hammer

Construction Work Area	Scenario	Construction scenario	Scenario reference no.	Scenario Description	Typical plant and equipment required
				stormwater trench	
			A6 Sc4.2	Backfill and compaction	1T Trench Roller
	Sc 5	Earthworks	A6 Sc5	Compaction of road/footpath pavement	2T - 10T Roller
Area No 7	Sc 1	Service Investigation	A7 Sc1	Potholing for services	Non-destructive excavator
	Sc 2	General Demolition	A7 Sc2.1	Saw-cut existing road	Road Saw
			A7 Sc2.2	Road and Footpath Demolition	5T – 8T Excavator Hammer
	Sc 3	Services – Telstra/Watermain/Elec	A7 Sc3	Backfill and compaction	Jumping Jack & Plate Compactor
	Sc 4	Stormwater Installation	A7 Sc4.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer
			A7 Sc4.2	Backfill and compaction	1T Trench Roller
	Sc 5	Earthworks	A7 Sc5	Compaction of road/footpath pavement	2T Roller
Area No 8	Sc 1	Service Investigation	A8 Sc1	Potholing for services	Non-destructive excavator
	Sc 2	General Demolition & Tree Trimming	A8 Sc2.1	Saw-cut existing road	Road Saw
			A8 Sc2.2	Road and Footpath Demolition	5T – 8T Excavator Hammer
			A8 Sc2.3	Tree Removal	Chain Saw Wood Chipper Stump Grinder
	Sc 3	Services – Jemena/Watermain	A8 Sc3.1	Backfill and compaction	Jumping Jack & Plate Compactor
			A8 Sc3.2	Watermain pipe cutting to suite alignment	Demo saw
	Sc 4	Earthworks	A8 Sc4	Compaction of road/footpath pavement	2T Roller

Construction Work Area	Scenario	Construction scenario	Scenario reference no.	Scenario Description	Typical plant and equipment required
Area No 9	Sc 1	Service Investigation	A9 Sc1	Potholing for services	Non-destructive excavator
	Sc 2	General Demolition	A9 Sc2.1	Saw-cut existing road	Road Saw
			A9 Sc2.2	Road Demolition	5T – 8T Excavator Hammer
	Sc 3	Services – Jemena/ Watermain/ Telstra/RMS	A9 Sc3	Backfill and compaction	Jumping Jack & Plate Compactor
	Sc 4	Sewer	A9 Sc4	Excavation of rock	8T – 13T Excavator
	Sc 5	Earthworks	A9 Sc5	Compaction of road/footpath pavement	2T Roller
Area No 10	Sc 1	Removal of median island	A10 Sc1.1	Island Demolition	5T – 8T Excavator Hammer
			A10 Sc1.2	Road cutting	Road Saw
Area No 11	Sc 1	Site Establishment (Underground service trenches)	A11 Sc1.1	Saw-cut existing road	Road Saw
			A11 Sc1.2	Demolition of existing road	5T - 8T Excavator Hammer
Area No 12	Sc1	Stockpile Compound (Off Mons Road)	A12 Sc 1	Tipping and loading stockpile materials	8-20T Excavator 2-4T Tipper Bogie Tipper Truck and Trailer Semi-trailer
			A12 Sc 2	Washing off concrete trucks and pumps	Concrete trucks and pumps Gerny
			A12 Sc 3	Loading and unloading trucks with forklift	Forklift Hiab Truck Semi-Trailer Small crane

5.1.2 Activity B: Cumberland Hospital (East Campus) Demolition

Construction works are anticipated to take place within standard construction hours as defined in Table 4-1. No OOHW are currently proposed for this activity.

Proposed construction activities and associated equipment for Activity B: Cumberland Hospital (East Campus) Demolition have been provided by Renascent for the project. These will be conducted in parallel for all buildings. Table 5-2 provides a summary of proposed construction scenarios (to be carried out for each building to be demolished) and associated plant and equipment. The works locations can be found in Figure 5-3 and Figure 5-4.

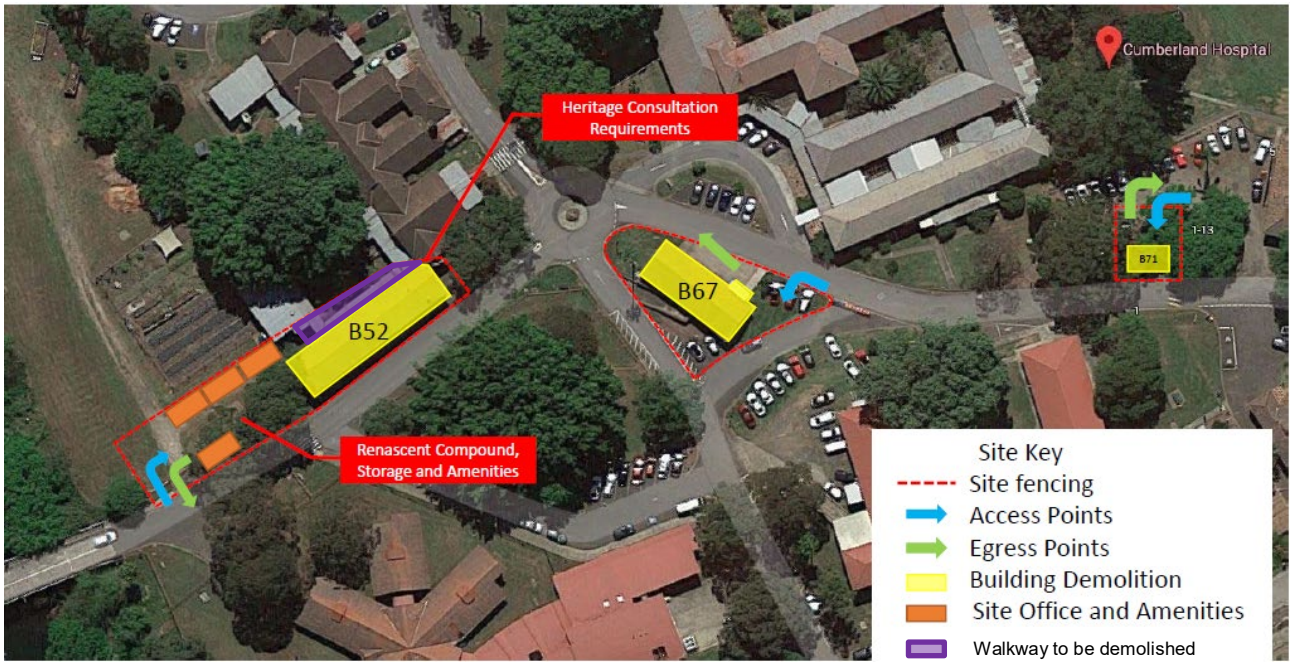

Figure 5-3: Construction locations for Activity B: Cumberland Hospital (East Campus) demolition (building 52, 67 and 71 locations) (provided by Renascent)

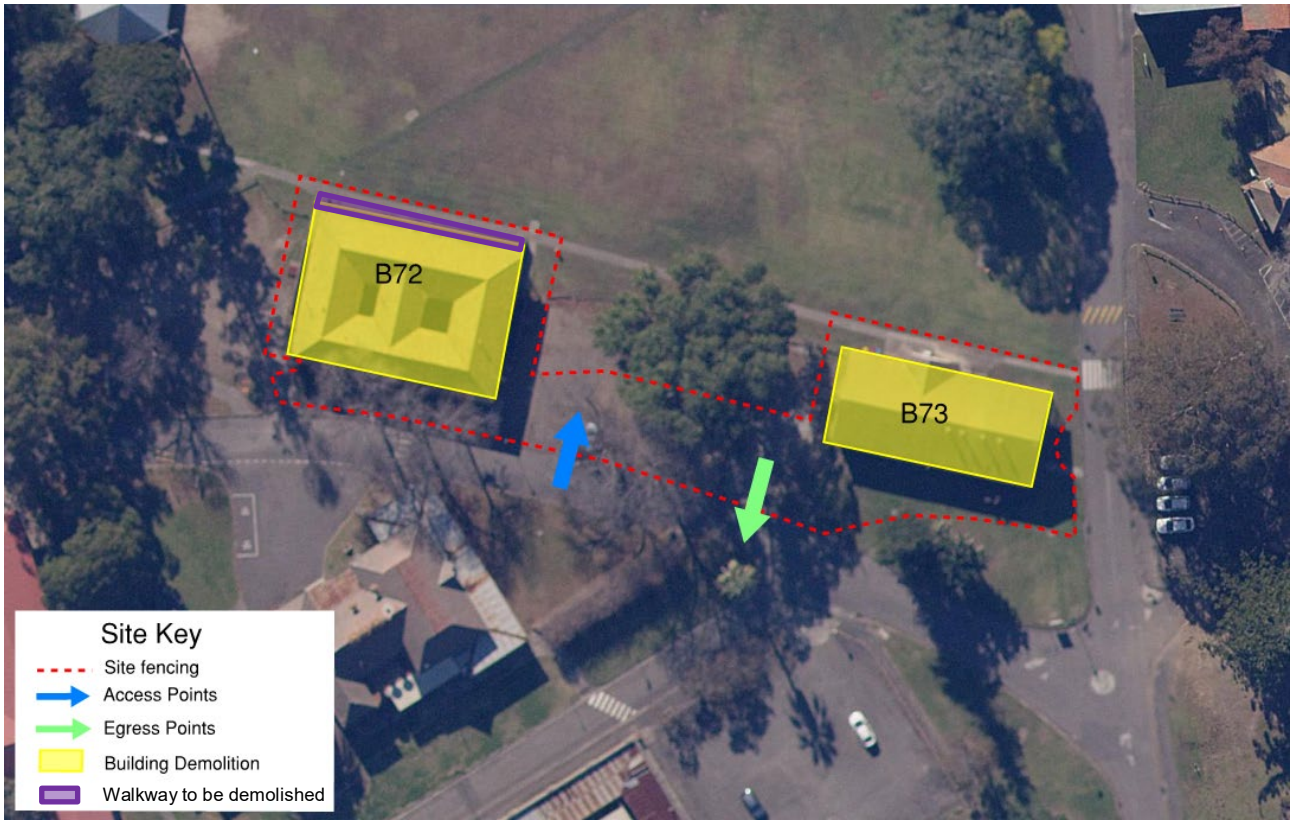

Figure 5-4: Construction locations for Activity B: Cumberland Hospital (East Campus) demolition (building 72 and 73 locations) (provided by Renascent)

Table 5-2: Activity B: Construction scenarios and associated plant and equipment

Scenario reference no.	Construction scenario[3]	Typical plant and equipment required
Sc A	Site establishment	1 truck delivering site fencing
Sc B	Services disconnection	4 x light vehicles
Sc C	Hazmat Removal	3 x light vehicles
Sc D1	Demolition (Walkway)	1x concrete saw
Sc D2[2]	Demolition (demolition to slab level, leaving only in-ground foundations and concrete slabs for each building)	2x tipper truck and dog 1x 23-30t excavator 6x light Vehicles
Sc E	Remediate Site	N/A
Sc F	Hand over	N/A
Note 1: N/A: Not Applicable Note 2: Floor slabs, foundations, hard stands and asphalt are not part of the demolition scope. There is no excavation or in-ground works proposed. Note 3: Major services diversion works are not part of the proposed works.		

5.1.3 Activity C: Cumberland Hospital (West Campus) Demolition

Construction works are anticipated to take place within standard construction hours as defined in Table 4-1. No OOHW are currently proposed.

Proposed construction activities and associated equipment for Activity C: Cumberland Hospital (West Campus) Demolition have been provided by Donnelley Construction. Table 5-3 provides a summary of proposed construction scenarios and associated plant and equipment and areas of works. The area of works locations can be found in Figure 5-5 and Figure 5-6 below.

Table 5-3: Activity C: Construction scenarios and associated plant and equipment

Work area (refer to Figure 5-5)	Scenario reference no.	Construction Scenario	Scenario Reference no.	Scenario Description	Typical plant and equipment required
Yellow Area (Demolition of cottages)	Sc 1	Cottages (to the north) – external works/ demolition	Sc1.1	Site establishment	1x truck delivering site fencing
			Sc1.2	Demolition	1x 20t excavator 1x 13t truck removing demolition waste 1x jackhammer
Light Blue Area (Building to be demolished)	Sc 2	Existing Boronia – Demolition	Sc2.1	Demolition of existing Boronia	1x 27t excavator 2x trucks
			Sc2.2	Demolition of concrete columns within the Boronia Ward (if any)	1x jackhammer or 1x concrete saw
Note 1: Floor slabs, foundations, hard stands and asphalt are not part of the demolition scope. There is no excavation or in-ground works proposed. Note 2: Major services diversion works are not part of the proposed works.					

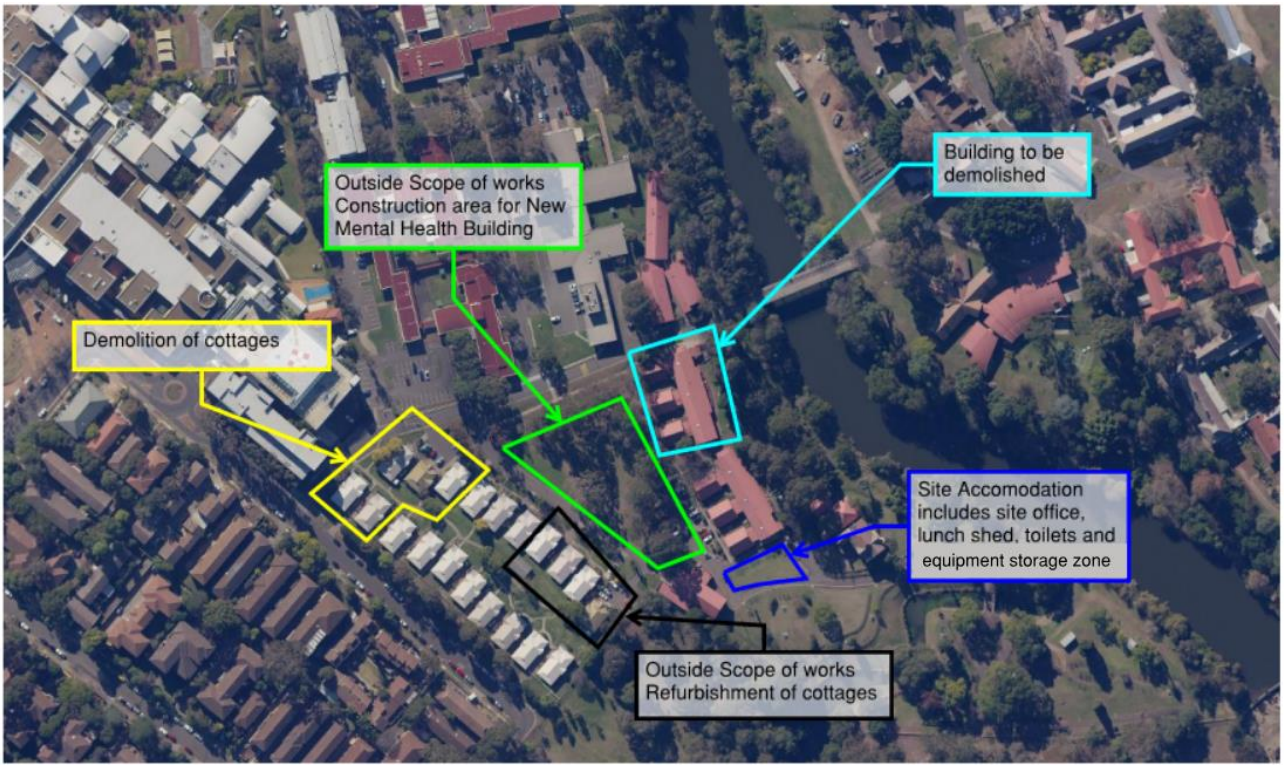

Figure 5-5: Construction locations for Activity C: Cumberland Hospital (West Campus) demolition

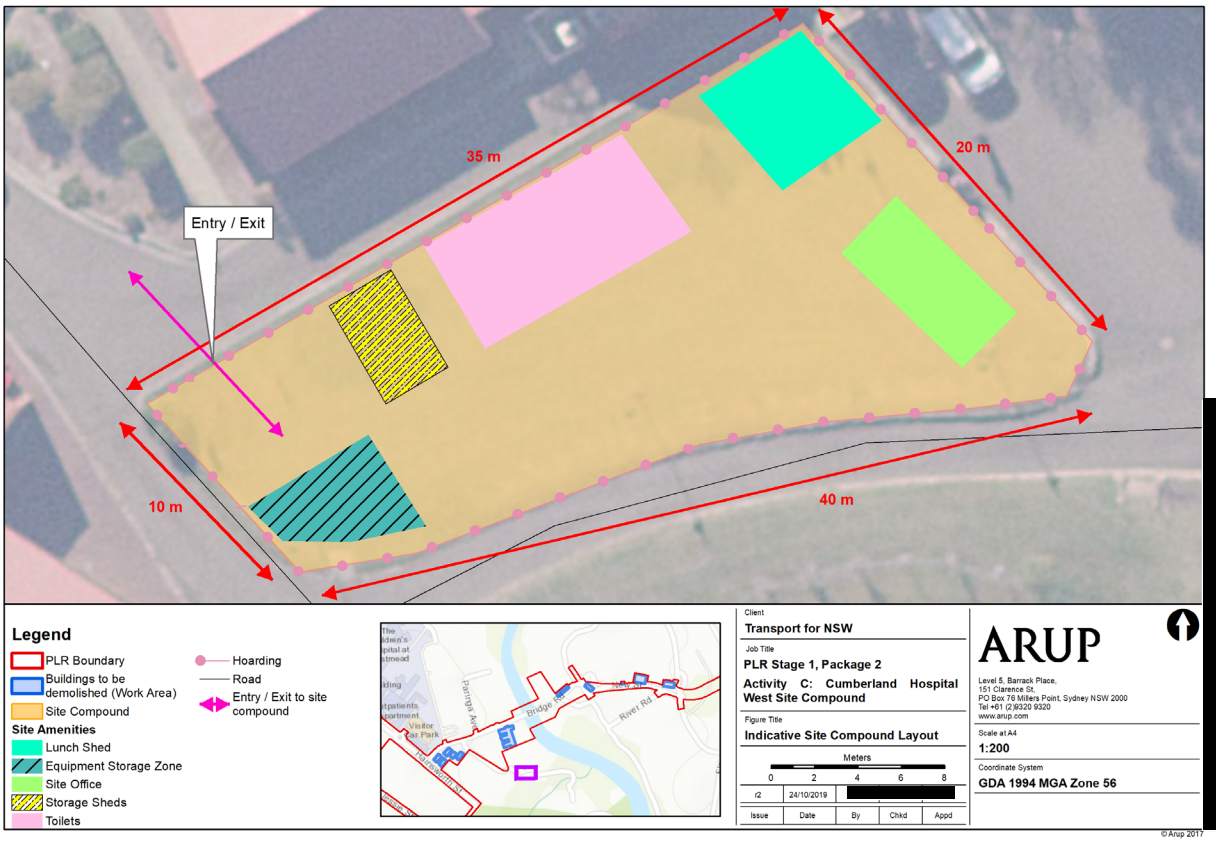

Figure 5-6: Activity C: Cumberland Hospital (West Campus) demolition

5.2 Construction staging

The following table shows the indicative staging of the three Package Activities. Detailed staging for each Activity is given in Appendix C. It should be noted while activity B and C (demolition of cottages) are shown as happening during 2020, this work will not be continuous and each activity would last for a period of approximately three months.

Table 5-4: Indicative construction staging for activities

Work Description	Indicative Commencement Date	Estimated Completion Date
Activity A: Stage 1 - Site establishment	Q3 2019	Q3 2019
Activity A: Stage 2 - Clearing car park - Retaining wall construction - Piling prep - Telstra work	Q3 2019	Q3 2019
Activity A: Stage 3 - Services Installation - Sewer main crossing - Piling - Block wall	Q3 2019	Q4 2019
Activity A: Stage 4 - Cantilever structure - Piling - Telstra	Q4 2019	Q4 2019
Activity A: Stage 5 - Cantilever structure - Watermain - Stormwater	Q4 2019	Q1 2020
Activity A: Stage 6 - Stormwater - Smart poles - Watermain	Q1 2020	Q2 2020
Activity A: Stage 7 - Road finishes - Kerb gutter - Footpaths	Q2 2020	Q3 2020

Work Description	Indicative Commencement Date	Estimated Completion Date
- Pavement works		
Activity B: Demolition of buildings	Q1 2020	Q4 2020
Activity C: Demolition of cottages	Q1 2020	Q4 2020
Activity C: Demolition of Boronia Ward	Q4 2020	Q1 2021

5.3 Noise and vibration assessment

The following provides a summary of the noise and vibration impact assessment, that is detailed in Appendix C.

5.3.1 Activity A: Hawkesbury Road Widening

The noise and vibration assessment for Activity A has been based on the construction activities outlined in Section 5.1.1 and detailed assessment results are outlined in Appendix C1.

Key outcomes:

- Results show exceedances of the NMLs are expected to occur during most of the construction activities during standard hours as most of the nearest residential receivers adjacent to Hawkesbury Road will fall into the Highly Noise Affected category defined in the ICNG.
- Exceedances are also predicted to occur during the OOHW period 2 (night-time). Noise levels at the nearest residential receivers are predicted to be above $L_{Aeq15\ min}$ 65 dBA criteria for all works occurring during OOHW period 2. Respite periods will need to be provided for all construction activities currently scheduled to occur during night time as required by CoAs.
- Areas of work and construction activities where respite periods are required have been identified in Appendix C1, Table C1-3.
- Noise mitigation and management measures identified in Section 6 shall be adopted for these works to limit noise impacts on nearest sensitive receivers.
- Vibration intensive plant is proposed to be used for this Activity and management measures described in Table 6-1 as well as monitoring is proposed to be implemented where sensitive receivers are located within the minimum working distances. Refer to Appendix E.
- Risk of damage to sensitive equipment located within the Hospital due to construction vibration generating activities have also been identified and management measures are proposed in Table 6-1 and Appendix E.

5.3.2 Activity B: Cumberland Hospital (East Campus) Demolition

The noise assessment for Activity B has been based on the construction activities outlined in Section 5.1.2 and detailed assessment results are outlined in Appendix C2.

Key outcomes:

- Highly Noise Intensive Works are proposed for this Activity with use of the concrete saw
- The saw cutting of the walkway to the north of buildings 52 and 72 will be conducted prior to demolition of the buildings 52 and 72 (to provide shielding to receivers located to the South)
- Saw cutting has been identified as the best option to limit noise and vibration impacts upon nearby sensitive receivers to undertake the required works.
- Predicted noise levels indicate exceedances of the NMLs during highly noise intensive works and/or exceedances of the highly noise affected criteria for sensitive receivers located within the Cumberland Hospital East Campus. Respite periods will therefore need to be provided.
- Opaque fencing and gates with locks will be installed for privacy and security purposes around the site compound.
- Should concurrent activities occur (such as, but not limited to the construction of the new Boronia Building as per Section 5.2), there is a potential that receivers may be exposed to

higher construction noise levels. In these instances, consultation with the relevant development shall be conducted as stated in Section 6.

- Noise mitigation and management measures identified in Section 6 shall be adopted for these works to limit noise impacts on nearest sensitive receivers.
- It is noted that the assessment is conducted in accordance with the noise and vibration guidelines and regulations for healthy individuals and that noise and vibration are likely to be perceived differently by consumers of Cumberland Hospital. The assessment has, wherever possible, ensured that equipment selection and demolition phasing minimises noise and vibration impacts as far as practicable.
- Appendix E of the Community Communication Strategy (PLR-TFNSW-CBD-PE-PLN-000001) includes a specific communication procedure for Cumberland Hospital for the entire PLR project. This provides the strategy to communicate information effectively within the hospital and to provide specific guidance management measures to cater for the different needs of different parts of the campuses. The communication strategy is based on on-going collaborative communication between the Cumberland Hospital (East and West) Campus and The Contractor (Refer to Section 6).
- Construction activities are predicted to be audible at the GHFF colony. Construction activities also include highly intensive works. Therefore, mitigation in accordance with the GHFF monitoring program shall be followed.
- Noise emissions from construction traffic within the Cumberland Hospital East Campus generated by Activity B works are anticipated to be noticeable due to the anticipated low existing traffic within the Cumberland Hospital East Campus. While there are no specific criteria for construction traffic travelling within the Cumberland Hospital East Campus, guidance is taken from the RNP and the local road criteria is applied. Construction traffic noise is unlikely to result in a 2 dBA increase and/or is anticipated to meet criteria defined in the RNP.
- No vibration intensive plant is proposed to be used for this Activity and therefore cosmetic damage and human response criteria are expected to be met. Vibration monitoring is therefore not proposed.
- In relation to building 52, it will be partly demolished, and the retained part will be refurbished. These refurbishment works should remedy any minor cosmetic damage, potentially caused by the demolition works. During its partial demolition, building 52 will be unoccupied.
- Inspection/dilapidation survey of building 52 will be required not because of potential damage to the building caused by vibration of ground but because of potential damage to the building caused by method of demolition unrelated to vibration of ground.

5.3.3 Activity C: Cumberland Hospital (West Campus) Demolition

The noise assessment for Activity C has been based on the construction activities outlined in Section 5.1.2 and detailed assessment results are outlined in Appendix C3.

Key outcomes:

- Highly Noise Intensive Works are proposed for this Activity with use of a jackhammer. Note that the use of a jackhammer (or a concrete saw) is required only if there are concrete columns within the Boronia Ward that need to be demolished.
- Predicted noise levels indicate exceedances of the NMLs during highly noise intensive works and/or exceedances of the highly noise affected criteria for sensitive receivers located within the Cumberland Hospital West Campus. Respite periods will therefore need to be provided.

- Opaque fencing and gates with locks will be installed for privacy and security purposes around the site compound.
- Noise mitigation and management measures identified in Section 6 shall be considered for these works to limit noise impacts on nearest sensitive receivers.
- It is noted that the assessment is conducted in accordance with the noise and vibration guidelines and regulations for healthy individuals and that noise and vibration are likely to be perceived differently by consumers of Cumberland Hospital. The assessment has, wherever possible, ensured that equipment selection and demolition phasing minimises noise and vibration impacts as far as practicable.
- Appendix E of the Community Communication Strategy (PLR-TFNSW-CBD-PE-PLN-000001) includes a specific communication procedure for Cumberland Hospital for the entire PLR project. This provides the strategy to communicate information effectively within the hospital and to provide specific guidance management measures to cater for the different needs of different parts of the campuses. The communication strategy is based on on-going collaborative communication between the Cumberland Hospital (East and West) Campus and The Contractor (Refer to Section 6).
- Construction activities are predicted to be audible at the GHFF colony. Construction activities also include highly intensive works. Therefore, mitigation in accordance with the GHFF monitoring program shall be followed.
- Noise emissions from construction traffic within the Cumberland Hospital West Campus generated by Activity C works are anticipated to be noticeable due to the anticipated low existing traffic within the Cumberland Hospital West Campus. While there are no specific criteria for construction traffic travelling within the Cumberland Hospital West Campus, guidance is taken from the RNP and the local road criteria is applied. Construction traffic noise is unlikely to result in a 2 dBA increase and/or is anticipated to meet criteria defined in the RNP.
- While vibration intensive plant might be used for this Activity (if a concrete column needs to be demolished using a jackhammer), cosmetic damage criteria and Human comfort criteria are predicted to be met at nearby sensitive receivers and sensitive equipment.

6 Management measures

6.1 Roles and responsibilities

The Contractors Team's organisational structure and overall roles and responsibilities are outlined in Section 3.2 of the CEMP. Specific responsibilities for the implementation of environmental controls relevant to noise and vibration are detailed in Table 6-1 of this Sub-Plan.

6.2 Training

All employees, contractors and utility 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 noise and vibration management including:

- Existence and requirements of this Sub-Plan
- All relevant project specific and standard noise and vibration management measures (Refer to Table 6-1)
- Relevant licence and approval conditions
- Permissible hours of work, such as standard hours, OOHW permits and respite periods.
- Out of hours works protocol, including consultation
- Any limitations on high noise generating activities
- Location of nearest sensitive receivers (provision of Land use survey maps)
- Construction employee parking areas
- Designated loading/unloading areas and procedures
- Site opening/closing times (including deliveries)
- Complaints reporting

Specific responsibilities to minimise impacts on the community and built environment from noise and vibration associated with the works.

Further details regarding staff induction and training are outlined in Section 3.4 of the CEMP.

Specific mitigation and management measures to address contract specifications, CoA and REMMMs in relation to impacts from noise and vibration are outlined in Table 6-1 and Section 6.4 to Section 6.8.

6.3 Management measures

The management measures in Table 6-1 aim to meet noise and vibration performance outcomes from PLR Stage 1 Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report, incorporating Preferred Infrastructure Report

- Noise levels would be minimised with the aim of achieving the noise management levels where feasible and reasonable.
- The project would avoid any damage to buildings, utilities or heritage items from vibration.

Section 3.1.1 of the CEMP notes that ongoing analysis of environmental risks, including those associated with noise and vibration risks will be incorporated as an agenda item in the weekly site meeting.

Table 6-1: Noise and vibration management measures summary

Management Measure Requirement	Details	Timing/ Frequency	Responsibility	CoA /REMMM Reference	Reference Id	Activity A	Activity B	Activity C
Community Consultation								
Community engagement prior to works	A suite of communication tools and activities will be utilised as required to target the sensitive receivers based on the nature of works and the potential impacts to provide clear, effective and timely information. The community consultation will be carried out in accordance with the Community Communication Strategy (PLR-TFNSW-CBD-PE-PLN-000001). Ongoing consultation in accordance with the Community Communication Strategy will assist to identify sensitive receivers and manage noise and vibration impacts (as required by E20, E31 and E39).	Refer to PLR-TFNSW-CBD-PE-PLN-000001	Communication Manager	CoA E20, E31 and E39		✓	✓	✓
	• Consultation shall be carried out with local schools and other educational facilities prior to noise intensive works to ensure impacts are minimised during examination periods and/or other critical periods in the school calendar (where works are predicted to exceed the relevant construction noise management level for this receiver). • Consultation with nearby childcare centres shall be carried out to potentially avoid noisy works during rest periods at the centres (where possible).	Pre-construction for works within 100 m of facilities (Area 1). Follow-up every month to reconfirm	Communication Manager	CoA E28, E31, E39, E42 REMMM NV-2 (e)	CCM 1	✓	N/A Receivers not relevant to work area	N/A Receivers not relevant to work area
	• Consultation shall be carried out with the Westmead hospital and research partners • A construction representative shall attend the fortnightly Westmead Hospital project meetings which includes representation from all agencies and contractors undertaking work affecting Westmead Hospital. • A local liaison representative shall engage with Westmead hospital.	Pre-construction (completed). Fortnightly meetings throughout.	Communication Manager	CoA E28, E31, E39, E42 REMMM NV-4, NV-8 (a)	CCM 2	✓	N/A Receivers not relevant to work area	✓
	• Consultation shall be carried out with Cumberland East and Cumberland West hospital as part of the communication strategy (refer to CEMP Section 3.13) • A local liaison representative shall engage with Cumberland East and West hospital.	Pre-construction (completed). Weekly meetings throughout.	Communication Manager	CoA E31, E42, REMMM NV-4	CCM 10	N/A	✓	✓
	• Cumberland hospital (East and West) Campus developed a communication strategy for the construction works to communicate information effectively within the hospital and to provide specific guidance management measures to cater for the different needs for the different parts of the campuses. The communication strategy is based on on-going collaborative communication between the Cumberland Hospital (East and West) Campus and The	Pre-construction To be implemented during construction	Cumberland Hospital to develop and implement	CoA E31	CCM 11	N/A	✓	✓

Management Measure Requirement	Details	Timing/ Frequency	Responsibility	CoA /REMMM Reference	Reference Id	Activity A	Activity B	Activity C
	Contractor. (Refer to CEMP Section 3.1.2, 3.13, 3.6 and 3.7.2)							
	• Disruption notice to be communicated to the Cumberland hospital (East and West) Campus prior to any (significant) disruption to Cumberland Hospital	To be communicated 10 days prior to any (significant) disruption to Cumberland Hospital	Communication Manager		CCM 12	N/A	✓	✓
	• Contact potentially noise affected neighbours (first row of house along Hawkesbury Road or as identified under the OOHW Protocol for HRW) at the earliest possible time before any site work begins and keep up to date with works progress • Note, if respite periods are triggered for the work, the community/stakeholder can be provided the option of alternative measures, such as at-property treatment or alternative accommodation to allow extend works duration.	Pre-construction Timing: Refer to PLR-TFNSW-CBD-PE-PLN-000001	Communication Manager Project Manager (to determine in alternative measures to be proposed)	CoA E28, E31, E37, E39, E42 REMMM NV-2 (n)	CCM 3	✓	N/A	N/A
	• Periodic notifications – These include regular newsletters, letterbox drops or advertisements in local papers to provide an overview of current and upcoming works and other topics of interest. • Website updates – The project website shall form a resource for members of the community to seek further information, including CNVMPs and current and upcoming construction activities • Project info-line and construction response line – Transport for NSW will operate a construction response line and a project info-line (1800 775 465). These numbers will provide a dedicated 24-hour contact point for any complaints regarding construction works and for any project enquiries. All complaints require a verbal response within two hours. All enquiries require a verbal response within 24 hours during standard construction hours, or on the next working day during out-of-hours work (unless the enquirer agrees otherwise). • Email distribution list shall be provided (used to disseminate project information to interested stakeholders) • Signage shall be provided to notify stakeholders of project details and project emergency or enquiry information • Specific notifications – Specific notifications would be letterbox dropped or hand distributed to the nearby residences and other sensitive receptors no later than seven 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.	Pre-construction assessment. To be implemented during construction Timing: Refer to PLR-TFNSW-CBD-PE-PLN-000001	Communication Manager	CoA E28, E42 REMMM NV2 (n) NV-3 (a to h)	CCM 4	✓	✓	✓

Management Measure Requirement	Details	Timing/ Frequency	Responsibility	CoA /REMMM Reference	Reference Id	Activity A	Activity B	Activity C
	• Phone calls – Phone calls will only be adopted if trigger by OOHW applications, or for specific receptors if requested (after notification of the works as above). Communications representatives from The Contractor(s) would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. • Individual briefings – Individual briefing will only be adopted if trigger by OOHW applications, or for specific receptors if requested (after notification of the works as above). Communications representatives from The Contractor(s) would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities.							
	The Contractor will maintain records of community engagements at the site office throughout construction in accordance with Section 3.6.3 of the CEMP.	Throughout construction.	Communication Manager		CCM 8	✓	✓	✓
	The Communications Manager must record all complaints on the stakeholder database, Consultation Manager, and register complaints on the Complaints spreadsheet (available in the Appendix C1 of the CEMP) if Consultation Manager is unavailable.	Throughout construction.	Communication Manager		CCM 9	✓	✓	✓
Consultation with other CSSI proponents	Consultation with proponents or applicants of other State Significant development and infrastructure works near the CSSI are to be undertaken. As pre-works consultation has been completed, it is expected that TfNSW will advise The Contractor of any unscheduled works by other applicants in the area. Should other projects be identified (such as but not limited to the construction of the New Boronia building), the communication manager must hold a coordination meeting with counterparts in other projects to identify measures to minimise cumulative noise and vibration impacts, reasonable steps are to be taken to coordinate works to minimise cumulative impacts of noise and vibration and maximise respite for affected sensitive receivers	Completed pre-construction.	Communication Manager	CoA E32 REMMM RC-1	CCM 5	✓	✓	✓
Register Noise Sensitive Receivers	The Contractor shall register all noise and vibration sensitive receivers (NSRs) and the register shall be kept on site. The register shall include the following details for each NSR: • Address of receiver • Category of receiver (e.g Residential, Medical, Commercial etc.) • Contact name and phone number.	Pre-construction	Communication Manager	CoA E20	CCM 6	✓	✓	✓
Programming – for emergency work	On becoming aware of the need for emergency construction works, the ER shall be notified of the need for those activities or works. Best endeavours	During construction Timing: Refer to PLR-TFNSW-CBD-PE-PLN-	Project Manager	E26	CCM 7	✓	✓	✓

Management Measure Requirement	Details	Timing/ Frequency	Responsibility	CoA /REMMM Reference	Reference Id	Activity A	Activity B	Activity C
	to notify all affected sensitive receivers of the likely impact and duration of those works shall be carried out. It is anticipated that letter box drops, emails and phone calls described in CCM4 and CCM12 will be used as a minimum.	000001 and OOHW Protocol	Communication Manager					
Works and Site Planning								
Develop and Update Environmental Management Plans	The CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies. A weekly review of the monitoring, complaints and incidents register shall be carried out to inform necessary changes to the plan.	Weekly review	Project Manager		WSP 1	✓	✓	✓
Construction hours and scheduling	Where feasible and reasonable, construction shall be carried out during the standard daytime working hours. Work that generates noise exceeding NML+15 dB (refer to noise predictions) or is considered high impact noise and/or high impact vibration levels, shall be scheduled during a time that will reduce the impact on sensitive receivers.	Pre-construction assessment. To be implemented during construction	Project Manager	CoA E21, E22 and E27 REMMM NV-2 (c)	WSP 2	✓	✓	✓
	Adherence to daytime construction hours is recommended for excavation, demolition, rock breaking or high impact noise, and for activities concentrated in a single area (i.e. activities that do not move along the alignment, and do not require out-of-hours activities for safety reasons or to minimise disruption to road networks). If the works cannot be undertaken during the daytime, it shall be completed before 10:00 pm. Refer to OOHW protocol	Pre-construction assessment. To be implemented during construction	Project Manager Senior Project Engineer	REMMM NV-2 (b) REMMM NV-5	WSP 3	✓	X	X
	Work generating high vibration levels are to be scheduled during less sensitive time periods.	Pre-construction assessment. To be implemented during construction.	Activity A: Senior Project Engineer Activity B and C: Project Engineer		WSP 4	✓	N/A Not relevant for activity	✓
	When Out of Hours work is required, out of hours works shall be programmed to minimise the number of consecutive out of hour work periods impacting the same receptors. Section 1.3 of Protocol identifies consideration of relocation. Due to close proximity of works to all receivers, it is not expected that work can be sufficiently removed to provide clear respite. Accordingly, 4 nights on/ 3 nights off would be followed. Refer to OOHW protocol	Pre-construction assessment. To be implemented during construction	Senior Project Engineer	REMMM NV-2(d)	WSP 5	✓	N/A No OOHW	N/A No OOHW
Respite periods	High noise and vibration generating activities (including jack and rock hammering, sheet and pile driving, rock breaking and vibratory rolling) shall only be carried out in continuous blocks, not exceeding 3	Pre-construction assessment.	Activity A: Senior Project Engineer	CoA E27, E36, E37	WSP 6	✓	✓	✓

Management Measure Requirement	Details	Timing/ Frequency	Responsibility	CoA /REMMM Reference	Reference Id	Activity A	Activity B	Activity C
	hours each, with a minimum respite period of one hour between each block. (Note: “Continuous” includes any period during which there is less than a 60 minutes respite between ceasing and recommencing any of the work). During standard hours, respite shall also be provided for activities that exceed the Highly Noise Affected Level of 75 dB $L_{Aeq,15\ minute}$. Refer to Table 4-2 for reference or assess using the TfNSW estimator tool or equivalent prediction method. During out-of-hours works, respite shall also be provided for activities that exceed the 65 dB $L_{Aeq,15\ minute}$. Refer to Table 4-2 for reference or assess using the TfNSW estimator tool or equivalent prediction method. Where Highly Noise Intensive Activities are utilised, refer to respite periods in E27: Works shall be conducted as follows: 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) in continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block. Where other equipment is utilised, timing can vary, but must accord with the 3 hours on / 1 hour off respite and be coordinated with other work in the Area. Respite periods in OOHW periods will be determined via assessment under the protocol and will vary dependent on the duration and times of works.	To be implemented during construction	Activity B: Project Engineer Activity A: Contractor Foreman Activity B and C: Site Foreman	REMMM NV-2 (m)				
Vehicle movements	• Where possible, heavy vehicle movements shall be limited to daytime hours. • Opportunities to reduce road traffic noise during construction shall be investigated during construction planning, including restricting heavy vehicle movements to standard construction hours and/or to routes with fewer sensitive receivers.	Pre-construction assessment. To be implemented during construction	Activity A: Contractor Foreman Activity B and C: Site Foreman	REMMM NV-6	WSP 7	✓	✓	✓
Traffic and loading areas	• Plan traffic flow, parking and loading/unloading areas to minimise reversing movements and idling traffic within the site. • Vehicles, shall not queue idling in front of residential apartments to await entry into the compound	Pre-construction assessment and to be implemented during construction	Activity A: Contractor Foreman Activity B and C: Site Foreman	REMMM NV-2 (p)	WSP 8	✓	✓	✓
	• Select site access points and roads as far as possible away from NSRs	Pre-construction assessment and to be	Superintendent	REMMM NV-6	WSP 9	✓	✓	✓

Management Measure Requirement	Details	Timing/ Frequency	Responsibility	CoA /REMMM Reference	Reference Id	Activity A	Activity B	Activity C
	• Dedicated loading/unloading areas to be shielded if close to NSRs • Delivery vehicles to be fitted with straps rather than chains for unloading, wherever feasible and reasonable • Reduce construction traffic if available to do so	implemented during construction						
Delivery vehicles	• Loading and unloading of materials/deliveries is to occur as far as possible from NSRs. • Vehicles being loaded/unloaded shall have engines switched off where practicable.	Pre-construction assessment. To be implemented during construction	Superintendent Activity A: Contractor Foreman Activity B and C: Site Foreman	REMMM NV-2 (p)	WSP 10	✓	✓	✓
Use and siting of plant	• The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. • Plant and equipment used intermittently is to be throttled down or shut down. • Noise-emitting plant is to be directed away from sensitive receivers. • Only have necessary equipment onsite • Cleaning of vehicles shall occur at the eastern most end of the Mons Road Compound, furthest removed from the residential receivers	Pre-construction assessment. To be implemented during construction	Activity A: Contractor Foreman Activity B and C: Site Foreman Subcontractors	REMMM NV-2 (f, g, h, i)	WSP 11	✓	✓	✓
Boundary screening and hoarding	Based on current assessment, the installation of 2.4 metre high hoarding of solid construction around site compounds to minimise noise on sensitive receivers is not expected to provide any noise benefit to surrounding sensitive receivers.	N/A	Superintendent	CoA C19 REMMM NV-2 (j)	SMM 2	✓	✓	✓
	Opaque fencing and gates with locks is to be installed around site compounds for privacy and security purposes.	N/A	Superintendent	CoA C19 REMMM NV-2 (j)	SMM 2	N/A Refer above.	✓	✓
Shielding by Site Sheds or other structures	Structures such as site sheds shall be positioned to further shield sensitive and residential receivers from works activities. This is likely to be limited to the planning of the two site compounds.	Pre-construction assessment. To be implemented during construction/demolition.	Activity A: Senior Project Engineer Activity B and C: Project Engineer	REMMM NV-2 (k)	SMM 3	✓	✓	✓
	Pavement demolition will be carried out prior to demolition of building 52 and 72 for the buildings to provide shielding to receivers located to the south of building 52 and 72.	Pre-construction assessment. To be implemented during demolition.	Project Engineer		SMM5	N/A	✓	X
Temporary acoustic fencing/barriers	For construction concentrated in a single area, such as at the stops, worksites, substation construction sites, bridge sites and the stabling and maintenance facility location, temporary acoustic fencing/barriers	Pre-construction assessment. To be implemented during construction.	Activity A: Contractor Foreman	REMMM NV-2 (a)	SMM 4	✓	✓	✓

Management Measure Requirement	Details	Timing/ Frequency	Responsibility	CoA /REMMM Reference	Reference Id	Activity A	Activity B	Activity C
	around the site perimeter will be used where feasible. Temporary noise barriers, such as loaded vinyl panels installed on temporary fences, are expected to be adopted for the works.		Activity B and C: Site Foreman					
	Temporary noise barriers will be installed in strategic locations to shield nearest most sensitive receivers as identified in Appendix C during demolition activities where practical to do so such as: • Around the Boronia building to be demolished (and in particular to the south of the Boronia Building to be demolished (to provide shielding to the Acacia building)) • To the south and west corner of B52 during demolition (to provide shielding to the Bunya building)	Pre-construction assessment. To be implemented during construction.	Activity B and C: Site Foreman	REMMM NV-2 (a,k)	SMM 6	N/A	✓	✓
Shield stationary noise sources	Sources such as pumps, compressors, fans etc: Stationary noise sources would be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained. Appendix F of AS 2436: 1981 lists materials suitable for shielding	To be implemented during construction.	Superintendent		SMM 1	✓	✓	✓
Work practices								
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • Existence and requirements of this Sub-Plan • All relevant project specific and standard noise and vibration management measures (this Table of measures) • Relevant licence and approval conditions • Permissible hours of work, such as standard hours, OOHW permits and respite periods. • Out of hours works protocol, including consultation • Any limitations on high noise generating activities • Location of nearest sensitive receivers (provision of Land use survey maps) • Construction employee parking areas • Designated loading/unloading areas and procedures • Site opening/closing times (including deliveries) • Complaints reporting	Pre-construction and to be implemented during construction	Environmental Manager		WP 1	✓	✓	✓
Toolbox talks	During toolbox talks, site and works specific NV requirements shall be included, including:	To be implemented during construction	Activity A: Contractor Foreman		WP 2	✓	✓	✓

Management Measure Requirement	Details	Timing/ Frequency	Responsibility	CoA /REMMM Reference	Reference Id	Activity A	Activity B	Activity C
	• Hours of work • Scheduled respites • Review of Work Practices measures • Current monitoring in vicinity of works.		Activity B and C: Site Foreman					
Behavioural practices	• No swearing or unnecessary shouting or loud stereos/radios onsite. • No dropping of materials from height, throwing of metal items and slamming of doors • Regularly train workers and contractors (such as at toolbox talks) to use equipment in ways to minimise noise. • Consideration shall be given to driver behaviours • No construction-based activity is to occur in the Hawkesbury Road site compound and the Activity C site compound and will be monitored closely.	To be implemented during construction	The Contractor, Associates and Subcontractors		WP 3	✓	✓	✓
Site review	• The foreman shall carry out daily review of works practices to ensure the compliance with this Sub-plan.	To be implemented during construction Daily	Activity A: Contractor Foreman Activity B and C: Site Foreman		WP 4	✓	✓	✓
Simultaneous operation of noisy plant	• Simultaneous operation of noisy plant near sensitive receptors shall be avoided (where possible). • Plant and equipment used intermittently is to be throttled down or shut down.	To be implemented during construction	Activity A: Contractor Foreman Activity B and C: Site Foreman	REMMM NV-2 (f)	WP 5	✓	✓	✓
Engine compression brakes	• Limit the use of engine compression brakes at night and in residential areas. • Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard.	Pre-construction assessment. To be implemented during construction.	Activity A: Contractor Foreman Activity B and C: Site Foreman		WP 6	✓	✓	✓
Activity and Equipment Selection								
Equipment selection	• Use quieter and less vibration emitting construction methods where feasible and reasonable. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration benefits. • During road demolition; pavement will be cut by road saw (instead of using an excavator hammer) and lifted using an excavator or mobile crane to minimise vibration impacts when works are conducted in close proximity to	Pre-construction assessment. To be implemented during construction	Superintendent	CoA E34	AES 1	✓	✓	✓

Management Measure Requirement	Details	Timing/ Frequency	Responsibility	CoA /REMMM Reference	Reference Id	Activity A	Activity B	Activity C
	the vibration sensitive facilities. Panels lowered into trucks for removal or moved to an area away from sensitive facilities where they can be broken up. • During general demolition: Use of saw cutting, hand held jack hammers to minimise vibration impacts when works are conducted in close proximity to the vibration sensitive facilities. Minimise dropped materials. Trucks to travel slowly to avoid bouncing induced vibration. • During ground compaction: Use of vibratory compactors is highly likely to cause an exceedance of the vibration criteria within sensitive facilities even when undertaken a significant distance away. Vibratory compaction shall be carefully trialled if undertaken when in close proximity to the nearest vibration sensitive facilities • During excavation: low vibration techniques such as saw cutting or ripping shall be the preferred option than the use of rock hammers. • The lowest powered/quietest practicable plant equipment shall be used for activities on the compound site, such as for the selection of excavators for loading/unloading							
	• Pavement will be broken using a concrete saw instead of jackhammers during demolition of building 52 and 72 walkways	Pre-construction assessment. To be implemented during construction	Superintendent		AES 9	N/A Outside of area	✓	N/A Outside of area
	• Concrete columns within Boronia Ward if any will be demolished using a handheld jackhammer or a road saw instead of an excavator hammer	Pre-construction assessment. To be implemented during construction	Superintendent		AES 10	N/A Outside of area	N/A Outside of area	✓
Equipment maintenance	Ensure plant is regularly maintained, and repair or replace equipment that becomes noisy. For permanent equipment, utilised for longer than 2 months, conduct compliance checks for noise emissions from all plant and machinery used to indicate whether noise emissions from plant items are higher than predicted and to identify defective silencing equipment on the items of plants.	To be conducted during construction For equipment utilised for longer than 2 months on site	Environmental Manager	REMMM NV-2 (l)	AES 2	✓	✓	✓
Reduced equipment power	Use only the necessary size and power of equipment.	To be conducted during construction	Activity A: Contractor Foreman Activity B and C: Site Foreman		AES 3	✓	✓	✓
Non-tonal and ambient sensitive reversing alarms	• Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used onsite and for any out-of-hours work.	Pre-construction assessment. To be conducted during construction.	Environmental Manager	REMMM NV-2 (o)	AES 4	✓	✓	✓

Management Measure Requirement	Details	Timing/ Frequency	Responsibility	CoA /REMMM Reference	Reference Id	Activity A	Activity B	Activity C
	• Factoring in the potential for use of hearing protection by workers, consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level whilst ensuring that the occupational health and safety of workers is maintained.							
Silencers on Mobile Plant	Where possible reduce noise from mobile plant through additional fittings including: • Residential grade mufflers • Damped hammers such as “City” Model Rammer Hammers • Air Parking brake engagement is silenced	Pre-construction assessment. To be conducted during construction.	Activity A: Contractor Foreman Activity B and C: Site Foreman		AES 5	✓	✓	✓
Rental plant and equipment	The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the criteria in Table 11 (of the CNVS)	Pre-construction assessment. To be conducted during construction.	Activity A: Senior Project Engineer Activity B and C: Project Engineer	REMMM NV-2 (l)	AES 6	✓	✓	✓
Vibration intensive activities	Where vibration intensive construction activities are proposed within 100 metres of sensitive receivers, these works shall be confined to the less sensitive daytime period where possible. Piling activities that affect sensitive receivers must be undertaken using quieter alternative methods than impact or percussion piling, such as bored piles or vibrated piles, where practicable. Bored Piling is proposed to be adopted for the project. In general, mitigation and management measures that would be considered include: • Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment. • Use lower vibration generating items of excavation plant and equipment (e.g. smaller capacity rock breaker hammers). • Minimise consecutive works in the same locality (if applicable). • Use dampened rock breakers to minimise the impacts associated with rock breaking works.	Pre-construction assessment and to be implemented during construction	Activity A: Senior Project Engineer Activity C: Project Engineer	CoA E34 REMMM NV-7 (a to e)	AES 7	✓	N/A Activities not proposed.	✓
Prefabrication of materials off-sites	Where practicable, pre-fabricate and/or prepare materials off-site to reduce noise with special audible characteristics occurring on site. Materials can then be delivered to site for installation.	Pre-construction assessment. To be conducted during construction.	Superintendent		AES 8	✓	N/A Demolition only	N/A Demolition only
Receptor Control								
Westmead Hospital	The Westmead Institute for Medical Research, The Children’s Hospital at Westmead, The Children’s Medical Research Institute and Kids Research Institute and the Institute for Clinical Pathology and	Pre-construction assessment. To be implemented during construction.	Project Manager		RC 1	✓	N/A Outside of area	N/ Outside of area A

Management Measure Requirement	Details	Timing/ Frequency	Responsibility	CoA /REMMM Reference	Reference Id	Activity A	Activity B	Activity C
	Medical Research (ICPMR) contain equipment that is sensitive to noise and vibration impacts. Noise and vibration management strategies are in place and consultation with the effected stakeholders is ongoing.							
Alternative accommodation	As described in the CNVS, provision of alternative accommodation for residents shall be considered in the event that highly intrusive noise impacts are predicted during OOHW period 2 (between 10:00 pm and 7:00 am). As this project is likely to require night-time works at many locations, provision of alternative accommodation will only be provided after two consecutive nights between 10:00 pm and 07:00 am of works generating highly intrusive noise impacts within a week. Offers of alternative accommodation will be provided in the event that, within a week, more than two consecutive nights of works generating highly intrusive noise impacts are required in any particular location. This is consistent with requirements of the ICNG which requires sleep disturbance impacts to be assessed only for works planned to extend over more than two consecutive nights. The OOHW Protocol will be followed for all OOHW and appropriate mitigation and management measures will be implemented as needed.	Pre-construction assessment. To be implemented during construction.	Project Manager	REMMM NV-3 (k)	RC 2	✓	N/A No OOHW proposed	N/A No OOHW proposed
Monitoring and inspection								
Structural surveys	Pre-construction surveys of the structural integrity of vibration sensitive buildings have been identified. Refer to Section 6.4	Pre-construction assessment.	Environmental Manager	REMMM NV-7 (g)	NVM 1	✓	✓	✓
Attended Vibration Measurements	Attended vibration measurements are required at the commencement of vibration generating activities that are either: • identified as High or Medium Risk in Table C1-7, unless otherwise verified via long-term unattended monitoring, or • works proposed within the minimum working distances, identified in Table C1-8 and Table C3-8. Monitoring will be used to established if alternative works procedures are required. Follow vibration measurement procedure in Appendix E	To be implemented during construction. Refer to Appendix E	Subcontractor	REMMM NV-7 (f)	NVM 2	✓	N/A Not relevant for activity.	N/A Not relevant for activity.
Extended Vibration Monitoring	If vibration intensive works are required within the minimum working distances in Table C1-8 and Table C3-8, and attended vibration monitoring has established risk of exceedance, extended monitoring will be carried out. See Appendix E for detail.	To be implemented during construction. Refer to 'Details' and Appendix E	Environmental Coordinator Subcontractor	REMMM NV-7 (f)	NVM 3	✓	N/A Not relevant for activity.	N/A Not relevant for activity.

Management Measure Requirement	Details	Timing/ Frequency	Responsibility	CoA /REMMM Reference	Reference Id	Activity A	Activity B	Activity C
Monitoring program	A noise monitoring program is to be carried out for the duration of the works in accordance with the Construction Noise and Vibration Management Plan and any approval and licence conditions. The monitoring program is outlined in Appendix E	To be implemented during construction.	Environmental Manager Subcontractor	CoA C9b REMMM NV-2 (m), NV-3 (j)	NVM 4	✓	✓	✓
	Ongoing noise monitoring during construction at sensitive receptors during critical periods shall be used to identify and assist in managing high risk noise events. Monitoring of noise shall also be carried out in response to complaints. All noise monitoring shall be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.	Pre-construction assessment and to be implemented during construction	Subcontractor	REMMM NV-2 (m), NV3-(i),	NVM 5	✓	✓	✓
Response for Vibration Sensitive Areas	Mitigation and management measures to address potential vibration impacts to facilities within the Westmead Research Zone and Cumberland Hospital shall be implemented during construction • Consultation with the affected facilities to determine periods when vibration intensive works can occur with least impact. • Relocation of vibration sensitive equipment to less impacted locations within the facilities. • Vibration isolation of sensitive equipment predicted to have potential impacts. • Unattended vibration monitoring within the facilities to ensure vibration levels are within acceptable levels.	Pre-construction and implemented during construction	Project Manager	REMMM NV-4 NV-8 (a to d)	NVM 6	✓	N/A No sensitive equipment identified	N/A No sensitive equipment identified

6.4 Inspections

Weekly and other routine inspections by Environmental Officers, Transport for NSW, ERG representatives and ER will occur throughout construction. Detail on the nature and frequency of these inspections are documented in Section 3.8 of the CEMP.

Dilapidation surveys within Cumberland Hospital are required to be conducted prior to construction works commencing, at the following building:

- Building 52

This is not as a result of potential vibration impacts, as no vibration intensive plant are proposed. This is due to the proximity of the remnant portion of the building to the section being demolished.

6.5 Noise and vibration monitoring

See Appendix E for the noise and vibration monitoring plan and programs for the three activities.

The monitoring plan and programs will comply with CoAs C9b, C10, C11, C12, C13, C14, C15, C16, C17 and C18e and REMMMS NV-2, NV-3, NV-7 and NV-8.

6.6 Reporting

Reporting requirements and responsibilities are documented in Section 3.10.4 of the CEMP.

Specific reports prepared in response to noise and vibration monitoring will capture detail as per CoA C10 and C16:

- Baseline data and details of how the baseline data was obtained and when
- The locations and description of monitoring undertaken
- The time/date/duration of measurements
- A tabulation of results (e.g. for noise including L_{MAX}, L_1, L_{10}, L_{90} and L_{Aeq} noise levels) together with notes identifying the principle sources and operations
- Summary of any measurements exceeding the nominated criteria, and descriptions of the plant or operations causing these exceedances
- Detail of any corrective actions and confirmation of their successful implementation (including ongoing consultation with relevant authorities and in accordance with Appendix F, Section 2.3 and Table 6-1)
- Monitoring reports would be submitted to TfNSW on a quarterly basis in line with the current frequency for other PLR packages.

Refer to monitoring plans in Appendix E.

6.7 Complaints

Complaints will be recorded and managed as detailed in Section 3.6.4 of the CEMP.

6.8 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub-plan, CoA and other relevant approvals, licenses and guidelines.

Internal noise audit systems will include recording of daily hours of construction, progressive impact assessments as work proceeds, allowing the AA to conduct informal checks, and providing active and communication links to surrounding sensitive receivers.

With regards to AA inspections/audits, minimum frequency of AA inspections will be determined based on the potential risk of noise impacts for the construction works as per the triggers listed below:
Where these items are not triggered, fortnightly inspections will occur as a minimum.

Where possible the routine inspections or those to review any of the additional triggers, would be completed in tandem with the ER and inspections for other works packages, such that the application of noise and vibration compliance and mitigation can be considered in corroboration with any other environmental/project issues.

Triggers for additional inspections are provided as follows:

- As a result of noise or vibration related complaint(s), determined to warrant investigation by the AA, ER or TfNSW, or occurring on successive nights at a single work location (where relevant)
- Where a work site has not fully implemented the noise management protocols as per the approved construction methods to minimise noise or vibration
- During the commencement of a trial of a new high noise or vibration risk activity
- If considered appropriate at the discretion of the AA:
    - Where requested by the independent certifier to assess compliance with the Planning Approval; or
    - Where requested by the ER, TfNSW or other entity with identified cause for concern pertaining to noise or vibration compliance.

Audit requirements are also detailed in Section 3.10 of the CEMP.

7 Review and improvement

This section describes how and when this plan will be updated.

7.1 Continuous improvement

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

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets. Due to the short nature of the works at all sites, The Contractor will not implement a formal continuous improvement system but will work proactively with the Environmental Representative to identify and improve environmental management across the project and address any non-compliances.

7.2 NVMP update and amendment

The processes described in Section 3.11.2 of the CEMP may result in the need to update or revise this plan. This will occur as needed.

Only The Contractor's Construction Environment Manager, or delegate, has the authority to change any of the environmental management documentation. These changes must be approved by the Environmental Representative (ER) or DPIE. The ER has the authority to approve minor amendments to plans in consultation with the DPIE. Only DPIE has the authority to approve major amendments to plans. See Section 3.11.2 in the CEMP.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure (refer to Section 3.11.3 of the CEMP).

References

- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- NSW Road Noise Policy (RNP), Dept. of Environment, Climate Change and Water 2011
- NSW Noise Policy for Industry, Environment Protection Authority 2017
- NSW Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- Australian Standard AS/NZS 2107:2000 Acoustics - Recommended design sound levels and reverberation times for building interiors
- Australian Standard AS 2187.2 Explosives - Storage and use - Part 2 Use of explosives
- Australian Standard AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites
- British Standard BS 5228-1 -2009 Code of Practice for noise and vibration control on construction and open sites
- British Standard BS 6472-2008, 'Evaluation of human exposure to vibration in buildings (1-80Hz)'
- British Standard 7385: Part 2-1993 'Evaluation and measurement of vibration in buildings'
- German Standard DIN4150-1999 Structural vibration Part 3: Effects of vibration on Structures
- Transport for NSW's Construction Noise and Vibration Strategy (7TP-ST-157/4.0)
- Transport for NSW's Construction Noise Estimation Tool (9TP-FT-150)
- Australian Standard AS 2670.2 – 1990 Evaluation of human exposure to whole-body vibration Part 2: Continuous and shock-induced vibration in buildings (1 to 80 Hz)
- TfNSW Ecosure document, Grey-headed Flying-fox Construction Monitoring Program, October 2019

Appendix A – Conditions and requirements matrices

A1 Minister's Conditions of Approval

The CoA relevant to this Sub-Plan are listed in Table A1-1 below. A cross reference is also included to indicate where the condition is addressed in this Sub-Plan or other project management documents.

Table A1-1: Minister's Conditions of Approval

CoA No.	Condition Requirements	Sub-Plan Reference
Condition A5	Where the terms of this approval require a document or monitoring program to be prepared or a review to be undertaken in consultation with identified parties, evidence of the consultation undertaken must be submitted to the Secretary with the document or monitoring program or review. The evidence must include: (a) documentation of the engagement with the party(ies) identified in the relevant condition of approval before submitting the document for approval; (b) log of the points of engagement or attempted engagement with the identified party(ies) and a summary of the issues raised by the identified party(ies); (c) documentation of any follow-up with the identified party(ies), where feedback has not been provided, to confirm that the identified party(ies) has none or has failed to provide feedback after repeated requests; (d) outline of the issues raised by the identified party(ies) and how they have been addressed, including evidence that the party(ies) is satisfied the issues have been addressed; and (e) where there are outstanding issues raised by the identified party(ies) that have not been adopted, the reasons why they have not been/could not be adopted must be provided, including evidence of consultation with the relevant party(ies).	Appendix F for Consultation Logs
Condition A18	The Proponent must use best endeavours to ensure that the duration of construction in any one location or zone, as defined to the Secretary's satisfaction, is such that any receiver is impacted by construction works for the minimum, reasonably practicable time.	Section 6 Table 6-1

CoA No.	Condition Requirements	Sub-Plan Reference
	The Proponent must demonstrate the principles that would be adopted to minimise the duration of construction in zones as part of the **Staging Report** required by **Condition A13.**	
Condition A26	**Acoustics Advisor** A suitably qualified and experienced **Acoustics Advisor** (AA) must be engaged for the duration of construction and for no less than six months following completion of construction of the CSSI. The AA must provide a statutory declaration to the Secretary that they are independent of the design and construction personnel. The Proponent must cooperate with the AA by: (a) providing access to noise and vibration monitoring activities as they take place; (b) providing for review noise and vibration plans, assessments, monitoring reports and data analyses undertaken; and (c) considering any recommendations to improve practices and demonstrating, to the satisfaction of the AA, why any recommendation is not adopted.	This Sub-Plan will be provided to the AA and Environmental Representative for endorsement as part of the approval process. Refer to Appendix F.
Condition A27	The AA must meet the following minimum requirements: (a) relevant experience in the last ten years as a senior acoustic specialist on major infrastructure projects, including a fieldwork and construction management component; (b) tertiary qualifications in an acoustic related discipline or equivalent experience; and (c) proven understanding and application of NSW State and local legislation, relevant Australian standards, NSW environmental regulatory requirements and implementation of noise mitigation and environmental best practice.	N/A
Condition A28	The Proponent must notify the Department in writing on the engagement of the AA including demonstrating the requirements of **Conditions A26 and A27**.	N/A.
Condition A29	The AA must: (a) receive and respond to communication from the Secretary about the performance of the CSSI in relation to noise and vibration;	This Sub-Plan will be provided to the AA and Environmental

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	(b) consider and inform the Secretary on matters specified in the terms of this approval relating to noise and vibration;	Representative as part of the approval process.
	(c) consider and recommend, to the Proponent, improvements that may be made to work practices to avoid or minimise adverse noise and vibration impacts;	
	(d) consider consultation outcomes with affected receivers to determine the adequacy of noise mitigation and management measures including work hours and respite periods;	
	(e) review all noise and vibration documents required to be prepared under the terms of this approval and, should they be consistent with the terms of this approval, endorse them before submission to the Secretary (if required to be submitted to the Secretary) or before implementation (if not required to be submitted to the Secretary);	
	(f) regularly monitor the implementation of all noise and vibration documents required to be prepared under the terms of this approval to ensure implementation is in accordance with what is stated in the document and the terms of this approval;	
	(g) in conjunction with the ER, the AA must: i) as may be requested by the Secretary, help plan, attend or undertake audits of noise and vibration management of the CSSI including briefings, and site visits; ii) if conflict arises between the Proponent and the community in relation to the noise and vibration performance during construction of the CSSI, follow the procedure in the Community Communication Strategy approved under Condition B3 of this approval to attempt to resolve the conflict, and if it cannot be resolved, notify the Secretary; iii) consider relevant minor amendments made to the CEMP, relevant sub-plans and noise and vibration monitoring programs that require updating or are of an administrative nature, and are consistent with the terms of this approval and the management plans and monitoring programs approved by the Secretary and, if satisfied such amendment is necessary, endorse the amendment. This does not include any modifications to the terms of this approval; iv) assess the noise impacts of minor construction ancillary facilities; and	
	(h) prepare and submit to the Secretary and other relevant regulatory agencies, for information, a monthly **Noise and Vibration Report** detailing the AAs actions and decisions on matters for which the AA was responsible in the preceding month (or another timeframe agreed with the Secretary). The **Noise and Vibration Report** must be submitted within seven days following the end of each month for the duration of construction of the CSSI, or as otherwise agreed with the Secretary.	

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Condition C3(b)	The following **CEMP Sub-plans** must be prepared in consultation with the relevant government agencies identified for each **CEMP Sub-plan** and be consistent with the CEMP referred to in **Condition C1**: (b) Noise and Vibration CEMP Sub-plan; for Approval; must be prepared in consultation with Relevant Council(s), EPA, NSW Health.	This Sub-plan and CEMP Appendix F - Consultation
Condition C4	The **CEMP Sub-plans** must state how: (a) the environmental performance outcomes identified in the documents listed in **Condition A1** will be achieved; (b) the mitigation measures identified in the documents listed in **Condition A1** will be implemented; (c) the relevant terms of this approval will be complied with; and (d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	Section 6.3 outlines performance outcomes identified in Condition A1 docs. Section 6.3 outlines how mitigation and management measures will be implemented, and relevant terms of approval complied with. Section 3.1.1 of the CEMP notes that ongoing analysis of environmental risks, including those associated with noise and vibration risks will be incorporated as an agenda item in the weekly site meeting.
Condition C5	The **CEMP Sub-plans** must be developed in consultation with relevant government agencies (including Relevant Council(s)). Details of all information requested by an agency to be included in a **CEMP Sub-plan** as a result of consultation, including all copies of correspondence from those agencies, must be provided to the Secretary with the relevant **CEMP Sub-plan**.	Appendix F outlines consultation logs
Condition C6	Any of the **CEMP Sub-plans** may be submitted along with, or subsequent to, the submission of the **CEMP** but in any event, no later than one month before construction.	NA
Condition C8	Construction must not commence until the **CEMP** and any **CEMP Sub-plan** specified in **Condition C3** have been submitted to or approved by the Secretary. The **CEMP** and **CEMP Sub-plans** submitted to or approved by the Secretary, including any minor amendments approved by the ER, must be implemented for the duration of	Section 2.3

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	construction. Where construction of the CSSI is staged, construction of a stage must not commence until the **CEMP** and **Sub-plans** for that stage have been submitted to or approved by the Secretary. *Note: The requirement to submit or have a CEMP or CEMP Sub-plan approved is specified in **Condition C3**.*	
Condition C9(b)	**Construction Monitoring Programs** The following **Construction Monitoring Programs** must be prepared in consultation with the relevant government agencies for each to compare actual performance of construction of the CSSI against performance predicted in the documents listed in **Condition A1b or in the** CEMP**:** (b) Noise and Vibration Monitoring; must be prepared in consultation with Relevant Council(s), EPA, NSW Health (as relevant)	Appendix E outlines the monitoring plans. Appendix F outlines correspondence with relevant government agencies. The monitoring program was consulted at various stages in consultation. Section 2.3 highlights this sub-plan will have continuous improvement through ongoing evaluation of environmental management performance.
Condition C10	Each **Construction Monitoring Program** must provide: (a) details of baseline data available; (b) details of baseline data to be obtained and when; (c) details of all monitoring of the Project to be undertaken; (d) the parameters of the Project to be monitored; (e) the frequency of monitoring to be undertaken; (f) the location of monitoring; (g) the reporting of monitoring results against relevant criteria; (h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and (i) any consultation to be undertaken in relation to the monitoring programs.	Section 6.5 and Appendix E

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Condition C11	The noise and vibration monitoring data collected during monitoring required by **Condition C9** must be available to the Proponent, ER, AA, Relevant Council(s) and the community to inform construction scheduling, the level of impacts and whether additional mitigation is required. The Department must also be provided access to this data if specifically requested.	Section 6.5 for monitoring notes and Appendix E for programs.
Condition C12	The **Construction Monitoring Programs** must be developed in consultation with relevant government agencies and Relevant Council(s) as identified in **Condition C9** of this approval and must include, information requested by an agency to be included in a **Construction Monitoring Programs** during such consultation. Details of all information requested by an agency, including copies of all correspondence from those agencies, must be provided with the relevant **Construction Monitoring Program**.	Section 6.5 for monitoring notes and Appendix E for programs. Train of correspondence with government agencies in Appendix F
Condition C13	The **Construction Monitoring Programs** must be endorsed by the ER and submitted to the Secretary for information at least one month before the commencement of construction.	Section 6.5 for monitoring notes and Appendix E for programs. This Sub-Plan will be reviewed for endorsement by the ER in accordance with C13 and will be submitted one month prior to construction commencement.
Condition C14	Construction must not commence until the Secretary has received all of the required **Construction Monitoring Programs**, and all relevant baseline data for the specific construction activity has been collected.	Section 6.5 for monitoring notes and Appendix E for programs. No construction will commence until the Noise and Vibration Monitoring Plan has been approved. Additional baseline monitoring data is not required.

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Condition C15	The **Construction Monitoring Programs**, as submitted to the Secretary including any minor amendments approved by the ER must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Secretary, whichever is the greater.	Section 6.5 for monitoring notes and Appendix E for programs. The construction monitoring programs and any minor amendment will be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Secretary.
Condition C16	The results of the **Construction Monitoring Programs** must be submitted to the Secretary, and relevant regulatory agencies, for information in the form of a **Construction Monitoring Report** at the frequency identified in the relevant **Construction Monitoring Program**.	Section 6.5 and Appendix E outline the reports to be provided to Secretary and relevant agencies.
Condition C17	Where a relevant **CEMP Sub-plan** exists, the relevant **Construction Monitoring Program** may be incorporated into that **CEMP Sub-plan**.	Appendix E of this Sub Plan incorporates the programs.
Condition C18(e)	**Site Establishment Management Plan** Before establishment of any construction ancillary facility as identified in the EIS and SPIR (and excluding minor construction ancillary facilities), the Proponent must prepare **a Site Establishment Management Plan** which outlines the environmental management practices and procedures to be implemented for the establishment of the construction ancillary facilities. The **Site Establishment Management Plan** must be prepared in consultation with the relevant council(s) and relevant government authorities. The Plan must be submitted to the Secretary for approval one (1) month before establishment of any construction ancillary facilities. The **Site Establishment Management Plan** must detail the management of the construction ancillary facilities and include: (e) a program for monitoring the performance outcomes, including a program for construction noise monitoring consistent with the requirements of **Conditions C9** and **C11.**	Appendix E

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	Nothing in this condition prevents the Proponent from preparing individual **Site Establishment Management Plans** for each construction ancillary facility.	
Condition C19	**Boundary Screening** Boundary fencing that incorporates screening must be erected around all construction ancillary facilities that are adjacent to sensitive receivers for the duration of site establishment and construction of the CSSI unless otherwise agreed with Relevant Council(s), affected residents, business operators and/or landowners and in accordance with **Condition B2(b)**.	Section 5.3, Appendix C and Table 6-1 Opaque fencing and gates with locks will be installed for privacy and security purposes around the ancillary facilities (site offices) for Activity B and C.
Condition C20	Boundary screening required under **Condition C19** of this approval must reduce visual, noise and air quality impacts on adjacent sensitive receivers	Section 5.3, Appendix C and Table 6-1 Opaque fencing and gates with locks will be installed for privacy and security purposes around the ancillary facilities (site offices) for Activity B and C.
Condition E20	**Land Use Survey** A detailed land use survey must be undertaken to confirm sensitive receivers (including critical working areas such as operating theatres, precision laboratories housing sensitive equipment and drama theatres) potentially exposed to construction noise and vibration, construction ground-borne noise and operational noise and vibration. The survey may be undertaken on a progressive basis but must be undertaken in any one area before the commencement of works which generate construction or operational noise, vibration or ground-borne noise in that area. The results of the survey must be used to develop the **Noise and Vibration Management Sub-Plan** required by **Condition C3** and **Construction Noise and Vibration Impact Statements** required by **Condition E42**.	Section 3.1 provides outlines of Land use Survey where Appendix B details each survey. Appendix C provides CNVIA.
Condition E21	**Hours of Works** Works must be undertaken during the following hours: (a) 7:00am to 6:00pm Mondays to Fridays, inclusive;	Section 4.2 and Appendix C Section C1.2

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	(b) 8:00am to 12:00pm Saturdays; and (c) at no time on Sundays or public holidays.	
Condition E22	Notwithstanding **Condition E21**, and with the exception of 'Eat Street', works may be undertaken during the following hours: (a) 6:00pm to 7:00pm Mondays to Fridays, inclusive; and (b) 12:00pm to 6:00pm Saturdays	Section 4.2 and Appendix C Section C1.2
Condition E25	Works may be undertaken outside of the hours defined in **Conditions E21 to E22**, as applicable, but only if one or more of the following applies: (a) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or (b) 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 (c) where different hours of works are permitted or required under an EPL in force in respect of the CSSI; or (d) works approved under an **Out-of-Hours Work Protocol** for works not subject to an EPL; or (e) construction that causes $LA_{eq(15\ minute)}$ noise levels: i) no more than 5 dB(A) above the rating background level at any residence in accordance with the *Interim Construction Noise Guideline* (DECC, 2009), and ii) no more than the 'Noise affected' noise management levels specified in Table 3 of the *Interim Construction Noise Guideline* (DECC, 2009) at other sensitive land uses, and iii) no more than 15dBA above the night-time rating background level at any residence during the night time period, when measured using the LA1(1 minute) noise descriptor, and iv) continuous or impulsive vibration values, measured at the most affected residence are no more than the maximum values for human exposure to vibration, specified in Table 2.2 of *Assessing Vibration: a technical guideline* (DEC, 2006), and v) intermittent vibration values measured at the most affected residence are no more than the maximum values for human exposure to vibration, specified in Table 2.4 of *Assessing Vibration: a technical guideline* (DEC, 2006).	Appendix C, OOHW protocol Section C1.2 and Appendix D

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Condition E26	**Emergency Works** On becoming aware of the need for emergency construction works, the Proponent must notify the ER of the need for those activities or works. The Proponent must also use best endeavours to notify all affected sensitive receivers of the likely impact and duration of those works.	Section 6 Table 6-1: Noise and vibration management measures summary
Condition E27	**Highly Noise Intensive Works** Except as permitted by an EPL, or through the **Out-of-Hours Work Protocol**, Highly Noise Intensive Works that result in an exceedance of the applicable NML at the same sensitive 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) in continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block. For the purposes of this condition, 'continuous' includes any period during which there is less than a one (1) hour respite between ceasing and recommencing any of the work that are the subject of this condition. *Note: A trial period of the Highly Noise Intensive Work undertaken with the approval of the Out of Hours Work Protocol may be established.*	Section 4.2, 4.3, Section 5.3.1, 5.3.2, 5.3.3, Section 6 Table 6-1, Appendix C Section C1.3, Table C1-3, Section C2.2 and C3.2. Appendix D and Appendix E.
Condition E28	**Out of Hours Work Protocol** An **Out-of-Hours Work Protocol** must be prepared to identify a process for the consideration, management and approval of works which are outside the permitted hours defined in **Conditions E21 to E22**, where an EPL does not apply. The Protocol must be approved by the Secretary before commencement of out-of-hours works. The Protocol must be prepared and implemented in consultation with AA. The Protocol must: (a) provide a process for the consideration of out-of-hours works against the relevant noise and vibration criteria; (b) provide a process for the identification and implementation of mitigation and management measures for residual impacts, in consultation with the community at each affected location, consistent with the requirements of **Condition E39**; (c) identify an approval process that considers the risk level of activities (in accordance with AS/NZS ISO 31000:2009 “Risk Management”), proposed mitigation, management, and coordination, including where:	Section 6 Table 6-1 outlines the OOHW requirements in management measures and Appendix D is OOHW protocol

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	i) low and moderate risk activities can be approved by the ER in consultation with the AA, and ii) high risk activities that are approved by the Secretary; and (d) identify Department and community notification arrangements for approved out of hours works, which will be detailed in the Communication Strategy. *Note: This condition does not apply where work is required for an emergency (as defined in **Condition E25 (b)**).*	
Condition E29	Out-of-hours works that may be regulated through an EPL or the **Out of Hours Work Protocol** as per **Condition E28** include, but are not limited to: (a) carrying out works that during standard hours would result in a high risk to construction personnel or public safety, based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2009 "Risk Management"; or (b) the relevant road authority has advised the Proponent in writing that carrying out the works and activities during standard hours would result in a high risk to road network operational performance and a road occupancy licence will not be issued; or (c) the relevant utility service operator has advised the Proponent in writing that carrying out the works and activities during standard hours would result in a high risk to the operation and integrity of the utility network; or (d) where the TfNSW 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 works or activities during the hours specified in Condition E21 and Condition E22; or (e) where Sydney Trains (or other rail authority) has advised the Proponent in writing that a Rail Possession is required.	Appendix D is OOHW protocol
Condition E30	**Construction Noise Mitigation Measures** Mitigation measures must be applied to construction activities that are predicted to result in the following residential ground-borne noise levels being exceeded as a result of the CSSI: (a) Evening (6.00pm to 10.00pm) – internal $L_{Aeq(15\ minute)}$: 40 dBA; and (b) Night (10.00pm to 7.00am) – internal $L_{Aeq(15\ minute)}$: 35 dBA. The mitigation measures must be outlined in the **Construction Noise and Vibration Management Sub-Plan** and the **Out of Hours Works Protocol**.	In accordance with the CNVS, ground-borne noise need only be considered if the airborne noise contribution is lower, such as for tunnelling projects. Assessment of ground-borne

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		noise is considered to be relevant where ground borne noise levels are higher than airborne noise levels, which happens predominantly when construction plant is located underground or is isolated from nearest sensitive receiver by a high-performance wall or enclosure. Airborne noise is anticipated to be dominant compared to ground-borne noise for Activity A, Activity B and Activity C. Management measures in Table 6-1 will be implemented.
Condition E31	Noise generating works near places of worship, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories, operating theatres, and mental health services and accommodation) must not be timetabled within sensitive periods, unless otherwise agreed with the affected institutions, and at no cost to the affected institution. This must be determined through ongoing consultation with the community during construction.	Section 4.2, Section 6 and Appendix F
Condition E32	The Proponent must consult with proponents or applicants of other State Significant development and infrastructure works near the CSSI and take reasonable steps to coordinate works to minimise cumulative impacts of noise and vibration and maximise respite for affected sensitive receivers	Section 6 Table 6-1 and Appendix C Section C1.3, C2.2, C3.2
Condition E33	Construction noise mitigation measures must be implemented in accordance with Tables 4, 5, 6 and 7 of TfNSW's *Construction Noise and Vibration Strategy* (2018), regardless of the number of sensitive receivers impacted	Section 6 outlines management measures

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Condition E34	Piling activities that affect sensitive receivers must be undertaken using quieter alternative methods than impact or percussion piling, such as bored piles or vibrated piles, where practicable.	N/A
Condition E35	Nothing in this approval permits blasting for construction of the CSSI.	No blasting proposed
Condition E36	**Construction Noise Mitigation - Respite** The Proponent must provide respite periods for sensitive receivers where any construction activity during the hours specified in **Condition E21** results in noise levels that exceed the Highly Noise Affected Level of 75 dB ($L_{Aeq,15\ minute}$).	Section 4.2.1 and Section 6 Table 6-1
Condition E37	Where works are undertaken outside hours specific in **Condition E21 and E22** and construction noise levels exceed 65 dB(A) $L_{Aeq\ (15\ mins)}$ at the façade of the building of a residential receiver, the Proponent must only work 4 nights in any 7 day period. The 4 nights worked must be informed by community consultation referenced in **Condition E39**. Outcomes of the community consultation, the identified works and respite periods and the scheduling of the likely out-of-hour works must be provided to the AA, ER and the Secretary for information. Relocation of work following 4 nights of works in any 7 day period must be sufficiently removed so as to provide clear respite of 3 days. Works in areas of respite must be subject to noise levels of no more than 5 dB(A) above the rating background level at any residence in accordance with the *Interim Construction Noise Guideline* (DECC, 2009). The requirements of this condition may be varied with the approval of the Secretary following the Secretary's review of community consultation outcomes, construction noise and vibration impacts and the implementation of noise management and mitigation measures.	Section 6 Table 6-1 and Appendix D Refers to the OOHW protocol for works undertaken outside standard construction hours specified in CoA E21 and E22. Requirements for respite periods are identified in the OOHW Protocol and in accordance with CNVS. Section N of Appendix A in OOHW Protocol requires consideration of this information and for the information to be attached when submitted for OOHW approval. Section 1.3 of Protocol identifies

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		consideration of relocation. Due to close proximity of works to all receivers, it is not expected that work can be sufficiently removed to provide clear respite. Accordingly, 4 nights on/ 3 nights off would be followed. Requirements of condition are noted and considered in high risk category of OOHW.
Condition E38	All works undertaken for the delivery of the CSSI, including those undertaken by utility contractors, must be coordinated to ensure respite, including the respite required by **Condition E37**. The Proponent must: (a) schedule any works to provide respite to impacted noise sensitive receivers so that all respite periods are achieved; or (b) consider the provision of alternative mitigation, including the provision of at receiver treatments and alternative accommodation to impacted noise sensitive receivers; and (c) provide documentary evidence to the AA in support of any decision made by the Proponent in relation to respite or mitigation.	Section 4, Section 5, Section 6 and Appendix C
Condition E39	In order to undertake out-of-hours work described in **Condition E25(c) and (d)**, the Proponent must identify appropriate work and respite periods for the works in consultation with the community at each affected precinct at three monthly intervals. This consultation must be ongoing and include (but not be limited to) providing the community with: (a) a schedule of likely out-of-hours work for a period of no less than two (2) months for medium to high risk work (as defined in the **Out-of-Hours Work Protocol** (**Condition E28**);	Section 4.2, Section 6, Appendix D

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	(b) a schedule of likely out-of-hours work for a period of no less than seven (7) days for low risk work (as defined in the **Out-of-Hours Work Protocol** (**Condition E28**); (c) the potential works, location and duration; (d) the noise characteristics and likely noise levels of the works; and (e) likely mitigation and management measures. The Proponent shall consider and respond to the affected community's preference for alternative hours and/or durations. The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour works must be provided to the AA, ER and the Secretary.	
Condition E40	The provision of respite periods does not preclude the application of other construction noise management measures, including the provision of at receiver treatments and or alternate accommodation.	Section 6 Table 6-1 provides a detailed suite of standard mitigation measures to be applied where reasonable and feasible regardless of respite periods implemented at any time as well as additional management measures in line with the CNVS for works where the NMLs cannot be achieved. The OOHW Protocol will be followed for all OOHW and appropriate management and mitigation measures will be implemented as needed.

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Condition E41	**Workplace Health and Safety for Nearby Workers** At no time can noise generated by construction exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of $L_{Aeq,8h}$, of 85dB(A) for any employee working at a location near the CSSI.	Section 4.4
Condition E42	**Construction Noise and Vibration Impact Statements** **Construction Noise and Vibration Impact Statements** must be prepared and implemented for each construction site before construction noise and vibration impacts commence and include specific mitigation measures identified through consultation with affected sensitive receivers. Each **Construction Noise and Vibration Impact Statement** will supplement the **Noise and Vibration Management Sub-Plan** and must specifically address each of the major construction sites and must include but not be limited to:	This Sub-plan includes CNVI for each site.
	(a) a description of the proposed activities;	Section 5.1 and Section 5.2 outline description of activities
	(b) predicted noise and vibration levels based on background noise levels;	Section 5.3 provide summary of assessment and Appendix C outlines assessment for each site including predicted levels
	(c) examination of alternative methods of construction that would potentially reduce noise and vibration if the potential noise and vibration exceeds the relevant criteria;	Section 6 Table 6-1 includes measure to examine alternative methods
	(d) description and commitment to work practices which limit noise and vibration;	Section 6 Table 6-1 includes description and commitment to limiting noise and vibration
	(e) description of specific noise and vibration mitigation treatments and time restrictions, including respite periods, duration, and frequency;	Section 6 Table 6-1 includes description of

CoA No.	Condition Requirements	Sub-Plan Reference
		specific mitigation treatment and restrictions
	(f) justification for any activities to be undertaken outside the specified construction hours defined in **Conditions E21** and **E22**;	Section 5.1, Appendix C Section C1.2 and Appendix D for OOHW protocol
	(g) internal noise audit systems including recording of daily hours of construction, progressive impact assessments as work proceeds, conducting informal checks by the AA, providing active and communication links to Council and surrounding residents and sensitive receivers;	Audit requirements are detailed in Section 3.8.3 and Section 3.10 of the CEMP. Section 6.8 of this Sub-Plan details audit requirements. Appendix E outlines monitoring procedures.
	(h) assessment of potential noise from the proposed construction methods including noise from construction vehicles and noise impacts from required traffic diversions;	Section 5.3 outlines the noise from proposed methods of construction for each site and further details in Appendix C
	(i) community consultation and notification;	Appendix F outlines community consultation and notification
	(j) all reasonable and feasible measures including adopting the least noisy available construction methods, systems and equipment;	Section 6 Table 6-1 includes description of specific management measures
	(k) additional noise and vibration mitigation measures as negotiated with affected residents and other sensitive receivers.	Section 6

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	Note: Existing noise levels, pre-construction noise levels, or the like for the purposes of identifying rating background noise levels, noise management levels and construction noise impacts are noise levels that do not include any other construction related noise.	
Condition E43	**Vibration** The Proponent must conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and monitoring shows that the preferred dose values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures.	Section 6.5 and Appendix E
Condition E44	The Proponent must seek the advice of a heritage specialist on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures.	N/A - Monitoring on heritage buildings has not been recommended
Condition E49	Noise mitigation measures as identified in **Condition E48** that will not be physically affected by works must be implemented within eighteen (18) months of the commencement of construction in the vicinity of the impacted receiver to minimise construction noise impacts, and detailed in the **Construction Noise and Vibration Management Sub-plan** for the CSSI.	N/A – Not determined or responsibility of enabling works contractor.

A2 Revised Environmental Mitigation and Management Measures

Relevant REMMMs are listed Table A2-1 below. This includes reference to required outcomes, the timing of when the commitment applies, relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table A2-1: Revised Environmental Mitigation Measures relevant to this CNVMP

Ref #	Commitment	CNVMP
GEN-1	A construction environmental management plan (CEMP) would be prepared for the construction phase of the project. The CEMP would provide a centralised mechanism through which all potential environmental impacts would be managed. The CEMP would document mechanisms for demonstrating compliance with the commitments made in the Environmental Impact Statement), the submissions report, as well as any other relevant statutory approvals (e.g. conditions of approval, licences and permits). The CEMP would outline a framework for the management of environmental impacts during construction, including further details on the following: a) Noise and vibration management.	This Sub-plan and Section 6
GEN-2	A construction compounds plan would be prepared for the project as part of the overall CEMP. This sub-plan would set out details for each of the approved construction compounds, including stockpile areas, laydown areas and other ancillary activities required to construct the project. The sub-plan would supplement, in greater detail, the information provided in the main body of the CEMP. The objectives and strategies of the construction compounds and ancillary facilities management sub-plan would include the following: a) Minimise the impact of construction compounds on surrounding land uses and sensitive receivers. b) Locate construction compounds away from sensitive land uses and receivers, wherever practical and feasible, or configure internal compound layouts in a manner that considers noise and light sensitive receivers (e.g. use of buildings to shield noisy activities, minimising the requirement for reversing vehicles, or locating noise intensive activities to maximise the distance to noise sensitive receivers).	Activity A: CCMP, Appendix C Activity B and C: CEMP
RC-1	Developing mitigation strategies in order to manage conflicts cumulative impacts of the Parramatta Light Rail and other interfacing projects involving Coordination of noise generating activities, such as out of hours works.	Section 6 Table 6-1 and Appendix D
HE-22	The construction methodology (including for demolition of existing buildings and/or structures) is to be developed to minimise direct and indirect impacts on adjacent and/or adjoining heritage items. This includes consideration of potential (vibration related impacts, where identified in the Construction Noise and Vibration Management Plan	Section 5.1 and Section 6 Table 6-1

Ref #	Commitment	CNVMP
NV-1	A Construction Noise and Vibration Management Plan (CNVMP) is to be developed in accordance with the requirements of Transport for NSW's Construction Noise Strategy and the Interim Construction Noise Guidelines (DECC 2009). It would document all necessary measures to manage and mitigate potential noise and vibration levels during standard working hours and for all out-of-hours construction activities (refer to section 17.2.3 of the EIS). The CNVMP would also provide the framework and mechanisms for: a) The mitigation and management of the noise and vibration impacts from the project. b) Development of site specific construction noise management plans. c) Out-of-hours work associated with the project.	This Sub-plan, Section 6, Appendix D
NV-2	The CNVMP prepared for the project would include mitigation and management measures for the works with reference to the NSW Interim Construction Noise Guideline (ICNG) and Transport for NSW Construction Noise Strategy (CNS). Mitigation and management measures which would be considered include: a) For construction concentrated in a single area, such as at the stops, worksites, substation construction sites, bridge sites and the stabling and maintenance facility location, temporary acoustic fencing/barriers around the site perimeter would be considered where feasible and reasonable to mitigate off-site noise levels. b) Given the potentially high noise levels at residential receivers, adherence to daytime construction hours would be used for excavation, demolition or rock breaking activities, and for activities concentrated in a single area (i.e. activities that do not move along the alignment, and do not require out-of-hours activities for safety reasons or to minimise disruption to road networks). c) Where possible, noisy works would be scheduled to minimise impacts to adjacent businesses and commercial properties, such as avoiding undertaking noisy activities on Eat Street during lunch and dinner periods. d) Out of hours works would be programmed to minimise the number of consecutive out of hour work periods impacting the same receptors. e) Consultation would be carried out with local schools and other educational facilities prior to noise intensive works to ensure impacts are minimised during examination periods and/or other critical periods in the school calendar (where works are predicted to exceed the relevant construction noise management level for this receiver). Consultation with nearby childcare centres would be carried out to potentially avoid noisy works during rest periods at the centres (where possible). f) Simultaneous operation of noisy plant in close proximity to sensitive receptors would be avoided (where possible).	Section 6 and Appendix D

Ref #	Commitment	CNVMP
	g) Equipment which is used intermittently would be shut down when not in use. h) Where possible, the offset distance between noisy plant items and nearby noise sensitive receptors would be as great as possible. i) Where possible, equipment with directional noise emissions would be oriented away from sensitive receptors. j) Construction compounds would use 2.4 metre high hoarding of solid construction where required to minimise noise on sensitive receivers, where safe to do so. k) Structures such as site sheds would be positioned to further shield sensitive and residential receivers from works activities. l) Regular compliance checks for noise emissions from all plant and machinery used for the project would be carried out to indicate whether noise emissions from plant items are higher than predicted. This would also identify defective silencing equipment on the items of plant. m) Ongoing noise monitoring would be carried out during construction at sensitive receptors during critical periods to identify and assist in managing high risk noise events. n) Where possible heavy vehicle movements should be limited to daytime hours. o) Reversing of equipment should be minimised so as to prevent nuisance caused by reversing alarms, which would be limited to the use of non-tonal reversing alarms. p) Loading and unloading should be carried out away from sensitive receptors, where practicable. ◦ Work should be scheduled to provide respite periods from the noisiest activities, and impacted residents should be communicated with to clearly explain the duration and noise levels for the works.	

NV-3	In the event of predicted exceedances of the noise goals, particularly during out-of-hours works, additional noise mitigation and management measures to be considered in the CNVMPs as described in the CNS. Additional mitigation and management measures would be determined on a site specific basis and are dependent upon the level of predicted impact. Additional mitigation and management measures which would be considered include: a) Periodic notifications – These include regular newsletters, letterbox drops or advertisements in local papers to provide an overview of current and upcoming works and other topics of interest. b) Website updates – The project website would form a resource for members of the community to seek further information, including CNVMPs and current and upcoming construction activities. c) Project info-line and construction response line – Transport for NSW will operate a construction response line and a project info-line (1800 775 465). These numbers will provide a dedicated 24-hour contact point for any complaints regarding construction works and for any project enquiries. All complaints require a verbal response within two hours. All enquiries require a verbal response within 24 hours during standard construction hours, or on the next working day during out-of-hours work (unless the enquirer agrees otherwise). d) Email distribution list – An email distribution list would be used to disseminate project information to interested stakeholders. e) Signage – Signage on construction sites would be provided to notify stakeholders of project details and project emergency or enquiry information. f) Specific notifications – Specific notifications would be letterbox dropped or hand distributed to the nearby residences and other sensitive receptors no later than seven 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. g) Phone calls – Phone calls may be made to identified/affected stakeholders within seven days of proposed work. For these works considering the large numbers of receptors, phone calls are not likely to be considered a reasonable mitigation and management measure in all cases, but could be used to inform specific receptors if requested (after notification of the works as above). h) Individual briefings – Individual briefings may be used to inform stakeholders about the impacts of high noise activities and mitigation and management measures that would be implemented. Communications representatives from the contractor(s) would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Considering the large numbers of potentially affected receptors, individual briefings may not be considered a reasonable mitigation and management measure in all cases, but could be used for specific receptors if requested (after notification of the works as above). i) Monitoring – Ongoing noise monitoring during construction at sensitive receptors during critical periods would be used to identify and assist in managing high risk noise events. Monitoring of noise would also be	Section 6, Appendix C, Appendix D and Appendix E

Ref #	Commitment	CNVMP
	carried out in response to complaints. All noise monitoring would be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures. j) Project specific respite offer – Residents subjected to lengthy periods of noise or vibration may be eligible for a project specific respite offer. The purpose of such an offer is to provide residents with respite from an ongoing impact. An example of a respite offer might be pre-purchased movie tickets. The provision of this measure would be determined on a case-by-case basis. Project specific respite offers are unlikely to be reasonable and feasible in the CBD precinct. This is partly due to the impracticability of providing respite offers to large numbers of people during the proposed 24-hour works, but also reflects the existing evening and weekend noise environment in the Parramatta CBD precinct. k) Alternative accommodation – As described in the CNS, provision of alternative accommodation for residents should be considered in the event that highly intrusive noise impacts are predicted during the night-time period (between 10 pm and 7 am). However, as the project is likely to require night-time works at many locations (particularly in the Parramatta CBD precinct), provision of alternative accommodation in all cases may not always be feasible or reasonable.	
NV-4	For sensitive receiver that operate outside standard construction hours, for example hospitals which operate on a 24-hour basis, feasible and reasonable noise mitigation options and measures would be developed in consultation with the sensitive receiver.	Section 6, Appendix E and Appendix F
NV-5	The use of noise intensive plant items would be scheduled for normal working hours. If the works cannot be carried out during the daytime, it has been recommended to complete them before 11 pm, where practicable. This would be particularly relevant for works impacting the following noise catchment areas (NCAs) where a number of activities have been predicted to result in high impacts on many residential receivers during the night-time: a) NCA04 in the Westmead precinct b) NCA06 and NCA07 in the Parramatta North precinct c) NCA11 in the Rosehill and Camellia precinct.	Section 5, Section 6, Appendix C and Appendix D
NV-6	Opportunities to reduce road traffic noise during construction would be investigated during construction planning, including restricting heavy vehicle movements to standard construction hours and/or to routes with fewer sensitive receivers.	Section 6 and Appendix C

Ref #	Commitment	CNVMP
NV-7	Where vibration intensive construction activities are proposed within 100 metres of sensitive receivers, these works would be confined to the less sensitive daytime period where possible. The potential impacts from vibration are to be considered in the site-specific Construction Noise and Vibration Impact Statements (to be developed during detailed design). In general, mitigation and management measures that would be considered include: a) Relocate vibration generating plant and equipment to areas within the site in order to lower the vibration impacts. b) Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment. c) Use lower vibration generating items of excavation plant and equipment (e.g. smaller capacity rock breaker hammers). d) Minimise consecutive works in the same locality (if applicable). e) Use dampened rock breakers to minimise the impacts associated with rock breaking works. f) If vibration intensive works are required within the minimum working distances, vibration monitoring or attended vibration trials would be carried out to ensure that levels remain below the cosmetic damage criterion. g) Building condition surveys would be completed both prior to the commencement of construction works and following the completion of construction works to identify existing damage and any damage due to the works. h) Measurements of existing ambient vibration levels would be carried out at receivers with vibration sensitive equipment during the detailed design. This information would be used to inform the site-specific Construction Noise and Vibration Impact Statements for works near these locations	Section 5, Section 6, Appendix C and Appendix E

Ref #	Commitment	CNVMP
NV-8	Mitigation and management measures to address potential noise and vibration impacts to facilities within the Westmead Research Zone would be implemented during construction. Mitigation and management measures would be determined in consultation with the facility operator / owner and informed by the sensitivity of impacted spaces prior to the commencement of construction. The mitigation and management measures (in addition to those provided in NV-1 to NV-7) could include: a) Consultation with the affected facilities to determine periods when noise and/or vibration intensive works can occur with least impact. b) Relocation of vibration sensitive equipment to less impacted locations within the facilities. c) Vibration isolation of sensitive equipment predicted to have potential impacts. d) Unattended noise and vibration monitoring within the facilities to ensure noise and/or vibration levels are within acceptable levels.	Section 6 and Appendix F

A3 Environmental Performance Outcomes

Relevant EPOs are listed in Table A3-1 below. This includes references to required outcomes, the timing of when the commitment applies relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table A3-1: Environmental Performance Outcomes relevant to this CNVMP

Ref #	Environmental Protection Outcome	CNVMP Reference
EPO-NV-1 Construction	Noise levels would be minimised with the aim of achieving the noise management levels where feasible and reasonable.	Section 5, Section 6 and Appendix C
EPO-NV-2 Construction	The project would avoid any damage to buildings or heritage items from vibrations.	Section 6 and Appendix C

Appendix B - Land Use Surveys

B1 Hawkesbury Road

Legend

Buildings

- Residential
- Commercial
- Place of Worship
- Medical
- Educational
- Hotels
- Childcare Centre
- Tribunal

- Heritage Listed Building
- Project Boundary
- Sensitive Equipment Locations
- EIS Noise Monitoring Locations
- Stockpile_Location
- Site Compound
- EIS Noise Catchment Area

KRI	Kids Research Institute
CMRI	Children's Medical Research Institute
WIMR	Westmead Institute of Medical Research
WSLHD	Western Sydney Local Health District

Client

Job Title
Hawkesbury Road Widening

Figure Title
Land Use Survey

Metres
0 50 100 150 200 250 300 350

Issue	Date	By	Chkd	Appd
D1	4/03/2019			

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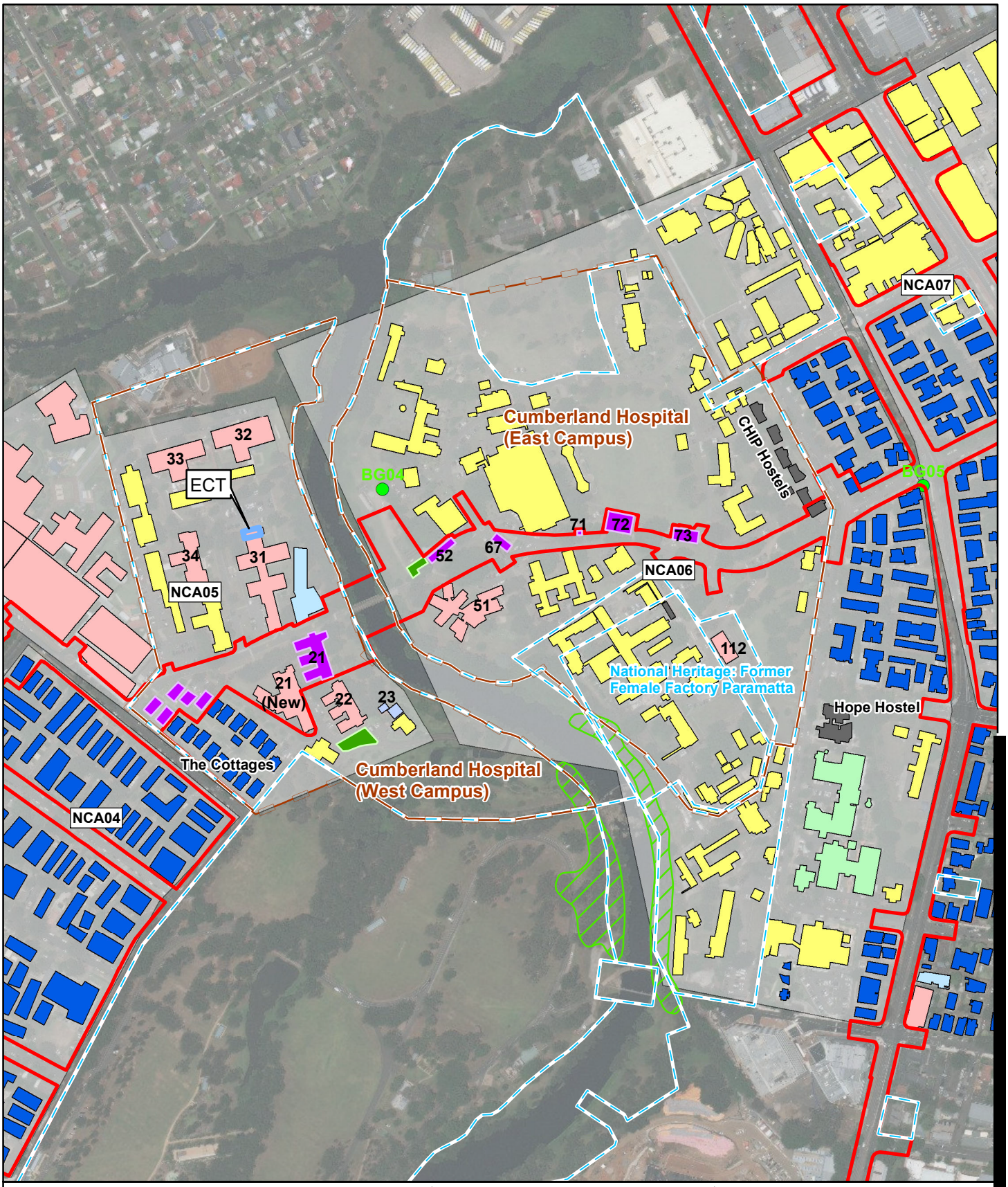
Scale at A4	Figure Status
1:7,000	Draft 1

Coordinate System
GDA 1994 MGA Zone 56

Job No	Figure No
236482-00	TBC

B2 Hawkesbury Road - Indicative Sensitive Equipment Locations [REDACTED AS CONFIDENTIAL]

B3 Cumberland Hospital (East and West Campus) – Land use survey



Buildings

- Residential
- Commercial
- Place of Worship
- Medical
- Educational
- Hotels
- Childcare Centre
- Tribunal
- Aged Care

Legend

- Hospital Boundary
- Building to be Demolished
- PLR Alignment
- Site Compound
- GHFF Camp Extent (Ecosure, Feb 2019)
- EIS Noise Monitoring Locations
- Listed Heritage Boundary
- Sensitive Equipment Locations

Job Title

Cumberland Hospital (East Campus and West Campus) Demolition

Figure Title

Land Use Map

Metres

0 25 50 75 100

Issue	Date	By	Chkd	Appd
r3	26/09/2019			

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Scale at A4

1:5,500

Coordinate System

GDA 1994 MGA Zone 56

Job No

236482-00

Appendix C - Construction Noise and Vibration Impact Assessments (CNVIAs)

C1 CNVIA – Activity A - Hawkesbury Road Widening

C1.1. Construction timeline

Construction of the Activity A - Hawkesbury Road project is anticipated to start in 2019 and finish in 2020. Indicative construction staging program is shown in Table C1.1.

Table C1.1: Indicative construction timeline – Activity A - Hawkesbury Road

Stage	Works Area	Detail of Works	2019 APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	2020 JAN	FEB	MAR	APR
Stage 1	Area 4 Area 10 Area 11 Area 12	• Site Establishment - Setup Site Compound Area • Roundabout, Median & Kerb Blister Removal (Night Works) • Removal of on-street carparking & bus stops (Caroline to Jessie Street)													
Stage 2	Area 1 Area 4 Area 7 Area 8 Area 11	• Clearing & Grubbing to Carpark –Commence Hoarding Install Southern Retaining Wall Construction & Filling • Telstra Road Crossing (South) –Darcy Road • Telstra Northern Section Install (Children's Medical Research Institute) • Jemena Gas Relocation • Piling Prep/Platform to Southern Piling Area													
Stage 3	Area 2 Area 4 Area 6 Area 7 Area 8 Area 9	• Services Installation –Watermain Stage 1, Optus • Sewer Main Crossing (Night Works) + Manhole Construction • Piling to Southern End (On-ground Section) • Block Wall Construction to Northern End Piled Section • Backfill & Piling Platform to Northern End Piled Section • Backfill & Piling Platform • Stormwater Installation –A/1 to A/4													
Stage 2/3 Night Works	Area 8 Area 9	• Watermain crossings • Telstra Crossings • RMS/ Electrical Crossings													

Stage	Works Area	Detail of Works	2019									2020			
			APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR
Stage 4	Area 2 Area 4	• Remove Barriers to Eastern Side • Suspend Structure to Southern Piled Area • Piling Works to Northern End Piled Section –2 rigs • Telstra Install to Southern End													
Stage 5	Area 2 Area 3 Area 4 Area 5 Area 6 Area 7	• Suspend Structure to Northern Piled Area • Stage 2 Section of Watermain • Stormwater Drainage: Lines A/22 to A/12, A/5 to A/4													
Stage 6	Area 2 Area 3 Area 4 Area 5 Area 6 Area 7	• Remaining Stormwater: A/12 to A/7 • Comms Cutovers & Relocations (Critical Path) • Smartpole Footings • Electrical Works • Watermain Installation –Stage 3													
Stage 7	Area 2 Area 3 Area 4 Area 5 Area 6 Area 7	• New Kerb & Gutter to Western Side • New Footpath to Western Side • Mill & Re-sheet/Pavement Works to Roadway • Full Depth Pavement Construction													

While Table 5-1 shows likely scenarios of operation and Table C1.1 shows areas where construction works might overlap, it is not clear what areas and what scenarios might overlap.

C1.2. OOHW Construction Justification

Construction works are anticipated to take place mostly within standard construction hours, however, some construction works will be required to be undertaken during OOHW periods. The OOHW Protocol would be used when required for these works and the form in Appendix D shall support the protocol.

Specific works that are currently anticipated to be required to be completed at night are justified in Table C1.2 and have been assessed in Table C1-3. Additional assessment in accordance with the OOHW Protocol shall be carried out should variations be determined to be required at a later date.

Table C1.2: OOHW activities justification

Area of Works	Justification of Works
Area No.1 – Telstra Service Installation	• The proposed Telstra service is located across the Darcy Rd perpendicular to the traffic lanes and T-way. The trench is situated in close proximity to the Hawkesbury Rd and Darcy Rd Traffic Intersection. Traffic Management Centre (TMC) is highly unlikely to approve closure of the traffic lanes due to the following reasons: o This is a highly trafficked road o The trench is in close proximity of the intersection o The existing T-way is in full operation during the day and in order to close lanes to install the Telstra service, buses will struggle to meet the swept paths o Transport will not allow closure of a T-way lane during the day • Given the aforementioned issues, The Contractor is obligated to perform the works during night hours • Proposed hours as per ROLs (from previous experience) will be 9pm till 5am
Area No. 3 – Westmead Hospital Emergency Access Driveway	• The Contractor is required to install services and construct new pavement across the hospital's Emergency Driveway (ED). These works require staged closures of the ED to perform the works. • 24/7 access is required at all times • Health Infrastructure confirmed that the driveway will be converted to one-way during the night time to enable The Contractor to construct half of the ED access whilst maintaining one entry lane at all times. • Proposed hours will be 8pm till 5am
Area No. 5 – University Clinic Patient Access and Multiplex Driveway	• Health Infrastructure has advised that the University Clinic driveway can be closed during a planned weekend shutdown. This reduces the night works to a minimum. • Multiplex entry driveway required access Mon – Sat during business hours. The Contractor is unable to close the driveway off to the Hospital building construction, therefore requiring to

Area of Works	Justification of Works
	perform the works at night. Sundays are another option to perform the works during the day. • Proposed hours will be 8pm till 5am
Area No. 6 – Multiplex Driveway	• Similar to the description of area no. 5 above, The Contractor is required to perform the works outside Multiplex's working hours • Although the Area Map shows this stage as significant in size, the night works will occur over a small area (10m) and not for the duration of the stage • Proposed hours will be 8pm till 5am
Area No. 7 – Research Lane	• Research Lane is a functioning road required by the hospital during business hours. There is an opportunity to perform works during the weekend subject to Health Infrastructure approval. • The works will be performed during the night time to obtain closure of the lane. • Proposed hours will be 8pm till 5am
Area No. 9 – Road Crossing	• The current traffic arrangement on Hawkesbury Rd permits one lane of travel in each direction. During construction works, this arrangement will remain as such with the traffic shifted from East to West depending on the staging requirements. • The road crossings are perpendicular to the travel lanes, and therefore, in order to perform the trenching works with large machinery, one lane will need to be occupied. Therefore, Hawkesbury Rd will be reduced to one lane for both traffic directions. • Due to the number of vehicles, buses, construction traffic and emergency vehicles, this will not be permitted by TMC and also a hazard for the hospital as they require unimpeded access 24/7 to the hospital. Therefore, The Contractor is required to perform the trenching works at night where there are reduced traffic volumes. • Proposed hours as per ROLs (from previous experience) will be 8:30pm till 5am

C1.3. Construction noise assessment

General construction

To assess the likely noise impacts associated with the construction of the project, a number of scenarios have been assessed based on the information provided by FCC (see Table 5-1).

The noise assessment aims to provide a 'realistic worst-case' noise impact assessment based on construction works within any 15-minute period. The scenarios assessed are presented in Table C1-3 and are considered representative of the noisiest construction activities likely to occur across the project. The predictions assume activities are located at the closest point of the works zone to the nearest sensitive receivers. In reality, the potential construction noise impacts at any particular location will vary depending on factors including:

- The position of the works within the site and distance to the nearest sensitive receiver
- The overall duration of the works
- The cumulative operation of works

- Shielding (existing or provided by buildings, barriers, equipment placed in front of noisy equipment…)

Anticipated plant and equipment used during each of the scenarios is also provided, together with the associated sound power levels (SWLs) which have been sourced from:

- AS2436: Guide to noise and vibration control on construction, demolition and maintenance sites
- BS 5228-1 -2009 Code of Practice for noise and vibration control on construction and open sites; and
- TfNSW Construction Noise Vibration Strategy 2018 Appendix C - Maximum noise levels for plant and equipment

Sound power data provided includes an estimated time correction of the plant and equipment use in 15 minutes. A 5 dB penalty has also been included to the sound power levels of equipment identified as particularly annoying to nearby residents in accordance with the ICNG, such as jackhammers, rock breakers, power saws, rock drilling, vibratory rollers where applicable.

An analysis of potential cumulative impacts due to works being undertaken concurrently within the project has not been included. While Table 5-1 shows likely scenarios of operation and Table C1-1 shows areas of works where construction works might overlap it is not clear what areas and what scenarios might overlap. As the predictions are based on worst-case nearest distances, the influence of cumulative works is not expected to be significantly higher than the levels predicted.

A cumulative analysis of impacts due to concurrent construction of other nearby developments has not been included. Should concurrent activities occur, there is a potential that receivers may be exposed to higher cumulative construction noise levels. In these instances, consultation with relevant development shall be conducted as stated in Section 6.

No barriers have been considered in the noise assessment in Table C1.3. Temporary barriers and screens may provide up to 5 dB reduction to the predicted levels at the sensitive receivers when located in close proximity to the noise source.

When noise intensive plant items such as a rock breaker, a chainsaw or a road saw are in use, high noise impacts are predicted at receivers located nearby. These impacts would however be expected to be of a relatively short duration.

It is noted that Table C1.3 does not include assessment of OOHW Period 1 as Period 2 is more stringent and OOHW are expected to occur across both periods. Triggering of impact and management measures have therefore been appropriately considered. Notwithstanding, should works be proposed at a later date only for OOHW Period 1, assessment will be carried out in accordance with the OOHW Protocol against the specific period of works.

Table C1.3: Construction noise assessment – residential receivers

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A1 Sc1	Potholing for services	Non-destructive excavator	109	100	109	35	70	No	-	-	Yes	Yes	63	Provide respite periods	6
A1 Sc2.1	Saw-cut existing road	Road saw	119 (124[1])	25	118[1]	35	79	Yes	56	Provide respite periods	Yes	Yes	177	Provide respite periods	18
A1 Sc2.2	Demolition of existing road	5T-8T Excavator Hammer Tipper (2-4t)	115 (120[1)] 110	50 50	117[1]	35	79	Yes	53	Provide respite periods	Yes	Yes	166	Provide respite periods	17
A1 Sc2.3	Backfill and Compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	35	72	No	-	-	Yes	Yes	75	Provide respite periods	8
A2 Sc1	Potholing for services	Non-destructive excavator	109	100	109	22	74	No	-	-	-	-	-	-	6
A2 Sc2.1	Saw-cut existing road/footpath	Road Saw	119 (124[1])	25	118[1]	22	83	Yes	56	Provide respite periods	-	-	-	-	18

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A2 Sc2.2	Road and Footpath Demolition	5T - 8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	22	83	Yes	53	Provide respite periods	-	-	-	-	17
A2 Sc3	Backfill of retaining wall fill	2T Smooth Drum Roller Tipper (2-4t) Concrete truck	107 (112[1]) 110 109	100 50 50	114[1]	22	79	Yes	35	Provide respite periods	-	-	-	-	11
A2 Sc4	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	22	76	Yes	24	Provide respite periods	-	-	-	-	8
A2 Sc5.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	22	85	Yes	72	Provide respite periods	-	-	-	-	23
A2 Sc5.2	Backfill and compaction	1T Trench Roller Tipper (2-4t)	105 (110[1]) 110	100 50	112[1]	22	77	Yes	27	Provide respite periods	-	-	-	-	9

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A2 Sc6	Compaction of road/footpath pavement	2T - 10T Roller	106 (111[1])	100	111[1]	22	76	Yes	25	Provide respite periods	-	-	-	-	8
A3 Sc1	Potholing for services	Non-destructive excavator	109	100	109	22	74	No	-	-	Yes	Yes	63	Provide respite periods	6
A3 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	22	83	Yes	56	Provide respite periods	Yes	Yes	177	Provide respite periods	18
A3 Sc2.2	Road and Footpath Demolition	5T - 8T Excavator Hammer Tipper (2-4t)	115 (120[1)] 110	50 50	117[1]	22	83	Yes	53	Provide respite periods	Yes	Yes	166	Provide respite periods	17
A3 Sc3	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	22	76	Yes	24	Provide respite periods	Yes	Yes	75	Provide respite periods	8
A3 Sc4.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	22	85	Yes	72	Provide respite periods	Yes	Yes	229	Provide respite periods	23

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A3 Sc4.2	Backfill and compaction	1T Trench Roller Tipper (2-4t)	105 (110[1]) 110	100 50	112[1]	22	77	Yes	27	Provide respite periods	Yes	Yes	87	Provide respite periods	9
A3 Sc5	Compaction of road/footpath pavement	2T - 10T Roller	106 (111[1])	100	111[1]	22	76	Yes	25	Provide respite periods	Yes	Yes	79	Provide respite periods	8
A4 Sc1	Potholing for services	Non-destructive excavator	109	100	109	22	74	No	-	-	No	-	-	-	6
A4 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	22	83	Yes	56	Provide respite periods	No	-	-	-	18
A4 Sc2.2	Road and Footpath Demolition	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	22	85	Yes	72	Provide respite periods	No	-	-	-	23
A4 Sc2.3	General cutting	Demo Saw Tipper (2-4t)	114 (119[1]) 110	25 50	118[1]	22	83	Yes	58	Provide respite periods	No	-	-	-	18

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A4 Sc3	Tree Removal	Chain Saw Wood Chipper Stump Grinder Tipper (2-4t)	114 (119[1]) 114 105 (110[1]) 110	25 100 100 50	118[1]	22	83	Yes	55	Provide respite periods	No	-	-	-	17
A4 Sc4.1	Piling Pad Preparation	12T Roller Semi-trailer Concrete truck Concrete pump	109 (114[1]) 108 109 109	100 25 50 50	115[1]	22	81	Yes	42	Provide respite periods	No	-	-	-	13
A4 Sc4.2	Piling Installation	Bauer Drill Rig BG24-01 Soilmec R620 Drill Rig	112 112	50 50	112	22	77	Yes	28	Provide respite periods	No	-	-	-	9
A4 Sc5.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	22	85	Yes	72	Provide respite periods	No	-	-	-	23

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A4 Sc5.2	Backfill and compaction	1T Trench Roller Tipper (2-4t)	105 (110[1]) 110	100 50	112[1]	22	77	Yes	27	Provide respite periods	No	-	-	-	9
A4 Sc6	Compaction of road/footpath pavement	2T - 10T Roller Tipper (2-4t)	106 (111[1]) 110	100 50	112[1]	22	78	Yes	30	Provide respite periods	No	-	-	-	9
A5 Sc1	Potholing for services	Non-destructive excavator	109	100	109	26	73	No	-	-	Yes	Yes	63	Provide respite periods	6
A5 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	26	82	Yes	56	Provide respite periods	Yes	Yes	177	Provide respite periods	18
A5 Sc2.2	Road and Footpath Demolition	5T – 8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	26	81	Yes	53	Provide respite periods	Yes	Yes	166	Provide respite periods	17
A5 Sc3	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	26	74	No	-	-	Yes	Yes	75	Provide respite periods	8

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A5 Sc4.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	26	84	Yes	72	Provide respite periods	Yes	Yes	229	Provide respite periods	23
A5 Sc4.2	Backfill and compaction	1T Trench Roller Tipper (2-4t)	105 (110[1]) 110	100 50	112[1]	26	75	Yes	27	Provide respite periods	Yes	Yes	87	Provide respite periods	9
A5 Sc5	Compaction of road/footpath pavement	2T - 10T Roller	106 (111[1])	100	111[1]	26	75	No	-	-	Yes	Yes	79	Provide respite periods	8
A6 Sc1	Potholing for services	Non-destructive excavator	109	100	109	21	75	No	-	-	Yes	Yes	63	Provide respite periods	6
A6 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	21	84	Yes	56	Provide respite periods	Yes	Yes	177	Provide respite periods	18
A6 Sc2.2	Road and Footpath Demolition	5T – 8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	21	83	Yes	53	Provide respite periods	Yes	Yes	166	Provide respite periods	17

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A6 Sc3.1	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	21	76	Yes	24	Provide respite periods	Yes	Yes	75	Provide respite periods	8
A6 Sc3.2	Watermain pipe cutting to suite alignment	Demo saw	119 (124[1])	25	118[1]	21	84	Yes	56	Provide respite periods	Yes	Yes	177	Provide respite periods	18
A6 Sc4.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	21	86	Yes	71	Provide respite periods	Yes	Yes	224	Provide respite periods	22
A6 Sc4.2	Backfill and compaction	1T Trench Roller Tipper (2-4t)	105 (110[1]) 110	100 50	112[1]	21	77	Yes	27	Provide respite periods	Yes	Yes	87	Provide respite periods	9
A6 Sc5	Compaction of road/footpath pavement	2T - 10T Roller	106 (111[1])	100	111[1]	21	77	Yes	25	Provide respite periods	Yes	Yes	79	Provide respite periods	8
A7 Sc1	Potholing for services	Non-destructive excavator	109	100	109	22	74	No	-	-	Yes	Yes	63	Provide respite periods	6

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A7 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	22	83	Yes	56	Provide respite periods	Yes	Yes	177	Provide respite periods	18
A7 Sc2.2	Road and Footpath Demolition	5T – 8T Excavator Hammer Tipper (2-4t)	115 (120[1)] 110	50 50	117[1]	22	83	Yes	53	Provide respite periods	Yes	Yes	166	Provide respite periods	17
A7 Sc3	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	22	76	Yes	24	Provide respite periods	Yes	Yes	75	Provide respite periods	8
A7 Sc4.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	22	85	Yes	71	Provide respite periods	Yes	Yes	224	Provide respite periods	22
A7 Sc4.2	Backfill and compaction	1T Trench Roller Tipper (2-4t)	105 (110[1]) 110	100 50	112[1]	22	77	Yes	27	Provide respite periods	Yes	Yes	87	Provide respite periods	9
A7 Sc5	Compaction of road/footpath pavement	2T Roller	105 (110[1])	100	110[1]	22	75	Yes	22	Provide respite periods	Yes	Yes	71	Provide respite periods	7

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A8 Sc1	Potholing for services	Non-destructive excavator	109	100	109	2	95	Yes	20	Provide respite periods	No	-	-	-	6
A8 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	2	104	Yes	56	Provide respite periods	No	-	-	-	18
A8 Sc2.2	Road and Footpath Demolition	5T – 8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	2	103	Yes	53	Provide respite periods	No	-	-	-	17
A8 Sc2.3	Tree Removal	Chain Saw Wood Chipper Stump Grinder Tipper (2-4t)	114 (119[1]) 114 105 (110[1]) 110	25 100 100 50	118[1]	2	104	Yes	55	Provide respite periods	No	-	-	-	17
A8 Sc3.1	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	2	97	Yes	24	Provide respite periods	No	-	-	-	8

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A8 Sc3.2	Watermain pipe cutting to suite alignment	Demo saw Tipper (2-4t)	119 (124[1]) 110	25 50	118[1]	2	104	Yes	56	Provide respite periods	No	-	-	-	18
A8 Sc4	Compaction of road/footpath pavement	2T Roller	105 (110[1])	100	110[1]	2	96	Yes	22	Provide respite periods	No	-	-	-	7
A9 Sc1	Potholing for services	Non-destructive excavator	109	100	109	5	87	Yes	20	Provide respite periods	Yes	Yes	63	Provide respite periods	6
A9 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	5	96	Yes	56	Provide respite periods	Yes	Yes	177	Provide respite periods	18
A9 Sc2.2	Road Demolition	5T – 8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	5	95	Yes	53	Provide respite periods	Yes	Yes	166	Provide respite periods	17
A9 Sc3	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	5	89	Yes	24	Provide respite periods	Yes	Yes	75	Provide respite periods	8

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A9 Sc4	Excavation of rock	8T – 13T Excavator Tipper (2-4t)	118 (123[1]) 110	50 50	120	5	98	Yes	71	Provide respite periods	Yes	Yes	224	Provide respite periods	22
A9 Sc5	Compaction of road/footpath pavement	2T Roller	105 (110[1])	100	110[1]	5	88	Yes	22	Provide respite periods	Yes	Yes	71	Provide respite periods	7
A10 Sc1.1	Island Demolition	5T – 8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	8	91	Yes	53	Provide respite periods	No	-	-	-	17
A10 Sc1.2	Road cutting	Road Saw	119 (124[1])	25	118[1]	8	92	Yes	56	Provide respite periods	No	-	-	-	18
A11 Sc1.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	45	77	Yes	56	Provide respite periods	No	-	-	-	18
A11 Sc1.2	Demolition of existing road	5T - 8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	45	76	Yes	53	Provide respite periods	No	-	-	-	17

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level	Approximated distance to nearest residential receiver	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			OOHW Period 2				Work Health and Safety
								Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	Approximate distance Highly Noise Affected Level is achieved - m	Respite periods required?	Anticipated OOHW	Trigger for respite period >= 65 dBA	Approximate distance at which receivers drop from the highly noise affected zone - m	Respite periods required?	Distance at which $L_{Aeq(15minute)}$ 85 dB is reached
A12	Loading stockpile	Excavator 8-20t Tipper 2-4t	100 110	50 50	107	25	71	No	-	-	No	-	-	-	5
	Washing trucks	Gerni	103	75	102	25	66	No	-	-	No	-	-	-	3
	Loading/ unloading trucks	Forklift Truck	100 103	75 50	102	25	66	No	-	-	No	-	-	-	3

Note 1: Includes 5 dBA penalty in accordance with the ICNG

Note that Standard hours and OOHW Period 2 only (not OOHW Period 1) have been assessed in Table C1.3 as they cover the extend of the impacts of the construction works.

Table C1.4: Construction noise assessment – non-residential receivers

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq(15min)}$ Sound Power Level	Approximated distance to nearest non-residential receiver	Predicted noise level – $L_{Aeq(15minute)}$ dB	All hours	
								Noise affected >= $L_{Aeq(15minute)}$ 65 dB	Approximate distance at which receivers drop from the noise affected zone - m
A1 Sc1	Potholing for services	Non-destructive excavator	109	100	109	38	69	Yes	63
A1 Sc2.1	Saw-cut existing road	Road saw	119 (124[1])	25	118[1]	38	78	Yes	177
A1 Sc2.2	Demolition of existing road	5T-8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	38	78	Yes	166
A1 Sc2.3	Backfill and Compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	38	71	Yes	75
A2 Sc1	Potholing for services	Non-destructive excavator	109	100	109	6	85	Yes	63
A2 Sc2.1	Saw-cut existing road/footpath	Road Saw	119 (124[1])	25	118[1]	6	94	Yes	177
A2 Sc2.2	Road and Footpath Demolition	5T - 8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	6	94	Yes	166

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq(15min)}$ Sound Power Level	Approximated distance to nearest non-residential receiver	Predicted noise level – $L_{Aeq(15minute)}$ dB	All hours	
								Noise affected >= $L_{Aeq(15minute)}$ 65 dB	Approximate distance at which receivers drop from the noise affected zone - m
A2 Sc3	Backfill of retaining wall fill	2T Smooth Drum Roller Tipper (2-4t) Concrete truck	107 (112[1]) 110 109	100 50 50	114[1]	6	90	Yes	112
A2 Sc4	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	6	87	Yes	75
A2 Sc5.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	6	97	Yes	229
A2 Sc5.2	Backfill and compaction	1T Trench Roller Tipper (2-4t)	105 (110[1]) 110	100 50	112[1]	6	88	Yes	87
A2 Sc6	Compaction of road/footpath pavement	2T - 10T Roller	106 (111[1])	100	111[1]	6	87	Yes	79
A3 Sc1	Potholing for services	Non-destructive excavator	109	100	109	16	77	Yes	63
A3 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	16	86	Yes	177

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq(15min)}$ Sound Power Level	Approximated distance to nearest non-residential receiver	Predicted noise level – $L_{Aeq(15minute)}$ dB	All hours	
								Noise affected >= $L_{Aeq(15minute)}$ 65 dB	Approximate distance at which receivers drop from the noise affected zone - m
A3 Sc2.2	Road and Footpath Demolition	5T - 8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	16	85	Yes	166
A3 Sc3	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	16	78	Yes	75
A3 Sc4.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	16	88	Yes	229
A3 Sc4.2	Backfill and compaction	1T Trench Roller Tipper (2-4t)	105 (110[1]) 110	100 50	112[1]	16	80	Yes	87
A3 Sc5	Compaction of road/footpath pavement	2T - 10T Roller	106 (111[1])	100	111[1]	16	79	Yes	79
A4 Sc1	Potholing for services	Non-destructive excavator	109	100	109	21	75	Yes	63
A4 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	21	84	Yes	177

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq(15min)}$ Sound Power Level	Approximated distance to nearest non-residential receiver	Predicted noise level – $L_{Aeq(15minute)}$ dB	All hours	
								Noise affected >= $L_{Aeq(15minute)}$ 65 dB	Approximate distance at which receivers drop from the noise affected zone - m
A4 Sc2.2	Road and Footpath Demolition	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	21	86	Yes	229
A4 Sc2.3	General cutting	Demo Saw Tipper (2-4t)	114 (119[1]) 110	25 50	118	21	84	Yes	184
A4 Sc3	Tree Removal	Chain Saw Wood Chipper Stump Grinder Tipper (2-4t)	114 (119[1]) 114 105 (110[1]) 110	25 100 100 50	118[1]	21	83	Yes	173
A4 Sc4.1	Piling Pad Preparation	12T Roller Semi-trailer Concrete truck Concrete pump	109 (114[1]) 108 109 109	100 25 50 50	115[1]	21	81	Yes	132
A4 Sc4.2	Piling Installation	Bauer Drill Rig BG24-01 Soilmec R620 Drill Rig	112 112	50 50	112	21	78	Yes	89
A4 Sc5.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	21	86	Yes	229
A4 Sc5.2	Backfill and compaction	1T Trench Roller Tipper (2-4t)	105 (110[1]) 110	100 50	112[1]	21	77	Yes	87

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq(15min)}$ Sound Power Level	Approximated distance to nearest non-residential receiver	Predicted noise level – $L_{Aeq(15minute)}$ dB	All hours	
								Noise affected >= $L_{Aeq(15minute)}$ 65 dB	Approximate distance at which receivers drop from the noise affected zone - m
A4 Sc6	Compaction of road/footpath pavement	2T - 10T Roller Tipper (2-4t)	106 (111[1]) 110	100 50	112[1]	21	78	Yes	94
A5 Sc1	Potholing for services	Non-destructive excavator	109	100	109	73	64	No	-
A5 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	73	73	Yes	177
A5 Sc2.2	Road and Footpath Demolition	5T – 8T Excavator Hammer Tipper (2-4t)	115 (120[1)] 110	50 50	117[1]	73	72	Yes	166
A5 Sc3	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	73	65	Yes	75
A5 Sc4.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	73	75	Yes	229
A5 Sc4.2	Backfill and compaction	1T Trench Roller Tipper (2-4t)	105 (110[1]) 110	100 50	112[1]	73	66	Yes	87

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq(15min)}$ Sound Power Level	Approximated distance to nearest non-residential receiver	Predicted noise level – $L_{Aeq(15minute)}$ dB	All hours	
								Noise affected >= $L_{Aeq(15minute)}$ 65 dB	Approximate distance at which receivers drop from the noise affected zone - m
A5 Sc5	Compaction of road/footpath pavement	2T - 10T Roller	106 (111[1])	100	111[1]	73	66	Yes	79
A6 Sc1	Potholing for services	Non-destructive excavator	109	100	109	2	95	Yes	63
A6 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	2	104	Yes	177
A6 Sc2.2	Road and Footpath Demolition	5T – 8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	2	103	Yes	166
A6 Sc3.1	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	2	97	Yes	75
A6 Sc3.2	Watermain pipe cutting to suite alignment	Demo saw	119 (124[1])	25	118[1]	2	104	Yes	177
A6 Sc4.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	2	106	Yes	224

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq(15min)}$ Sound Power Level	Approximated distance to nearest non-residential receiver	Predicted noise level – $L_{Aeq(15minute)}$ dB	All hours	
								Noise affected >= $L_{Aeq(15minute)}$ 65 dB	Approximate distance at which receivers drop from the noise affected zone - m
A6 Sc4.2	Backfill and compaction	1T Trench Roller Tipper (2-4t)	105 (110[1]) 110	100 50	112[1]	2	98	Yes	85
A6 Sc5	Compaction of road/footpath pavement	2T - 10T Roller	106 (111[1])	100	111[1]	2	97	Yes	79
A7 Sc1	Potholing for services	Non-destructive excavator	109	100	109	2	95	Yes	63
A7 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	2	104	Yes	177
A7 Sc2.2	Road and Footpath Demolition	5T – 8T Excavator Hammer Tipper (2-4t)	115 (120[1)] 110	50 50	117[1]	2	103	Yes	166
A7 Sc3	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	2	97	Yes	75
A7 Sc4.1	Hammer existing rock in stormwater trench	8T – 13T Excavator Hammer Tipper (2-4t)	118 (123[1]) 110	50 50	120[1]	2	106	Yes	224

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq(15min)}$ Sound Power Level	Approximated distance to nearest non-residential receiver	Predicted noise level – $L_{Aeq(15minute)}$ dB	All hours	
								Noise affected >= $L_{Aeq(15minute)}$ 65 dB	Approximate distance at which receivers drop from the noise affected zone - m
A7 Sc4.2	Backfill and compaction	1T Trench Roller Tipper (2-4t)	105 (110[1]) 110	100 50	112[1]	2	98	Yes	85
A7 Sc5	Compaction of road/footpath pavement	2T Roller	105 (110[1])	100	110[1]	2	96	Yes	71
A8 Sc1	Potholing for services	Non-destructive excavator	109	100	109	6	85	Yes	63
A8 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	6	94	Yes	177
A8 Sc2.2	Road and Footpath Demolition	5T – 8T Excavator Hammer Tipper (2-4t)	115 (120[1)] 110	50 50	117[1]	6	94	Yes	166
A8 Sc2.3	Tree Removal	Chain Saw Wood Chipper Stump Grinder Tipper (2-4t)	114 (119[1]) 114 105 (110[1]) 110	25 100 100 50	118[1]	6	94	Yes	173
A8 Sc3.1	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	6	87	Yes	75

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq(15min)}$ Sound Power Level	Approximated distance to nearest non-residential receiver	Predicted noise level – $L_{Aeq(15minute)}$ dB	All hours	
								Noise affected >= $L_{Aeq(15minute)}$ 65 dB	Approximate distance at which receivers drop from the noise affected zone - m
A8 Sc3.2	Watermain pipe cutting to suite alignment	Demo saw Tipper (2-4t)	119 (124[1]) 110	25 50	118[1]	6	94	Yes	177
A8 Sc4	Compaction of road/footpath pavement	2T Roller	105 (110[1])	100	110[1]	6	86	Yes	71
A9 Sc1	Potholing for services	Non-destructive excavator	109	100	109	11	80	Yes	63
A9 Sc2.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	11	89	Yes	177
A9 Sc2.2	Road Demolition	5T – 8T Excavator Hammer Tipper (2-4t)	115 (120[1)] 110	50 50	117[1]	11	89	Yes	166
A9 Sc3	Backfill and compaction	Jumping Jack & Plate Compactor Tipper (2-4t)	108 110	100 50	111	11	82	Yes	75
A9 Sc4	Excavation of rock	8T – 13T Excavator Tipper (2-4t)	118 (123[1]) 110	50 50	120	11	91	Yes	224
A9 Sc5	Compaction of road/footpath pavement	2T Roller	105 (110[1])	100	110[1]	11	81	Yes	71

Scenario reference no.	Scenario Description	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq(15min)}$ Sound Power Level	Approximated distance to nearest non-residential receiver	Predicted noise level – $L_{Aeq(15minute)}$ dB	All hours	
								Noise affected >= $L_{Aeq(15minute)}$ 65 dB	Approximate distance at which receivers drop from the noise affected zone - m
A10 Sc1.1	Island Demolition	5T – 8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	7	93	Yes	166
A10 Sc1.2	Road cutting	Road Saw	119 (124[1])	25	118[1]	7	93	Yes	177
A11 Sc1.1	Saw-cut existing road	Road Saw	119 (124[1])	25	118[1]	15	86	Yes	177
A11 Sc1.2	Demolition of existing road	5T - 8T Excavator Hammer Tipper (2-4t)	115 (120[1]) 110	50 50	117[1]	15	86	Yes	166
A12	Loading stockpile	Excavator 8-20t Tipper 2-4t	100 110	50 50	107	60	68	Yes	80
	Washing trucks	Gerni	103	75	102	60	58	No	-
	Loading/ unloading trucks	Forklift Truck	100 103	75 50	102	60	59	No	-

Note 1: Includes 5 dBA penalty in accordance with the ICNG

According to Table C1.3, results show exceedances of the NMLs are expected to occur during most of the construction activities identified in Table 5-1 during standard hours as most of the nearest residential receivers adjacent to Hawkesbury Road will fall into the Highly Noise Affected category defined in the ICNG.

Exceedances are also predicted to occur during the OOHW period 2 (night-time). Noise levels at the nearest residential receivers are predicted to be above $L_{Aeq15\ min}$ 65 dBA criteria for all works occurring during OOHW period 2. Respite periods will need to be provided for all construction activities currently scheduled to occur during night time as shown in Table C1.3 as required by CoAs.

Areas of work and construction activities where respite periods are required have been identified in Table C1.3.

According to Table C1.4, results show exceedances are expected to occur during most of the construction activities identified in Table 5-1 as most of the nearest non-residential receivers adjacent to Hawkesbury Road will fall into the noise affected category.

It is noted that the assessment presented in Table C1.3 and Table C1.4 is based on the closest distance between work areas and receivers.

Noise management measures identified in Section 6 shall be considered for these works to limit noise impacts on nearest sensitive receivers

Ancillary facility and stockpile operation (including access)

The construction site compound for this activity is located on Hawkesbury Road while the stockpile compound is located off Mons Road near the site.

Hawkesbury Road construction site compound

The Hawkesbury Road construction site compound is to be used as a site office and amenity area. The office and amenities area will be used by staff during approved work hours. Noise emission from the area would be limited to people conversing if located in the external areas or a car arriving to drop off staff, for which recommendations regarding behaviour of staff are outlined in the summary of management measures in Table 6-1 (refer to Work Practices section in particular). The Hawkesbury Road site compound will be used as an administrative and amenity area only and no construction equipment or activity is to take place in the site. Due to the nature of activity in the compound area, and the ambient environment along Hawksbury Road, the site is considered low impact. This compound activity will not be different to that occurring on a daily basis on Hawkesbury Road (non-construction vehicle movements and conversations between people. Accordingly, conditions regarding noise screening in the form of solid barriers around the area is not considered to be warranted.

Mons Road stockpile compound

Potential noise and vibration impact from the use of the proposed Mons Road stockpile compound has been assessed in accordance with relevant CoA and associated requirements for the PLR project.

Site description

The Mons Road stockpile compound is to be used as a storage and clearing area and is shown in Figure 5-2. The area is currently being utilised for bulk material storage and laydown area by Multiplex in association with works currently being undertaken for Westmead Hospital.

Activity at the site will be intermittent and occurring during Standard Hours only (Monday to Friday – 7:00 am to 7:00 pm and Saturdays – 8:00 am to 6:00 pm).

Receptor locations

The nearest sensitive receiver are residential high-rise apartments on the opposite side of Mons Road [redacted], which includes non-residential use at ground level. A child care centre is also identified, however located at the rear of the residential building and therefore acoustically shielded. Medical uses are further removed from the compound site.

Assessment

Table C1.5 presents an assessment of the proposed activities within the compound upon the nearest most potentially affected receiver location. The assessment is limited to noise emissions, as vibration intensive work is not proposed within the compound. Further, the tabulated assessment is limited to activities within the compound, as construction traffic volumes is low between the Hawkesbury Road Works and compound and noise levels from construction traffic vehicles are not expected to exceed the RNP criteria.

Table C1.5 outlines assessment for the three primary activities in the compound and assess impact against criteria established in accordance with the ICNG and based on noise monitoring results presented in the EIS. The range in predicted noise levels are based on the varied potential location of activities, from the western end, appropriately 25 m from the residential receivers, to approximately 80 m at the eastern end of the compound.

Table C1.5: Construction noise assessment – residential receivers

Scenario Description	Typical plant and equipment required	L_{Aeq} Sound Power Level	Receiver	Predicted $L_{Aeq(15minute)}$	Criteria $L_{Aeq(15minute)}$	
					Noise Affected	Highly noise affected
Loading stockpile	8-20T Excavator 2-4T Tipper Bogie Tipper Truck and Trailer Semi-trailer	107	[redacted]	61-71 dB	59 dB	75 dB
Washing trucks	Gerni	102	[redacted]	56-66 dB	59 dB	75 dB
Loading/ unloading trucks	Forklift Hiab Truck Semi-trailer Small crane	102	[redacted]	56-66 dB	59 dB	75 dB

Discussion and recommendations

The assessment indicates that while exceedance of the NML is predicted for some activities at some locations in the compound, the Highly Noise Affected criteria should be satisfied for all activities at all locations. Given that the area is not proposed to be in constant use, and operated during the day time only, it is not expected that the compound will result in significant impact. Noise impacts from the proposed site activities to sensitive receivers are anticipated to be consistent with that associated with the current designated use of the site.

Notwithstanding, the following key recommendations are made regarding the operation of the compound (and are also listed in Section 6):

- The lowest powered/quietest practicable plant equipment should be used for activities on the compound site, such as for the selection of excavators for loading/unloading
- Vehicles, should not queue idling in front of residential apartments to await entry into the compound
- Vehicles being loaded/unloaded shall have engines switched off where practicable.
- Plant and equipment should be fitted with non-tonal reversing beepers. Factoring in the potential for use of hearing protection by workers, consider the use of ambient sensitive

alarms that adjust output relative to the ambient noise level whilst ensuring that the occupational health and safety of workers is maintained.

- Cleaning of vehicles is recommended to occur at the eastern most end of the compound, furthest removed from the residential receivers

It is noted that acoustic screening around the site was not deemed to be beneficial for reducing noise emission to the high-rise residential receivers.

Both the Mons Road and Hawkesbury Road compounds were assessed on using standard working hours to determine noise and vibration impacts. Should any OOHW be required, these compounds will be assessed against the OOHW Protocol Form (PLR-TFNSW-CBD-PE-FRM-000001) per E28 which addresses all requirements for OOHW including community consultation. The OOHW Protocol Form will be submitted to both the ER and AA for endorsement and approval before any OOHW can proceed. Further CoA for the compounds will also be assessed as part of the OOHW submission, such as C19 and C20 for boundary screening requirements.

C1.4. Work Health and Safety

WHS is assessed as an L_{Aeq} averaged over an 8-hour period, while the general construction assessment is averaged over a 15 minute period, for a worst-case period. As noise from construction activities will be lower for most of the 8-hour period, the assessment presented is conservative. Table C1.3 and Table C1.4 provides indicative distances, at which people external to the project, if located there for extended periods, could exceed the WHS requirements.

The requirement does not refer to construction workers, however recommendations for workers are provided in Table 6-1.

There are no identified external staff areas (including non-project workplaces) identified around the works site, and exposure would largely concern pedestrians that would be transient and therefore not exposed to extended noise exposure.

C1.5. Construction traffic impact assessment

The construction of the project will generate an increase in vehicle movements on Hawkesbury Road and around the surrounding road network. Additional vehicle movements will be generated by:

- The arrival and departure of construction plant, equipment and vehicles; this may require off-peak movement of construction plant and equipment to/from work areas
- The haulage and delivery of road work materials, and removal of waste to and from the construction zones
- The arrival and departure of construction workers at the start and end of each work day and night shift, which will result in an increased traffic demand and turning manoeuvres to and from the construction site access.
- Traffic diversion due to lane closure on Hawkesbury Road because of construction works

Table C1-6 presents a summary of the daily average construction traffic volumes (provided by FCC) across the construction area:

Table C1.6: Construction traffic vehicles

Work Areas	Proposed construction vehicles type	Average truck movements/day
Area 1	2 - 4T tippers	8
Area 2	2 - 4T tippers, non-destructive digging truck, concrete trucks	11

Work Areas	Proposed construction vehicles type	Average truck movements/day
Area 3	2 - 4T tippers	8
Area 4	2 – 4T tippers, bogies, crane trucks, concrete trucks and pumps, semi-trailers	20
Area 5	2 - 4T tippers	8
Area 6	2 - 4T tippers, mini concrete trucks	10
Area 7	2 - 4T tippers, mini concrete trucks	10
Area 8	2 - 4T tippers	10
Area 9	2 - 4T tippers	8
Area 10	2 - 4T tippers	8
Area 11	work utes, crane trucks (establishment)	4

Based on anticipated traffic presented in Table C1.6, construction traffic noise is unlikely to result in a 2 dBA increase and is anticipated to meet criteria defined in Table 4-5 if travelling on Hawkesbury Road, Mons Road and Darcy Road.

The assessment does not include cumulative contribution form vehicles attending all work areas that may operate simultaneously (driving past a single location to arrive at the respective final destinations) as the vehicle movements are minor and expected to be inconsequential.

Existing traffic will be rerouted during lane closure (Stage 2) on Hawkesbury Road to Queens Road, Jessie Street and Park Avenue. As defined in the Construction Noise Estimator and associated Application Notes the functional classification of those roads will then change from local roads to new roads and therefore the new road criteria will then apply. Rerouting of traffic is anticipated to exceed new road criteria applicable to Queens Road, Jessie Street and Park Avenue for up to one month. Management measures should be put in place as per Section 6 including scheduling rerouting to daytime period if possible and limiting speed.

C1.6. Construction vibration impact assessment

Sensitive laboratories and medical spaces

An initial assessment has been undertaken to identify the risk of the planned construction activity for the Hawksbury Road Widening Works creating vibration levels that exceed the criteria within sensitive laboratory and medical spaces.

This assessment included:

- Review of construction activity and types of construction equipment planned
- Assessment of likely vibration level created by the activity based on previous measurements and published data
- Likely reduction in vibration with distance from the activity
- Feedback from monitoring of the sensitive spaces during construction of the CASB building.

Figure C1-1 defines the Hawksbury Road Widening Works construction area into four zones relating to their distance from sensitive spaces and the sensitivity of those spaces. These zones are defined as:

- **Zone A:** 0-25m from facilities with highly sensitive microscopy lab (VC-C /VC-B)
- **Zone B**: 25-50m from facilities with highly sensitive microscopy lab (VC-C /VC-B)
- **Zone C:** 50-80m from facilities with highly sensitive microscopy lab (VC-C /VC-B)
- **Zone D:** >80m from facilities with highly sensitive microscopy lab (VC-C /VC-B) and >50m from facilities with criterion of AS2670.2 Curve 1 and above such as the Biological Science Facility Laboratories and sensitive equipment within Westmead Adult Hospital.

C1.7. Auditing of impacts

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub-plan, CoA and other relevant approvals, licenses and guidelines.

Internal noise audit systems to be put in place by The Contractor will include recording of daily hours of construction, progressive impact assessments as work proceeds, allowing the AA to conduct informal checks, and providing active and communication links to surrounding sensitive receivers via the community communication strategy.

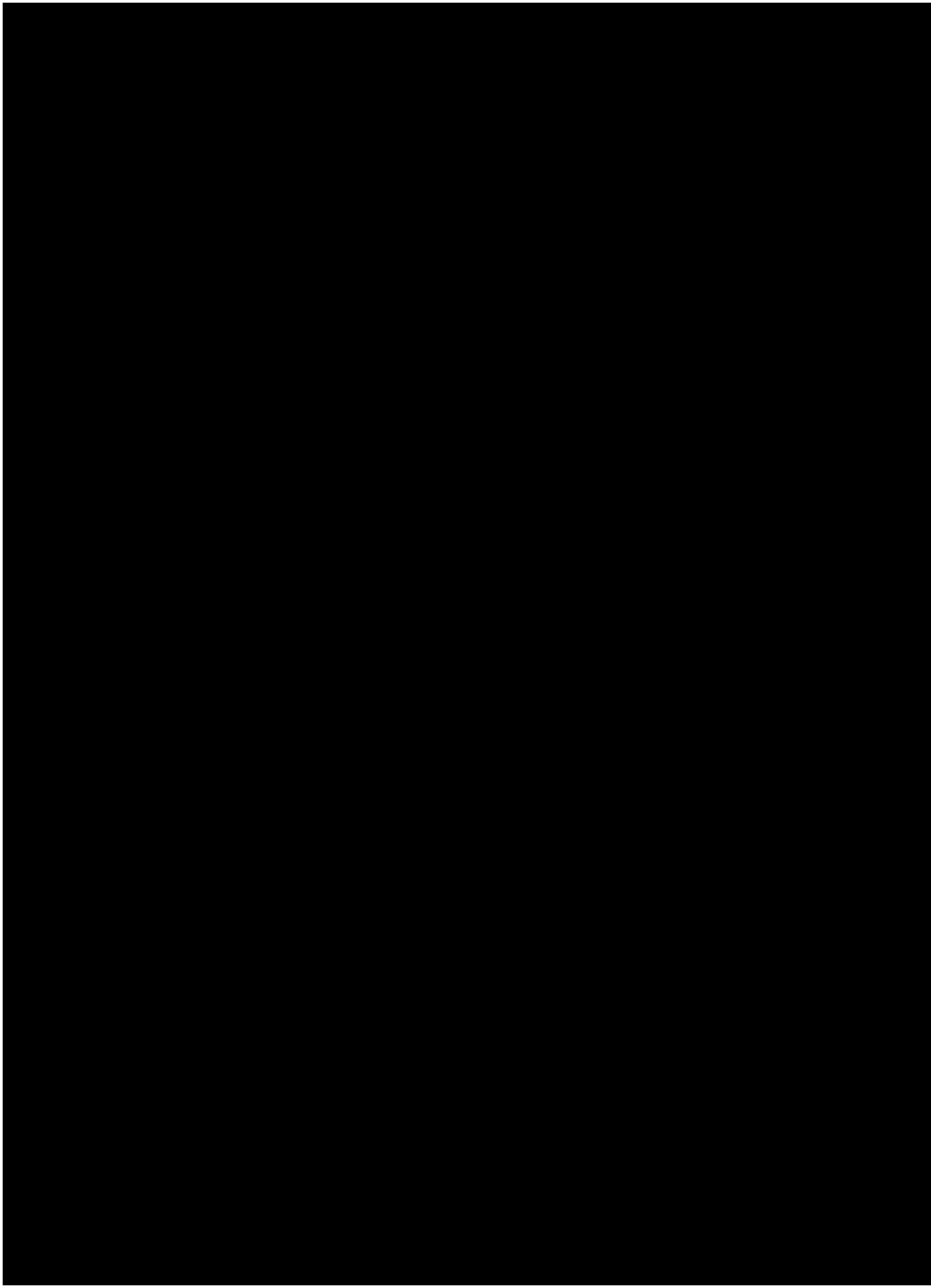
With regards to AA inspections/audits, minimum frequency of AA inspections will be determined based on the potential risk of noise impacts for the construction works as per the triggers listed below:
Where these items are not triggered, fortnightly inspections will occur as a minimum.

Where possible the routine inspections or those to review any of the additional triggers, would be completed in tandem with the ER and inspections for other works packages, such that the application of noise and vibration compliance and mitigation can be considered in corroboration with any other environmental/project issues.

Triggers for additional inspections are provided as follows:

- As a result of noise or vibration related complaint(s), determined to warrant investigation by the AA, ER or TfNSW, or occurring on successive nights at a single work location (where relevant)
- Where a work site has not fully implemented the noise management protocols as per the approved construction methods to minimise noise or vibration
- During the commencement of a trial of a new high noise or vibration risk activity
- If considered appropriate at the discretion of the AA:
    - Where requested by the independent certifier to assess compliance with the Planning Approval; or

- Where requested by the ER, TfNSW or other entity with identified cause for concern pertaining to noise or vibration compliance.



Based on the vibration assessment, construction activities within each Zone of the site have been classified as Low, Medium or High risk of exceeding the vibration criteria. This is summarised in Table C1.7.

It is however very difficult to accurately predict construction vibration levels as they are highly dependent on the exact equipment being used, the operator, the exact activity undertaken as well as site ground conditions and building structural details. Predictions can only provide a guide for planning purposes.

Initial site-specific vibration measurements of construction activity can be undertaken to clarify and potentially relax these limitations on construction activity. Further input from the construction of the CASB project is also expected prior to work commencing and these will be used Table C1.7.

Table C1-7 presents the potential risks of construction activity exceeding vibration criteria for sensitive laboratory and medical spaces when undertaken in the proposed construction activity zones.

Management measures shall be put in place to limit vibration impacts (Refer to Section 6)

Table C1.7: Construction vibration

Equipment	Zone A	Zone B	Zone C	Zone D
Bored piles	H	M	L	L
Heavy site traffic	H	M	L	L
Road saw	H	M	L	L
Vibratory roller, 2t	H	H	H	M
Vibratory roller, 6t	H	H	H	H
Vibratory roller, 12t	H	H	H	H
Jumping jack & Plate compactor	H	H	H	H
Trench roller, 1t (vibratory)	H	H	H	M
Wood chipper	M	L	L	L
Excavator hammer (5-8t)	H	H	M	L
Excavator hammer (8-13t)	H	H	H	H
Non vibratory: chain saw, stump grinder, non-destructive excavator	L	L	L	L

Table C1.7 presents an envelope of the risk of exceeding the vibration criteria specified within any of the spaces considering both standoff to the activity location and the criteria nominated for the space.

In general:

- The risk levels reported for Zones A/B are governed by achieving VC-C/VC-B criteria in laboratories within WIMR and CMRI although vibration criteria may also be exceeded within the Biological Science Facility.
- The risk levels reported for Zone C are governed by achieving VC-C/VC-B criteria in laboratories within WIMR.
- The risk levels reported for Zone D are governed by achieving VC-C/VC-B criteria in laboratories within WIMR and Curve 1 within the Hospital.

Other sensitive receivers

The CNVG provides, as a guide, minimum working distances from sensitive receivers for typical items of vibration intensive plant. The minimum working distances are reproduced in Table C1.8.

Table C1.8: CNVG recommended minimum working distances for vibration intensive plant

Plant Item	Rating/Description	Safe Working Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Vibration Guideline)
Vibratory Roller	< 50 kN (Typically 1-2t)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4t)	6 m	20 m
	< 200 kN (Typically 4-6t)	12 m	40 m
	< 300 kN (Typically 7-13t)	15 m	100 m
	> 300 kN (Typically 13-18t)	20 m	100 m
	> 300 kN (Typically > 18t)	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	Hand held	1 m (nominal)	2 m
Heavy Site Traffic		2m	2m
Road Saw[1]		2m	10m
Jumping Jack and plate compactor[2]		5m	55m

Plant Item	Rating/Description	Safe Working Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Vibration Guideline)
Trench Roller		5m	15m
Note 1: Assuming rock saw with 1mm/s vibration and 10m (CASB project report reference) Note 2: Reference Vibration Source: hhtp://epubs.scu.edu.au/acmsm23/112/			

The minimum working distances are indicative only and will vary depending on the item of plant and local geotechnical conditions. Accordingly, vibration monitoring will be conducted to confirm the minimum working distances at specific sites with specific geotechnical conditions as per monitoring program in Appendix E1.

In relation to human comfort (response), the minimum working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent in nature and for this reason higher vibration levels, occurring over shorter periods are considered allowable.

Mitigation shall be considered where sensitive receivers are located within the minimum working distances (refer to Table 6-1). Monitoring is only proposed where works are identified within the minimum working distances for cosmetic damages.

A review of Table C1.8 and location of proposed areas of work and location of buildings indicates that cosmetic damage criteria may be exceeded when works are undertaken in close proximity to buildings such as works undertaken in Area No6, Area No7, Area No8 and Area No9 especially when using equipment such as road saw, excavator hammer (5t-8t), excavator hammer (8t-13t), jumping jack and plate compactor, roller (2t-10t) within 2 m of a building. Human response criteria is likely to be exceeded at all the nearest receivers for most of the construction areas when using the equipment described above. Vibration monitoring and careful selection of plant is required as described in Section 6.

Heritage buildings

Impacts from the proposed works onto the heritage building University of Western Sydney have been identified in the “Parramatta Light Rail – Built Heritage Impact Assessment” (EIS document) as negligible.

The heritage building is currently used as part of Western Sydney University and therefore is not considered to be unsound.

Western Sydney University is located approximately 120m away from the construction zone

Vibration levels are anticipated to be under the cosmetic damage screening levels (refer to Table C1.8) and therefore no specific mitigation measures have been recommended to be put in place in relation to this heritage building.

The Cumberland Hospital also identified as Heritage listed is significantly removed from the subject works (> 450 m). Vibration levels are anticipated to be under the cosmetic damage screening levels (refer to Table C1.8) and therefore no specific mitigation measures have been recommended to be put in place.

C2 CNVIA – Activity B - Cumberland Hospital (East Campus) Demolition

C2.1. Construction timeline

Activity B demolition is anticipated to be undertaken during 2020 over a period of approximately three months. Indicative construction staging program is shown in Table C2-1.

Table C2-1 : Indicative construction timeline – Activity B - Cumberland East

Task Name	Duration	Month 1	Month 2	Month 3	Month 4
Demolition Programme	56 d				
Pre-Construction Works	11 d				
DPIE Approval	0 d				
Safe Work & Hazardous Materials Notification	5 d				
Mobilize Demolition Project Team	6d				
Services Investigation for Isolation Process	5 d				
Demolition Building 67	25 d				
SC 1 - Site Establishment	5 d				
SC 2 - Services Disconnection	5 d				
SC 3 - Hazmat Removal	5 d				
SC 4 - Salvage & Demolition	10 d				
Sc 5 - Remediate Site	5 d				
Sc 6 - Hand Over	0 d				
Demolition Building 52	50 d				
Sc 7 - Site Establishment	5 d				
Sc 8 - Services Disconnection	5 d				
Sc 9 - Identify and protect Heritage Building	10 d				
Sc 10 - Hazmat Removal	5 d				
Sc 11 - Salvage & Demolition	10 d				
Sc 12 - Remediate Building 52B	20 d				
Sc 13 - Hand Over	0 d				
Demolition Building 71 & Building 73	25 d				
Sc 14 - Site Establishment	5 d				
Sc 15 - Services Disconnection	5 d				
Sc 16 - Hazmat Removal	5 d				
Sc 17 - Salvage & Demolition	10 d				
Sc 18 - Remediate Site	5 d				
Sc 19 - Hand Over	0 d				
Demolition Building 72	30 d				
Sc 20 - Site Establishment	5 d				
Sc 21 - Services Disconnection	5 d				
Sc 22 - Hazmat Removal	5 d				
Sc 23 - Salvage & Demolition	10 d				
Sc 24 - Remediate Site	5 d				
Sc 25 - Hand Over	0 d				
Practical Completion	0 d				
Certification and OC	0 d				

C2.2. Construction noise impact assessment

General construction

To assess the likely noise impacts associated with the construction of the project, a number of scenarios have been assessed based on the information provided by Renascent (Refer to Section 5.1.2)

Anticipated plant and equipment used during each of the main activities is provided below in Table C2-2, together with the associated sound power levels (SWLs) which have been sourced from:

- AS2436: Guide to noise and vibration control on construction, demolition and maintenance sites
- BS 5228-1 -2009 Code of Practice for noise and vibration control on construction and open sites; and
- TfNSW Construction Noise Vibration Strategy 2018 Appendix C - Maximum noise levels for plant and equipment

Table C2-2: Activities, plant and equipment and associated sound power levels

Activities	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level of equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level
Site Establishment	1x truck	103	20	96
Services disconnection	4x light vehicles	88	20	87
Hazmat removal	3x Light vehicles	88	20	86
Demolition (Building)	1x tipper truck and dog 1x 23-30t excavator 6x light Vehicles	108 110 88	50 100 20	111
Demolition (Walkway)[2]	1x concrete saw	119 (124[1])	25	118[1]
Note 1: Includes 5dB penalty in accordance with the ICNG Note 2: Demolition required for building 52 and 72 only				

Sound power data in Table C2-2 includes an estimated time correction of the plant and equipment use in 15 minutes. A 5 dB penalty has also been included to the sound power levels of equipment identified as particularly annoying to nearby residents in accordance with the ICNG, such as concrete saw.

Highly noise intensive works is proposed (when using the concrete saw) for this project as defined in the glossary.

The noise assessment presented in Table C2-3, Table C2-4 and Table C2-5 aims to provide a 'realistic worst-case' noise impact assessment based on construction works within any 15-minute period. The predictions assume activities are located at the closest point of the works zone to the nearest sensitive receivers. In reality, the potential construction noise impacts at any particular location will vary depending on factors including:

- The position of the works within the site and distance to the nearest sensitive receiver

- The overall duration of the works
- The cumulative operation of works
- Shielding (provided by buildings, barriers, equipment placed in front of noisy equipment)

The methodology to conduct the capping of services is currently to locally cap off gas supplies at each building with a licensed plumber. No excavation is currently required. This approach is pending confirmation. The need for an assessment of works associated with utility capping will be reassessed if significant excavation works and/or vibration intensive works are to be conducted.

Cumulative impacts due to activities conducted concurrently as part of the Activity B demolition works have been included with reference to Table C2-1 showing the staging of the Activity B works.

An analysis of potential cumulative impacts due to concurrent construction of other nearby developments has not been included. Should concurrent activities occur (such as but not limited to the construction of the new Boronia Building as per Section 5.2), there is a potential that receivers may be exposed to higher construction noise levels. In these instances, consultation with relevant development shall be conducted as stated in Section 6.

No barriers have been considered in the noise assessment in Table C2-3, Table C2-4 and Table C2-5. Temporary barriers and screens may provide up to 5 dB reduction to the predicted levels at the sensitive receivers when located in close proximity to the noise source or to a receiver. Refer to mitigation in Table 6-1.

Demolition of walkway near building 52 and 72 will be carried out prior to demolition of the buildings to provide shielding to receivers located to the south of the buildings (Refer to Table 5-2).

Construction works are anticipated to take place during standard construction hours and therefore OOHW have not been assessed.

Table C2-3: Construction noise assessment – residential receivers (including Aged Care and Hotel)

Scenario reference no.	Scenario description	Receivers	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			
				Noise Management Level	Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	NML exceedances	Respite periods required?
Sc 1, Sc 7, Sc 14, Sc 20	Site Establishment at building 67, 52, 71 and 73, 72	NCA06 Residences	46	55	No	-	No
		NCA05 Cottages	43	59	No	-	No
		NCA06 Hotel and aged care	42	55	No	-	No
Sc 4, Sc 10, Sc 17, Sc 23[1]	Demolition of building 67, 71 and 73, 72 (walkway) and Hazmat removal at building 52	NCA06 Residences	60	55	No	5	Yes[2]
		NCA05 Cottages	54	59	No	-	No
		NCA06 Hotel and aged care	55	55	No	-	No
Sc 4, Sc 10, Sc 17, Sc 23	Demolition of building 67, 71 and 73, 72 (building) and Hazmat removal at building 52	NCA06 Residences	60	55	No	5	No
		NCA05 Cottages	54	59	No	-	No
		NCA06 Hotel and aged care	57	55	No	2	No

Scenario reference no.	Scenario description	Receivers	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			
				Noise Management Level	Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	NML exceedances	Respite periods required?
Sc 5, Sc 11[1], Sc 18, Sc 23	Demolition of building 52 (Walkway) and building 72 (Building)	NCA06 Residences	53	55	No	-	No
		NCA05 Cottages	47	59	No	-	No
		NCA06 Hotel and aged care	52	55	No	-	No
Sc 5, Sc 11, Sc 18, Sc 23	Demolition of building 52 (Building) and building 72 (Building)	NCA06 Residences	55	55	No	-	No
		NCA05 Cottages	56	59	No	-	No
		NCA06 Hotel and aged care	53	55	No	-	No

Note 1: Scenarios that include highly noise intensive works as defined in glossary

Note 2: As per Table 4-2. Respite period required due to:

- highly noise intensive works are conducted (use of the concrete saw) which generate noise exceeding NML at receiver or
- construction activities generate noise exceeding the highly noise affected level of 75 dBA at the receiver.

Works to be undertaken in continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block.

Table C2-4: Construction noise assessment – non-residential receivers

Scenario reference no.	Scenario description	Receivers	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			
				Noise Management Level (external)	Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	NML exceedances	Respite periods required?
Sc 1, Sc 7, Sc 14, Sc 20	Site Establishment at building 67, 52, 71 and 73, 72	NCA06 medical	59	65	No	-	No
		NCA06 commercial	65	70	No	-	No
		NCA05 medical	46	65	No	-	No
		NCA05 commercial	41	70	No	-	No
		NCA05 Place of Worship	46	65	No	-	No
		NCA05 Educational	47	65	No	-	No
Sc 4, Sc 10, Sc	Demolition of building 67, 71 and 73, 72 (walkway) and	NCA06 medical	66	65	No	1	Yes[2]
		NCA06 commercial	77	70	Yes	7	Yes[2]

Scenario reference no.	Scenario description	Receivers	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			
				Noise Management Level (external)	Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	NML exceedances	Respite periods required?
17, Sc 23[1]	Hazmat removal at building 52	NCA05 medical	56	65	No	-	No
		NCA05 commercial	53	70	No	-	No
		NCA05 Place of Worship	55	65	No	-	No
		NCA05 Educational	58	65	No	-	No
Sc 4, Sc 10, Sc 17, Sc 23	Demolition of building 67, 71 and 73, 72 (Building) and Hazmat removal at building 52	NCA06 medical	66	65	No	1	No
		NCA06 commercial	80	70	Yes	10	Yes[2]
		NCA05 medical	57	65	No	-	No
		NCA05 commercial	54	70	No	-	No
		NCA05 Place of Worship	56	65	No	-	No
		NCA05 Educational	58	65	No	-	No
Sc 5, Sc 11[1], Sc 18, Sc 23	Demolition of building 52 (Walkway) and building 72 (Building)	NCA06 medical	54	65	No	-	No
		NCA06 commercial	80	70	Yes	10	Yes[2]
		NCA05 medical	49	65	No	-	No
		NCA05 commercial	49	70	No	-	No
		NCA05 Place of Worship	49	65	No	-	No
		NCA05 Educational	50	65	No	-	No
Sc 5, Sc 11, Sc 18, Sc 23	Demolition of building 52 (Building) and building 72 (Building)	NCA06 medical	73	65	No	7	No
		NCA06 commercial	80	70	Yes	10	Yes[2]
		NCA05 medical	59	65	No	-	No
		NCA05 commercial	53	70	No	-	No
		NCA05 Place of Worship	60	65	No	-	No
		NCA05 Educational	60	65	No	-	No

Scenario reference no.	Scenario description	Receivers	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			
				Noise Management Level (external)	Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	NML exceedances	Respite periods required?

Note 1: Scenarios that include highly noise intensive works as defined in glossary

Note 2: As per Table 4-2. Respite period required due to:

- highly noise intensive works are conducted (use of the concrete saw) which generate noise exceeding NML at receiver or
- construction activities generate noise exceeding the highly noise affected level of 75 dBA at the receiver.

Works to be undertaken in continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block.

Note that the building "attached" to building 52 (to be demolished) will be unoccupied during the demolition of building 52.

Table C2-5: Construction noise assessment – GHFF colony

Scenario reference no.	Scenario description	Predicted $L_{Aeq(15minute)}$ - dBA
Sc 1, Sc 7, Sc 14, Sc 20	Site Establishment at building 67, 52, 71 and 73, 72	43
Sc 4, Sc 10, Sc 17, Sc 23[1]	Demolition of building 67, 71 and 73, 72 (walkway) and Hazmat removal at building 52	56
Sc 4, Sc 10, Sc 17, Sc 23	Demolition of building 67, 71 and 73, 72 (Building) and Hazmat removal at building 52	56
Sc 5, Sc 11[1], Sc 18, Sc 23	Demolition of building 52 (Walkway) and building 72 (Building)	49
Sc 5, Sc 11, Sc 18, Sc 23	Demolition of building 52 (Building) and building 72 (Building)	54

Note 1: Scenarios that include highly noise intensive works as defined in glossary

Note 2: Assessment was conducted at the closest distance to the GHFF colony from the Activity B works

Note 3: Data regarding the extent of the GHFF colony was provided by TfNSW on the 6 March 2019 and is based on continuous monitoring undertaken at the GHFF colony undertaken since 2007 (Refer to the TfNSW Ecosure document, 'Grey-headed Flying-fox Construction Monitoring Program', October 2019). Approximate distance between Activity B and the GHFF colony is 195 m. (Refer to Section 3.1)

Predicted levels indicate exceedances of the highly noise affected criteria for sensitive receivers located within the Cumberland Hospital (East Campus). Respite period will need to be provided.

Noise mitigation and management measures identified in Section 6 shall be considered for these works to limit noise impacts on nearest sensitive receivers.

Construction activities are predicted to be audible at the GHFF colony. Construction activities also include highly intensive works. Therefore, mitigation in accordance with the GHFF monitoring program shall be followed.

Ancillary facility (including access)

The site compound shown in Figure 5-3 is to be used as a site office and amenity area. The office and amenities area will be used by staff during approved work hours. Noise emissions from the area would be limited to people conversing if located in the external areas or a car arriving to drop off staff, for which recommendations regarding behaviour of staff are outlined in the summary of mitigation and management measures in Table 6-1 (refer to Work Practices section in particular). The west part of the site compound will be used as an administrative and amenity area only and no construction equipment or activity is to take place in the site (Works associated with the demolition of building 52 are assessed above). Conditions regarding noise screening in the form of solid barriers around the area is not considered to be warranted. However, opaque fencing and gates with locks will be installed for privacy and security purposes.

C2.3. Work Health and Safety

WHS is assessed as an L_{Aeq} averaged over an 8-hour period, while the general construction assessment is averaged over a 15 minute period, for a worst-case period. As noise from construction activities will be lower for most of the 8-hour period, the following assessment presented is conservative.

Indicative distance at which the $L_{Aeq\ 15minute}$ 85 dBA is reached for Activity B is 17 m during demolition of the walkways and 8 m during demolition. Those distances represent the distance at which people external to the project, if located there for extended periods, could exceed the WHS requirements. The requirement does not refer to construction workers, however recommendations for workers are provided in Table 6-1. Note that demolition of the walkways will be undertaken prior demolition of the buildings which will therefore provide shielding.

One café with an outdoor area has been identified within Cumberland Hospital (East Campus), across the road from building 72 to be demolished. Predicted levels are up to 80 dBA at this outdoor area during building 72 demolition works.

External staff areas (including non-project workplaces) around the works site and exposure would largely concern pedestrians that would be transient and therefore not exposed to extended noise exposure.

It is noted that this assessment is conducted in accordance with the noise and vibration guidelines and regulations for healthy individuals and that noise and vibration are likely to be perceived differently by consumers of Cumberland Hospital. Management measures have been developed by the Cumberland Hospital in the communication strategy and will be implemented and updated as necessary (Refer to Section 6 of this sub-plan and to Section 3.1.2, 3.13, 3.6 and 3.7.2 of the CEMP).

C2.4. Construction traffic impact assessment

The construction of the project will generate an increase in vehicle movements within the Cumberland Hospital East Campus and around the surrounding road network (Church Street, Victoria Road, Barney Street, Prince Street, Fleet Street and O'Connell Street). Additional vehicle movements will be generated by:

- The arrival and departure of construction plant, equipment and vehicles; this may require off-peak movement of construction plant and equipment to/from work areas
- The haulage and delivery of road work materials, and removal of waste to and from the construction zones
- The arrival and departure of construction workers at the start and end of each work day, which will result in an increased traffic demand and turning manoeuvres to and from the construction site access.

Table C2-6 presents a summary of the daily average construction traffic volumes (provided by Renascent) across the construction area:

Table C2-6: Construction traffic vehicles

Proposed construction vehicles type	Average two-way vehicle movements/day
Trucks	12
Light vehicles	8

Based on anticipated traffic presented in Table C2-6, construction traffic noise when travelling on the road network is unlikely to result in a 2 dBA increase and is anticipated to meet criteria defined in Table 4-5.

Noise emissions from construction traffic within the Cumberland Hospital East Campus generated by Activity B works are anticipated to be noticeable due to the anticipated low existing traffic within the Cumberland Hospital East Campus. While there are no specific criteria for construction traffic travelling within the Cumberland Hospital East Campus, guidance would be taken from the RNP and the local road criteria would be applied.

Traffic within the Cumberland Precinct is not known. A desktop calculation assuming two trucks and five light vehicles per hour generated by the construction works results in predicted levels at closest buildings (approximately 4 m from edge of road) of approximately 52 dBLAeq(1hour), for contribution from construction traffic only. If existing traffic is below the 55 dBA criteria, the additional traffic is unlikely to result in it being exceeded. If the existing traffic noise levels are above the criteria, the additional construction traffic is not predicted to result in a 2 dBA increase.

Impact from construction traffic travelling within the Cumberland Hospital East Campus is to be mitigated by applying the management measures listed in Section 6 such as accessing site during daytime hours and limiting speed.

C2.5. Construction vibration impact assessment

General Construction

The CNVG provides, as a guide, minimum working distances from sensitive receivers for typical items of vibration intensive plant. No vibration intensive plant is proposed to be used for Activity B and therefore cosmetic damage and human response criteria are predicted to be met.

In relation to the building ‘attached’ to building 52 that is to be demolished, there will be refurbishment due to the removal of part of the building. These works should remedy any minor cosmetic damage if caused by the demolition works. It is also noted that building 52 to be retained will be unoccupied during the demolition of building 52.

Inspection/dilapidation survey of building 52 will be required not because of potential damage to the building caused by vibration of ground but because of potential damage to the building caused by method of demolition unrelated to vibration of ground.

C2.6. Auditing of impacts

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub-plan, CoA and other relevant approvals, licenses and guidelines.

Internal noise audit systems to be put in place by The Contractor will include recording of daily hours of construction, progressive impact assessments as work proceeds, allowing the AA to conduct informal checks, and providing active and communication links to surrounding sensitive receivers via the community communication strategy.

With regards to AA inspections/audits, minimum frequency of AA inspections will be determined based on the potential risk of noise impacts for the construction works as per the triggers listed below:
Where these items are not triggered, fortnightly inspections will occur as a minimum.

Where possible the routine inspections or those to review any of the additional triggers, would be completed in tandem with the ER and inspections for other works packages, such that the application of noise and vibration compliance and mitigation can be considered in corroboration with any other environmental/project issues.

Triggers for additional inspections are provided as follows:

- As a result of noise or vibration related complaint(s), determined to warrant investigation by the AA, ER or TfNSW, or occurring on successive nights at a single work location (where relevant)
- Where a work site has not fully implemented the noise management protocols as per the approved construction methods to minimise noise or vibration
- During the commencement of a trial of a new high noise or vibration risk activity
- If considered appropriate at the discretion of the AA:
    - Where requested by the independent certifier to assess compliance with the Planning Approval; or
    - Where requested by the ER, TfNSW or other entity with identified cause for concern pertaining to noise or vibration compliance.

C3 CNVIA –Activity C - Cumberland Hospital (West Campus) Demolition

C3.1. Construction timeline

Activity C demolition is anticipated to be undertaken in two stages. Demolition of cottages would be undertaken in 2020 and the demolition of the existing Boronia Ward would be undertaken in December/January 2021 (once the New Boronia Building has been built). Indicative construction staging program is shown in Table C3-1.

It is noted that other known activities (Outside this scope of works) are scheduled to take place in Cumberland West such as the refurbishment of the cottages and the construction of the new Boronia Building as per Figure 5-5. Those activities are shown for information in Table C3-1.

Table C3-1: Indicative construction timeline (Sc1)– Cumberland West

Task Name	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15
Sc1.1 - Site Establishment															
Sc1.2 - Demolition															
Sc2.1 - Demolition of Existing Boronia															
Out of Scope Works - Cottages Refurbishment 1															
Out of Scope Works - Cottages Refurbishment 2															
Out of Scope Works - Construction of New Mental Health Building 1															
Out of Scope Works - Construction of New Mental Health Building 2															

Note OSW = Out of Scope Works

C3.2. Construction noise impact assessment

General construction

To assess the likely noise impacts associated with the construction of the project, a number of scenarios have been assessed based on the information provided by Donnelley Construction (Refer to Section 5.1.3)

Anticipated plant and equipment used during each of the main activities is provided below in Table C3-2, together with the associated sound power levels (SWLs) which have been sourced from:

- AS2436: Guide to noise and vibration control on construction, demolition and maintenance sites
- BS 5228-1 -2009 Code of Practice for noise and vibration control on construction and open sites; and
- TfNSW Construction Noise Vibration Strategy 2018 Appendix C - Maximum noise levels for plant and equipment

Table C3-2: Activities, plant and equipment and associated sound power levels

Activities	Anticipated plant and equipment required	Max L_{Aeq} Sound Power Level per equipment	% of use in 15 minutes	$L_{Aeq\ (15min)}$ Sound Power Level
Sc1.1 Site Establishment	1x truck delivering site fencing	103	50	96
Sc1.2 Demolition	1x 20t excavator 1x 13t truck removing demolition waste 1x jackhammer	105 110 118[1]	100 50 50	116
Sc2.1 Demolition of existing Boronia	1x 27t excavator 2x trucks	110 110	50 50	112
Sc2.2 Demolition of existing Boronia (concrete columns if required)	1x jackhammer	113[1]	50	115
Note: 1. Includes 5dB penalty in accordance with the ICNG				

Sound power data in Table C3-2 includes an estimated time correction of the plant and equipment use in 15 minutes. A 5 dB penalty has also been included to the sound power levels of equipment identified as particularly annoying to nearby residents in accordance with the ICNG, such as when using a jackhammer.

Highly noise intensive works (when using the jackhammer) are proposed for this project (refer to Sc1.2 and Sc2.2) as defined in the glossary.

The noise assessment presented in Table C3-3 and Table C3-4 aims to provide a 'realistic worst-case' noise impact assessment based on construction works within any 15-minute period. The predictions assume activities are located at the closest point of the works zone to the nearest sensitive receivers. In reality, the potential construction noise impacts at any particular location will vary depending on factors including:

- The position of the works within the site and distance to the nearest sensitive receiver

- The overall duration of the works
- The cumulative operation of works
- Shielding (existing or provided by buildings, barriers, equipment placed in front of noisy equipment…)

Cumulative impacts due to activities conducted concurrently as part of Activity C demolition works are not anticipated with reference to Table C3-1.

An analysis of potential cumulative impacts due to concurrent construction of other nearby developments has not been included. Should concurrent activities occur, there is a potential that receivers may be exposed to higher cumulative construction noise levels. In these instances, consultation with relevant development shall be conducted as stated in Section 6.

No barriers have been considered in the noise assessment in Table C3-3, Table C3-4 and Table C3-5. Temporary barriers and screens may provide up to 5 dB reduction to the predicted levels at the sensitive receivers when located in close proximity to the noise source. Refer to management measures in Table 6-1.

Construction works are anticipated to take place during standard construction hours and therefore OOHW have not been assessed.

Table C3-3: Construction noise assessment – Residential receivers

Scenario reference no.	Scenario description	Receivers	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			
				Noise Management Level	Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	NML exceedances	Respite periods required?
Sc 1.1	Site Establishment	NCA04 Residences	54	59	No	-	No
		NCA05 Cottages	73	59	No	14	No
Sc 1.2[1]	Demolition of cottages	NCA04 Residences	74	59	No	15	Yes[2]
		NCA05 Cottages	93	59	Yes	34	Yes[2]
Sc 2.1	Demolition of existing Boronia	NCA04 Residences	57	59	No	-	No
		NCA05 Cottages	60	59	No	1	No
Sc 2.2[1]	Demolition of existing Boronia (Demolition of columns)	NCA04 Residences	60	59	No	1	Yes[2]
		NCA05 Cottages	64	59	No	5	Yes[2]

Note 1: Scenarios that include highly noise intensive works as defined in glossary

Note 2: As per Table 4-2. Respite period required due to:

- highly noise intensive works are conducted (use of the jackhammer) which generate noise exceeding NML at receiver or
- construction activities generate noise exceeding the highly noise affected level of 75 dBA at the receiver.

Works to be undertaken in continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block.

Table C3-4: Construction noise assessment – Non-residential receivers

Scenario reference no.	Scenario description	Receivers	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			
				Noise Management Level (external)	Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	NML exceedances	Respite periods required?
Sc 1.1	Site Establishment	NCA05 Medical	45	65	No	-	No
		NCA05 Commercial	54	70	No	-	No
		NCA06 Medical	39	65	No	-	No
		NCA06 Commercial	60	70	No	-	No
		NCA05 Place of Worship	34	65	No	-	No
		NCA05 Educational	44	65	No	-	No

Scenario reference no.	Scenario description	Receivers	Predicted $L_{Aeq(15minute)}$ - dBA	Standard Hours			
				Noise Management Level (external)	Highly noise affected > $L_{Aeq(15minute)}$ 75 dB	NML exceedances	Respite periods required?
Sc 1.2[1]	Demolition of cottages	NCA05 Medical	65	65	No	-	No
		NCA05 Commercial	74	70	No	4	Yes[2]
		NCA06 Medical	59	65	No	-	No
		NCA06 Commercial	80	70	Yes	10	Yes[2]
		NCA05 Place of Worship	54	65	No	-	No
		NCA05 Educational	64	65	No	-	No
Sc 2.1	Demolition of existing Boronia	NCA05 Medical	94	65	Yes	29	Yes[2]
		NCA05 Commercial	65	70	No	-	No
		NCA06 Medical	60	65	No	-	No
		NCA06 Commercial	59	70	No	-	No
		NCA05 Place of Worship	66	65	No	1	No
		NCA05 Educational	79	65	Yes	14	Yes[2]
Sc 2.2[1]	Demolition of existing Boronia (Demolition of columns)	NCA05 Medical	97	65	Yes	32	Yes[2]
		NCA05 Commercial	69	70	No	-	No
		NCA06 Medical	64	65	No	-	No
		NCA06 Commercial	62	70	No	-	No
		NCA05 Place of Worship	69	65	No	4	Yes[2]
		NCA05 Educational	82	65	Yes	17	Yes[2]

Note 1: Scenarios that include highly noise intensive works as defined in glossary

Note 2: As per Table 4-2. Respite period required due to:

- highly noise intensive works are conducted (use of the jackhammer) which generate noise exceeding NML at receiver or
- construction activities generate noise exceeding the highly noise affected level of 75 dBA at the receiver.

Works to be undertaken in continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block.

Table C3-5: Construction noise assessment – GHFF colony

Scenario reference no.	Scenario description	Predicted $L_{Aeq(15minute)}$ - dBA
Sc 1.1	Site Establishment	33
Sc 1.2[1]	Demolition of cottages	53
Sc 2.1	Demolition of existing Boronia	55
Sc 2.2[1]	Demolition of existing Boronia (Demolition of columns)	58
Note 1: Scenarios that include highly noise intensive works as defined in glossary Note 2: Assessment was conducted at the closest distance to the GHFF colony from the Activity C works Note 3: Data regarding the extent of the GHFF colony was provided by TfNSW on the 6 March 2019 and is based on continuous monitoring undertaken at the GHFF colony undertaken since 2007 (Refer to the TfNSW Ecosure document, 'Grey-headed Flying-fox Construction Monitoring Program', October 2019). Approximate distance between Activity C and the GHFF colony is approximately 255 m. (Refer to Section 3.1)		

Predicted levels indicate exceedances of the highly noise affected criteria for sensitive receivers located within the Cumberland Hospital West Campus. Respite periods will need to be provided. Works to be undertaken in continuous blocks not exceeding three (3) hours each with a minimum respite from those activities and works of not less than one (1) hour between each block. (Refer to Table 4-2).

Noise mitigation and management measures identified in Section 6 shall be considered for these works to limit noise impacts on nearest sensitive receivers.

It is noted that this assessment is conducted in accordance with the noise and vibration guidelines and regulations for healthy individuals and that noise and vibration are likely to be perceived differently by consumers of Cumberland Hospital. Specific management measures have been developed by the Cumberland Hospital in the communication strategy and will be implemented and updated as necessary (Refer to Section 6 of this sub-plan and to Section 3.1.2, 3.13, 3.6 and 3.7.2 of the CEMP).

Construction activities are predicted to be audible at the GHFF colony. Construction activities also include highly intensive works. Therefore, mitigation in accordance with the GHFF monitoring program shall be followed.

Ancillary facility (including access)

Potential noise and vibration impact from the use of the proposed site compound has been assessed in accordance with relevant CoA and associated requirements for the PLR project.

Site description

The site compound is currently operational and used as a site office and amenity area. The site compound use is to remain the same throughout Activity C demolition. The location and layout of the site compound are shown in Figure 5-5 and Figure 5-6.

Noise emission from the site compound is and will remain limited to people conversing, if located in the external areas, or from light vehicle arrivals and departures at the start and end of the work day (limited to six cars). All other vehicles will park in the work areas. It is noted that there is no core team that will be permanently present at the site compound. No other activities, such as loading/unloading, garbage and waste collection will occur (amenities are connected to sewer).

Activities will therefore be minimal and intermittent. In terms of vehicle movements, this is expected to be limited to six light vehicles from 6.45 am when vehicles enter the site for workers to

commence work at 7 am, then departing at 4 pm when workers leave site for the day. Throughout the working day, workers will use the amenities sporadically.

Receptor locations

The nearest sensitive receiver is the Acacia building (Building 22) located directly north of the site compound.

Assessment

Table C3-6 presents an assessment of the proposed activities within the site compound upon the nearest most potentially affected receiver location. The assessment is limited to noise emissions, as vibration intensive work is not proposed within the compound.

Table C3-6 outlines assessment for the three primary activities in the site compound and assess impact against criteria established as described in Section 3.1.3 and Section 4.3. The range in predicted noise levels are based on the varied locations of activities as defined in Figure 5-6. With regard to the sleep disturbance criteria (LAmax), vehicle entry activity does fall within the night period, however on the basis of the limited number of occurrences (six or less) is not considered a significant concern.

Table C3-6: Construction noise assessment for Activity C site compound – medical receiver

Scenario Description	Typical plant and equipment required	L_{Aeq} Sound Power Level per equipment	Receiver (Distance range to source)	Predicted $L_{Aeq(15minute)}$	Criteria $L_{Aeq(15minute)}$	
					Noise Management Level	Highly noise affected
Cars arriving and parking within the compound	6 x Cars	88 dBA	Acacia building (14 m - 11 m)	45-48 dBA	65 dBA	75 dBA
Door slamming	6 x door slamming	105 dBA ($L_{Aeq,1second}$)	Acacia building (19 m - 13 m)	49-52 dBA	65 dBA	75 dBA
People talking	2 x groups of 2 people	71 dBA	Acacia building (23 m - 8 m)	38-47 dBA	65 dBA	75 dBA

Discussion and recommendations

The assessment indicates that compliance with NML is predicted for all activities. In addition, given that the area is not proposed to be in constant use, and operated mostly during the day time only, it is expected that the site compound results and will continue to result in minimum impact. Noise impacts from the proposed site activities to sensitive receivers are anticipated to be consistent with that associated with the current designated use of the site. Conditions regarding noise screening in the form of solid barriers around the site compound is not considered to be warranted. However, opaque fencing and gates with locks are currently installed for privacy and security purposes. Recommendations regarding behaviour of staff are outlined in the summary of management measures in Table 6-1 (refer to Work Practices section in particular).

C3.3. Work Health and Safety

WHS is assessed as an L_{Aeq} averaged over an 8-hour period, while the general construction assessment is averaged over a 15 minute period, for a worst-case period. As noise from construction activities will be lower for most of the 8-hour period, the following assessment presented is conservative.

Indicative distance at which the $L_{Aeq\ 15minute}$ 85 dBA is reached is 34 m for Activity C demolition of Boronia works which represents the distance at which people external to the project, if located

there for extended periods, could exceed the WHS requirements. The requirement does not refer to construction workers, however recommendations for workers are provided in Table 6-1.

External staff areas (including non-project workplaces) around the works site and exposure would largely concern pedestrians that would be transient and therefore not exposed to extended noise exposure.

C3.4. Construction traffic impact assessment

The construction of the project will generate an increase in vehicle movements on the route into Cumberland Hospital West Campus off Hainsworth Street and around the surrounding road network. Additional vehicle movements will be generated by:

- The arrival and departure of construction plant, equipment and vehicles; this may require off-peak movement of construction plant and equipment to/from work areas
- The haulage and delivery of road work materials, and removal of waste to and from the construction zones
- The arrival and departure of construction workers at the start and end of each work day, which will result in an increased traffic demand and turning manoeuvres to and from the construction site access.

Table C3-7 presents a summary of the daily average construction traffic volumes (provided by Donnelley Construction) across the construction area:

Table C3-7: Construction traffic vehicles

Proposed construction vehicles type	Average two-way vehicle movements/day
Trucks	4
Light vehicles	8

Based on anticipated traffic presented in Table C3-6, construction traffic noise when travelling on the road network is unlikely to result in a 2 dBA increase and is anticipated to meet criteria defined in Table 4-5.

Noise emissions from construction traffic within the Cumberland Hospital West Campus generated by Activity C works are anticipated to be noticeable due to the anticipated low existing traffic within the Cumberland Hospital West Campus. While there are no specific criteria for construction traffic travelling within the Cumberland Hospital West Campus, guidance would be taken from the RNP and the local road criteria would be applied.

Traffic within the Cumberland Precinct is not known. A desktop calculation assuming one truck and five light vehicles per hour generated by the construction works results in predicted levels at closest buildings (approximately 4 m from edge of road) of approximately 50 dBLAeq(1hour), for contribution from construction traffic only. If existing traffic is below the 55 dBA criteria, the additional traffic is unlikely to result in it being exceeded. If the existing traffic noise levels are above the criteria, the additional construction traffic is not predicted to result in a 2 dBA increase.

Impact from construction traffic travelling within the Cumberland Hospital West Campus is to be mitigated by applying the management measures listed in Section 6 such as accessing site during daytime hours and limiting speed.

C3.5. Construction vibration impact assessment

General Construction

The CNVG provides, as a guide, minimum working distances from sensitive receivers for typical items of vibration intensive plant. The minimum working distances for equipment to be used during Activity C are reproduced in Table C3-10.

Table C3-1: CNVG recommended minimum working distances for vibration intensive plant

Plant Item	Rating/Description	Minimum Working Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Vibration Guideline)
Jackhammer	Hand held	1 m (nominal)	2 m
Heavy Site Traffic		2m	2m

The minimum working distances are indicative only and will vary depending on the item of plant and local geotechnical conditions.

In relation to human comfort (response), the minimum working distances relate to continuous vibration. For most construction activities, vibration emissions are intermittent in nature and for this reason higher vibration levels, occurring over shorter periods are considered allowable.

Mitigation shall be considered where sensitive receivers are located within the minimum working distances (refer to Table 6-1).

A review of Table C3-2: and Table C3-10 and location of proposed areas of work and location of buildings indicates that cosmetic damage criteria and Human comfort criteria are predicted to be met for Activity C at nearby sensitive receivers. Compliance with human comfort criterion at nearest receivers will infer compliance with vibration criterion for the sensitive equipment identified in Table 4-3.

Accordingly, vibration monitoring is therefore not proposed for this Activity.

C3.6. Auditing of impacts

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub-plan, CoA and other relevant approvals, licenses and guidelines.

Internal noise audit systems to be put in place by The Contractor will include recording of daily hours of construction, progressive impact assessments as work proceeds, allowing the AA to conduct informal checks, and providing active and communication links to surrounding sensitive receivers via the community communication strategy.

With regards to AA inspections/audits, minimum frequency of AA inspections will be determined based on the potential risk of noise impacts for the construction works as per the triggers listed below:
Where these items are not triggered, fortnightly inspections will occur as a minimum.

Where possible the routine inspections or those to review any of the additional triggers, would be completed in tandem with the ER and inspections for other works packages, such that the application of noise and vibration compliance and mitigation can be considered in corroboration with any other environmental/project issues.

Triggers for additional inspections are provided as follows:

- As a result of noise or vibration related complaint(s), determined to warrant investigation by the AA, ER or TfNSW, or occurring on successive nights at a single work location (where relevant)
- Where a work site has not fully implemented the noise management protocols as per the approved construction methods to minimise noise or vibration
- During the commencement of a trial of a new high noise or vibration risk activity
- If considered appropriate at the discretion of the AA:

- Where requested by the independent certifier to assess compliance with the Planning Approval; or
- Where requested by the ER, TfNSW or other entity with identified cause for concern pertaining to noise or vibration compliance.

Appendix D - OOHW Protocol

PLR Out-Of-Hours Work Protocol Form

(Environment Protection Licence Variation NOT Required)

This form should be read and completed in conjunction with Out-of-Hours Work Protocol (PLR-TFNSW-CBD-PE-FRM-000002)

No:		
ENSURE APPROPRIATE TIMEFRAME FOR APPLICATION AND ALL SUPPORTING INFORMATION THAT IS TO BE SUBMITTED TO THE APPROVING AUTHORITY BEFORE THE PLANNED DATES OF OUT-OF-HOURS WORK (OOHW). TFNSW REQUIRE A 10 DAY REVIEW PRIOR TO THE SUBMISSION TO THE APPROVING AUTHORITY.		
Application Date:	**Contractor:**	**Project:**

A. Contact details	Name	Mobile number	Email
Contractor's Representative			
Contractor's 24 hour contact person			
TfNSW Project Manager			
TfNSW Environment & Planning Manager			
TfNSW Public Affairs Manager/Officer			

B. Justification for OOHW List any environmental / community benefits of OOHW (if any)	*Attach additional details if required.*	
	Consideration of OOHW in accordance with Condition E29	☐ (a) Carrying out works that during standard hours would result in a high risk to construction personnel or public safety, based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2009 "Risk Management" ☐ (b) The relevant road authority has advised the Proponent in writing that carrying out the works and activities during standard hours would result in a high risk to road network operational performance and a road occupancy licence will not be issued ☐ (c) The relevant utility service operator has advised the Proponent in writing that carrying out the works and activities during standard hours would result in a high risk to the operation and integrity of the utility network ☐ (d) Where the TfNSW 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 works or activities during the hours specified in Condition E21 and Condition E22 ☐ (e) Where Sydney Trains (or other rail authority) has advised the Proponent in writing that a Rail Possession is required.

C. Details of work ☐ **Map attached** (showing location / work extent / nearest sensitive receivers / landscape)		
	Location	
	Description of works	
	Proposed dates	
	Proposed timings	

IMPACT ASSESSMENT	Reference table			
D. Timings Identify time period when each item of plant is to be used, from reference table on right. Tick which plant to be used in Section E. below and record whether to be used in Period 1 or Period 2, or both. Note Period 1 and 2 refer back to Table 2-1 of out-of-hours work protocol. Acoustic assessment of OOHW required if Period 2 used. Note Condition E23 for specific locations in Camellia and Rosehill and Carlingford Precincts. For risk factors refer to Section 5 of out-of-hours work protocol.		Standard hours	**Period 1**	**Period 2**
	Weekdays	No OOHW application required	1900-2200 (Eat Street) (1800-2200)	2200-0700 overnight
	Saturdays		18:00-22:00 (Eat Street) (1200-2200)	2200-0800 overnight
	Sundays and public holidays		0800-1800	1800-0700 overnight

E. Plant required & level of risk

e.g. Generator to be used between 2300 and 0200 on a weekday is Period 2 and acoustic assessment is required

Refer to Appendix C of TfNSW CNVS or TfNSW Construction Noise Estimation Tool (9TP-FT-150) for additional plant

Plant (SPL, at 7m LAeq15 min)	**Period**	**Plant (SPL, at 7m LAeq15 min)**	**Period**
☐ Rock breaker (97dBA)		☐ Sucker Truck/ Road Sweeper (84dBA)	
☐ Dump truck (85dBA)		☐ Truck and dog (30 tonne) (83dBA)	
☐ Front end loader (87dBA)		☐ Medium rigid truck (20 tonne) (78dBA)	
☐ Excavator – 40 tonne (90dBA)		☐ Elevated work platform (77dBA)	
☐ Vibratory roller (84dBA)		☐ Concrete saw/corer (93dBA)	
☐ Water cart (82dBA)		☐ Concrete vibrator (88dBA)	
☐ Jackhammer (88dBA)		☐ Generator – diesel/petrol (78dBA)	
☐ D10 Bulldozer (96dBA)		☐ Compressor (84dBA)	
☐ Crane (franna) (73dBA)		☐ Backhoe (86dBA)	
☐ Concrete truck (84dBA)		☐ Daymaker (73dBA)	
☐ Piling rid impact (109dBA)		☐ Asphalt – truck and sprayer (81dBA)	
☐ Piling rig bored (87 dBA)		☐ Power tool	
☐ Compactor (81dBA)		☐ Others – impact wrenches etc	
☐ Tub Grinder/Mulcher (91dBA)			
☐ Welder (85dBA)			
☐ Concrete pump (84dBA)			

<table>
<tr><td>F. Distance to nearest sensitive noise receiver(s)</td><td>
Distances to nearest sensitive noise receiver(s)
<table>
<tr><th>Sensitive Receiver</th><th>Distance</th><th>Sensitive Receiver</th><th>Distance</th></tr>
<tr><td>☐ Place of Worship</td><td></td><td>☐ Educational institution (including child care centres)</td><td></td></tr>
<tr><td>☐ Nearest Residential Receivers</td><td></td><td>Distances and receivers to be identified in the ECM</td><td></td></tr>
<tr><td colspan="3">☐ Noise and Vibration sensitive business and critical working area (such as theatres, laboratories, operating theatres, mental health services, animal welfare facilities and accommodation).</td><td></td></tr>
</table>
Where one of the above has been checked, noise generating works must not be timetabled within sensitive periods, unless otherwise agreed with the affected institutions. This must be determined through ongoing consultation with the community in accordance with Community Consultation Strategy.
Has the sensitive receiver agreed for these works or are there any preference for alternative hours and/or duration (refer to E31). Attach any of the outcomes from this consultation
☐ Yes ☐ No
</td></tr>
<tr><td>G. Nature of landscape / nature of any barriers or shielding between source & sensitive receiver</td><td>e.g. brick wall 2m high; open grassland; embankments at 30m</td></tr>
<tr><td>H. Details of alternatives & how investigated. Details of any consultation carried out.</td><td></td></tr>
<tr><td>I. Noise Assessment of activities and work covered in this form
Contractor must provide evidence of</td><td>☐ E25(a)&(c) Activities and works required for one or more of the following:
• For the delivery of materials required by the NSW Police Force or other authority for safety reasons
• Where different hours of works are permitted or required under an EPL in force in respect of the CSSI
☐Approval not required unless activities are highly noise intensive work</td></tr>
</table>

consultation in accordance with A5.	☐ E 25(e) Activities and works causes $L_{Aeq(15\ minute)}$ noise levels: i No more than 5 dBA above the rating background level at any residence in accordance with the *Interim Construction Noise Guideline* (DECC, 2009) ii No more than the 'Noise affected' noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses iii No more than 15dBA above the night-time rating background level at any residence during the night time period, when measured using the LA1 (1 minute) noise descriptor iv Continuous or impulsive vibration values, measured at the most affected residence are no more than the maximum values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006) v Intermittent vibration values measured at the most affected residence are no more than the maximum values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006). ☐Approval not required unless activities are highly noise intensive work
	☐ E23 Activities and works cause noise emissions that are <5dBA above background noise level from 10pm to 7am and are located in the Camellia and Rosehill precinct (east of James Ruse Drive) and the Carlingford precinct (from Parramatta River to Victoria Road) ☐ Approval not required ☐ Community notification required
	☐ E28 Activities and works are outside standard hours and are low to medium risk (refer to out-of-hours protocol for identifying risk factor). ☐Approval from ER/ AA and community consultation (E39) required.
	☐ E28 Activities and works are outside standard hours and are high risk (refer to out-of-hours protocol for identifying risk factor). ☐Approval from Secretary and community consultation (E39) required.
	☐ E24&E28 Activities and works are occurring in 'Eat Street' outside the standard hours. ☐Approval required and Business Reference Group (E110) required to be consulted as well as community consultation (E39).
	Consultants' acoustic assessment attached? ☐ Yes ☐ No
J. Contractor's community notification strategy *Contractor must provide minimum 7 days notice of works in accordance with the Community Consultation Strategy.*	

K. Associated impacts of proposed OOHW	☐ Dust e.g. heavy trucks; soil clearance ☐ Traffic e.g. deliveries, lane closures ☐ Pedestrian access e.g. pavements closed ☐ Vibration e.g. rollers, damage to heritage properties ☐ Adjacent construction works ☐ Property access	☐ Public transport *e.g. schedule changes* ☐ Lighting *e.g. floodlit residential areas* ☐ Parking *e.g. closure of spaces* ☐ Impulsive vibration or noise ☐ Continuous vibration or noise ☐ Tonal vibration or noise ☐ Highly noise intensive work (defined by CoA) ☐ Others (*specify)*
L. Mitigation measures *E.g. noisy works moved to standard hours or 'low risk' hours; silencing; consultation.* *Refer to CEMP, Condition E30, E33 and E39.*	Mitigation measures would be identified in accordance with Tables 4-7 of TfNSW Construction Noise and Vibration Strategy where reasonable and feasible. In accordance with the Communication Consultation Strategy, consultation with the community has informed the following mitigation measures:	
M. Evidence of Consultation with AA	Consultation with acoustic advisor attached? ☐ Yes ☐ No	
N. Evidence of Consultation with community (in accordance with Community Consultation Strategy and E24 or E39)	Have these works been included in the consultation schedule circulated every 3 months for work? ☐ Yes ☐ No Does the community have any preference for alternative hours and/or duration? Attach any of the outcomes from the community consultation ☐ Yes ☐ No Have the proposed construction works factored in respite periods? ☐ Yes ☐ No ☐ N/A Comment: Has the community notification also been sent to DPE? ☐ Yes ☐ No ☐ N/A Comment: Attach details to this form	
Contractor signature		Date

O. TfNSW Communications Team	*Comments on application (include comment on community)*
	☐ Community notification required by Contractor? ☐ Application on Register?
P. Environmental Management Representative *For OOHW, make recommendation for approval by ER/AA or Secretary as applicable.*	☐ OOHW recommendation of approved / endorsed *(delete as appropriate)* ☐ OOHW recommendation of approved with conditions *(see below)* ☐ OOHW rejected
	EMR recommendation for conditions of approval for OOHW / comments *Attach additional letter/comments if required*
Q. Environment Representative / Acoustics Advisor *For OOHW with high risk factors, make recommendation for approval by Secretary*	☐ OOHW approved / endorsed *(delete as appropriate)* ☐ OOHW approved with conditions *(see below)* ☐ OOHW rejected
R. Approval to conduct OOHW *For OOHW with low and medium risk factors, Approval may be granted by the ER/AA;* *For OOHW with high risk factors approval by Secretary is required.*	Assessment of Risk Factors: ☐ Low ☐ Medium ☐ High (refer to out-of-hour work protocol for example of risk factors)
	Approved by (strike out as applicable): [redacted] with [redacted] Secretary Signature Date

Appendix E - Noise and Vibration Monitoring Plan

This section is to address CoAs C9b, C10, C11, C12, C13, C14, C15, C16, C17, C18e, NV-2, NV-3, NV-7 and NV-8.

This section is to be reviewed and updated, where necessary, to ensure relevance to the Project.

Weekly and other routine inspections by Environmental Officers, Transport for NSW, ERG representatives and ER will occur throughout construction. Detail on the nature and frequency of these inspections are documented in Section 3.8 of the CEMP

Construction Monitoring Programs have been prepared (see Appendix E1 to E7) and will be implemented for the duration of the subject construction works (CoA C15). The anticipated duration of the projects are:

- Activity A - HRW: one year
- Activity B - Cumberland East demolition works: less than three months
- Activity C - Cumberland West demolition works: less than three months of work to be conducted in stages

Noise and vibration monitoring will also occur routinely for the duration of the Project.

Monitoring will be undertaken by an Acoustic Consultant or the Environmental Officer during the construction phase of the Project. No construction shall commence until the Secretary has received all of the Construction Monitoring Programs. Baseline data was collected for the EIS, therefore no additional baseline data has been collected nor is anticipated to be collected. The approved Construction Monitoring Programs will be implemented for the duration of construction (CoA C15).

Content and frequency of monitoring reports to be provided to the Secretary and relevant regulatory agencies is detailed in below:

- Outline the noise monitoring that would occur, when and how this would occur
- Outline procedure for what would happen if noise levels are found to exceed identified criteria
- Outline the standards and guidelines which monitoring would be carried out in accordance with.

Note condition C9 requires noise and vibration monitoring prior to construction. This can be incorporated into the relevant sub-plan as required by C17, see the tables below.

Exceedances of criteria will be sent to HAC. It will be HAC's responsibility to report to TFNSW.

Consultation with relevant agencies for the three sites was carried out and was used to develop the noise and vibration monitoring programs in Appendix E. Appendix E is continually developed through fortnightly meetings and changing conditions on site.

E1 HRW - Noise monitoring

Table E1-1 outlines the construction noise monitoring procedures for Activity A.

It is not proposed to conduct noise testing during site compounds establishment as proposed works are minor.

Table E1-1 : Construction noise monitoring procedure

Item	Details	Requirements
General requirements:	Environmental audits (which include noise monitoring) must be conducted in accordance with AS/NZS ISO 19011. All noise monitoring would be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.	
Baseline Data	Baseline data is available from previous study including the EIS. Additional baseline is not deemed to be required. (Refer to Section 3.2)	C10 (a) C10 (b)
Monitoring to be undertaken	Short-term attended monitoring is to be carried out in response to specific complaint to quantify noise levels and compare with those predicted in this Sub Plan. This will be carried out on an as-needed basis. Additional attended monitoring may be required in accordance with OOHW Protocol requirements, to be determined following specific application. Long-term unattended monitoring (24/7 monitoring) has been nominated for critical locations within the Health Precinct only as detailed in this sub plan.	C10 (c) C10 (e)
Noise Monitor requirements Parameters to be monitored	• Attended: ○ Comply with AS IEC 61672.1 2004 “Electroacoustics - Sound Level Meters” and designated either Type 1 or 2. ○ Allow averaging and storing data for standard 15-minute measurement period. ○ Measurements to be carried out in accordance with AS 1055 ○ Plant specific noise measurements shall be carried out in accordance with AS2012.1. • Unattended: ○ As above: ○ Operate continuously during construction works when on site. ○ Be capable of sending immediate exceedance alerts to relevant site staff via email/SMS or visual/audible warning. ○ Store all relevant data for regular reporting. Noise parameters recorded (for attended and unattended monitoring) are L_{MAX}, L_1, L_{10}, L_{90} and L_{Aeq}. Audio is recorded when conducting unattended noise monitoring only.	C10 (d)

Item	Details	Requirements

Monitoring Frequency	• Monitoring will occur at a frequency as dictated by TfNSW CNVS:
	  ○ Within 14 days of commencement of construction (one off attended verification event)
	  ○ At a frequency to satisfy requirements of auditing and verification outlined in the CNVS
	  ○ At the nearest affected receiver (or nominated representative location)
	  ○ During construction hours where the predicted airborne noise level is more than 20dB(A) above project RBLs identified in Section 6.3, for any work period (Standard Construction Hours, Period 1, or Period 2)
	  ○ As soon as reasonably practical after receiving a complaint regarding construction noise
	• Further attended monitoring will be carried out in accordance with OOHW Protocol as works are approved.
		C10 (e)

Item	Details	Requirements
Locations and trigger levels:	• Attended monitoring will be carried out at the complainant's premises, if known, or the nearest most potentially affected location. Monitoring will typically be carried out at external publicly accessible locations, unless access to private property is granted. • Unattended monitoring is to be carried out at specified sensitive receiver location or suitable representative location (Sensitive receivers are identified in Appendix B and Table 3-1). Based on current consultation unattended monitoring (24/7 monitoring) is proposed at Westmead Hospital, including (Indicative locations are shown graphically in Appendix B2): ○ WIMR building: [redacted] ○ CMRI building: [redacted] ○ Westmead Adults Hospital – Block E [redacted] Microphone minimum 1.2 m above the ground level in the free-field, away from reflecting surfaces (> 3.5 m)	C10 (f) C10 (d)

Item	Details	Requirements
Reporting	As per CoA No. C11, the monitoring data must be available to the Proponent, ER, AA, Relevant Council(s) and the community to inform construction scheduling, the level of impacts and whether additional mitigation is required. The Department must also be provided access to this data if specifically requested. Monitoring report/s will be provided by email. Monitoring report/s shall include all noise investigations, calculations and mitigation measures and additional noise surveys undertaken if any. Details of the reporting information is listed in Section 6.6. <u>Long-term within Westmead Hospital</u> Reporting of the unattended measurements at established locations listed above will be sent to the contractor, Health, and relevant hospitals (WMIR, CMRI, Westmead Adults Hospital representatives). Health will then send monitoring results (from the non-confidential monitoring locations) to TfNSW who will then publish them on their website. Long-term monitoring report would be provided weekly during the first month of monitoring then quarterly. <u>Other monitoring</u> Reports shall be issued to TfNSW for publishing of data and distribution to the ER, AA, relevant Council(s) and DPIE. This monitoring information is then summarised by TfNSW as part of the full construction compliance reports required to be undertaken which are available of the PLR website. Short-term monitoring report will be provided within 5 working days from completion of the monitoring/ survey.	C10 (g)
Procedures to identify and implement additional mitigation measures	• Where exceedance is identified (when an sms alert has been sent as per section “Noise Monitor Requirements” to the Main Contractor, Health Infrastructure, and relevant stakeholder representatives or identified during attended monitoring), review equipment usage, mitigation and management measures. If noise levels are repeatedly exceeding the criteria levels, then work shall be stopped, and appropriate action taken such as: • Modifications to construction equipment used • Modifications to methods of construction • Changes to hours of activities generating excessive noise levels Refer to the memo (Appendix F2.1) for more information regarding trigger noise levels	10 (h)
Consultation	Refer to Appendix F, Section 2.3 and Table 6-1	10 (i)

E2 HRW - Vibration monitoring of Sensitive Laboratory and Medical Spaces

Table E2-1: Construction vibration monitoring procedure

Item	Details	Requirements
General requirements:	Environmental audits (which include noise monitoring) must be conducted in accordance with AS/NZS ISO 19011. All vibration monitoring would be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.	
Baseline Data	Baseline data is not specifically required for the vibration monitoring program. Additional baseline is not anticipated to be conducted.	C10 (a) C10 (b)
Monitoring to be undertaken	Generally short-term attended monitoring when required. Continuous long-term vibration monitoring (24/7 monitoring) is to be undertaken in the identified sensitive areas (refer to locations below) throughout the construction period	C10 (c)
Vibration Monitor requirements Parameters to be monitored	The monitoring system will have the following features: • Continuous vibration monitoring system with notification trigger levels • Ability to send notification emails/SMS messages when the prescribed trigger levels are exceeded. • Ability to monitor and trigger notifications on peak particle velocity (PPV) and 3rd Octave Band RMS velocities. • Sensitivity to monitor vibration levels below the vibration criteria specified in the memo (Refer to Appendix C1) • Recorded vibration time history data for a minimum of 1 minute following a trigger event • Proposed equipment shall be reviewed by the vibration consultant to ensure the results obtained are readily comparable with criteria and any previous testing results • Capability for online access to monitored data.	C10 (d)
When to monitor:	• As vibration levels experienced on site are highly dependent upon the site characteristics e.g. ground stratigraphy, the specific items of equipment being used, and the equipment operator, early vibration level checks are therefore recommended to be carried out at the outset of each key vibration generating activity: o At commencement of activities o At a representative of typical worst-case activities • Continuous vibration monitoring will be undertaken at locations agreed with Health and listed below.	C10 (e)

Item	Details	Requirements
Locations and trigger levels:	Based on current consultation unattended monitoring (24/7 monitoring) is proposed at Westmead Hospital, including (Indicative locations are shown graphically in Appendix A2): ○ WIMR building:  ○ CMRI building:  ○ Westmead Adults Hospital – Block E  VC-A indicates a vibration criterion: 3rd octave band root mean square velocity V_{RMS} of 0.05 mm/s VC-B indicates a vibration criterion V_{RMS} of 0.025 mm/s VC-C indicates a vibration criterion V_{RMS} of 0.0125 mm/s R=1 indicates a vibration criterion V_{RMS} of 0.100 mm/s KR is further from the Hawkesbury Road Widening works and will be adequately covered by monitoring within CMRI and WIMR. For monitoring of sensitive equipment, the vibration monitor shall be located on the structure common with the sensitive equipment, so as to be representative of the vibration induced into the equipment.	C10 (f)

Item	Details	Requirements
Reporting	Vibration monitoring and inspection reporting shall outline the results and summary of vibration including any exceedances of related limits/criteria. The results of any vibration monitoring shall be provided as requested and to assist in addressing complaints, where required. The monitoring report/s shall include vibration investigations, calculations and mitigation measure and additional noise and vibration surveys undertaken if any. The report will aim to be provided within 5 working days within completion of the monitoring/ survey. Monitoring report/s will be provided by email weekly during the first month of monitoring then quarterly Reporting of the unattended measurements at established locations listed above will be sent to the Contractor, Health, and relevant hospitals (WMIR, CMRI, Westmead Adults hospital representatives). Health will then send monitoring results (from the non-confidential monitoring locations) to TfNSW who will then publish them on their website, and distribution to the ER, AA and DPE. Details of the reporting information is listed in Section 6.6.	C10 (g)
Procedures to identify and implement additional mitigation measures	• Short term testing can be used to reduce or increase the required minimum working distances between the construction activity and sensitive laboratory and medical spaces to ensure vibration criteria are not breached whilst proceeding with construction works with maximum possible efficiency. High vibration generating activities will be scheduled to start as far as possible from vibration sensitive equipment to evaluate impacts from the vibration generating activities and re-assess construction methods if required (i.e works will be scheduled to start at further sites and move towards WIMR to manage risks) Where exceedance is identified (when an sms alert has been sent as per section “Vibration Monitor Requirements” to the Main Contractor, Health Infrastructure, and relevant stakeholder representatives), review equipment usage, mitigation and management measures. If vibration levels are repeatedly exceeding the criteria levels, then work shall be stopped, and appropriate action taken such as: • Modifications to construction equipment used • Modifications to methods of construction • Changes to hours of activities generating excessive vibration levels Review of vibration impact on sensitive space operation with stakeholders to identify if criteria could be revised. Refer to the memo (Appendix F2.1) for more information regarding trigger vibration levels	10 (h)
Consultation	Refer to Appendix F, Section 2.3 and Table 6-1 Stakeholders will be provided with contact details of a person within the construction team to enable vibration issues to be swiftly resolved shall they arise.	10 (i)

The proposed construction vibration management strategy relating to sensitive laboratory and medical spaces is summarised below:

1. Continuous vibration monitoring is to be undertaken in the identified sensitive areas throughout the construction period. It is proposed to monitor within CMRI, WIMR and Nuclear Medicine facilities. KR is further from the Hawkesbury Road Widening works and will be adequately covered by monitoring within CMRI and WIMR.
   In addition, it is noted that monitoring may be in place for other projects occurring in Westmead hospital.

2. Clear management process and communication pathways to allow swift action to be taken to resolve any vibration issues within surrounding buildings.

3. Performing initial site-specific vibration measurements for new critical site activities to identify required standoff.

4. Site planning to keep vibration sources away from more sensitive receivers where possible.

5. Use of alternative lower vibration construction methods and equipment such as bored piles instead of driven piles.

6. Use of alternative lower vibration equipment. In general equipment that operates higher frequency will result in lower vibrations for instance 40Hz compactor will generate lower vibration levels at a distance from the activity than a 12Hz compactor.

Further details on key items are provided below.

A flow chart outlining the proposed vibration monitoring procedure is provided in Figure E2-1.

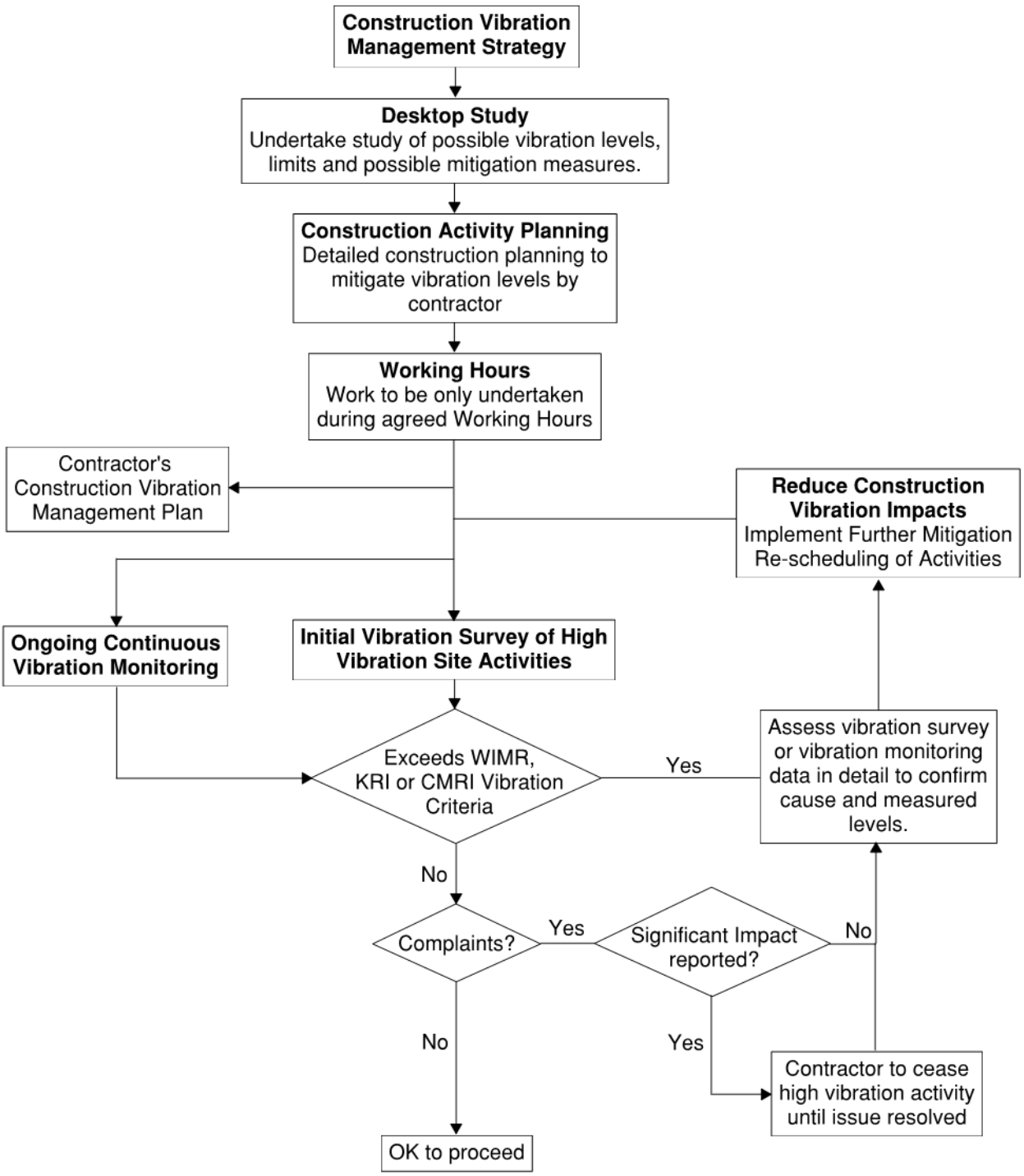


Figure E2-1: Proposed construction vibration management process

E3 HRW - Vibration monitoring – other sensitive receivers

The following Table E3-1 outlines the vibration monitoring procedures proposed.

Table E3-1: Construction vibration monitoring procedure – other sensitive receivers

Item	Details	Requirements
General requirements:	Environmental audits (which include noise monitoring) must be conducted in accordance with AS/NZS ISO 19011. All vibration monitoring would be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.	
Baseline Data	Baseline data is not specifically required for the vibration monitoring program. Additional baseline is not anticipated to be conducted.	C10 (a) C10 (b)
Monitoring to be undertaken	Short-term attended monitoring shall be undertaken if vibration intensive works are required within the safe working distances defined in Table C1.8. Long-term unattended monitoring (24/7 monitoring) will be carried out where short-term monitoring indicates works is close to or at risk of exceeding vibration criteria for cosmetic damage.	C10 (c) C10 (e)
Parameters to be monitored	Vibration Dose Values (VDVs) – for the assessment of human comfort Peak Particle Velocity (PPV) – for the assessment of cosmetic damage	
Locations:	At specified sensitive receiver location or suitable representative location, preferable connected to the building foundation or structure. Alternatively located immediately adjacent to building structure, with appropriate mounting to couple with the ground (e.g. stake/spike). (Sensitive receivers are identified in Appendix B and Table 3-1) At locations where there are high risk receptors, vibration monitoring will be conducted during the activities causing vibration. The vibration monitor(s) will be relocated as required during the works such that it/they are located at a representative distance from the works to the nearest sensitive structures and locations. Monitoring for the establishment of minimum working distances shall be carried out away from sensitive structures, or commence with plant operating well outside the anticipated minimum working distances.	C10 (f)

Item	Details	Requirements
Reporting	Vibration monitoring and inspection reporting shall outline the results and summary of vibration impacts including any exceedances of related limits/criteria. The results of any vibration monitoring shall be provided as requested and to assist in addressing complaints, where required. The monitoring report/s shall include vibration investigations, calculations and management and mitigation measure and additional vibration surveys undertaken if any. The report will aim to be provided within 5 working days within completion of the monitoring/ survey. Monitoring report/s will be provided by email. Reports shall be issued to TfNSW for publishing of data and distribution to the ER, AA and relevant Council(s) and DPE. Details of the reporting information is listed in Section 6.6.	C10 (g)
Procedures to identify and implement additional management and mitigation measures	Where exceedance is identified (when an sms alert has been sent as per section “Vibration Monitor Requirements”), review equipment usage, mitigation and management measures. If vibration levels are repeatedly exceeding the criteria levels, then work shall be stopped, and appropriate action taken such as: • Modifications to construction equipment used • Modifications to methods of construction Refer to the memo (Appendix F2.1) for more information regarding trigger vibration levels	10 (h)
Consultation	Refer to Appendix F, Section 2.3 and Table 6-1	10 (i)

E4 Cumberland East Noise monitoring

Table E4-1 outlines the construction noise monitoring procedure for Cumberland East. It is not proposed to conduct noise testing during site compounds establishment as proposed works are minor.

Table E4-1: Construction noise monitoring procedure – Cumberland East

Item	Details	
General requirements:	Environmental audits (which include noise monitoring) must be conducted in accordance with AS/NZS ISO 19011. All noise monitoring would be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.	
Baseline Data	Baseline data is available from previous study including the EIS. Additional baseline is not deemed to be required. (Refer to Section 3.2)	C10 (a) C10 (b)
Monitoring to be undertaken	Long-term unattended monitoring (24/7 monitoring) will be nominated for critical locations within the Cumberland Hospital Precinct as detailed in this sub plan. Short-term attended monitoring is to be carried out in response to specific complaint to quantify noise levels and compare with those predicted in this Sub-plan. This will be carried out on an as-needed basis. Short-term attended monitoring will be carried out for any alternative equipment or processes expected to be significantly louder (>5 dB than those listed in this CNVMP)	C10 (c) C10 (e)
Noise Monitor requirements Parameters to be monitored	• Attended: ○ Comply with AS IEC 61672.1 2004 “Electroacoustics - Sound Level Meters” and designated either Type 1 or 2. ○ Allow averaging and storing data for standard 15-minute measurement period. ○ Measurements to be carried out in accordance with AS 1055 ○ Plant specific noise measurements shall be carried out in accordance with AS2012.1. Noise parameters recorded are L_{MAX}, L_1, L_{10}, L_{90} and $L_{Aeq.}$ Audio is recorded when conducting unattended noise monitoring only. • Unattended: ○ As above: ○ Operate continuously during construction works when on site. ○ Be capable of sending immediate exceedance alerts to relevant site staff via email/SMS or visual/audible warning. ○ Store all relevant data for regular reporting. Noise parameters recorded (for attended and unattended monitoring) are L_{MAX}, L_1, L_{10}, L_{90} and $L_{Aeq.}$ Audio is recorded when conducting unattended noise monitoring only.	C10 (d)

Item	Details	

Monitoring Frequency	• Monitoring will occur at a frequency as dictated by TfNSW CNVS:
	  ○ Within 14 days of commencement of construction (one off attended verification event)
	  ○ At a frequency to satisfy requirements of auditing and verification outlined in the CNVS
	  ○ At the nearest affected receiver (or nominated representative location)
	  ○ As soon as reasonably practical after receiving a complaint regarding construction noise
		C 10 (e)

Locations and trigger levels:	• Attended monitoring will be carried out at the complainant's premises, if known, or the nearest most potentially affected location. Monitoring will typically be carried out at external publicly accessible locations, unless access to private areas is granted. • Attended monitoring will be carried out for any alternative equipment or processes expected to be significantly louder (>5 dB than those listed in this CNVMP • Unattended monitoring is to be carried out at a suitable location to be discussed with HAC. Based on current information the anticipated location will be near or inside Building 51 (Bunya Ward), due to the sensitivity of consumers using this ward. Trigger levels will be discussed and agreed with HAC and will depend on location. Microphone minimum 1.2 m above the ground level in the free-field, away from reflecting surfaces (> 3.5 m)	C10 (f) C10 (d)
Reporting	Plant specific noise measurements shall be carried out in accordance with AS2012.1 with results compared to standard published noise levels for that equipment/ activity. Monitoring report/s will be provided by email. Monitoring report/s shall include all noise investigations, calculations and management and mitigation measures and additional noise surveys undertaken if any. Details of the reporting information is listed in Section 6.6 Reports shall be issued to HAC. It is HAC responsibility to issue reports to TfNSW on a quarterly basis for publishing of data and distribution to the ER, AA, relevant Council(s) and DPIE. This monitoring information is then summarised by TfNSW as part of the full construction compliance reports required to be undertaken which are available of the PLR website. Long-term monitoring report would be provided weekly during the first month of monitoring then quarterly. Short-term monitoring report will be provided within 5 working days from completion of the monitoring/ survey.	C10 (g)

Item	Details	
Procedures to identify and implement additional management and mitigation measures	• Where an exceedance is identified (when an sms alert has been sent as per section “Noise Monitor Requirements” to the Main Contractor, Health Infrastructure, and relevant stakeholder representatives or identified during attended monitoring), review equipment usage, mitigation and management measures. If noise levels are repeatedly exceeding the criteria levels, then work shall be stopped, and appropriate action taken such as: • Modifications to construction equipment used • Modifications to methods of construction • Changes to hours of activities generating excessive noise levels	10 (h)
Consultation	Refer to Appendix F, Section 2.3 and Table 6-1	10 (i)

E5 Cumberland East Vibration monitoring

Vibration monitoring is not deemed to be required as no vibration intensive works are proposed to be conducted for Activity B – Cumberland East demolition works.

E6 Cumberland West Noise monitoring

Table E6-1 outlines the constriction noise monitoring procedure for Cumberland West. It is not proposed to conduct noise testing during site compounds establishment as proposed works are minor.

Table E6-1: Construction noise monitoring procedure - Cumberland West

Item	Details	
General requirements:	Environmental audits (which include noise monitoring) must be conducted in accordance with AS/NZS ISO 19011. All noise monitoring would be carried out by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.	
Baseline Data	Baseline data is available from previous study including the EIS. Additional baseline is not deemed to be required. (Refer to Section 3.2)	C10 (a) C10 (b)
Monitoring to be undertaken	Long-term unattended monitoring (24/7 monitoring) will be nominated for critical locations within the Health Precinct as detailed in this sub plan. Generally short-term attended monitoring in response to specific complaint should it be required to quantify noise levels and compliance with relevant criteria. This will be carried out on an as-needed basis. Short-term attended monitoring will be carried out for any alternative equipment or processes expected to be significantly louder (>5 dB than those listed in this CNVMP)	C10 (c) C10 (e)
Noise Monitor requirements Parameters to be monitored	• Attended: ○ Comply with AS IEC 61672.1 2004 “Electroacoustics - Sound Level Meters” and designated either Type 1 or 2. ○ Allow averaging and storing data for standard 15-minute measurement period. ○ Measurements to be carried out in accordance with AS 1055 ○ Plant specific noise measurements shall be carried out in accordance with AS2012.1. Noise parameters recorded are L_{MAX}, L_1, L_{10}, L_{90} and L_{Aeq}. Audio is recorded when conducting unattended noise monitoring only. • Unattended: ○ As above: ○ Operate continuously during construction works when on site. ○ Be capable of sending immediate exceedance alerts to relevant site staff via email/SMS or visual/audible warning. ○ Store all relevant data for regular reporting. Noise parameters recorded (for attended and unattended monitoring) are L_{MAX}, L_1, L_{10}, L_{90} and L_{Aeq}. Audio is recorded when conducting unattended noise monitoring only.	C10 (d)

Item	Details	

Monitoring Frequency	• Monitoring will occur at a frequency as dictated by TfNSW CNVS:
	  ○ Within 14 days of commencement of construction (one off attended verification event)
	  ○ At a frequency to satisfy requirements of auditing and verification outlined in the CNVS
	  ○ At the nearest affected receiver (or nominated representative location)
	  ○ As soon as reasonably practical after receiving a complaint regarding construction noise
		C10 (e)

Locations and trigger levels:	• Attended monitoring will be carried out at the complainant's premises, if known, or the nearest most potentially affected location. Monitoring will typically be carried out at external publicly accessible locations, unless access to private property is granted. • Attended monitoring will be carried out for any alternative equipment or processes expected to be significantly louder (>5 dB than those listed in this CNVMP • Unattended monitoring is to be carried out at a suitable location to be discussed with HAC. Based on current information the anticipated location will be near or inside Building 22 (Acacia Ward), due to the sensitivity of consumers using this ward. Trigger levels will be discussed and agreed with HAC and will depend on location. Microphone minimum 1.2 m above the ground level in the free-field, away from reflecting surfaces (> 3.5 m)	C10 (f) C10 (d)
Reporting	Plant specific noise measurements shall be carried out in accordance with AS2012.1 with results compared to standard published noise levels for that equipment/ activity. Monitoring report/s will be provided by email. Monitoring report/s shall include all noise investigations, calculations and mitigation measures and additional noise surveys undertaken if any. Details of the reporting information is listed in Section 6.6. Reports shall be issued to HAC. It is HAC responsibility to issue reports to TfNSW on a quarterly basis for publishing of data and distribution to the ER, AA, relevant Council(s) and DPIE. This monitoring information is then summarised by TfNSW as part of the full construction compliance reports required to be undertaken which are available of the PLR website. Long-term monitoring report would be provided weekly during the first month of monitoring then quarterly. Short-term monitoring report will be provided within 5 working days from completion of the monitoring/ survey.	C10 (g)

Item	Details	
Procedures to identify and implement additional management and mitigation measures	• Where an exceedance is identified (when an sms alert has been sent as per section “Noise Monitor Requirements” to the Main Contractor, Health Infrastructure, and relevant stakeholder representatives or identified during attended monitoring), review equipment usage, mitigation and management measures. If noise levels are repeatedly exceeding the criteria levels, then work shall be stopped, and appropriate action taken such as: • Modifications to construction equipment used • Modifications to methods of construction • Changes to hours of activities generating excessive noise levels	10 (h)
Consultation	Refer to Appendix F, Section 2.3 and Table 6-1	10 (i)

E7 Cumberland West Vibration monitoring

Vibration monitoring is not deemed to be required as cosmetic damage criteria and Human comfort criteria are predicted to be met for Activity C - Cumberland West demolition works.

E8 Cumberland West Vibration monitoring – other sensitive receivers

Vibration monitoring is not deemed to be required for the ECT machine for Activity C - Cumberland West demolition works. (Refer to Section C3.5).

Appendix F - Consultation

F1 Requirements under the Infrastructure Approval

The CoA require that the NVMP (CoA C3(b)) and the Noise and Vibration Monitoring Plan (C9(b)) is prepared in consultation with City of Parramatta Council, EPA and NSW Health.

CoA conditions below in Table F1-1 detail how consultation is required for noise and vibration activities during construction phase.

Table F1-1: CoA for consultation prior to and during construction for noise and vibration

CoA	Details
C3(b)	The following **CEMP Sub-plans** must be prepared in consultation with the relevant government agencies identified for each **CEMP Sub-plan** and be consistent with the CEMP referred to in **Condition C1**: (b) Noise and Vibration CEMP Sub-Plan; Relevant Council(s), EPA, NSW Health to be consulted for CEMP Sub-Plan with approval required by Secretary.
C9(b)	The following **Construction Monitoring Programs** must be prepared in consultation with the relevant government agencies for each to compare actual performance of construction of the CSSI against performance predicted in the documents listed in **Condition A1** or in the **CEMP**: (b) Noise and Vibration Monitoring; must be prepared in consultation with Relevant Council(s), EPA, NSW Health (as relevant)
C10(i)	Each **Construction Monitoring Program** must provide: (i) any consultation to be undertaken in relation to the monitoring programs.
E31	Noise generating works near places of worship, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories, operating theatres, and mental health services and accommodation) must not be timetabled within sensitive periods, unless otherwise agreed with the affected institutions, and at no cost to the affected institution. This must be determined through ongoing consultation with the community during construction.

CoA	Details
E39	In order to undertake out-of-hours work described in **Condition E25(c) and (d)**, the Proponent must identify appropriate work and respite periods for the works in consultation with the community at each affected precinct at three monthly intervals. This consultation must be ongoing and include (but not be limited to) providing the community with: (a) a schedule of likely out-of-hours work for a period of no less than two (2) months for medium to high risk work (as defined in the **Out-of-Hours Work Protocol** (**Condition E28**); (b) a schedule of likely out-of-hours work for a period of no less than seven (7) days for low risk work (as defined in the **Out-of-Hours Work Protocol** (**Condition E28**)) (c) the potential works, location and duration; (d) the noise characteristics and likely noise levels of the works; and (e) likely mitigation and management measures. The Proponent shall consider and respond to the affected community's preference for alternative hours and/or durations. The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour works must be provided to the AA, ER and the Secretary.

F2 Activity A: Hawkesbury Road Widening

Consultation workshop was held with the following Government Stakeholders on 17 December 2018 and 16 January 2019. Table F2-1 is a Log of consultation as per CoA A5, C3b, C9(b), E31, and E39:

- City of Parramatta Council (CoPC)
- Environment Protection Authority (EPA)
- Cumberland Council
- NSW Health consortium including Westmead Adults Hospital (WSLHD), Westmead Institute of Medical Research (WIMR), Kids Research (KR) and Children's Medical Research Institute (CMRI)

Table F2-1: Summary of issues raised during the consultation carried out to support this Sub-Plan

In / Out	Date	Type of Communication	Stakeholders
Outgoing	06 December 2018 5.33pm	Email: Invitation from Arup ([redacted] to attend Workshop on 17 December 2018	**INVITEES** **CoPC:** [redacted] **EPA**: [redacted] **Cumberland Council:** [redacted] **NSW Health**: [redacted]
Incoming	12 December 2018 11.44am	Email: Decline for EPA to attend consultation workshop and request to receive Noise and Vibration Management Plan document for consultation.	**STAKEHOLDERS** **EPA**: [redacted]
Outgoing	14 Dec 2018 2.45pm	Email: [redacted] sent a reminder to invitees who did not accept and alternative attendees to the Workshop on 17 December 2018	**INVITEES** **CoPC**: [redacted] **EPA**: [redacted] **Cumberland Council:** [redacted] **NSW Health**: [redacted]
Workshop	17 Dec 2018 1-4pm	Workshop: TfNSW Offices 130 George Street, Parramatta	**ATTENDEES** **CoPC**: [redacted] **Cumberland Council**: [redacted] **NSW Health**: [redacted]

In / Out	Date	Type of Communication	Stakeholders
Outgoing	17 December 2018 10.13pm	Email: [redacted] emailed the Noise and Vibration Management Plan to Stakeholders for consultation and review	**STAKEHOLDERS** **CoPC**: [redacted] **EPA**: [redacted] **NSW Health:** [redacted]
Outgoing	8 January 2019	Workshop: E2 Conference Room, Executive Offices, Westmead Hospital Comment reference numbers: 1 – 5 (Table F2-2)	**STAKEHOLDERS** **Kids Research**: [redacted] **The Westmead Institute for Medical Research (WIMR):** [redacted] **SCHN-CHW:** [redacted] **Westmead Adults Hospital (WSLHD):** [redacted]
Outgoing	8 January 2019 6.30pm	Email: [redacted] emailed the Noise and Vibration Management Plan to Stakeholders for consultation and review	**STAKEHOLDERS** **Cumberland Council:** [redacted]
Incoming	15 January 2019 10.20am	Email: Comments received from Westmead Adults Hospital Comment reference numbers: 6 – 12 (Table F2-2)	**STAKEHOLDERS** **Westmead Adults Hospital (WSLHD):** [redacted]
Outgoing	18 January 2019 8.36am	Email [redacted] sent email reminder to stakeholders of consultation closing for Noise and Vibration Management Plan on 21 January 2019.	**STAKEHOLDERS** **CoPC:** [redacted] **EPA:** [redacted] **Cumberland Council:** [redacted] **NSW Health**: [redacted]
Incoming	21 January 2019 4.53pm	Email Comments received from CoPC Comment reference numbers: 13, 14 (Table F2-3)	**STAKEHOLDERS** **CoPC**: [redacted]

In / Out	Date	Type of Communication	Stakeholders
Incoming	21 January 2019 5.45pm	Email Comments received from Cumberland Council Comment reference numbers: 15 (Table F2-4)	**STAKEHOLDERS** **Cumberland Council:** [redacted]
Outgoing	22 January 2019 3.54pm	Email [redacted] sent follow-up requesting any comments on the Noise and Vibration Management Plan for which consultation closed on 21 January 2019.	**STAKEHOLDERS** **EPA:** [redacted]
Incoming	22 January 2019 5.04pm	Email [redacted] requesting extension of consultation until 29 January 2019	**STAKEHOLDERS** **EPA:** [redacted]
Outgoing	22 January 2019 5.10pm	Email [redacted] to [redacted] agreement to extended consultation period	**STAKEHOLDERS** **EPA:** [redacted]
Incoming	25 January 2019 3.20pm	Email Comments received from EPA Comment reference numbers: 16 - 33 (Table F2-5)	**STAKEHOLDERS** **EPA:** [redacted]
Incoming	7 March 2019 1:17pm	Email Comments received from EPA	**STAKEHOLDERS** **EPA:** [redacted]
Incoming	11 March 2019 9:56am	Email Comments received from CoPC Comment reference number: 13 and 14 (Table F2-3) No further comments	**STAKEHOLDERS** **CoPC:** [redacted]

In / Out	Date	Type of Communication	Stakeholders
Incoming	13 March 2019	Email Comments received from EPA regarding vacuum truck noise and definition of lengthy periods of construction	**STAKEHOLDERS** **EPA:** [redacted]
Incoming	14 March 2019	Email AA endorsement letter reproduced in Appendix C2	**STAKEHOLDERS** **AA:** [redacted]
Incoming	15 March 2019	Email Comment reference number: 34 to 36 (Table F2-2)	**STAKEHOLDERS** **KR:** [redacted]
Incoming	15 March 2019	Email No further comment from CMRI	**STAKEHOLDERS** **CMRI:** [redacted]
Incoming	16 March 2019	Email No further comment from WMIR	**STAKEHOLDERS** **WIMR:** [redacted]
Incoming	19 March 2019	Email WIMR Noise and Vibration Monitor Location Walkthrough	**STAKEHOLDERS** **WIMR:** [redacted]
Incoming	20 March 2019	Email No further comment from KR	**STAKEHOLDERS** **KR:** [redacted]
Incoming	20 March 2019	Email No further comment from Westmead Adults Hospital	**STAKEHOLDERS** **Westmead Adults Hospital (WSLHD):** [redacted]

Table F2-2 to F2-5 provides a log of issues raised by each of the Government Stakeholders and how these have been addressed.

Table F2-2: Log of issues raised by NSW Health consortium including Westmead Adults Hospital (WSLHD), Westmead Institute of Medical Research (WIMR), Kids Research (KR) and Children's Medical Research Institute (CMRI)

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
1	Workshop: Currently only one monitor. Additional monitors may be required - to be determined by site walk (operating theatre, nuclear medicine, cath labs)	Site investigations and walkthroughs were carried out with Hospital stakeholders on 16 January 2019 to review sensitive receiver locations and finalise Noise & Vibration requirements. This resulted in the attached report '190205 AC06 v2 PLR HRW HAC CN&V sensitive locations-FINAL.pdf' which has been reviewed and agreed with stakeholders (see correspondence where feedback is provided, and additional site walk done on 19/03/19.) Noise & Vibration monitors has been adjusted to suit stakeholder requirements as done through Westmead Redevelopment works.	Closed
2	Workshop: Brain Dynamics Centre and Sleep Studies areas located within WIMR on Hawkesbury Rd side are sensitive areas and will need to be considered throughout construction phase.	Area identified in above report - noise monitor installed	Closed
3	Workshop: Sleep Study area will require noise monitoring and be sensitive to night works.	Area identified in above report - noise monitor installed	Closed

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
4	Workshop: The Clinical Research Centre within KR is a sensitive area.	KR is significantly removed from the proposed works and the locations are no more sensitive than the closer locations within WIMR and CMRI Relevant monitoring locations to the Hawkesbury works have been discussed with relevant parties (KR, WMIR, CMRI and Westmead Hospital). Monitoring for the Hawkesbury works is currently undertaken in WMIR, CMRI and Westmead Hospital. Monitoring is also being undertaken in KR as part of the CASB works which is independent from the Hawkesbury works.	Closed
5	Workshop: Monitoring will need to commence at the Children's Medical Research Institute	Area identified in above report - 2 Noise Monitors and 2 Vibration Monitors will be installed.	Closed
6	Table C3.2; Area No. 3 ED driveway access changed to one way at night may be an issue if this is the area used by the Ambulance Service. There will need to be consultation with Ambulance NSW regarding this being two-way part of the day and one-way part of the day. This also poses a risk to patient's who drive in to the ED.	ED Driveway access will be maintained throughout the day and detailed staging plans for night disruption will be submitted to Westmead Hospital (and Ambulance NSW) for signoff as part of the established Disruption Notice process before works proceed.	Closed
7	Table C3.2; [redacted]	Before any works take place, access will be coordinated with users (WIMR, CMRI and Westmead Hospital) as part of the Disruption Notice process and obtain signoff before works proceed.	Closed

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
8	Table C3.2; Area No. 9 The trenching works being conducted at night to reduce the impact on through traffic is understood, however this might impede the access to the ED, particularly for Ambulance vehicles.	One lane of traffic access toward the hospital will always be available, with Ambulance traffic prioritized by Traffic controllers. This work will follow the established Westmead Redevelopment Disruption Notice process and obtain key stakeholder signoff before works proceed.	Closed
9	Section C1.5; Construction Traffic is likely to impact on ED traffic flow and whilst off-peak movement of heavy machinery might reduce the impact on traffic flow at night, the noise impact needs to be considered for the hospital.	Noise monitors have been established at sensitive hospital locations based on consultation and walk through. Noise monitoring will be actively managed and adjusted to suit.	Closed
10	Section C1.6; It would be helpful to have some indication of the potential duration of each of the vibration activities per zone. For example, zone A has a high impact for almost all activities, so might need different mitigation strategies than zone D.	Details of vibration works will be communicated to Hospital Stakeholders 2 weeks beforehand using existing Interface PWG meeting and TWG meetings. At present detailed information is not available. Excavation works will start mid-May-2019 ending July-2019. Road pavement construction (and compaction) is scheduled for Nov-Dec 2019. No works beyond this period.	Closed
11	Table 6-1; Community Consultation Measures should include specific reference to the Hospital and Research partners. For Westmead Hospital it would be helpful to have a representative attend the fortnightly project meetings which includes representation from all agencies and contractors undertaking work affecting Westmead Hospital. A local liaison person who engages with the Hospital would also be helpful.	Stakeholder Consultation for Hawkesbury Road Widening is managed through existing Westmead Redevelopment Fortnightly meetings: existing Interface PWG and existing TWG meeting with all Researchers Groups. A wider PLR working group has been set up in early March.	Closed

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
12	Table 6-1; Receptor Control - Westmead Hospital. Please include the Institute for Clinical Pathology and Medical Research (ICPMR) in this grouping as they utilise very sensitive pathology and other testing equipment.	Included in consultation. Noise and Vibration monitors have been set up for their requirements.	Closed
34	Can all reference to KRI or Kids Research Institute please be removed and replaced with KR or Kids Research	Amended	Closed
35	Hainsworth St not Rd (p2)	Amended	Closed
36	This report indicates monitors not being in place within KR, but if fact they will be, not for the PLR works but for the ongoing redevelopment work in close proximity to KR [redacted] Can you please note this in the report so it does not read that monitors are not in place within KR.(p100 +)	Text added to respond to comments. Report indicates that monitoring may be in place for other projects occurring in Westmead hospital.	Closed

Table F2-3: Log of issues raised by CoPC

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
13	Table 6-1: This section indicates the grounds for provision of alternative accommodation for sensitive residential receivers during 'highly intrusive noise impacts' predicted during OOHW (10pm - 7am). It is indicated that this offer will only be made after two nights of highly disturbing noise exposure, i.e. respite for the third night. Councils view is that an offer of alternative accommodation after 1 night of disturbance is more reasonable.	In accordance with NV-3, offer of alternative accommodation is to be determined on a case by case basis. There are no other conditions specifically referring to the duration of impact before alternative accommodation shall be offered. The current approach in the sub-plan is based on the sleep disturbance guidance outlined in the ICNG and CNVS. The OOHW Protocol will be followed for all OOHW and appropriate management and mitigation measures will be implemented as needed.	Closed
14	Section C2.2: This section provides justification on why the provision of acoustic shielding to the ancillary site is not warranted. Council's view is that any acoustic shielding that can be feasibly provided, should be provided. While the noise reduction on the residential receivers may be minimal, there is also an advantage in having the work areas fully screened from view at ground level and there will be a significant reduction in ground level noise provided. For the same reason temporary acoustic barriers should be located adjacent to noisy works being conducted along the works area and moved according to schedule of noisy works as they occur.	Screening is not required for the site compound as no noisy activities have been identified. However, screening can be put in place to reduce visual impact in accordance with CoA C20. Recommendations for use of temporary acoustic barriers have been recommended in Table 6-1.	Closed

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
37	Section C1.3, please consider changing “A 5 dB penalty has also been included to the sound power levels of equipment identified as particularly annoying to nearby residents…” To: A 5 dB penalty has also been included to the sound power levels of equipment identified as Highly Noise Intensive Works in accordance with this document…	Current wording has been kept; Highly noise intensive refers to CoA definition. it is understood that there is a lack of clarity, but this is simply due to having to address multiple policies and conditions with varying definitions and requirements.	Closed

Table F2-4: Log of issues raised by Cumberland Council

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
15	Council does not have any comments at this instance.	Noted	Closed

Table F2-5: Log of issues raised by EPA

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
16	Pg. 53, Section 6.1, dot point 3 - reword - "Encourage construction during the recommended standard hours only, unless approval is given for works that cannot be undertaken during these hours" **TO** Construction must only occur during recommended standard hours, unless works cannot be undertaken during normal work hours and appropriate approval is given.	Was noted and amended. Original wording directly from ICNG. This section has been deleted from this CNVMP.	Closed
17	Section C1.2 - Area No. 5 - University Clinic Patient Access and Multiplex Driveway. As indicated work can either be conducted at night or during the day on Sundays. With appropriate community consultation and communication, good neighbour initiative should be observed, and the community given an option. Less complaints will be made by affected residents.	Comment added in Table 6-1 Management Measures Summary under the consultation section	Closed
18	Section C1.2 - Area No. 6 - Comment same as above good neighbour initiative.	Comment added in Table 6-1 Management Measures Summary under the consultation section	Closed

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
19	Section C1.2 - Area No. 7 - Comment same as above good neighbour initiative. If there is an option to not do night works, then allow the community the ability to decide when they will be impacted.	Comment added in Table 6-1 Management Measures Summary under the consultation section	Closed
20	Section C1.2 - Area No. 9 - Can general private traffic be diverted to Bridge Rd and a detour route be set up to facilitate day time construction? Has this been considered?	This has been put forward to the traffic consultant. Bridge Road is not considered a suitable diversion route for the majority of traffic using Hawkesbury Road.	Closed
22	Table 6-1: Mitigation Measures Summary - "Specific notifications - … no later than seven days ahead of construction activities that are likely to exceed the noise objectives" TO **no later than seven days ahead of any activities that are within 5 dB of the 75 dB highly noise affected.**	The wording proposed by EPA is less onerous and therefore no change to the CNVMP is proposed	Closed

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
23	Table 6-1: Measures Summary - Works and site planning - Construction hours and scheduling - Define special or reword - "Work generating noise with special audible characteristics and/or vibration levels should be scheduled during less sensitive time periods." **TO - Work that generates noise exceeding NML + 15 dB or is considered high impact noise and/or high impact vibration levels should be scheduled during a time that will reduce the impact on sensitive receivers.**	Special audible characteristics are defined in CNVS however we agree that a quantitative criterion to evaluating works is preferable. There are however other conditions that establish requirements for scheduling of high impact works.	Closed
24	Table 6-1: Mitigation Measures Summary - Works and site planning - Scheduling for noise intensive plant - reword - "Items such as concrete saws and ballast tampers" **TO - Any plant or equipment that makes high impact noise should be scheduled for normal working hours..."**	Amended	Closed
25	Table 6-1: Traffic and loading areas - reword - "…to minimise reversing movements within the site." TO **...to minimise reversing movements and idling traffic within the site.**	Amended	Closed

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
27	Table 6-1: Temporary acoustic fencing/barriers - reword - "…temporary acoustic fencing/barriers around the site perimeter would be considered where feasible and reasonable…" TO **'...temporary acoustic fencing/barriers around the site perimeter will be used where feasible...'**	Amended. Noted that previous wording was based on NV-2 REMMM	Closed
28	Table 6-1: Receptor Control - Structural surveys and vibration monitoring - reword - "…At locations where there are high risk receptors, vibration monitoring should be conducted during the activities causing vibration." TO …At locations where there are high risk receptors, vibration monitoring **will** be conducted during the activities causing vibration.	Amended	Closed

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
29	Table 6-1: Receptor Control - Alternative accommodation - reword - "...However, as this project is likely to require night-time works at many locations, provision of alternative accommodation in all cases may not always be feasible or reasonable." TO **…As this project is likely to require night-time works at many locations, provision of alternative accommodation will only be provided after two consecutive nights between 22:00 and 07:00 of work within a week.**	Noted but reworded to clarify that application only relates to highly intrusive works	Closed
30	Table 6-1: Receptor Control - Alternative accommodation - reword - "...Offers of alternative accommodation would be considered in the event that more than two consecutive nights of highly intrusive works are required in any particular location..." TO **...Offers of alternative accommodation will be provided in the event that, within a week, more than two consecutive nights of construction works are required in any particular location.** This aims to ensure that the contractor stages work appropriately.	Reworded to clarify that application only relates to highly intrusive works	Closed

Reference	Comments (including page, figure and/or section number)	How addressed	Outstanding issues
31	Appendix D - High risk works - "Prolonged work" should be classified as 'night works extending beyond two consecutive nights within one week'	Appendix D now refers to the OOHW protocol that can be found here: http://www.parramattalightrail.nsw.gov.au/library/environment/environmental-management which includes the now revised TfNSW approved OOHW protocol.	Closed
32	Appendix E: Inspection and monitoring - reword - "Exceedances of criteria will be sent to Transport for NSW environmental staff" TO **Exceedances of criteria will be sent to relevant staff at Transport for NSW and the Environmental Protection Authority.**	EPA will receive information as required under the PoEO Act.	Closed
33	Appendix E: Construction Noise Monitoring Procedure - amend to reflect comments made in row 18.	(to reflect comments made in item 28). Comment added in Appendix E	Closed

F2.1. Memo sent in response to the workshop undertaken on Tuesday 8 January 2019 [REDACTED AS CONFIDENTIAL]

F2.2. Endorsement letter of the CNVMP for Activity A by AA

Air Noise Environment Pty Ltd

Unit 3, 4 Tombo Street
Capalaba
QLD 4157

[redacted]

ACN 081 834 513
ABN 13 081 834 513

Attention: Transport for NSW (PLR)

Ref: HAC-HRW-NV-PLN-000001_Rev2.1_AA_Endorsement_23July2019

23 July2019 (previous revision 28 May 2019)

RE: PLR–HAC-HRW-NV_Rev1 (Noise and Vibration Management Sub-Plan) - Adequacy for Submission (AA Review)

[redacted] appointed Acoustic Advisor (AA), reviewed the following documentation with regard to the PLR – Stage 1 project:

Title:	Document Reference:	Version Status	Review Date
Appendix B3 Noise and Vibration Management Sub-Plan Parramatta Light Rail – Stage 1, Package 2, Activity A Hawksbury Road Widening Works -	PLR-HAC-HRW-NV-PLN-000001.1.08.1.04 PLR-HAC-HRW-NV-PLN-000001.Rev_2.1	Revision 1, May 2019 Revision 2.1, July 2019	28 May 2019 23 July 2019

Pursuant to Schedule 12 of the Deed (ISD-18-7058) and Conditions of Approval A29(g) iv, the review is inclusive of two associated minor construction compound sites. Each were found to be of low noise impact on surrounding existing sensitive receiver areas. Furthermore the Construction Monitoring Program (noise and vibration) is found suitable to meet the requirements of the Conditions of Approval C10, C17.

The review confirms the documents have incorporated the recommendations and changes requested by the AA, in ensuring the documents meet the acoustic requirements of the Terms of Approval (NSW Government – Infrastructure Approval (Application No.: SSI 8285)), as well as best practice methodologies for acoustics.

Yours sincerely
for Air Noise Environment Pty Ltd

[redacted]

Senior Environmental Engineer

Note: All professional advice provided by Air Noise Environment, including any information contained in this letter, is subject to the terms of the Disclaimer shown on our website at www.ane.com.au/disclaimer.html

[redacted]

F2.3. Endorsement letter of the CNVMP for Activity A by ER

OptimE PTY LTD ATF Majocaev Trust
ABN 57683487196

24 Grays Point Road,
Grays Point, NSW 2232

[redacted]

www.optimenv.com.au

23 July 2019

Ref: [redacted]

Transport for NSW

Parramatta Light Rail (PLR) – Early Works, Hawkesbury Road Widening (HRW)
Environmental Representative (ER) - Construction Noise & Vibration Sub-plan PLR-HAC-HRW-NV-PLN-000001 (Rev 2.1)

Pursuant to SSI8285 Condition of Approval A23 (d) i), as the approved Environmental Representative, I confirm that I have reviewed the following documentation to be submitted to the Secretary for approval:

- Construction Noise & Vibration Sub-plan PLR-HAC-HRW-NV-PLN-000001.Rev_2.1 (CoA C3) incorporating the Land Use Survey (COA E20), Out of Hours Work Protocol (CoA E28) and Construction Monitoring Program (noise and vibration monitoring), which was incorporated into the CNVMP as permitted by CoA C17.

In my opinion the document has addressed the issues previously raised by Department of Planning, Industry and Environment (previously the Department of Planning and Environment) on 4 April 2019 and 27 June 2019 and is consistent with the requirements included in or required under the terms of the Conditions of Approval for the Parramatta Light Rail (Stage 1) development as applicable for Package 2 (Westmead Precinct Works), Activity A (Hawkesbury Road Widening Works).

In addition, I acknowledge the endorsement of the Construction Noise & Vibration Sub-plan PLR-HAC-HRW-NV-PLN-000001 (Rev 2.1) by the PLR Acoustic Advisor by letter (Ref: HAC-HRW-NV-PLN-000001.3_AA_Endorsement_23July2019).

Yours sincerely,

[redacted]

Environmental Representative (HI-ER) - PLR HRW
OptimE Pty Ltd

F3 Activity B and C: Cumberland Hospital (East and West campus) Demolition

This is a Log of consultation with the following Government Stakeholders as per CoA A5, C3 (b), C9(b) and E31:

- City of Paramatta Council (CoPC)
- Environment Protection Authority (EPA)
- NSW Health
    - HETI
    - Western Sydney Local Health District (WSLHD)

Table F3-1: Log of consultation with stakeholders as per A5 (b) and (c)

Table F3-2: Outline of issues raised, how they have been addressed, including evidence that party is satisfied the issues have been addressed CoA A5 (d) and (e).

Table F3-1: Engagement log with government stakeholders

In / Out	Date	Type of Communication	Stakeholders
Outgoing	8 July 2019 5:52pm	Email: Invitation from Arup ([redacted]) to attend workshop on 23 July 2019	**INVITEES** **CoPC:** [redacted] **EPA:** [redacted]
Outgoing	12 July 2019 3:46pm	Email: Invitation from Arup ([redacted] to attend Workshop on 29 July 2019	**INVITEES** **WSLHD:** [redacted]
Outgoing	12 July 2019 4:53pm	Email: Invitation from Arup ([redacted] to attend workshop on 24 July 2019	**INVITEES** **HETI:** [redacted] **WSLHD:** [redacted]
Workshop	23 July 2019 9am – 12:00pm	Workshop: Lv 5, 151 Clarence St Sydney	**ATTENDEES** **CoPC:** [redacted]
Workshop	24 July 2019 1pm – 2:45pm	Workshop: Room No.1 – Education Building No. 29, Cumberland Hospital Comment reference numbers: 1 - 4	**ATTENDEES** **HETI:** [redacted] **WSLHD:** [redacted]
Outgoing	26 July 2019 10:19am	Email: Arup ([redacted] issued the Management Plan to stakeholders to review	**STAKEHOLDERS** **CoPC:** [redacted] **EPA:** [redacted]
Workshop	29 July 2019 10am – 11:45am	Workshop: MH Board Room, Admin Building No. 35, Cumberland Hospital	**ATTENDEES** **WSLHD:** [redacted]

In / Out	Date	Type of Communication	Stakeholders
Outgoing	29 July 2019 6:16pm	Email: Arup ([redacted] issued the Management Plans to stakeholders for review	**STAKEHOLDERS** **HETI:** [redacted] **WSLHD:** [redacted]
Incoming	31 July 2019 4:31pm	Email: Comment received from WSLHD. Comment reference number: 19	**STAKEHOLDERS** **WSLHD:** [redacted]
Incoming	31 July 2019	Comments received via shared consultation log Comment reference number: 20 – 27	**STAKEHOLDERS** **WSLHD:** [redacted]
Incoming	31 July 2019	Comments received via shared consultation log Comment reference number: 27 – 29	**STAKEHOLDERS** **WSLHD:** [redacted]
Incoming	6 August 2019 3:52pm	Email: Comments received from WSLHD Comment reference numbers: 30 – 35	**STAKEHOLDERS** **WSLHD:** [redacted]
Incoming	6 August 2019 5:44pm	Email: Comments received from WSLHD Comment reference numbers: 36 – 48 This was also received from [redacted] 8 August 2019 12:51pm.	**STAKEHOLDERS** **WSLHD:** [redacted]
Incoming	8 August 2019 11:27am	Email: Comments received from WSLHD Comment reference numbers: 49	**STAKEHOLDERS** **WSLHD:** [redacted]
Outgoing	12 August 2019 12:48pm	Email: Arup ([redacted] sent email reminder to stakeholders of consultation closing for Noise and Vibration Management Plan on 13 August 2019	**STAKEHOLDERS** **CoPC:** [redacted]

In / Out	Date	Type of Communication	Stakeholders
Outgoing	12 August 2019 12:51pm	Email: Arup ([redacted] sent email reminder to stakeholders of consultation closing for Noise and Vibration Management Plan on 13 August 2019	**STAKEHOLDERS** **EPA:** [redacted]
Incoming	13 August 2019 10:11am	Email: Comments received from CoPC Comment reference numbers: 5	**STAKEHOLDERS** **CoPC:** [redacted]
Incoming	14 August 2019 3:30pm	Email: Comments received from EPA Comment reference numbers: 6 – 18	**STAKEHOLDERS** **EPA:** [redacted]
Outgoing	2 September 2019 11:07am	Email: Arup ([redacted] contacted the EPA to confirm that an EPL is not required for the Enabling Works.	**STAKEHOLDERS** **EPA:** [redacted]
Outgoing	11 November 2019 9:23am	Email: Arup ([redacted] issued the Noise and Vibration Management Plan to stakeholders to close comments.	**STAKEHOLDERS** **EPA:** [redacted]
Outgoing	11 November 2019 9:22am	Email: Arup ([redacted] issued the Noise and Vibration Management Plan to TfNSW to issue to WSLHD/HETI stakeholders to close comments.	**STAKEHOLDERS** **WSLHD:** [redacted]
Incoming	11 November 2019 12:45pm	Email: [redacted] responded that they are satisfied with comment response	**STAKEHOLDERS** **WSLHD:** [redacted]
Incoming	15 November 2019 4:45pm	Email: Response from NSW Health received. [redacted] and [redacted] were satisfied with comment response. [redacted] was not satisfied and provided revised comments. Comment reference numbers: 30 – 35	**STAKEHOLDERS** **WSLHD:** [redacted]
Outgoing	18 November 2019 1:34pm	Call: Arup ([redacted] contacted stakeholder to enquire when close of consultation is likely to be received. EPA advised that response will be delayed due to recent bushfires.	**STAKEHOLDERS** **EPA:** [redacted]

In / Out	Date	Type of Communication	Stakeholders
Outgoing	22 November 2019 8:41am	Email: Arup ([redacted] contacted stakeholder to follow up on status of comments.	**STAKEHOLDERS** **EPA:** [redacted]
Outgoing	22 November 3:55pm	Email: Additional comment response was provided to stakeholder.	**STAKEHOLDERS** **WSLHD:** [redacted]
Incoming	25 November 2019 9:36am	Email: [redacted] responded that they are satisfied with comment response.	**STAKEHOLDERS** **WSLHD:** [redacted]
Outgoing	25 November 2019 12:45pm	Call: Arup [redacted] contacted stakeholder and left a voicemail message.	**STAKEHOLDERS** **EPA:** [redacted]
Outgoing	27 November 2019 2:09pm	Call: Arup ([redacted] contacted stakeholder. [redacted] is out of office until 15th December. Voicemail was left with [redacted]	**STAKEHOLDERS** **EPA:** [redacted]
Outgoing	29 November 2019 2:15pm	Call: Arup ([redacted] contacted stakeholder.	**STAKEHOLDERS** **EPA:** [redacted]
Incoming	2 December 2019 9:12am	Email: EPA responded that they are satisfied with comment response.	**STAKEHOLDERS** **EPA:** [redacted]

Table F3-2: Log of issues raised by government stakeholders

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
Consultation workshop			
1	Noted that additional buildings have sensitive equipment or are active wards. This included, but not limited to: • Riverview (Bld 31) with ECT machine at far end • Bld 112 &51 • Boronia • Bunya • Yarralla Updated map of buildings with wards or sensitive equipment to be provided to Arup by WSLHD before next consultation meeting and an assessment of the proximity and potential impact of the works to occur.	Land use maps shown in Appendix B and the assessment of vibration impacts (Section C3.5 of Appendix C) has been updated to include sensitive equipment located at the Riverview building.	Closed
2	Discussion on hours of works, how contractors are and the potential need for respite periods. Further discussion on when the most appropriate time for respite is, based upon proximity of works to customers and their timetables.	Active consultation between The Contractor and the hospital shall be put in place regarding activities to be conducted, anticipated dates/hours and respite periods proposed (via disruption notice issued by The Contractor). Cumberland hospital (East and West) Campus shall also develop a communication strategy for the construction works to communicate information effectively within the hospital and to provide specific guidance management measures to cater for the different needs for the different parts of the campuses.	Closed

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
3	It was noted that the noise and vibration assessment considered the most sensitive users under the guidelines but mitigation measures will be reviewed based on the feedback and additional information provided by Health.	Mitigation and management practices have been updated as relevant to respond to feedback from consultation. As noted above, a communication strategy is to be prepared by Cumberland Hospital, providing specific guidance management measures to cater for the different needs for the different parts of the campuses.	Closed
4	Works classified as not high noise impacting can occur prior to 8am as agreed	The hours available for construction are shown in Table 4-1.	Closed
CoPC			
5	Plans have been reviewed and they have been found to be satisfactory with no comments considered necessary.	N/A	N/A
EPA			
6	Pg 24, table 4-1. Construction hours may differ in EPL	This package of works does not require an Environmental Protection Licence (EPL). TfNSW have confirmed that packages of enabling or early works are not subject to the project-wide EPL. Once these sites are handed over for the next stage the project-wide EPL would need to be applied. No action required for this plan as its scope is limited to Early Works and an EPL does not apply to these works.	Closed
7	Pg 25, table 4-2. Respite period and OOHW hours may differ within an EPL.	See response for comment 6 Respite periods that apply are shown in Table 4-2 and Table 6-1.	Closed
8	Pg 25, table 4-2 Notes: 'Except as permitted by an EPL, or through the out-of-hours work protocol" - EPL should take precedence where there is both EPL and OOW Protocol in place	See response for comment 6	Closed

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
9	pg 34, Construction activities taking place at night to comply with an EPL	See response for comment 6 OOHW will be managed in accordance with the OOHW protocol. However note that no OOHW are proposed for activity B and C.	Closed
10	Pg 46, Training. -Suggest to include compliance with EPL awareness training	See response for comment 6	Closed
11	Pg 47, Table 6-1, "Consultation with nearby childcare centres shall be carried out to potentially avoid noisy works during rest periods at the centres (where possible)" suggest to remove "Where Possible"	Consultation with nearby childcares centres is applicable for the works to be conducted on Hawkesbury Road, however it is not applicable for Activity B and C. CNVMP for the works in Hawkesbury Road has been approved including this wording. Therefore, no change has been made.	Closed
12	Pg 47, Table 6-1, copy of Complaints register provided to EPA as per EPL condition	See response to comment 6. Complaints will be recorded and managed as detailed in Section 3.6.4 of the CEMP	Closed
13	Pg 48 "Where feasible and reasonable, construction shall be carried out during the standard daytime working hours." include 'and inline with EPL'	See response to comment 6.	Closed
14	Pg 49 , Construction hour scheduling. Include reference to working inline with EPL	See response to comment 6.	Closed
15	Pg 49, table 6-1, vehicle movements, where possible, heavy vehicle movements shall be limited to daytime hours - Include a line confirming that where this is not possible, impacted receivers will be notified in advance.	All OOHW will be managed in accordance with the OOHW protocol, however note that no OOHW are proposed for Activity B and C. Where OOHW are required an assessment will be conducted including the extent of project notifications.	Closed
16	pg 84 OOHW Construction Justification. Include reference to complying with EPL conditions	See response to comment 6.	Closed

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
17	Appendix D, suggest that a section be included to confirm OOHW is in line with EPL	See response to comment 6.	Closed
18	pg 137, reporting. Suggest including confirmation that reports will be available to ARA	Appendix E has been amended. Exceedances of criteria will be sent to HAC. HAC will be responsible for reporting to TfNSW.	Closed
NSW Health			
19	As a person on the group to represent the needs and views of Consumers (patients), I think it is important to consider ongoing communication with the Consumers about what is happening with the construction to avoid misinformation. My colleague [redacted] and I, who both attended the meeting discussed could the days where there is most noise and disruption occurring to a particular area, could outings for the Consumers in that area be organised, where they are taken out of the hospital grounds for the day. As we will know the schedule of construction, these outings could be planned for. This will allow the Consumers in that area be away from the construction zone and noise and also have a pleasant activity for the day. I am aware that [redacted] has sent an email to [redacted] in regards to this. Also I think there needs to be close liaison from the builders with senior nurse managers communicating how the consumers are going with the construction and the impact this is having on them on a daily basis, similar to what occurred with the minor capital works	As per Ref No2 Active consultation between The Contractor and the hospital shall be put in place regarding activities to be conducted, anticipated dates/hours and respite periods proposed (via disruption notice issued by The Contractor). Cumberland hospital (East and West) Campus shall also develop a communication strategy for the construction works to communicate information effectively within the hospital and to provide specific guidance management measures to cater for the different needs for the different parts of the campuses	Closed

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
	program at Bungaribee House. This handover happened twice a day with the Bungaribee minor capital works. I can see a lot of work has gone into the preparation, noise testing etc which is great to see. The impact on mental health consumers and their mental state needs to be sensitively addressed as part of the Construction process is the main feedback I would like to give.		
20	Page 21 Table 3-3 The CHIP Hostel Cottages are no longer in use / vacated so why include them here?	Noted. This has been updated in the assessment and discussion.	Closed
21	Page 21 Table 3-3 The line that refers to Cottages (rehabilitation units) should not be in this table, as they are on Cumberland West and are appropriately included in Table 3-4	It is acknowledged that the Cottages are within the Cumberland Hospital West Campus. The purpose of Table 3-3 is to outline all nearby receivers potentially impacted by noise and vibration due to works on Cumberland East Campus. Noise emission at the Cottages due to works as part of Activity B are included in the noise and vibration assessment.	Closed
22	Page 22 Table 3-4 The line that refers to Cottages (rehabilitation units) should be labelled Medical or Residential and not Commercial, as there are inpatients in these cottages 24:7	Land use maps shown in Appendix B and the assessment updated.	Closed
23	Pages 21-22 Table 3-4 The Boronia Sub-Acute Mental Health Inpatient Unit should be included, as it is not one of the cottages (rehabilitation units) and should be labelled Medical or Residential also.	Land use maps shown in Appendix B and the assessment updated.	Closed
24	"Page 24 - word order issue ... ICNG is defined on page viii as ICNG NSW Interim Construction Noise Guideline and used repeatedly but NSW Interim Noise Construction Guideline (INCG) appears on page 24	Noted and amended throughout. Correct wording is ICNG (Interim Construction Noise Guideline)	Closed

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
	then is repeated in some tables ... ? the same thing or different ?"		
25	Page 80+ - map incorrectly indicates Cumberland West and Cumberland East as all Commercial when the map on page 78+ correctly labels the inpatient units on Cumberland West and Cumberland East as Medical. Could be considered residential plus because consumers in Acacia and Boronia	Land use maps shown in Appendix B and the assessment updated.	Closed
26	Page 126 Wording refers to demolition of cottages in March / April 2020 and demolition of Boronia in Feb/Mar 2021 but this appears to be contradicted in Table C3.1 and Table C3.2 where Demolition is shown in Aug2019 and ... perhaps I'm missing something ?	The program of works in Appendix C have been updated to the latest information.	Closed
27	Page 20,21, Table 3-3; the Cumberland West cottages should be defined as residential and not commercial. Consumers are long stay residents within these cottages, and often stay on the site 24/7 each day	Land use maps shown in Appendix B and the assessment updated.	Closed
28	Page 24, Table 4-1; for a residential area, construction hours for 12 hours (7am-7pm)per working day, and also over weekends, would be unacceptable to the Cumberland Hospital West consumers who live on the site, irrespective of respite periods throughout the day	Table 4-1 outlines permitted standard hours of construction for the PLR project in accordance with CoA. It is noted that it is unlikely that demolition works will be conducted over a 12 hour period. Notwithstanding, active communication between The Contractor and the hospital shall be put in place regarding activities to be conducted, anticipated dates/hours and respite periods proposed (via disruption notice issued by The Contractor). Cumberland hospital (East and West) Campus shall also develop a communication strategy for the construction works to communicate information effectively within the	Closed

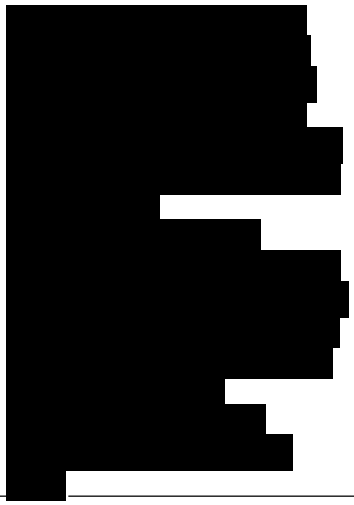
Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
		hospital and to provide specific guidance management measures to cater for the different needs for the different parts of the campuses	
29	Page 25, table 4-2, the OOHW if required are noted as requiring community consultation; clarity is requested that this consultation includes the consumers residing on Cumberland West campus and the inpatients within the Bunya unit on Cumberland East	Community consultation is described in Table 6-1 and include consultation to be conducted with Cumberland East and Cumberland West. Communication strategy developed by the hospital should be developed in accordance with consumers requirement.	Closed
30	Page 47, community consultation is welcomed in row 3 and perhaps should include Sydney Children's Hospital Network given proximity of the Children's Hospital at Westmead and it's Medical Centre. 15/11/2019 – I cannot see that SCHN & medical centre are included in community consultation	Community Consultation with Westmead Hospital and research partner is included on row 2. 22/11/2019 - Western Sydney Local Health District facilitated the on site consultation sessions where SCHN and Medical Centre were consulted for works occurring as Stage 1, Package 2, Activity A (Cumberland Hospital East and West are Stage 1, Package 2, Activity B and C, respectively). Comments are addressed in Appendix F2.	Closed
31	Page 47, consultation at row 4 with Cumberland East and West should form part of a Communication Plan with WSLHD staff working in Cumberland East and West. Communication should not be limited to engagement prior to works but throughout and local liaison should not be limited to Cumberland East. 15/11/2019 – Communication strategy is referenced on pg 53 has been assigned the responsibility of Cumberland Hospital. I believe this should be the Communications Manager. I provide the relevant extract	Table 6-1 has been amended 22/11/2019 - It is the responsibility of Western Sydney Local Health District / Cumberland Hospital to determine how they will communicate project impacts to staff (i.e. internal communication strategy). This is not the responsibility of the contractor. The contractor will hold weekly meetings with Western Sydney Local Health District and key Stakeholders to update them on project changes/potential impacts as detailed on page 59 of the CEMP.	Closed

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
	below for ease of reference at *. *"Cumberland hospital (East and West) Campus developed a communication strategy for the construction works to communicate information effectively within the hospital and to provide specific guidance management measures to cater for the different needs for the different parts of the campuses. The communication strategy is based on on-going collaborative communication between the Cumberland Hospital (East and West) Campus and The Contractor. (Refer to CEMP Section 3.1.2, 3.1.3, 3.6 and 3.7.2)"		
32	Page 48, under Works and Site Planning, Develop & Update Environmental Management plans, weekly monitoring, complaints and incidents register is noted. Communications Plan should be updated with information for staff on how to make a contribution/report to such register. 15/11/2019 – there is no update observed regarding communications of how staff can report a complaint or lodge an incident.	Communication strategy to include information on how to complaints can be raised. More information is also included in the Community Consultation Strategy available on the PLR website. 22/11/2019 - It is responsibility of Western Sydney Local Health District / Cumberland Hospital to determine if they wish to have an internal process to report staff complaints. Otherwise complaints would be reported in the standard process in Section 3.6.4 of the CEMP.	Closed
33	Pg 63, Condition E26 how will emergency construction works be communicated to WSLHD facility management? Incorporate in Communications Plan. 15/11/2019 – The following sentence is noted: "The Proponent must also use best endeavours to notify all affected sensitive receivers of the likely impact and	Communication strategy to include emergency communications procedures. 22/11/2019 - Section 3.7 of the CEMP addresses how emergency incidents will be managed. It is noted that the Cumberland Hospital Disaster Controller is a 24 hour contact who will be notified of any emergencies that may impact on Cumberland Hospital and will	Closed

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
	duration of those works". It remains unclear how emergency construction works will be communicated and to whom.	contact site operations should emergencies impact on the construction.	
34	Pg 134, Appendix E indicates exceedances will be reported to staff at Transport NSW. It is suggested that WSLHD Work Health & Safety is also in receipt of any exceedances reported. 15/11/2019 – "Exceedances of criteria will be sent to HAC. It will be HAC's responsibility to report to TFNSW". There has been no inclusion of WSLHD WHS for the reporting of exceedances.	Appendix E has been amended. Exceedances of criteria will be sent to HAC. HAC will be responsible for reporting to TfNSW. 22/11/2019 - It is a legislative requirement that TfNSW is reported to for any exceedances. HAC may choose to advise WSLHD WHS of these exceedances at their discretion.	Closed
35	Pg 146 & 151 outlines that no noise monitoring will occur for Cumberland East and West proposed works are minor. Short term monitoring will only occur in response to specific complaints, however, there appears to be no complaint management/incident reporting process available for staff (as per 13 above). 15/11/2019 – No complaint management/incident reporting process is evident for staff. Also in E4 & E6 for noise monitoring, there is no inclusion of WSLHD WHS for the reporting of exceedances.	Complaints are recorded and managed as detailed in Section 3.6.4 of the CEMP. Communication strategy to include information on how to make a complaint. More information is also included in the Community Consultation Strategy available on the PLR website. 22/11/2019 - It is responsibility of Western Sydney Local Health District / Cumberland Hospital to determine if they wish to have an internal process to report staff complaints. Otherwise complaints would be reported in the standard process in Section 3.6.4 of the CEMP. It is a legislative requirement that TfNSW is reported to for any exceedances. HAC may choose to advise WSLHD WHS of these exceedances at their discretion.	Closed
36	[redacted]	[redacted]	Closed

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
	[redacted]	[redacted]	
37	The usual criterion of 'sleep disturbance' needs to be expanded to include assessment of noise across the 24 hour period in the light of a patient population with more than normal sensitivity to noise who may experience a worsening of their ability to think and function when experiencing noise.	Assessment has been conducted in accordance with the relevant noise and vibration guidelines which include hospital receivers. All feasible and reasonable management and mitigation measures have been put in place. The Communication strategy developed by the hospital should address specific consumers requirement.	Closed
38	[redacted]	[redacted]	Closed

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
39	That there be a single point of contact person appointed to receive any reports of distress from staff, caused by the works amongst the patient cohort and a protocol designed for the advising of and amelioration of same - For example it might be better to use building number when reporting rather than ward name, descriptors clearly more in use with those conducting the works, in order to more quickly identify where the issue might lie	Specific management measures have been developed by the Cumberland Hospital in the communication strategy and will be implemented and updated as necessary (Refer to Section 6 of this sub-plan and to Section 3.1.2, 3.13, 3.6 and 3.7.2 of the CEMP)	Closed
40	A few staff and carer representatives suggested noise barriers be installed for the construction of the new building, demolition and also to mitigate the noise coming from construction of the PLR and its subsequent operations from 5am to 1am seven days per week.	This CNVMP covers the demolition of buildings at Cumberland Hospital only. Consumers' reactions to construction noise and vibration emissions are currently unknown and a reactive mitigation approach is currently planned in the communication strategy and will be implemented. Measures to mitigate noise have been addressed (such as but not limited to undertaking demolition of the walkways prior demolition of the buildings to provide shielding for Activity B). While noise mats are currently considered to be currently unpracticable for Activity B and Activity C, the reactive approach from the communication strategy will aim to identify additional management and mitigation measures following reported incidents to Cumberland Hospital as part of the communication strategy.	Closed.
41	[redacted]	[redacted]	Closed

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
			
42	Pages 21-22 Table 3-4 The Boronia Sub-Acute Mental Health Inpatient Unit should be included, as it is not one of the cottages (rehabilitation units) and should be labelled Residential also.	Land use maps shown in Appendix B and the assessment updated.	Closed
43	Page 24, Table 4-1; for a residential area, construction hours for 12 hours (7am-7pm) per working day, and also over weekends. This is unacceptable to the Cumberland Hospital West consumers who live on the site, irrespective of respite periods throughout the day	See response to comment 28.	Closed
44	Page 25, table 4-2, the OOHW if required are noted as requring community consultation; clarity is requested that this consultation includes the consumers residing on Cumberland West campus and the inpatients within the Bunya unit on Cumberland East	See response to comment 29.	Closed
45	Page 21 Table 3-3 The CHIP Hostel Cottages are no longer in use / vacated so why include them here	See response to comment 20.	Closed
46	Page 21 Table 3-3 The line that refers to Cottages (rehabilitation units) should not be in this table, as they are on Cumberland West	See response to comment 21.	Closed

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
	and are appropriately included in Table 3-4		
47	Additional resourcing - Peer Workers suggest that the days where there is most noise and disruption occurring to a particular area, could outings for the Consumers in that area be organised, where they are taken out of the hospital grounds for the day. As we will know the schedule of construction, these outings could be planned for. This will allow the Consumers in that area be away from the construction zone and noise and also have a pleasant activity for the day. In addition, a carer suggested that consideration be given to increasing nursing numbers in affected wards during this period both to help alleviate the concerns of patients as they arise and to provision escorted leave, for those who currently enjoy a more casual grounds leave, into designated areas away from harm	See response to comment 19.	Closed
48	A carer found it very unsettling that “buildings have been blanket classified as commercial with the exception of some classified as aged care facilities and hotel. I realise that for hospital classification there must be operating theatres on site. It seems that generally there is no classification for quiet zones where mentally ill people are recovering. The mitigation of all unfavourable conditions is left to localised advocacy which depends on the ability of the advocate to cut through the white noise and get to the centre of things which from my perspective means patient care and the minimisation of disruption of that care.....The best that can	As above all feasible and reasonable mitigation and management measures have been put in place as described in Table 6-1. In addition, the communication strategy developed by Cumberland Hospital shall provide specific guidance management measures to cater for the different needs for the different parts of the campuses to minimise noise and vibration impacts on consumers.	Closed

Comment Reference No.	Comment	How addressed and management plan reference	A description of any outstanding issues and the reason why
	be hoped for in the noise aspect is mitigation...”		
49	Nil further comment	N/A	N/A

F3.1. Endorsement letter of the CNVMP by AA

Air Noise Environment Pty Ltd

Unit 3, 4 Tombo Street
Capalaba
QLD 4157

[redacted]

ACN 081 834 513
ABN 13 081 834 513

Attention: Transport for NSW (PLR)

Ref: PLR-HAC-HRW-NV-PLN-000001_Rev5_AA_Endorsement_08Nov2019

8 November 2019

RE: PLR–HAC-HRW-NV_Rev5 (Noise and Vibration Management Sub-Plan) - Adequacy for Submission (AA Review)

[redacted] appointed Acoustic Advisor (AA), reviewed the following documentation with regard to the PLR – Stage 1 project:

Title:	Document Reference:	Version Status	Review Date
Appendix B3 Noise and Vibration Management Sub-Plan Parramatta Light Rail – Stage 1, Package 2: Westmead Precinct Works	PLR-HAC-HRW-NV-PLN-000001.1.08.1.04	Revision 1, May 2019	28 May 2019
	PLR-HAC-HRW-NV-PLN-000001.Rev_2.1	Revision 2.1, July 2019	23 July 2019
	PLR-HAC-HRW-NV-PLN-000001	Revision 5, Nov 2019	8 Nov 2019

The updates from prior CNVMP are generally provided to include Activity B and C (Cumberland Precinct).

Pursuant to Schedule 12 of the Deed (ISD-18-7058) and Conditions of Approval A29(g) iv, the review is inclusive of the associated Ancillary Facility site. Each were found to be of low noise impact on surrounding existing sensitive receiver areas. Furthermore the Construction Monitoring Program (noise and vibration) is found suitable to meet the requirements of the Conditions of Approval C10, C17.

The review confirms the documents have incorporated the recommendations and changes requested by the AA, in ensuring the documents meet the acoustic requirements of the Terms of Approval (NSW Government – Infrastructure Approval (Application No.: SSI 8285)), as well as best practice methodologies for acoustics.

Yours sincerely
for Air Noise Environment Pty Ltd

[redacted]

Senior Environmental Engineer

[redacted]

F3.2. Endorsement letter of the CNVMP by ER

OptimE PTY LTD ATF Majocaev Trust
ABN 57683487196

24 Grays Point Road,
Grays Point, NSW 2232

[redacted]

www.optimenv.com.au

11 November 2019 [redacted]

Transport for NSW
Attention: [redacted]

Dear [redacted]

Package 2 of the Stage 1 Parramatta Light Rail project
Environmental Representative (ER) - Review of pre-construction documentation (Rev 5)

The pre-construction documentation for Package 2 of the Stage 1 Parramatta Light Rail project (Activity A - Hawkesbury Road Widening), approved by the Planning Secretary of the Department of Planning Industry & Environment on 13 August 2019, has been updated to incorporate:

- Activity B – Cumberland Hospital East Campus Demolition
- Activity C - Cumberland Hospital East Campus Demolition.

As the approved Environmental Representative for pre-construction documentation, I confirm that the updates are not considered minor. Pursuant to SSI8285 Condition of Approval A23 (d) i), I confirm that I have reviewed the following documentation to be re-submitted to the Secretary for approval:

- Construction Environmental Management Plan PLR-HAC-HRW-PE-PLN-000001 **Rev 5** (CoA C1)
- Construction Noise & Vibration Sub-plan PLR-HAC-HRW-NV-PLN-000001 **Rev 5** (CoA C3) incorporating the Land Use Survey (COA E20) and Out of Hours Work Protocol (CoA E28) and Construction Monitoring Program (noise and vibration monitoring), which was incorporated into the CNVMP as permitted by CoA C17
- Heritage Sub-plan PLR-HAC-HRW-PE-PLN-000005 **Rev 5** (CoA C3).

I confirm that I have reviewed the following documentation to be re-submitted to the Secretary for information:

- Transport Traffic and Access Sub-plan PLR-HAC-HRW-PE-PLN-000002 **Rev 5** (CoA C3)
- Flora and Fauna Biodiversity Sub-plan PLR-HACHRW-PE-PLN-000003 **Rev 5** (CoA C3)
- Flood Management Sub-plan PLR-HAC-HRW-PE-PLN-000007 **Rev 5** (CoA C3)
- Soil & Water Management Plan PLR-HAC-HRW-PE-PLN-000004 **Rev 5** (REMMM GEN-1)
- Pre-Construction Compliance Report PLR-HAC-HRW-PE-PLN-000009 **Rev 5** (CoA A34).

I confirm that I have reviewed the following additional documentation to be submitted to the Secretary for information:

- Photographic Archival Recording PLR-ARUP-HRW-HE-RPT-000002 (CoA E70)
- Salvage Strategy PLR-ARUP-HRW-HE-RPT-000003 (CoA E70)
- Historical Archaeological Research Design PLR-ARUP-HRW-HE-RPT-000001 **Rev 6** (CoA E72).

In my opinion the documents are consistent with the requirements included in or required under the terms of the Conditions of Approval for Package 2 of the Stage 1 Parramatta Light Rail project.

In addition, I acknowledge the endorsement of the Construction Noise & Vibration Sub-plan PLR-HAC-HRW-NV-PLN-000001 (Rev 5) by the PLR Acoustic Advisor by letter (PLR-HAC-HRW-NV-PLN-000001_Rev5_AA_Endorsement_08Nov2019).

Yours sincerely,

Environmental Representative for pre-construction documentation - PLR Early Works
OptimE Pty Ltd


NSW
GOVERNMENT