

Appendix B3

Noise and Vibration Management Sub Plan Infrastructure Works Stage 1

Parramatta Light Rail – Stage 1

November 2021

PLR1INF-CPBD-ALL-NV-PLN-000001 Rev 11

Noise and Vibration Management Sub-plan

Project Name: Parramatta Light Rail Stage 1
Infrastructure Contract

Project number	N81080
Document number	PLR1INF-CPBD-ALL-NV-PLN-000001
Revision date	26/11/2021
Revision	11

Rev.	Date	Prepared By	Reviewed By	Approved By	Remarks
A	03/03/2019				nil
B	08/04/2019				nil
0	08/04/2019				nil
1	04/06/2019				nil
2	05/08/2019				nil
3	13/08/2019				nil
4	15/08/2019				nil
5	15/08/2019				nil
6	8/11/2019				nil
7	10/02/2020				nil
8	01/05/2020				nil
9	19/08/2020				nil
10	8/10/2020				nil
11	26/11/2021				nil

Details of Revision Amendments

Document Control

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

Amendments

Any revisions or amendments must be approved by the Project Director and/or client before being distributed / implemented.

Revision	Details
Rev A	Initial submission.
Rev B	Internal review.
Rev 0	First draft submitted to TfNSW and ER.
Rev 1	Incorporation of TfNSW / ER Rev 0 comments. Revision issued for external stakeholder consultation.
Rev 2	Second draft submitted to TfNSW and ER for ER endorsement.
Rev 3	Incorporation of AA comments and submitted to ER for endorsement.
Rev 4	Incorporation of ER comments and submitted to ER for endorsement.
Rev 5	Incorporation of ER endorsement and submitted to the DPIE for approval.
Rev 6	Incorporation of DPIE comments and ER endorsement letter qualifications. Submitted to the DPIE for approval.
Rev 7	Minor amendments following issue of Environmental Protection Licence 21347 and minor errors and omissions from Rev 6 raised by the AA.
Rev 8	Minor amendments following DPIE review of Rev 7.
Rev 9	Minor amendments as part of annual review.
Rev 10	Minor amendments as part of annual review.
Rev 11	Minor amendments as part of annual review.

THIS PAGE LEFT INTENTIONALLY BLANK

Contents

Contents	i
Glossary/Abbreviations.....	iv
1 Introduction	1
1.1 Context	1
1.2 Background and project description	1
1.3 Infrastructure Works	4
1.4 Relationship with SOM	5
1.5 Scope of this sub-plan	5
1.6 Environmental Management Systems Overview	6
2 Purpose and objectives	9
2.1 Purpose	9
2.2 Objectives.....	9
2.3 Targets	9
3 Environmental requirements	10
3.1 Relevant legislation	10
3.2 Transport for NSW's Construction Noise and Vibration Strategy	10
3.3 Minister's Conditions of Approval	11
3.4 Revised Environmental Mitigation and Management Measures	38
3.5 Environmental Performance Outcomes.....	58
4 Consultation	60
5 Construction Hours of Work	61
5.1 Hours of Works.....	61
5.2 Works Outside of Standard Hours of Works (Out-of-Hours)	62
6 Construction Noise and Vibration Objectives	63
6.1 Construction noise and assessment objectives.....	63
6.2 Construction Noise Management Levels.....	63
6.3 Construction Ground-borne Noise Guideline.....	67
6.4 Construction Vibration criteria	68
7 Background noise and Noise Sensitive Receivers	72
7.1 Baseline noise and noise management levels	72
7.2 Precincts, Noise Catchment Areas and Surrounding Land Uses	74
7.3 Sensitive receivers	78
7.4 Heritage buildings.....	83

8	Environmental aspects and impacts	87
8.1	Environmental aspects	87
8.2	Environmental impacts	87
9	Construction noise and vibration assessment	93
9.1	Construction Noise and Vibration Impact Statements	93
10	Operational noise and vibration	94
10.1	Operational Noise and Vibration Assessment	94
11	Environmental control measures	95
11.1	Cumulative Impacts	95
11.2	Respite periods	95
11.3	Additional Noise and Vibration Mitigation Measures	96
11.4	Other Noise and Vibration Consultation Requirements	98
11.5	Hierarchy of Preferred Working Hours	99
11.6	Management and Mitigation Measures	100
12	Compliance management	123
12.1	Roles and responsibilities	123
12.2	Training	126
12.3	Inspection and monitoring	127
12.4	Monitoring and inspection schedule	133
12.5	Reporting	133
12.6	Auditing	146
12.7	Licences and permits	146
13	Review and improvement	147
13.1	Continuous improvement	147
13.2	Update and amendment	147
	Appendix A – Out of Hours Work Protocol	148
	Appendix B – Land Use Survey	149
	Appendix C – Construction Works and Sound Power Levels for Construction Equipment	150
	Appendix D – Predicted worst-case noise levels	153
	Appendix E – Consultation Evidence	160
	Appendix F – Acoustic Advisor and Environmental Representative Endorsement	175

Tables

Table 3-1: Minister's Conditions of Approval.....	11
Table 3-2: Revised environmental mitigation measures relevant to this NVMP	38
Table 3-3: Environmental Performance Outcomes relevant to this NVMP	58
Table 4-1: Summary of Consultation and Approval	60
Table 6-1: NMLs at Residential Receivers.....	64
Table 6-2: ICNG NMLs for Other Sensitive Receivers.....	65
Table 6-3: NMLs for Project Specific Other Sensitive Receivers	66
Table 6-4: RNP Criteria for Assessing Construction Vehicles on Public Roads	67
Table 6-5: Preferred and Maximum Vibration Dose Values for Intermittent Vibration	68
Table 6-6: Transient Vibration Guide Values - Minimal Risk of Cosmetic Damage	69
Table 6-7: Recommended minimum working distances from vibration intensive equipment.....	70
Table 7-1: Noise Management Levels at Residential Receivers	73
Table 7-2: Precincts, Noise Catchment Areas and Surrounding Land Uses	74
Table 7-3: Other Noise and Vibration Sensitive Receivers	78
Table 7-4: Heritage Items Identified Within Cosmetic Damage Minimum Safe Working Distance .	83
Table 8-1: Predicted Ground-borne Noise Impacts from Rockbreaking Activities	89
Table 8-2: Construction vibration assessment summary (assuming use of a large rock breaker) - Westmead precinct	91
Table 11-1: Noise and vibration management and mitigation measures	97
Table 11-2: Noise and vibration management and mitigation measures	101
Table 12-1: Ambient Noise Monitoring Locations	129
Table 12-2: Inspection and Monitoring Requirements	134
Table 12-3: Reporting Requirements	140

Figures

Figure 1 1: Parramatta Light Rail Stage 1 Route	2
Figure 1 2: Parramatta Light Rail Stage 1 Delivery Strategy	4
Figure 1 3: Relationship between SOM and INF	5
Figure 1 4: Environmental Management System.....	8
Figure 7 1: Site Plan and Monitoring Locations (Westmead, Parramatta and Camellia).....	76
Figure 7 2: Site Plan and Monitoring Locations (Carlingford)	77

Glossary/Abbreviations

Abbreviations	Expanded text
AA	The Acoustics Advisor for the CSSI, as defined by Condition of Approval A26
AltA	Alternate 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
Attenuation	The reduction in the level of sound or vibration
CAP	Communication Action Plan
CEP	Communication and Engagement Management Plan
CEMP	Construction Environmental Management Plan
CNVIS	Construction Noise and Vibration Impact Statement
CoA	Condition of Approval
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear
DPIE	NSW Department of Planning, Industry and Environment (functions of the former Department of Planning and Environment and Planning and Office of Environment and Heritage (OEH) are now administered by the Department of Planning, Industry and Environment)
EIS	Environmental Impact Statement
EMS	Environmental management system
Environmental aspect	Defined by AS/NZS ISO 14001:2015 as an element of an organisation's activities, products or services that can interact with the environment
Environmental impact	Defined by AS/NZS ISO 14001:2015 as any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects

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 to achieve those objectives
EPA	NSW Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
ER	Environmental Representative
ECM	Environmental Control Map
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements
Highly Noise Affected	Activities that result in a noise level that exceed 75 dB(A)
High Noise Impact activity or works	Means jack hammering, rock breaking or hammering, pile driving, vibratory rolling, cutting of pavement, concrete or steel or other work occurring on the surface that generates noise with impulsive, intermittent, tonal or low frequency characteristics
JV, the	CPB Contractors and Downer EDI Works Joint Venture (Parramatta Connect)
LAeq (15min)	The A-weighted equivalent continuous (energy average) A-weighted sound pressure level of the construction works under consideration over a 15-minute period and excludes other noise sources such as from industry, road, rail and the community
LA (max)	The A-weighted maximum noise level only from the construction works under consideration, measured using the fast time weighting on a sound level meter
Noisy or Noise Affected	Activities that result in a noise level that exceed the Noise Management Level (see NML)

Abbreviations	Expanded text
NML	Noise Management Level Recommended Standard Hours - RBL + 10 dB Outside recommended standard hours - RBL + 5 dB
OEH	Former Office of Environment and Heritage. Relevant functions of the OEH are now administered by the Department of Planning, Industry and Environment
RBL	The Rating Background Level for each period is representative of the typical lowest ambient noise level not exceeded for more than 90% of the daytime, evening, or night-time period
REMMM	Revised Environmental Mitigation and Management Measure
SWP	Sound Power Level
SPIR	Submissions and Preferred Infrastructure Report
SPL	Sound Pressure Level
TCP	Traffic Control Plan
VMP	Site Vehicle Movement Plans

1 Introduction

1.1 Context

This Construction Noise and Vibration Management Sub Plan (NVMP or Sub-plan) forms part of the Construction Environmental Management Plan (CEMP) for Parramatta Light Rail Stage 1, Package 4 Infrastructure Works (Infrastructure Works). This NVMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA) SSI-8285, the revised environmental mitigation and management measures (REMMMs) and Environmental Performance Outcomes (EPO's) listed in *Parramatta Light Rail Stage 1 Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement* (the 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). In addition, this Sub-plan addresses all applicable legislation and contractual requirements, including the PLR Stage 1 Infrastructure Contract Project Deed (ISD-17-6721).

1.2 Background and project description

1.2.1 Parramatta Light Rail – Stage 1 description

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

Stage 1 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 Stage 1 include:

- A new dual track light rail network of approximately twelve (12) kilometres in length, including approximately seven (7) kilometres within the existing road corridor and approximately 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 approximately every 7.5 minutes in the peak period between 7am and 7pm
- Modern and comfortable air-conditioned light rail vehicles, nominally 45 metres long and driver-operated, each carrying up to 300 passengers.
- Intermodal interchanges with existing public transport services at Westmead terminus, Parramatta CBD and the Carlingford terminus
- Creation of two light rail and pedestrian zones (no general vehicle access) within the Parramatta CBD along Church Street (generally between Market Street and Macquarie Street) and along Macquarie Street (generally between Horwood Place and Smith Street)

- A Stabling and Maintenance (SaM) Facility located in Camellia for light rail vehicles (LRV) to be stabled, cleaned and maintained
- New bridge structures along the alignment including over James Ruse Drive and Clay Cliff Creek, Parramatta River (near the Cumberland Hospital), Kissing Point Road and Vineyard Creek, Rydalmere
- 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
- Closure of the heavy rail line between Carlingford and Clyde
- Active transport corridors and additional urban design features along Sections of the alignment and within Stop precincts
- Integration with the Opal Electronic Ticketing System (ETS)
- 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**.

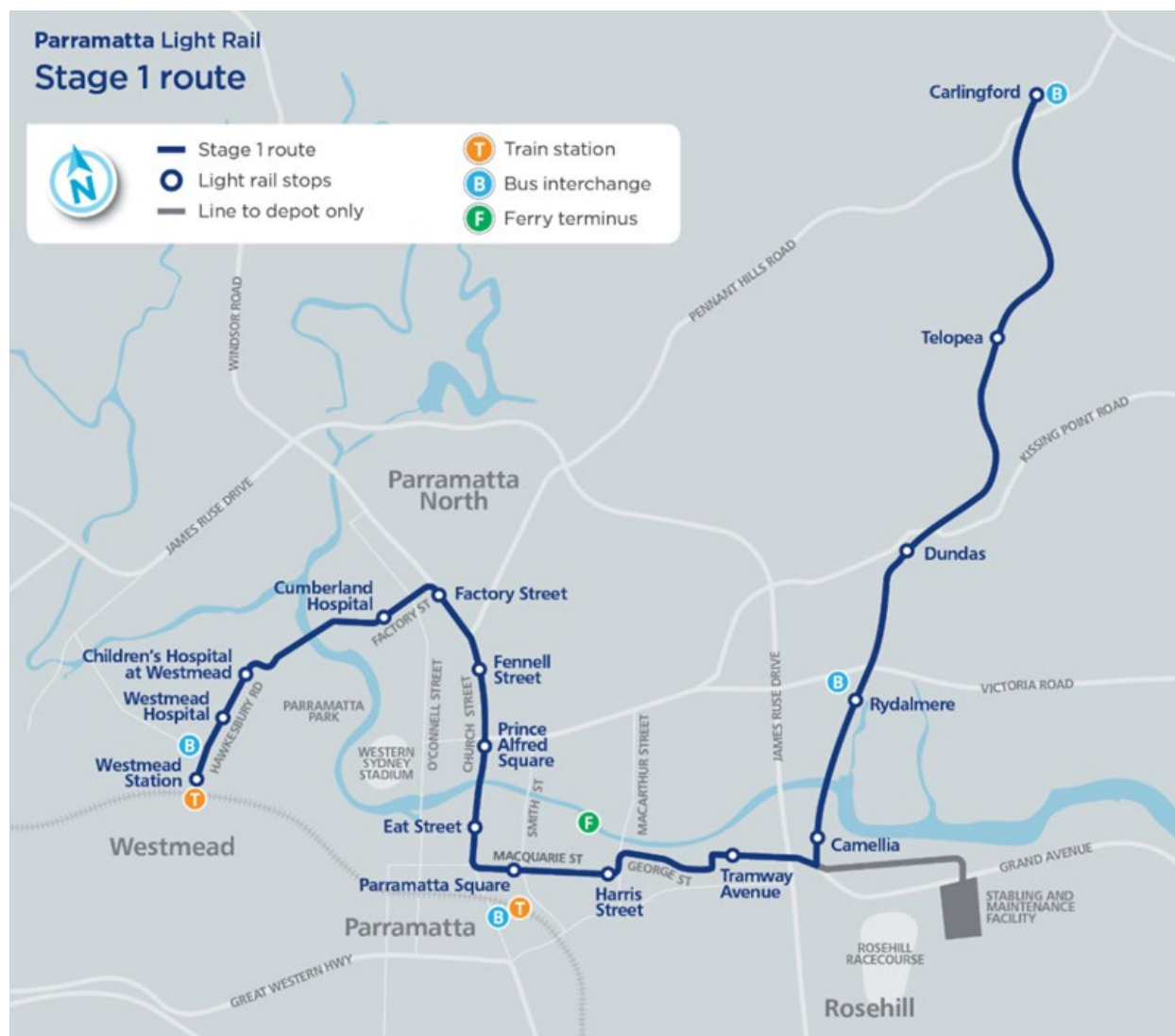


Figure 1-1: Parramatta Light Rail Stage 1 Route

1.2.2 Statutory Context

The Parramatta Light Rail 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). The EIS assessed impacts for Parramatta Light Rail Stage 1 (Westmead to Carlingford). This covered the light rail and associated works including road enabling work.

Stage 1 received Infrastructure Approval from the Minister for Planning under Section 5.19 of the EP&A Act on 29 May 2018 (Critical State Significant Infrastructure Application SSI-8285), subject to the conditions provided in the Instrument of Approval, specifically Schedule B – Ministerial Conditions of Approval.

The Infrastructure Approval was subsequently modified under Section 5.25 of the EP&A Act on 21 December 2018 and 25 January 2019.

The planning approval, modifications and related environmental assessment documents are located at: http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8285.

1.2.3 Stage 1 Delivery Strategy

Delivery of Stage 1 is achieved through the following five packages of work:

- **Enabling Works (Package 1)** – Local road network improvements including O’Connell Street and George Street (off-alignment)
- **Westmead Precinct Works (Package 2)** – Hawkesbury Road widening and demolition at Cumberland Hospital (east and west Campus)
- **Early Works (Package 3)** – Remediation of the Stabling and Maintenance (SaM) Facility
- **Infrastructure Works (Package 4) (the subject of this Sub-plan)** – Design and construction of civil works, public domain and light rail infrastructure up to road level/top of rail and to the top of the concrete slab at stops, including provision of utility services (excluding high-voltage power supply and cabling for rail systems), and decommissioning of the T6 Carlingford Line
- **Supply, Operate and Maintain Works (Package 5)** – Design and construction of the light rail systems, high-voltage power supply and stops above slab level, the supply of light rail vehicles, and the design and construction of the SaM Facility, including all light rail operations, customer service and asset management.

Each package of work is to be delivered under separate contracts on behalf of the proponent Transport for NSW. While the packages will commence at different times under separate construction approvals, there will be periods during which the packages works will overlap. The interactions between the packages are shown in **Figure 1-2**.

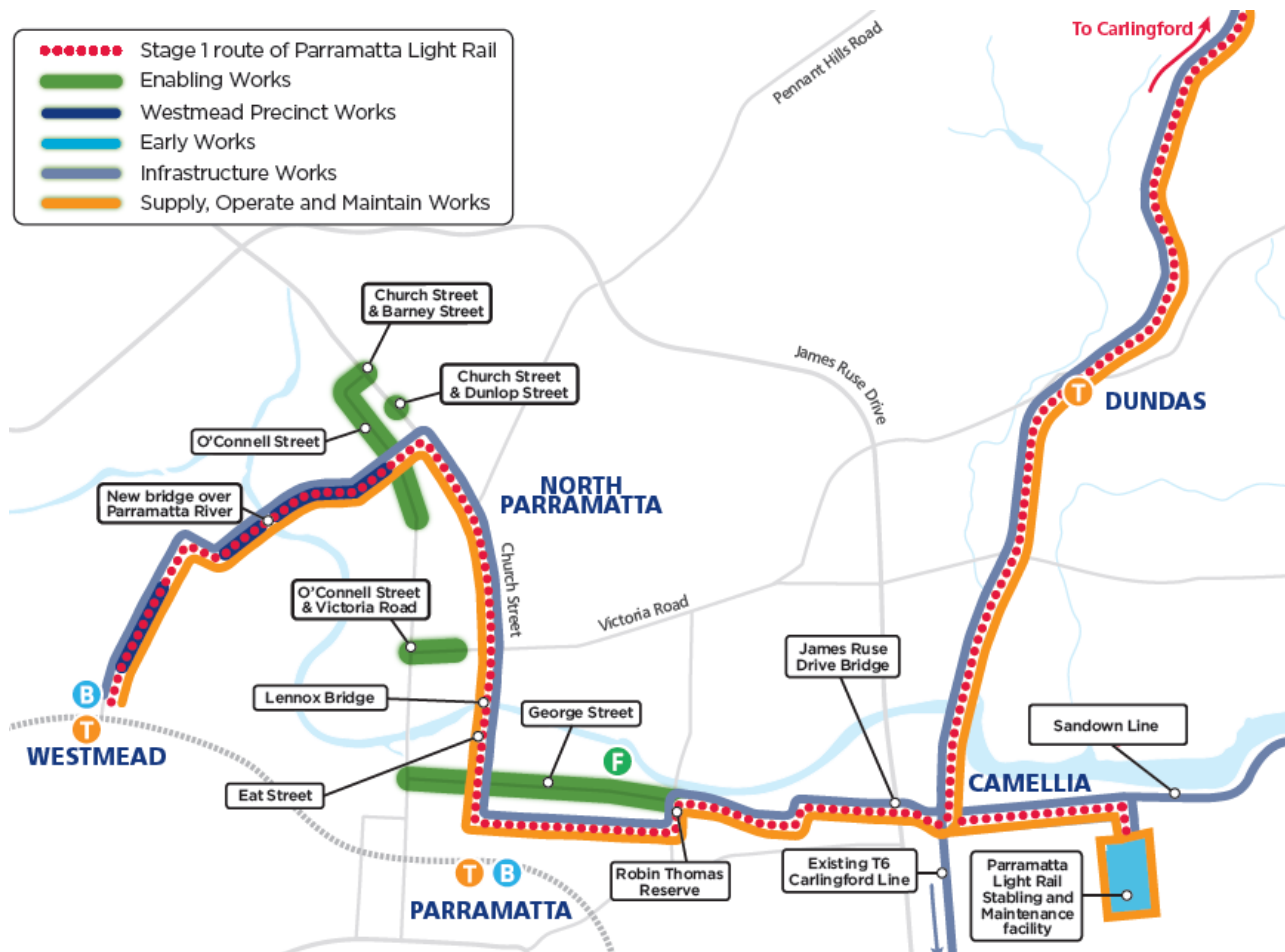


Figure 1-2: Parramatta Light Rail Stage 1 Delivery Strategy

1.3 Infrastructure Works

The CPB Contractors and Downer EDI Works Joint Venture (JV), Parramatta Connect, has been engaged to deliver Package 4 – Infrastructure Works (INF).

In summary the Infrastructure Works include:

- Utility Services adjustment and relocation works (for more than minor impact)
- Property demolition to make space for the light rail tracks and ancillary facilities
- Decommissioning of the existing Carlingford T6 heavy rail line and disused Sandown Line
- Earthworks and retaining structures
- Drainage works
- Intersection signalling works
- The light rail civil infrastructure and Stop slabs
- Urban and architectural design and finishes of the corridor and public domain
- Rail, track slabs, ballasted track and grass tracks
- Footpath and kerb realignment including intersection works and road upgrades to accommodate light rail and other traffic (both temporary and permanent)
- New light rail bridges carrying the light rail over the Parramatta River (at Cumberland Hospital), James Ruse Drive, Vineyard Creek and Kissing Point Road and bridge strengthening and modifications to existing bridges as required

- Provision of the Active Transport Link for pedestrians and cyclists
- Staff and passenger facilities at each light rail terminus
- Rail/road interaction including traffic signals and road sharing
- Testing and commissioning of the Infrastructure Works.

1.4 Relationship with SOM

The Infrastructure Works is closely aligned to the Package 5, Supply, Operate and Maintain (SOM) Works which is being delivered by the Great River City Light Rail consortium. A graphical representation of the split in scope between the two packages is depicted in **Figure 1-3**.

The reasoning for dividing this work into two stages is to ensure that suitably qualified and experienced sub-contractors are in place for each specialised component; civil infrastructure, and operational systems. The Infrastructure Works will deliver the civil infrastructure components of Stage 1 and will not trigger the operational conditions with the exception of those that relate to detailed design.

An interface between the two Joint Ventures has been established to monitor cumulative impacts and the coordination of environmental complaints management, site management controls, and the delineation of incident reporting and non-conformance management. Opportunities to share information, materials and resources will also be explored to support an overall minimisation of noise and vibration impacts during construction (cumulative) and operation.

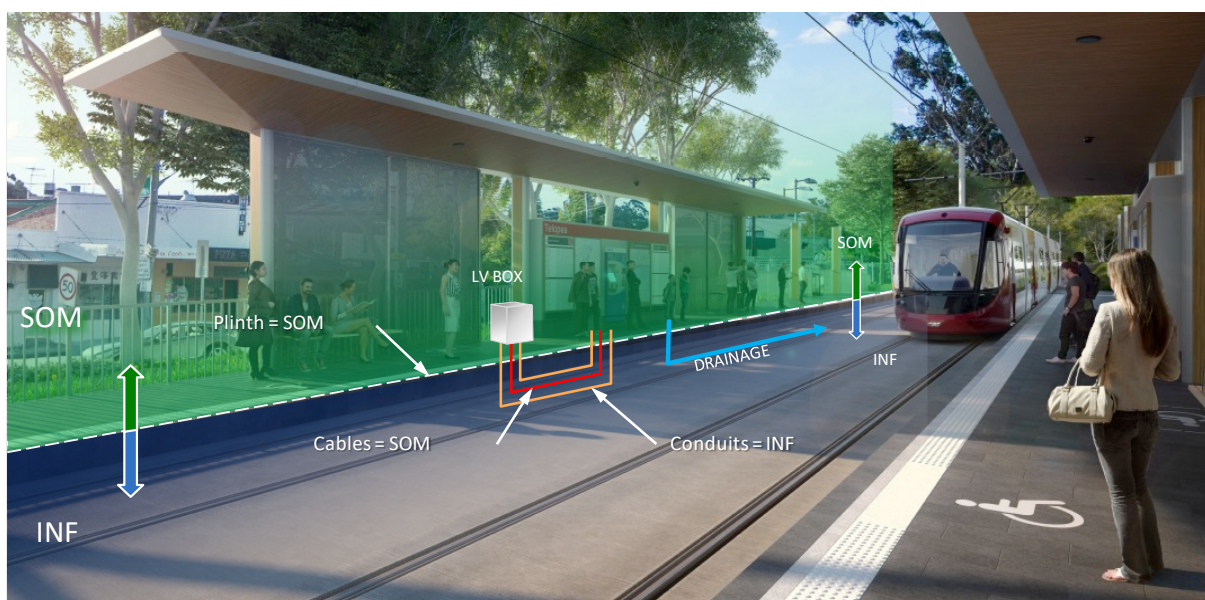


Figure 1-3: Relationship between SOM and INF

1.5 Scope of this sub-plan

This Sub-plan outlines the mitigation and management measures the CPB Contractors and Downer EDI Works Joint Venture (the JV) will use to address potential impacts to noise and vibration during design and construction of the Infrastructure Works, while complying with relevant approval, statutory and contract requirements. Sections 3.3, 3.4 and 3.5 provide compliance tables identifying where in this Sub-plan relevant requirements are addressed.

This Sub-plan is applicable to all activities during construction of the Infrastructure Works, including all areas where physical works will occur or areas that may be otherwise impacted by the construction works, and under the control of the JV. All the JV staff and sub-contractors are required to operate fully under the requirements of this Sub-plan and related environmental management plans, over the full duration of the construction program.

1.6 Environmental Management Systems Overview

The environmental management system (EMS) overview is described in Section 1.5 of the CEMP. The relationship between this Sub-plan and the CEMP is detailed in **Figure 1-4**. Key interactions for this Sub-plan with components of the EMS include:

- **The JV Environment and Sustainability Policy** – outlines the commitments and intentions established by the JV to ensure environmental performance and sustainability objectives and targets are achieved (Appendix A3 of the CEMP)
- **The CEMP** – This document details the processes and procedures to be implemented during the Infrastructure Works to comply with applicable CoA, REMMMs, EPOs, legislative obligations and contractual requirements
- **Environmental Management Sub-plans** – these documents describe procedures and controls for specific environmental aspects requiring more rigorous management strategies
- **Environmental Design Review Reports** – reports to accompany each design package that will demonstrate consideration of environmental impacts including, where relevant, noise and vibration impacts
- **Environmental Work Method Statements (EWMS)** – task-specific risk assessment prepared for high-risk construction activities with a focus on activities with significant environmental risks
- **Environmental Control Maps (ECMs)** – reflecting the outcomes of risk assessments, ECMs depict environmental risks and controls on site-specific maps
- **Geographic Information System (GIS)** – management of spatial data of key features of the alignment and relevant environmental constraints. Features include heritage items and sensitive receivers identified in the Land Use Survey amongst other site relevant features. The GIS forms the basis of Environmental Control Maps (ECMs).
- **Procedures, strategies and protocols** – detailed procedures.

Key interactions for this Sub-plan with other management plans and documents include:

- **Land Use Survey (CoA E20)** – current survey to identify 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 (included in **Appendix B**)
- **Out of Hours Works (OOHW) Protocol (CoA E28)** – outlines a process for the consideration, management and approval of works which are outside the permitted hours defined in Conditions CoA E21 to E22, where an EPL does not apply
- **Construction Noise and Vibration Impact Statements (CoA E42)** – site specific assessments which utilise information from the Land Use Survey to predict noise and vibration impacts of construction activities used to determine suitable mitigation measures
- **TfNSW Community Communication Strategy (CoA B1)** – provides the framework for communication and engagement for Stage 1 of the Parramatta Light Rail (PLR)
- **JV Community and Engagement Management Plan (CEP)** – details specific procedures and processes for community notification, consultation and complaints management for the Infrastructure Works
- **Heritage Management Sub-plan (Appendix B3 of the CEMP)** – details the management controls and requirements for managing potential vibration impacts on identified heritage items

- **Grey-headed flying fox Monitoring Program** – identifies safeguards, including for noise control in relation to the protection of the grey-headed flying fox camp within Parramatta Park
- **Safety Management Plan** – provides the framework including details of procedures and protocols to manage potential noise and vibration impacts to workers.

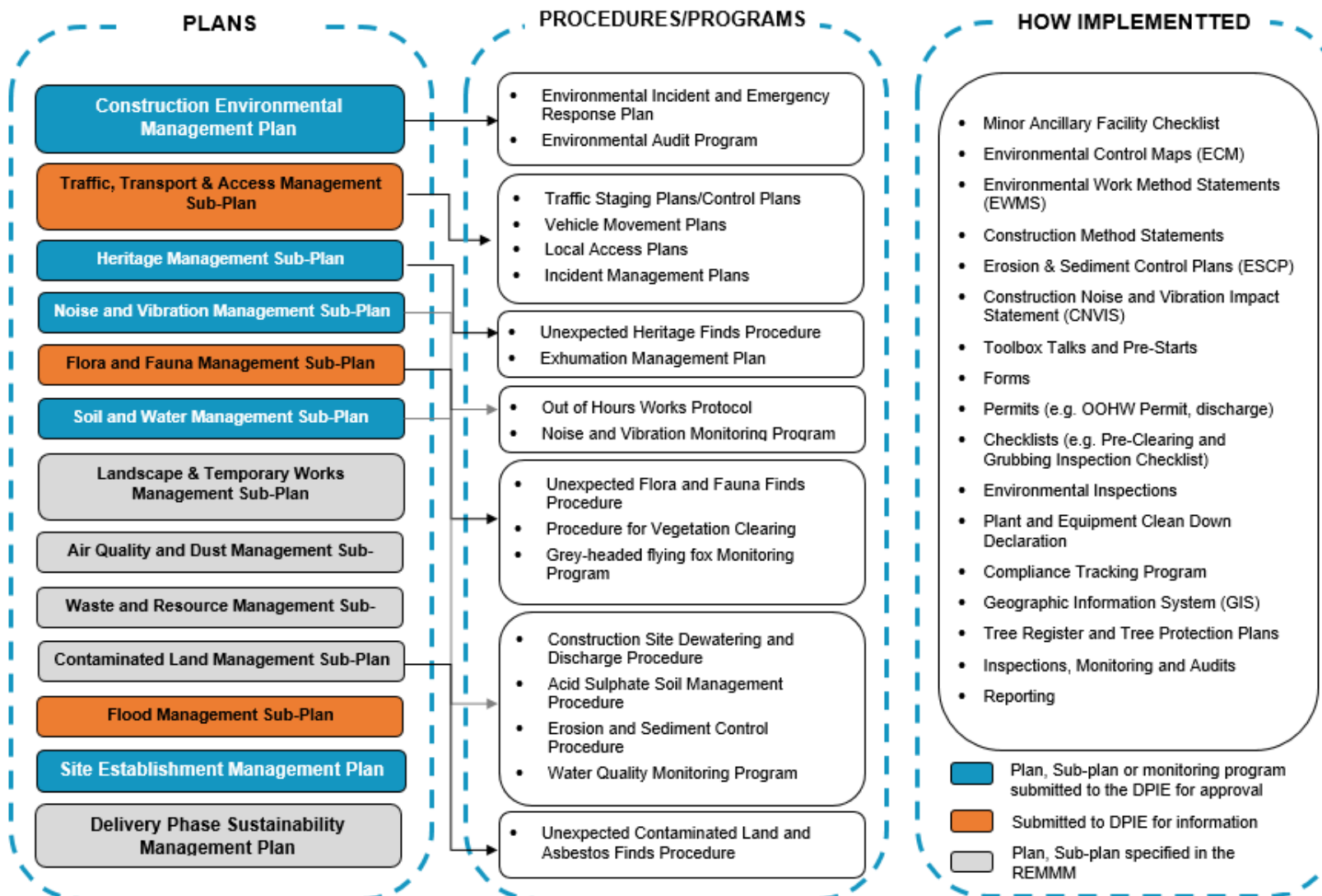


Figure 1-4: Environmental Management System

2 Purpose and objectives

2.1 Purpose

The purpose of this Sub-plan is to describe how the JV proposes to manage potential noise and vibration impacts during construction of the Infrastructure Works.

2.2 Objectives

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

- Environmental Impact Assessment prepared for Parramatta Light Rail – Stage 1
- Submissions and Preferred Infrastructure Report prepared for Parramatta Light Rail – Stage 1
- Conditions of Approval granted to the project on 29 May 2018 and modifications
- PLR Stage 1 Infrastructure Contract Project Deed (Project Deed).

Additional objectives and strategies of the Sub-plan include:

- Minimise noise and vibration impacts to the community resulting from construction and operation
- Avoid any damage to buildings, utilities, heritage items and sensitive equipment from vibration during construction.

2.3 Targets

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

- Comply fully with all relevant legislative requirements, CoA, REMMMs and EPOs
- Control noise and vibration at the source, on the source to receiver transmission path and at the receiver
- Meet the specific noise levels and vibration criteria as specified in the Planning approval
- No divergence from the noise management process
- No recurring or major exceedances of vibration goals for human comfort criteria
- Minimise noise levels with the aim of achieving the noise management levels where feasible and reasonable.

3 Environmental requirements

3.1 Relevant legislation

3.1.1 Legislation

All legislation relevant to this NVMP is included in Appendix A1 of the CEMP.

3.1.2 Guidelines

The main guidelines, specifications and policy documents relevant to this Sub-plan include:

- Australian Standard 2107-2000, Acoustics - Recommended design sound levels and reverberation times for building interiors
- Australian Standard 2187.2-2006, Explosives - Storage and use - Part 2 Use of explosives
- Australian Standard 2436-1981, Guide to Noise Control on Construction, Maintenance and Demolition Sites
- Australian Standard 2834-1995, Computer Accommodation, Chapter 2.9 Vibration
- British Standard 6472-2008, Evaluation of human exposure to vibration in buildings (1-80Hz)
- British Standard 7385.2-1993, Evaluation and measurement of vibration in buildings
- German Standard DIN4150-1999, Structural vibration Part 3: Effects of vibration on Structures
- IS Technical Manual Version 1.2, Infrastructure Sustainability Council of Australia (ISCA) 2016
- Noise Policy for Industry, NSW Environment Protection Authority 2017
- NSW Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- NSW Road Noise Policy, Department of Environment, Climate Change and Water 2011
- 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).

3.2 Transport for NSW's Construction Noise and Vibration Strategy

Transport for NSW's Construction Noise and Vibration Strategy (CNVS) is a key reference document for the development of this Sub-plan that is referred to by the Planning Approval and the Submissions and Preferred Infrastructure Report. The CNVS provides a framework for the assessment of impacts and standard, source and path mitigation measures that must be implemented relevant to infrastructure construction works.

The mitigation measures in Tables 4, 5, 6 and 7 of the CNVS have been referenced in the development of the mitigation and management measures in Section 11.

3.3 Minister's Conditions of Approval

The CoA relevant to this Sub-plan are listed **Table 3-1** below. A cross reference is also included to indicate where the condition is addressed in this Sub-plan or other project management documents.

Table 3-1: Minister's Conditions of Approval

CoA No.	Condition Requirements	Document Reference	How Addressed
A1	The CSSI must be carried out in accordance with the terms of this approval and generally in accordance with the description of the CSSI in the Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impact Statement (dated August 2017) (the EIS) as amended by (a) the Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report (incorporating Preferred Infrastructure Report) (February 2018) (the SPIR); (b) SSI 8285 Administrative modification (November 2018) (MOD 1); and (c) SSI 8285 Correction to Administrative modification (January 2019) (MOD 2).	Section 3.3 Section 3.4	Compliance tables demonstrate where and how the terms of the Planning Approval (based on the consolidated conditions following MOD 2) and the REMMMs in the SPIR have been addressed in this Sub-plan.

CoA No.	Condition Requirements	Document Reference	How Addressed
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).	Section 4 Appendix E	Details of consultation carried out during the development of this Sub-plan is provided in Section 4 and Appendix E.

CoA No.	Condition Requirements	Document Reference	How Addressed
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. 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.	Section 9.1	CNVIS will assess the potential impacts including duration. CNVIS will be used in the development of construction work procedures.
A26	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.	Section 12.1.2	A suitably qualified and experienced Acoustics Advisor has been appointed to the Project and has been approved by the DPIE. The AA has demonstrated independence to the design and construction personnel on the Project.

CoA No.	Condition Requirements	Document Reference	How Addressed
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.	Section 12.1.2	A suitably qualified and experienced Acoustics Advisor has been appointed to the Project. The AA has been approved by the DPIE.
A28	The Proponent must notify the Department in writing on the engagement of the AA including demonstrating the requirements of Conditions A26 and A27.	Section 12.1.2	The engagement of an AA was communicated to the Department. The AA has been approved by the DPIE.
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; (b) consider and inform the Secretary on matters specified in the terms of this approval relating to noise and vibration;	Section 12.1.2	The responsibilities of the AA are outlined in Section 12.1.2.

CoA No.	Condition Requirements	Document Reference	How Addressed
	(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);	Section 9.1 Section 12.1.2 Section 12.4 Section 11.4 Section 12.1.2	The AA will be provided with opportunities to recommend improvements that may be made to work practices through the review and endorsement of CNVIS, monitoring the implementation of all noise and vibration documents or during conflict resolution of issues between the JV and the community. The consultation outlined in Section 11.4 will inform the Projects mitigation and management measures. Communication Action Plans and Consultation Records will be made available to the AA. These measures will be revised as necessary. The following noise and vibration documents will be provided to the AA for review: • This Sub-plan • Land Use Survey (Section 12.3.1) • Building Condition Survey (Section 12.3.2) • Measurements of existing ambient vibration levels (Section 12.3.4) • CNVIS (Section 9.1) • Communication Action Plans and Consultation Records (Section 11.4) • Noise and Vibration Noise Complaint reports (CEMP Section 3.6.5) • Noise and Vibration Monitoring Report (Section 12.5).

CoA No.	Condition Requirements	Document Reference	How Addressed
	(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;	Section 12.1.2 Section 12.1.2 Section 12.6 Section 12.1.2 TfNSW Community Communication Strategy approved under Condition B3 Section 12.1.2 Section 13.2	The JV will facilitate the AA to attend inspections, monitoring or audits as requested by the AA or Secretary. Audits will be undertaken in accordance with Section 12.6. The AA or Secretary will plan and attend these audits if required. The JV will attend and provide all information required to complete these audits. The JV will cooperate with the AA and provide all information required for the AA to assist in resolving conflicts between the Proponent, JV and the community. The continuous improvement process for this Sub-plan will involve determining any relevant minor amendments.

CoA No.	Condition Requirements	Document Reference	How Addressed
	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.	Section 9.1	The potential impacts minor construction ancillary facilities will be assessed in CNVIS or using the TfNSW noise calculator where impacts are likely to be short term of low impact. These assessments will be provided to the AA for review and endorsement. Monthly Noise and Vibration Reports will be prepared by the AA and submitted to DPIE within seven days following the end of each month for the duration of construction of the CSSI, or as otherwise agreed with the Secretary. The JV will assist the AA in providing all documents, information and co-operation reasonably requested by TfNSW in relation to this reporting.
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 – Relevant Council(s), EPA, NSW Health – Secretary Approval	Section 4 Appendix E	The NVMP has been prepared in consultation with City of Parramatta Council, Cumberland Council, EPA and NSW Health. A summary of this consultation is provided in Section 4, and full details in Appendix E.
C4	The CEMP Sub-plans must state how: (a) The environmental performance outcomes identified in the documents listed in Condition A1 will be achieved;	Section 3.5	A compliance table demonstrates where and how the relevant environmental performance outcomes have been addressed in this Sub-plan.

CoA No.	Condition Requirements	Document Reference	How Addressed
	(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 3.4 Section 3.3 Section 8 Section 11 The CEMP	A compliance table demonstrates where and how the relevant mitigation measures have been addressed in this Sub-plan. A compliance table demonstrates where and how the relevant terms of the Planning Approval have been addressed in this Sub-plan. Issues that require management during construction are outlined in Section 8 as well as their predicted impact. The process for quantitative risk assessment for the Project is outlined in the CEMP Section 1.5.1. CEMP Appendix A2 is the environmental risk register for the construction activities associated with the Project. The risk register is reviewed annually, at minimum, and in response to significant issues, incidents and non-compliances. The management of these risks has been outlined in Section 11. These will be implemented during pre-construction and construction phases of the Project.
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.	Section 4 Appendix E	The NVMP has been prepared in consultation with City of Parramatta Council, Cumberland Council, EPA and NSW Health. A summary of this consultation is provided in Section 4, and full details in Appendix E.

CoA No.	Condition Requirements	Document Reference	How Addressed
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.	Section 4	This NVMP will be submitted no later than one month prior to construction.
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 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. <i>Note: the requirement to submit or have a CEMP or CEMP Sub-plan approved is specified in Condition C3.</i>	Section 4	Construction will not commence until this Sub-plan has been submitted to the Secretary and approved. Once approved, it will be implemented for the duration of construction.
C9	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 - Relevant Council(s), EPA, NSW Health (as relevant)	Section 4 Section 12.4	The Construction (Noise and Vibration) Monitoring Program has been prepared in consultation with City of Parramatta Council, Cumberland Council, EPA and NSW Health. A summary of this consultation is provided in Section 4, and full details in Appendix E.
C10	Each Construction Monitoring Program must provide: (a) details of baseline data available;	Section 12.3.3	Details of baseline data are addressed in Section 12.3.3 for construction noise.

CoA No.	Condition Requirements	Document Reference	How Addressed
	(b) details of baseline data to be obtained and when;	Section 12.3.4 Section 12.3.5 Section 12.3.6	Ambient vibration monitoring will be undertaken at facilities with vibration sensitive scientific and medical equipment for a minimum of one week prior to the commencement of vibration intensive activities. The construction noise and vibration monitoring programs each include verification monitoring to assess the accuracy of predicted noise and vibration impacts at the commencement of new activities.
	(c) details of all monitoring of the project to be undertaken;	Section 12.3 Section 12.4	The construction noise and vibration monitoring programs are described in Section 12.3 and a schedule of the inspection and monitoring program is presented in Section 12.4.
	(d) the parameters of the project to be monitored;	Section 12.3	The parameters to be measured during the noise and vibration monitoring program are included in Section 12.3.
	(e) the frequency of monitoring to be undertaken;	Section 12.4	The timing and frequency of the noise and vibration monitoring program is included in the schedule of the inspection and monitoring program is presented in Section 12.4.
	(f) the location of monitoring;	Section 9.1 Section 12.3.5	Locations of out of hours or high impact noise and vibration works will be determined in the CNVIS relative to the location and activities being undertaken and access to properties. The locations of periodic noise monitoring is presented in Table 12-1 in Section 12.3.5.

CoA No.	Condition Requirements	Document Reference	How Addressed
	(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 12.5 Section 12.3.5 Section 12.3.6 Section 4 Appendix E	Details of the reporting of the noise and vibration monitoring program results is presented in Section 12.5. The construction noise and vibration monitoring programs each provide actions to be implemented in the event of exceedance of the predicted impacts. The Noise and Vibration Monitoring Program for noise and vibration is included in this Sub-plan and was provided to EPA, NSW Health, City of Parramatta Council and Cumberland Council for consultation.
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 12.5	A schedule of the reporting of the noise and vibration monitoring program is presented in Section 12.5. The schedule identifies the submission of each report generated as a result of the noise and vibration monitoring program.
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 4 Appendix E	The Noise and Vibration Monitoring Program for noise and vibration is included in this Sub-plan and was provided to EPA, NSW Health, City of Parramatta Council and Cumberland Council for consultation.

CoA No.	Condition Requirements	Document Reference	How Addressed
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 4 Section 12.3	The Noise and Vibration Monitoring Program will be endorsed by the ER. The Noise and Vibration Monitoring Program will be submitted to DPIE before commencement of construction.
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 4 Section 12.3	Construction activities, involving noise and vibration, will not commence until DPIE has approved the Noise and Vibration Monitoring Program relevant noise and vibration, and all the necessary baseline data for the monitoring program has been collected.
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 4 Section 12.3	The Noise and Vibration Monitoring Program will be implemented for the duration of the Project.
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 12.5	A schedule of the reporting of the noise and vibration monitoring program is presented in Section 12.5. The schedule identifies the submission of each report generated as a result of the noise and vibration monitoring program. Monthly monitoring reports will be prepared to report the noise and vibration monitoring data collected during monitoring undertaken in accordance with this Sub-plan and the CNVISs.
C17	Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	Section 12.5	The Noise and Vibration Monitoring Program for noise and vibration is incorporated into this NVMP in Section 12.5.

CoA No.	Condition Requirements	Document Reference	How Addressed
E20	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 12.3.1 Appendix B	A land use survey has been prepared in accordance with the scope outlined in Section 12.3.1 and attached to the NVMP in Appendix B. The results of the land use survey have been used in the development of this Sub-plan and will be used for the development of CNVIS.
E21	Works must be undertaken during the following hours: (a) 7:00am to 6:00pm Mondays to Fridays, inclusive; (b) 8:00am to 12:00pm Saturdays; al(c) at no time on Sundays or public holidays.	Section 5.1	Construction activities will be undertaken during the approved construction hours as outlined in Section 5.1.
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 5.2	Construction activities will be undertaken during the approved construction hours as outlined in Section 5.2.

CoA No.	Condition Requirements	Document Reference	How Addressed
E23	Notwithstanding Condition E21, works may be undertaken in the Camellia and Rosehill precincts (east of James Ruse Drive) and the Carlingford precinct (from Parramatta River to Victoria Road) 24 hours a day, seven days a week provided that sensitive receivers are not affected by noise levels of greater than 5 dBA above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), between 10.00pm and 7.00am.	Section 5.2 Appendix A	Construction activities will be undertaken during the approved construction hours as outlined in Section 5.2. EPL 21347 has been issued to the JV and includes an equivalent clause to permit works to be undertaken in the Camellia and Rosehill precincts (east of James Ruse Drive) and the Carlingford precinct (from Parramatta River to Victoria Road) 24 hours a day, seven days a week provided that sensitive receivers are not affected by noise levels of greater than 5 dBA above the rating background level.
E24	Construction outside the hours identified in Condition E21 along 'Eat Street' must be established through consultation with affected businesses as outlined in the Business Activation Plan required by Condition E110.	Section 5.2	A Communication Action Plan (CAP) will be developed to direct the consultation with businesses of Eat Street to determine works period that minimise disruption to the businesses.
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	Section 5.2 Appendix A	The JV was issued EPL Number 21347 on the 3 January 2020 for Railway activities - railway infrastructure construction. The EPL includes conditions permitting works to be undertaken outside of the approved working hours that are substantially consistent with the Planning Approval. The Out of Hours Works Protocol does not apply to works subject to EPL.

CoA No.	Condition Requirements	Document Reference	How Addressed
	(d) works approved under an Out-of-Hours Work Protocol for works not subject to an EPL; or (e) construction that causes LAeq (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).		

CoA No.	Condition Requirements	Document Reference	How Addressed
E26	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 12.5	Appropriate departments, regulators and sensitive receivers will be notified of any emergency works occurring as outlined.
E27	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. <i>Note: A trial period of the Highly Noise Intensive Work undertaken with the approval of the Out of Hours Work Protocol may be established.</i>	Section 5 Section 9.1	Predicted noise and vibration impacts will be assessed in the CNVIS in accordance with Section 9.1. The JV was issued EPL Number 21347 on the 3 January 2020 for Railway activities - railway infrastructure construction. The EPL includes conditions permitting works to be undertaken outside of the approved working hours that are substantially consistent with the Planning Approval including respite periods.

CoA No.	Condition Requirements	Document Reference	How Addressed
E28	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: 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)).	Section 11.5 Appendix A	Incorporated in mitigation measure NV07. An Out of Hours Works Protocol has been prepared by TfNSW and approved by DPIE for works outside of the standard working hours not subject to an EPL. The JV was issued EPL Number 21347 on the 3 January 2020 for Railway activities - railway infrastructure construction. The EPL includes conditions permitting works to be undertaken outside of the approved working hours that are substantially consistent with the Planning Approval. The Out of Hours Works Protocol does not apply to works subject to EPL.

CoA No.	Condition Requirements	Document Reference	How Addressed
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.	Section 11.5 Appendix A	Incorporated in mitigation measure NV07. The JV was issued EPL Number 21347 on the 3 January 2020 for Railway activities - railway infrastructure construction. The EPL includes conditions permitting works to be undertaken outside of the approved working hours that are substantially consistent with the Planning Approval. The Out of Hours Works Protocol does not apply to works subject to EPL.

CoA No.	Condition Requirements	Document Reference	How Addressed
E30	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 LAeq (15 minute): 40 dBA; and (b) Night (10.00pm to 7.00am) – internal LAeq (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.	Section 6.2.2 Section 6.3 Section 11.3	The ground-borne noise criteria is outlined in Section 6.3 as noise objectives. Exceedance of the ground-borne noise levels during the night period will be managed as exceeding the sleep disturbance. Exceedance of the ground-borne noise levels during evening and night periods will be managed in accordance with the additional mitigation measures for Highly Intrusive works. The Out of Hours Works Protocol does not apply to works subject to EPL 21347.
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 6.2.3 Section 6.2.4 Section 9.1 Section 10.8	Non-residential noise and vibration sensitive receivers have been identified in the Land Use Survey and summarised in Sections 6.2.3 and 6.2.4. The predicted construction noise and vibration impacts will be assessed in the CNVIS. Any restrictions on timetabling of works because of consultation will be documented in the CNVIS. A mitigation measure to address noise generating works near places of worship, educational institutions and noise and vibration-sensitive businesses and critical working areas is included in Section 11.5 as mitigation measure NV49.

CoA No.	Condition Requirements	Document Reference	How Addressed
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 11.4	Consultation will be undertaken with proponents or applicants of other State Significant development and infrastructure works near the CSSI to coordinate respite periods. The exact nature of the consultation will be determined on a case by case basis through the development of a Communication Action Plan (CAP) in accordance with the JV's CEP.
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 9.1 Section 11.5	The impact assessment procedures in CNVS Table 4 have been incorporated into the development of CNVIS. The standard management measures, source mitigation measures and path mitigation measures have been incorporated into the management and mitigation measures in Section 11.5.
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.	Section 11.5	This has been included in Section 11.5 as mitigation measure NV53. This will be addressed in design packages for permanent works and CNVIS for temporary works.
E35	Nothing in this approval permits blasting for construction of the CSSI.	Section 11.5	No blasting is proposed for the JV's works. This has been included in Section 11.5 as mitigation measure NV54.
E36	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 (LAeq,15 minute).	Section 11.2 Section 11.5	Section 11.2 outlines the respite periods for noise and vibration for the project. This has been included in Section 11.5 as mitigation measure NV55.

CoA No.	Condition Requirements	Document Reference	How Addressed
E37	Where works are undertaken outside hours specific in Condition E21 and E22 and construction noise levels exceed 65 dB(A) LAeq (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.	Section 9.1 Section 11.2 Section 11.5	CNVIS will be prepared to predict the noise and vibration impacts at sensitive receivers. Programming of works and respite will be determined in accordance with the Out of Hours Works Protocol. This has been included in Section 11.5 as mitigation measure NV56.
	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 11.2 Section 11.5 -	Community consultation, OOHW, and the resulting respite periods will be provided to the AA, ER and Secretary for information. Section 11.2 outlines the respite periods for noise and vibration for the project. This has been included in Section 11.5 as mitigation measure NV57. Information only.

CoA No.	Condition Requirements	Document Reference	How Addressed
E38	All work 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 9.1 Section 11.2 Section 11.3	Predicted noise and vibration impacts will be assessed in the CNVIS as described in the Section 8.1. Section 11.2 outlines the respite periods for noise and vibration for the project. Alternative / additional mitigation measures will be determined based on the predicted impacts in accordance with the Additional Mitigation Measures described in Section 11.3
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 Works 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 Works Protocol (Condition E28));	Section 9.1 Section 11.2 Section 11.4	Consultation will occur with affected receivers as outlined in Section 11.4. Appropriate work and respite periods will be informed by this consultation. The outcomes of the consultation will be incorporated in the mitigation measures determined in the CNVIS and provided to community members. TfNSW, the Secretary, AA and ER will be provided with the outcomes of the community consultation, and subsequent construction respite periods and scheduling of OOH.

CoA No.	Condition Requirements	Document Reference	How Addressed
	(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.		
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 11.2	Section 11.2 outlines the respite periods for the project. Mitigation measures will still be implemented even if respite periods have been completed as determined through the preparation of the CNVIS.
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 LAeq,8h, of 85dB(A) for any employee working at a location near the CSSI.	Section 11.5	Construction noise will not exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of LAeq,8h, of 85dB(A) for any employee working at a location near the Project. This has been included in Section 11.5 as mitigation measure NV60.

CoA No.	Condition Requirements	Document Reference	How Addressed
E42	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: (a) A description of the proposed activities; (b) Predicted noise and vibration levels based on background noise 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; (d) Description and commitment to work practices which limit noise and vibration; (e) Description of specific noise and vibration mitigation treatments and time restrictions, including respite periods, duration, and frequency; (f) Justification for any activities to be undertaken outside the specified construction hours defined in Conditions E21 and E22; (g) Internal noise audit systems including recording of daily hours of construction, progressive impact assessments as work proceeds, conducting informal checks by the AA,	Section 9.1	Construction Noise and Vibration Impact Statements will be prepared and implemented for each construction site before construction commences. Section 9.1 outlines how CNVIS will be prepared and reviewed and endorsed by the ER and AA as required.

CoA No.	Condition Requirements	Document Reference	How Addressed
	providing active and communication links to Council and surrounding residents and sensitive receivers; (h) Assessment of potential noise from the proposed construction methods including noise from construction vehicles and noise impacts from required traffic diversions; (i) Community consultation and notification; (j) All reasonable and feasible measures including adopting the least noisy available construction methods, systems and equipment; (k) Additional noise and vibration mitigation measures as negotiated with affected residents and other sensitive receivers. <i>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.</i>		
E43	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 12.3.4 Section 12.3.5	Vibration testing will be undertaken as outlined in the Noise and Vibration Monitoring Program.

CoA No.	Condition Requirements	Document Reference	How Addressed
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.	Section 7.4 Section 11.5 Section 12.3.5 Section 12.3.6	Heritage listed structures are listed in Section 7.4. A heritage specialist will be engaged when vibration, movement and noise monitoring of heritage-listed structures will occur, as outlined in Section 11.5 in NV62. This has also been referenced in the noise and vibration monitoring methods.
E45	Before commencement of any construction, and with the agreement of the landowner, a structural engineer must undertake building condition surveys of all buildings identified in the documents listed in Condition A1 as being at risk of damage. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the landowners of the buildings surveyed, and if agreed by the landowner, the relevant Council within three weeks of completing the surveys and no later than one month before the commencement of construction.	Section 12.3.2	Building Condition Survey Reports will be undertaken as part of the Noise and Vibration Monitoring Program.

CoA No.	Condition Requirements	Document Reference	How Addressed
E46	After completion of construction and with the agreement of the landowner, Building Condition Surveys of all buildings for which building condition surveys were undertaken in accordance with Condition E45 of this approval must be undertaken by a structural engineer. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the landowners of the buildings surveyed, and if agreed by the landowner, the relevant Council within three weeks of completing the surveys and no later than three (3) months following the completion of construction.	Section 12.3.2	Building Condition Survey Reports will be undertaken as part of the Noise and Vibration Monitoring Program.
E47	Any physical damage caused to a property as a result of the CSSI shall be rectified or the property owner compensated, within a timeframe agreed to by the property owner with the costs borne by the Proponent. This condition is not intended to limit any claims that the property owner may have against the Proponent.	Section 12.3.2	The JV will review the pre- and post- Building Condition Survey Reports and prepare a root cause analysis for each damage claim received. In the event that the root cause analysis determines that the damage is not attributable to the Infrastructure Works and the outcome is disputed by the property owner, the JV will engage an independent structural engineer to assist in resolving the dispute.
E50	The CSSI must be designed and operated with the objective of not exceeding the air-borne and ground-borne noise trigger levels as defined in the Rail Infrastructure Noise Guideline (EPA, 2012) and the vibration levels defined in the Assessing Vibration: A Technical Guideline (DEC, 2006).	Section 10.1	The JV will design and construction the track slab designs in accordance with Project Scope and Technical Requirements to air-borne and ground-borne noise trigger levels as defined in the Rail Infrastructure Noise Guideline (EPA, 2012).

3.4 Revised Environmental Mitigation and Management Measures

Relevant REMMMs are listed **Table 3-2** 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 3-2: Revised environmental mitigation measures relevant to this NVMP

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Communication	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:	Pre-construction	CEMP	The CEMP provides a central mechanism for all potential environmental impacts. The CEMP outlines the framework for the management of environmental impacts. The CEMP has been prepared and will be implemented during construction.
Communication	GEN-1	Noise and vibration management.	Pre-construction	This Sub-plan	The NVMP outlines the noise and vibration management for the Project. This Sub-plan complies with the relevant approval, statutory and contract requirements.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Communication	NV-1	A Construction Noise and Vibration Management Plan (CNVMP) would 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 daytime working hours and for all and out-of-hours construction activities (refer to Section 17.2.3 of the EIS). The CNVMP would also provide the framework and mechanisms for:	Pre-construction	Section 3.2 Section 11.6	The impact assessment procedures in CNVS Table 4 have been incorporated into the development of CNVIS. The standard management measures, source mitigation measures and path mitigation measures have been incorporated into the management and mitigation measures in Section 11.6.
Communication	NV-1	The mitigation and management of the noise and vibration impacts from the project.	Pre-construction	Section 11	The mitigation and management measures for the noise and vibration impacts has been outlined in Section 11.
Communication	NV-1	Development of site specific construction noise management plans.	Pre-construction	Section 9.1	The process for developing site specific CNVIS is outlined in Section 9.1.
Communication	NV-1	Out-of-hours work associated with the project.	Pre-construction	Section 5.2 Appendix A	Out of Hours Works are conducted in accordance with EPL 21347 as detailed in Section 5.2. An Out-of-Hours-Work Protocol has also been prepared by TfNSW and approved by DPIE.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Acoustic management	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:	Construction	Section 3.2 Section 11.6	The impact assessment procedures in CNVS Table 4 will be incorporated into the development of CNVIS. The standard management measures, source mitigation measures and path mitigation measures have been incorporated into the management and mitigation measures in Section 11.6.
Acoustic management	NV-2	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.	Construction	Section 11.6	This specific mitigation measure has been included as mitigation measure NV04 in Section 11.6. This will be included in the modelling of impacts in the relevant CNVIS and captured in ECMs.
Community management	NV-2	Given the potentially high noise levels at residential receivers, adherence to daytime construction hours is recommended 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).	Construction	Section 11.6	This has been included as mitigation measure NV05 in Section 11.6. Toolbox talks and daily pre-starts will ensure these measures are communicated for implementation by relevant staff.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Community management	NV-2	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.	Construction	Section 5.2 Section 11.6	The scheduling of works on Eat Street will be determined through consultation with affected businesses in accordance with CoA E24. This has been included as mitigation measure NV06 in Section 11.6.
Community management	NV-2	Out of hours works would be programmed to minimise the number of consecutive out of hour work periods impacting the same receptors.	Construction	Section 5.2 Section 11.6	Out-of-Hours-Work will be determined in accordance with the Out-of-Hours-Work Protocol. This has been included as mitigation measure NV08 in Section 11.6.
Community management	NV-2	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).	Construction	Section 11.4 Section 11.6	CAPs will be prepared to guide the consultation with schools and other educational facilities prior to noise intensive works. Consultation with nearby childcare centres will be carried out to discuss avoidance of noisy works during rest periods at the centre. This has been included as mitigation measure NV09 and NV10 in Section 11.6.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Community management	NV-2	Simultaneous operation of noisy plant in close proximity to sensitive receptors would be avoided (where possible).	Construction	Section 11.6 Section 12.2	Where possible, the operation of noisy plant will be planned to reduce impacts to sensitive receptors. This has been included as mitigation measure NV11 in Section 11.6. Toolbox talks and daily pre-starts will ensure these measures are communicated for implementation by relevant staff.
Acoustic management	NV-2	Equipment which is used intermittently would be shut down when not in use.	Construction	Section 11.6 Section 12.2	This has been included as mitigation measure NV12 in Section 11.6. This will be communicated through toolbox talks and daily pre-starts to ensure implementation by relevant staff.
Acoustic management	NV-2	Where possible, the offset distance between noisy plant items and nearby noise sensitive receptors would be as great as possible.	Construction	Section 11.6 Section 12.2	This has been included as mitigation measure NV13 in Section 11.6. This will be communicated through toolbox talks and daily pre-starts to ensure implementation by relevant staff.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Acoustic management	NV-2	Where possible, equipment with directional noise emissions would be oriented away from sensitive receptors.	Construction	Section 11.6	Work planning will ensure directional noise emitting equipment will be oriented away from sensitive receivers. This has been included as mitigation measure NV14 in Section 11.6.
Acoustic management	NV-2	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.	Pre-construction Construction	Section 9.1 Section 11.6	Requirement for hoarding around construction compounds will be assessed in the CNVIS and included on relevant ECMs. Construction hoardings in the Cumberland Precinct to be determined in consultation with HAC to maintain consumer safety and manage clinical risks. This has been included as mitigation measure NV15 in Section 11.6.
Acoustic management	NV-2	Structures such as site sheds would be positioned to further shield sensitive and residential receivers from works activities.	Pre-construction Construction	Section 11.6	This has been included as mitigation measure NV18 in Section 11.6. Planning of site layout will include strategic placement of sheds to mitigate noise impacts. This will be captured in ECMs.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Equipment maintenance	NV-2	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.	Construction	Section 11.6 Section 12.3.5	This has been included as mitigation measure NV19 in Section 11.6. Spot noise checks of noise levels of plant has been included in the Noise and Vibration Monitoring Program.
Communication	NV-2	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.	Construction	Section 9.1 Section 11.6 Section 12.3.5 Section 12.4	Monitoring requirements as additional mitigation measures will be identified in each CNVIS. This has been included as mitigation measure NV20 in Section 11.6 and the Noise and Vibration Monitoring Program is presented in Sections 12.3.5 and 12.4.
Acoustic management	NV-2	Where possible heavy vehicle movements should be limited to daytime hours.	Construction	Section 11.6	This has been included as mitigation measure NV21 in Section 11.6.
Acoustic management	NV-2	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.	Construction	Section 10.8	This has been included as mitigation measure NV22 in Section 10.8. This will be considered during compound layout and development of TCP and verified during site inspections and noise verification monitoring.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Acoustic management	NV-2	Loading and unloading should be carried out away from sensitive receptors, where practicable.	Construction	Section 11.6	This will be managed through Site Vehicle Movement Plans. This has been included as mitigation measure NV23 in Section 11.6.
Acoustic management	NV-2	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.	Construction	Section 11.4 Section 11.6	Coordination of works will occur to minimise impacts on sensitive receivers and to respond to community consultation throughout the project. Updates such as newsletters will be distributed to communicate with the community. This has been included as mitigation measure NV26 in Section 11.6.
Acoustic management	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:	Construction	Section 9.1 Section 11.3	Predicted noise impacts will be assessed in the CNVIS. The frameworks for application of additional mitigation measures is outlined in Section 11.3. These will be included in the CNVIS. The planning of Out of Hours Works will be undertaken in accordance with the requirements of EPL 21347.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Community management	NV-3	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.	Construction	Section 11.3 Section 11.4	The community will be informed of OOHW and other updates at three monthly intervals through various forms of communication.
Community management	NV-3	Website updates – The project website would form a resource for members of the community to seek further information, including CNVPs and current and upcoming construction activities.	Pre-construction Construction	Section 11.3	Details of the TfNSW Parramatta Light Rail will be distributed to the community. The website will provide a variety of information regarding the project including a schedule of out-of-hours work.
Community management	NV-3	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).	Construction	Section 11.3	A project info-line has been set up as a contact point for enquires and complaints.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Community management	NV-3	Email distribution list – An email distribution list would be used to disseminate project information to interested stakeholders.	Construction	Section 11.3	The email list will be utilised regularly to notify stakeholders of upcoming works.
Community management	NV-3	Signage – Signage on construction sites would be provided to notify stakeholders of project details and project emergency or enquiry information.	Construction	Section 11.3	The TfNSW Community Communication Strategy approved under Condition B3 will be followed to establish signage around the construction to notify affected stakeholders of important project details.
Community management	NV-3	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.	Construction	Section 11.3	The TfNSW Community Communication Strategy approved under Condition B3 will be followed to distribute specific notifications to the community regarding construction activities that are likely to exceed noise objectives.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Community management	NV-3	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).	Construction	Section 11.3	Specific receptors may be notified within seven days of construction works under the TfNSW Community Communication Strategy approved under Condition B3.
Community management	NV-3	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).	Construction	Section 11.3	This is a form of additional mitigation measure that will be utilised based on the predicted impacts determined through the CNVIS. The TfNSW Community Communication Strategy approved under Condition B3 will be followed to notify affected stakeholders of important project details such as individual briefings for specific receptors.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Communication	NV-3	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 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.	Construction	Section 11.3 Section 12.3.5 Section 12.4	This is a form of additional mitigation measure that will be utilised based on the predicted impacts determined through the CNVIS. The Noise and Vibration Monitoring Program is provided in Section 12.3.5 and 12.4.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Community management	NV-3	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.	Construction	Section 11.2 Section 11.3	This is a form of additional mitigation measure that will be utilised based on the predicted impacts determined through the CNVIS. The TfNSW Community Communication Strategy approved under Condition B3 will be followed to provide respite for affected residents.
Community management	NV-3	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.	Construction	Section 11.3	This is a forms of additional mitigation measures that will be utilised based on the predicted impacts determined through the CNVIS. The TfNSW Community Communication Strategy approved under Condition B3 will be followed to provide respite for affected residents.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Community management	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.	Construction	Section 11.4 Section 9.1 Section 11.6	CAPs will be developed for each sensitive receiver. The outcome of the consultation will be incorporated into the CNVIS. This has been included as mitigation measure NV28 in Section 11.6.
Acoustic management	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: NCA04 in the Westmead precinct NCA06 and NCA07 in the Parramatta North precinct NCA11 in the Rosehill and Camellia precinct.	Construction	Section 11.6	This has been included as mitigation measure NV29 in Section 11.6.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Acoustic management	NV-6	Opportunities to reduce road traffic noise during construction would be investigated, including restricting heavy vehicle movements to standard construction hours and/or to routes with fewer sensitive receivers.	Pre-construction Construction	Section 9.1 Section 11.6	The potential to reduce road traffic noise will be examined in the CNVIS. If possible, heavy vehicle movement will be restricted to limit impacts on sensitive receivers. This will be captured in TCP. This has been included as mitigation measure NV30 in Section 11.6.
Acoustic management	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:	Construction	Section 11.6	This has been included as mitigation measure NV38 in Section 11.6 Intensive vibration construction activities will be confined to the daytime period where occurring within 100 metres of sensitive receivers. Sensitive receivers will be identified in the Land Use Survey and the data included in the GIS supporting the development of ECMs.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Vibration management	NV-7	Relocate vibration generating plant and equipment to areas within the site in order to lower the vibration impacts.	Construction	Section 11.6	Where possible, the location of construction equipment will be planned to reduce impacts to sensitive receptors. This will be captured in ECMs. This has been included as mitigation measure NV39 in Section 11.6.
Vibration management	NV-7	Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment.	Construction	Section 11.6	Where possible, major vibration works will be planned to reduce impacts to sensitive receptors. Toolbox talks and daily pre-starts will ensure these measures are communicated for implementation by relevant staff. This has been included as mitigation measure NV40 in Section 11.6.
Vibration management	NV-7	Use lower vibration generating items of excavation plant and equipment (e.g. smaller capacity rock breaker hammers).	Construction	Section 11.6	Lower vibration generating items of excavation plant and equipment will be used to reduce impacts to sensitive receivers. This has been included as mitigation measure NV41 in Section 11.6.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Vibration management	NV-7	Minimise consecutive works in the same locality (if applicable).	Construction	Section 11.6	Consecutive works in the same locality will be minimised. This will be addressed through implementation of the requirements of EPL 21347 and the OOHWP Permit. To be verified during noise monitoring. This has been included as mitigation measure NV42 in Section 11.6.
Vibration management	NV-7	Use dampened rock breakers to minimise the impacts associated with rock breaking works.	Construction	Section 11.6	Dampened rock breakers will be used to minimise the impacts associated with rock breaking works. This has been included as mitigation measure NV43 in Section 11.6.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Vibration management	NV-7	If vibration intensive works are required within the safe working distances, vibration monitoring or attended vibration trials would be carried out to ensure that levels remain below the cosmetic damage criterion.	Construction	Section 9.1 Section 11.6 Section 12.3.6 Section 12.4	These areas will be identified through the Land Use Survey and the CNVIS. This has been included as mitigation measure NV44 in Section 11.6. Vibration monitoring or attended vibration trials will be undertaken where vibration intensive works are required has been included in the Noise and Vibration Monitoring Program.
Communication	NV-7	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.	Pre-construction	Section 11.6 Section 12.3.2	Prior to the commencement of construction works and following the completion of construction works, building condition surveys will be undertaken as described in Section 12.3.2. This has been included as mitigation measure NV45 in Section 11.6.
Communication	NV-7	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.	Pre-construction	Section 12.3.4 Section 12.4	Measurements of existing ambient vibration levels has been included in the Noise and Vibration Monitoring Program.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Vibration management	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: • Consultation with the affected facilities to determine periods when noise and/or 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.	Construction	Section 11.4 Section 9.1	A CAP will be developed to guide consultation with facilities within the Westmead Research Zone. The outcomes of the consultation and mitigation measures will be incorporated into CNVIS for works in the Westmead Precinct.

Outcome	Ref #	Commitment	Timing	NVMP Reference	How Addressed
Vibration management	NV-8	Unattended noise and vibration monitoring within the facilities to ensure noise and/or vibration levels are within acceptable levels.	Construction	Section 11.6 Section 12.3.6 Section 12.4	Unattended noise and vibration monitoring within facilities has been included in the Noise and Vibration Monitoring Program. This has been included as mitigation measure NV48 in Section 11.6.
Local traffic, transport and access	TT-28	Hours of when construction deliveries and spoil removal would be undertaken within the Parramatta CBD and Rosehill and Camellia precincts would be determined in consultation with the Sydney Coordination Office and Roads and Maritime Services.	Construction	Section 11.4	A CAP will be developed to guide consultation with Sydney Coordination Office and Roads and Maritime Services.

3.5 Environmental Performance Outcomes

Relevant Environmental Performance Outcomes (EPOs) are listed in **Table 3-3** below. This includes reference to requirement outcomes, the timing of when the commitment applies, and relevant documents or Sections of the environmental assessment influencing the outcome and implementation.

Table 3-3: Environmental Performance Outcomes relevant to this NVMP

ID Ref#	Environmental Performance Outcome	Timing	NVMP reference	How Addressed
EPO-NV-1	Noise levels would be minimised with the aim of achieving the noise management levels where feasible and reasonable.	Construction	Section 6 Section 11	The construction noise, ground-borne noise and vibration objectives are established in Section 6 based on relevant reference guidelines. The predicted construction noise and vibration impacts will be modelled throughout construction in the development of CNVIS. The control measures outlined in Section 11 will be implemented to achieve the noise and vibration objectives or ensure that suitable mitigation measures are implemented where the management levels are exceeded.

ID Ref#	Environmental Performance Outcome	Timing	NVMP reference	How Addressed
EPO-NV-2	The project would avoid any damage to buildings or heritage items from vibrations.	Construction	Section 9.1 Section 12.3	Damage to buildings or heritage items from vibrations will be managed through the process of steps outlined in this Sub-plan. This includes: • Identification of buildings or heritage items at risk of vibration impacts through a land use survey and consultation. • Assessment of potential vibration impacts in CNVISs. • Completion of Building Condition Survey Reports prior of works. • Establishment of vibration criteria and safe working distances for vibratory equipment. • Limitations on the size or type of equipment that can be used within the safe working distances for vibratory equipment. • Mandatory continuous monitoring with equipment with alarm / notification systems where plant or equipment must be used within or near the safe working distances for vibratory equipment. • Obligations on the JV to repair or compensate any damage to buildings of their contents because of vibration.

4 Consultation

In accordance with the CoA C5, this NVMP as a Sub-plan to the CEMP is required to be developed in consultation with EPA, NSW Health, City of Parramatta Council and Cumberland Council.

The consultation is intended to assist in the development and finalisation of the Sub-plan.

Table 4-1 summarises the relevant stakeholder reviews and their responses to review. A detailed consultation log and response to comments are provided in Appendix E.

This NVMP was endorsed by the Environmental Representative (ER) prior to submission to DPIE for approval no later than one month prior to the commencement of construction. The Sub-plan, as submitted to DPIE, including any minor amendments approved by the ER, will be implemented for the duration of construction.

Table 4-1: Summary of Consultation and Approval

Agency	Requirement	Status	Response	Date
City of Parramatta Council	No requirements raised	Closed	Confirmed	08/07/19
Cumberland Council	No requirements raised	Closed	Confirmed	17/07/19
EPA	Suggested amendments to wording of some mitigation measures	Addressed	Confirmed	17/10/19
Parramatta Park Trust	Suggestions to address Flying Fox Colony in Parramatta Park in the NVMP	Closed	The Trust's concerns have been adequately addressed.	29/07/19
Health NSW – Westmead Precinct (including HAC and Cumberland Hospital)	Request consultation during construction planning	Addressed	Confirmed	1/11/19

5 Construction Hours of Work

5.1 Hours of Works

In accordance with the CoA E21 and E22, approved standard working hours are:

- 7:00am to 6:00pm Mondays to Fridays, inclusive
- 8:00am to 12:00pm Saturdays
- At no time on Sundays or public holidays.

Extended working hours are permitted under CoA E22, with the exception of 'Eat Street' during the following hours:

- 6:00pm to 7:00pm Mondays to Fridays, inclusive
- 12:00pm to 6:00pm Saturdays.

Extended working hours permitted under the COVID-19 Infrastructure Construction Work Days Order 2020 are:

- 7:00am to 6:00pm Mondays to Sundays, inclusive
- 7:00am to 6:00pm on public holidays.

Construction outside the hours along 'Eat Street' will be established through consultation with affected business as outlined in the Business Activation Plan.

Works in the Camellia and Rosehill precincts (east of James Ruse Drive) and the Carlingford precinct (from Parramatta River to Victoria Road) will be undertaken 24 hours a day, seven days a week provided that sensitive receivers are not affected by noise levels of greater than 5 dBA above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), between 10:00 pm and 7:00 am.

Notwithstanding the CoA E21, 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) will not be timetabled within sensitive periods, unless otherwise agreed with the affected institutions. This will be determined through ongoing consultation with the community during construction.

Except as permitted by an EPL, or through the Transport for NSW's Out-of-Hours Work Protocol, Highly Noise Intensive Works that result in an exceedance of the applicable Noise Management Level (NML) at the same sensitive receiver must only be undertaken:

- Between the hours of 8:00 am to 6:00 pm Monday to Friday;
- Between the hours of 8:00 am to 1:00 pm Saturday; and
- 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.

5.2 Works Outside of Standard Hours of Works (Out-of-Hours)

Notwithstanding the approved construction hours in Section 5.1, works associated with the CSSI may be undertaken outside the hours specified under those conditions, only if one or more of the following circumstances applies:

- For the delivery of materials required by the NSW Police Force or other authority for safety reasons
- 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
- Where different hours of works are permitted or required under an EPL in force in respect of the CSSI or
- Works approved under an Out-of-Hours Work Protocol for works not subject to an EPL or
- Construction that causes LAeq(15 minute) noise levels:
 - no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), and
 - 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
 - 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
 - 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
 - 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).

The JV was issued EPL Number 21347 on the 3 January 2020 for Railway activities - railway infrastructure construction. The EPL includes conditions permitting works to be undertaken outside of the approved working hours that are substantially consistent with the Planning Approval. The Out of Hours Works Protocol does not apply to works subject to EPL.

6 Construction Noise and Vibration Objectives

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

- Interim Construction Noise Guideline (ICNG)
- Assessing Vibration: a technical guideline (AVTG)
- ANZECC, Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration.

The TfNSW Construction Noise and Vibration Strategy (see Section 3.2) also provides direction for establishing noise and vibration criteria.

Relevant elements of these documents are summarised and discussed in this section.

6.1 Construction noise and assessment objectives

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

The main objectives of the ICNG are to:

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

6.2 Construction Noise Management Levels

6.2.1 Residential Receivers

The ICNG provides an approach for determining LAeq(15minute) NMLs at adjacent residential receivers based on the measured LA90(15minute) RBL, as described in **Table 6-1**.

Table 6-1: NMLs at Residential Receivers

Time of Day	NML LAeq(15minute)	How to Apply
Standard hours Monday to Friday 7:00 am to 7:00 pm Saturday 8:00 am to 6:00 pm No work on Sundays or public holidays	RBL + 10 dBA	- The noise affected level represents the point above which there may be some community reaction to noise. - Where the predicted or measured LAeq(15minute) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practises to meet the noise affected level. - The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
Standard Highly Noise Affected hours Monday to Friday 8:00 am to 6:00 pm AND Saturday 8:00 am to 1:00 pm 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. No work on Sundays or public holidays	Highly Noise Affected 75 dBA	- The Highly Noise Affected (HNA) level represents the point above which there may be strong community reaction to noise. - Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restructuring the hours that the very noisy activities can occur, considering: - Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools or mid-morning or mid-afternoon for works near residences. - If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	RBL + 5 dBA	- A strong justification would typically be required for works outside the recommended standard hours. - The proponent should apply all feasible and reasonable work practices to meet the noise affected level. - Where all feasible and reasonable practises have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

Note 1 The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the Noise Policy for Industry.

6.2.2 Sleep Disturbance

The most recent guidance in relation to sleep disturbance is contained in the Noise Policy for Industry (2017).

Where construction is required to be undertaken during the night-time period, the potential for sleep disturbance will be assessed. The current approach to identifying potential sleep disturbance impacts is to set a screening criterion 15 dB above the RBL (or >65dB whichever is lower), or >40dB ground-borne noise, during the night-time period (10.00 pm to 7.00 am).

The term 'screening criterion' indicates a noise level that is intended as a guide to identify the likelihood of sleep disturbance. It is not a firm criterion to be met, however where the criterion is met, sleep disturbance is unlikely. When the screening criterion is not met, a more detailed analysis is required.

6.2.3 Commercial and Industrial Premises

The ICNG notes that due to the broad range of sensitivities that commercial or industrial land can have to noise from construction, the process of defining management levels is separated into three categories:

- Industrial premises: external LAeq(15minute) 75 dBA
- Offices, retail outlets: external LAeq(15minute) 70 dBA
- Other businesses that may be very sensitive to noise, where the noise level is project specific as discussed below.

The external noise levels will be assessed at the most-affected occupied point of the premises.

Potentially noise and vibration sensitive small business receivers (i.e. childcare centres, cafes/bars/restaurants, etc), which have been identified in the project area have been assessed against specific criteria as detailed in Section 6.2.4.

6.2.4 Other Sensitive Land Uses

The ICNG's quantitative assessment method provides NMLs for other sensitive land uses, such as educational institutes, hospitals, medical facilities and outdoor recreational areas. These land uses are considered potentially sensitive to construction noise only when the properties are in use.

The project specific LAeq(15minute) NMLs for other non-residential noise sensitive receivers from the ICNG are provided in **Table 6-2**.

Table 6-2: ICNG NMLs for Other Sensitive Receivers

Land Use	NML LAeq(15minute) (Applied when the property is in use)
Classrooms at schools and other education institutions	Internal noise level 45 dBA
Hospital wards and operating theatres	Internal noise level 45 dBA
Places of Worship	Internal noise level 45 dBA
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dBA

Land Use	NML LAeq(15minute) (Applied when the property is in use)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, e.g. reading, meditation)	External noise level 60 dBA
Community centres	Depends on the intended use of the centre. Refer to the recommended 'maximum' internal levels in AS 2107 for specific uses.

For sensitive receivers such as hospitals, schools and places of worship, the NMLs presented in **Table 6-2** are based on internal noise levels. For this assessment, it is conservatively assumed that all schools and places of worship have openable windows. On the basis that external noise levels are typically 10 dB higher than internal noise levels when windows are open, an external NML of 55 dBA LAeq(15minute) has been adopted.

Other noise-sensitive receivers require separate project specific noise goals and, as per the guidance in the ICNG, NMLs for these receivers have been derived from the internal levels presented in AS 2107. The project specific NMLs for other sensitive receivers are presented in **Table 6-3**.

Table 6-3: NMLs for Project Specific Other Sensitive Receivers

Land Use	NML LAeq(15minute)		NML Derived From
	Internal	External	
Theatre / Auditorium	30 dBA	50 dBA ¹	AS2107 for drama theatre
Court / Tribunal	35 dBA	55 dBA ¹	AS2107 for court rooms
Childcare Centre	60 dBA play areas	70 dBA ² play area	ICNG outdoor passive recreation
	40 dBA sleeping area	50 dBA ² sleeping area	AS2107 for residential sleeping areas near to major roads
Library	45 dBA	55 dBA ²	AS2107 for reading areas
Public Building	50 dBA	60 dBA ²	AS2107 for public space
Café/bar/restaurant	50 dBA	60 dBA ²	AS2107 for coffee bar
Stables	-	60 dBA ²	ICNG outdoor passive recreation

Note 1: These receivers are typically well insulated from external noise break-in. For this assessment, a minimum (conservative) outside-to-inside attenuation of 20 dB has been assumed. The corresponding external noise goal is therefore the internal NML +20 dB.

Note 2: Receiver conservatively assumed to have openable windows and a 10 dB outside to inside facade performance.

6.2.5 Construction Road Traffic Noise Guidelines

When trucks and other vehicles are operating within the boundaries of construction sites, road vehicle noise contributions are included in the predicted LAeq(15minute) noise emissions and assessed against the ICNG criteria in Section 6.2.1.

When construction related traffic moves onto the public road network a different noise assessment methodology is appropriate, as vehicle movements are regarded as 'additional road traffic' rather than as part of the works and are assessed under the RMS Road Noise Policy (RNP).

As required by the RNP, an initial screening test should first be applied by evaluating whether noise levels would increase by more than 2 dB (an increase in the number vehicles of approximately 60%) due to construction traffic or a temporary reroute due to a road closure.

Where noise levels increase by more than 2 dB (i.e. 2.1 dB or greater) further assessment is required using the criteria presented in the RNP, as reproduced below in **Table 6-4**.

Table 6-4: RNP Criteria for Assessing Construction Vehicles on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria	
		Daytime (7am-10pm)	Night-time (10pm-7am)
Freeway/ arterial/sub- arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	LAeq(15hour) 60 (external)	LAeq(9hour) 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	LAeq(1hour) 55 (external)	LAeq(1hour) 50 (external)

6.3 Construction Ground-borne Noise Guideline

Ground-borne noise criteria are applicable when ground-borne noise levels are higher than the corresponding airborne noise levels. The NMLs for ground-borne noise in the ICNG are based on ground-borne noise levels at residences for evening and night-time periods only, as the ICNG objectives are to protect the amenity and sleep of people when at home.

The ICNG has established following ground-borne NMLs for residences:

- Evening LAeq(15minute) 40 dBA
- Night-time LAeq(15minute) 35 dBA.

These NMLs are applicable to residences and commercial receivers located near to construction activities where ground-borne noise levels are higher than airborne noise levels, such as rock breaking. This situation may occur at construction sites where airborne noise levels are shielded by noise barriers or other structures, or sensitive areas within residential or commercial buildings which are removed from the airborne noise impacts due to their location within the building, such as theatres or underground studios.

6.4 Construction Vibration criteria

The effects of vibration on buildings can be divided into three main categories:

- Human comfort – those in which the occupants or users of the building are inconvenienced or possibly disturbed
- Structural or cosmetic damage – those in which the integrity of the building or the structure itself may be prejudiced (i.e. cosmetic damage)
- Effects on building contents – those where the building contents may be affected (such as vibration sensitive scientific or medical equipment).

6.4.1 Human Comfort Vibration

The EPA's Assessing Vibration: a technical guideline (2006) provides guideline values for continuous, transient and intermittent events that are based on a Vibration Dose Value (VDV) rather than a continuous vibration level. The VDV is dependent upon the level and duration of the vibration event, as well as the number of events occurring during the daytime or night-time period.

The VDV's recommended in the guideline for vibration that is intermittent nature are presented in **Table 6-5**.

Table 6-5: Preferred and Maximum Vibration Dose Values for Intermittent Vibration

Building Type	Vibration Dose Value (m/s ^{1.75})	
	Preferred	Maximum
Critical Working Areas (e.g. hospital operating theatres, precision laboratories)	0.10	0.20
Residential Daytime	0.20	0.40
Residential Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80
Workshops	0.80	1.60

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

6.4.2 Structural Damage Vibration

Structural damage vibration limits are based on Australian Standard AS 2187: Part 2-2006 Explosives - Storage and Use - Part 2: Use of Explosives and British Standard BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2. These standards provide frequency-dependent vibration limits related to cosmetic damage, noting that cosmetic damage is very minor in nature, is readily repairable and does not affect the structural integrity of the building.

The recommended vibration limits from BS 7385 for transient vibration for minimal risk of cosmetic damage to residential and industrial buildings are shown in **Table 6-6**.

Table 6-6: Transient Vibration Guide Values - Minimal Risk of Cosmetic Damage

Line	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note: Based on BS 7385-2

6.4.3 General Vibration Screening Criterion

The guide values in **Table 6-6** relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings. Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%. Rock breaking / hammering activities are considered to have the potential to cause dynamic loading in some structures (e.g. residences) and it is therefore appropriate to reduce the transient values by 50%.

For construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers and excavators, the predominant vibration energy occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, a conservative vibration damage screening level per receiver type is given below:

- Reinforced or framed structures: 25.0 mm/s
- Unreinforced or light framed structures: 7.5 mm/s.

At locations where the predicted and/or measured vibration levels are greater than shown above (peak component particle velocity) monitoring will be performed during construction. At these locations a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be undertaken to determine the applicable safe vibration level.

6.4.4 Heritage Buildings

Heritage buildings will be considered on a case by case basis, and detailed inspections of heritage listed structures should be undertaken for all potentially affected heritage structures prior to the commencement of works.

In accordance with BS 7385, a heritage listed structure should not (unless it is structurally unsound) be assumed to be more sensitive to vibration resulting in application of the 7.5 mm/s screening criterion. Where a historic building is however deemed to be sensitive to damage from vibration (following inspection), a more conservative superficial cosmetic damage criterion of 2.5 mm/s peak component particle velocity (from DIN 4150) should be applied.

As detailed in Section 12.3.6, vibration testing will also be conducted both before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage, as per CoA E43.

6.4.5 Indicative minimum working distances for vibration intensive equipment

The minimum working distances for typical items of vibration intensive plant are listed in **Table 6-7**. The minimum working distances are quoted for both “cosmetic” damage (refer BS 7385) and human comfort (refer OEH’s Assessing Vibration – a technical guideline).

Table 6-7: Recommended minimum working distances from vibration intensive equipment

Plant Item	Approximate Size / Weight / Model	Minimum Distance – Cosmetic Damage (BS 7385)	Minimum Distance – Human Response (OE&H Vibration Guideline)
Vibratory Roller	1-2 tonne	5 m	15 m
	2-4 tonne	6 m	20 m
	4-6 tonne	12 m	40 m
	7-13 tonne	15 m	100 m
	13-18 tonne	20 m	100 m
	>18 tonne	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
Pile Driver – Vibratory	Sheet piles	2 – 20m	20 m
Piling Rig – Bored	≤ 800 mm	2 m (nominally)	n/a
Piling Rig – Hammer	12 t down force	15m	50 m
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

Table adapted from the TfNSW Construction Noise and Vibration Strategy

6.4.6 Effects on Building Contents (including Sensitive Scientific and Medical Equipment)

People can perceive floor vibration at levels well below those likely to cause damage to building contents or affect the operation of typical equipment found in most buildings that is not particularly vibration sensitive. For most receivers, the controlling vibration criterion is the human comfort criterion, and it is therefore not normally required to set separate criteria in relation to the effect of construction vibration on typical building contents.

Some scientific equipment (e.g. electron microscopes and microelectronics manufacturing equipment) can require more stringent vibration objectives than those applicable to human comfort.

Where it has been identified that vibration sensitive scientific and/or medical instruments are likely to be in use inside the premises of an identified vibration sensitive receiver, objectives for the

satisfactory operation of the instrument should be sourced from manufacturer's data through or through consultation with facility operators.

Where manufacturer's data is not available, baseline vibration monitoring (refer to Section 12.3.6) will inform the criteria specific to identified receptors.

6.4.7 Utilities and Other Vibration Sensitive Structures

Where structures and utilities are encountered which may be particularly sensitive to vibration, a vibration goal which is more stringent than the structural damage goals presented in Section 6.4.2 may need to be adopted. Examples of such structures and utilities could include:

- Tunnels
- Gas pipelines (including the jet fuel pipeline at Camellia)
- Fibre optic cables.

Specific vibration goals should be determined on a case-by-case basis during detailed design. An acoustic consultant will be engaged and will liaise with the structure or utility's owner to determine acceptable vibration levels.

7 Background noise and Noise Sensitive Receivers

7.1 Baseline noise and noise management levels

To quantify and characterise the existing ambient noise environment across the project area, a baseline noise monitoring survey was undertaken in October 2016 (EIS Technical Paper 13 – Noise and Vibration Impact Assessment). The measured background noise levels were used to establish the existing noise environment along the route and to assist with the determination of noise goals. These residential NMLs derived for the project are detailed in **Table 7-1**.

The noise monitoring locations were selected to capture background noise levels at the typically most affected receiver locations in the various catchments along the alignment. The most affected receivers are usually adjacent receivers that have a direct line of sight to the construction works.

Whilst background noise levels may reduce for receivers which are further back from the construction works (and nearby roads), the construction noise predictions are likely to drop off at a quicker rate meaning the level of impact would be lower than the most affected ‘front row’ receivers.

Table 7-1: Noise Management Levels at Residential Receivers

PLR Precinct	NCA	Logger ID	Noise Monitoring Location	Rating Background Level (RBL) L_{A90}			Noise Management Level (NML) $L_{Aeq(15min)}$				Sleep Disturbance L_{Amax}
				Day	Eve	Night	Day	Day (OOH)	Eve	Night	
Westmead	NCA01	BG01	8-12 Alexandra Ave, Westmead	49	47	37	59	54	52	42	52
	NCA02	BG02	157 Hawkesbury Rd, Westmead	51	48	43	61	56	53	48	58
	NCA03	BG02	199 Hawkesbury Rd, Westmead	51	48	43	61	56	53	48	58
	NCA04	BG03	Cumberland Hospital East	49	48	47	59	54	53	52	62
Parramatta North	NCA05	BG03	55 O'Connell St, North Parramatta	49	48	47	59	54	53	52	62
	NCA06	BG04	St Patricks Cemetery, North Parramatta	42	41	41	52	47	46	46	5
Parramatta CBD	NCA07	BG06	20 Victoria Rd, Parramatta	51	50	39	61	56	55	44	54
	NCA08	BG07	Arthur Phillip Highschool, Parramatta	59	57	46	69	64	62	51	61
Rosehill and Camellia	NCA09	BG08	9 Noller Pde, Parramatta	58	53	43	68	63	58	48	58
	NCA10	BG09	5 Hope St, Rosehill	43	40	34	53	48	45	39	49
Carlingford	NCA11	BG09	14 Dudley St, Rydalmere	43	40	34	53	48	45	39	49
	NCA12	BG10	Dundas Station	51	48	41	61	56	53	46	56
	NCA12A	BG17 ¹	10-42 East Street, Granville	43	45	42	53	48	48	47	57
	NCA13	BG10	22 Adderton Rd, Telopea	51	48	41	61	56	53	46	56
	NCA14	BG11	Telopea Station	45	43	38	55	50	48	43	53
	NCA15	BG12	89 Marshall Rd, Telopea	45	43	37	55	50	48	42	52
	NCA16	BG13	Carlingford Station	46	42	34	56	51	47	39	49

Notes: 1. Resonate Acoustics Acoustic Planning Report: East and Cowper Streets Granville Residential Development (S15235) July 2016

7.2 Precincts, Noise Catchment Areas and Surrounding Land Uses

The project is located in the urban environment of Westmead, North Parramatta, Parramatta CBD and Camellia with much of the project in this section being within established road transportation corridors. The project would also use the existing heavy rail corridor of the Carlingford Line, travelling through the suburbs of Dundas, Telopea and Carlingford.

The existing ambient noise environment surrounding the route is variable, with road traffic noise typically the primary influence. In addition to road traffic, the CBD is influenced by general urban hum from mechanical plant and pedestrian activities. Existing noise levels are generally higher nearer to the CBD than in the surrounding suburbs. During the evening and night-time in the suburban areas the ambient noise decreases in locations where road traffic volumes are seen to reduce.

The five precinct areas used to assess the project reflect the changing land uses adjacent to the project and are detailed in **Table 7-2** together with corresponding Noise Catchment Areas (NCAs) that have been used to represent each of the precincts. The location of the various precincts, NCAs and EIS noise monitoring locations are indicated in **Figure 7-1** and **Figure 7-2**.

Table 7-2: Precincts, Noise Catchment Areas and Surrounding Land Uses

Precinct	NCAs	Minimum Distance (m) ¹	Description
Westmead	NCA01	105 m	Residential receivers except for Westmead Public School and a small number of commercial receivers.
	NCA02	5 m	Mostly buildings and land usages associated with Marist High School, Western Sydney University (Westmead) and Westmead Hospital including Westmead Institute for Medical Research (WIRM).
	NCA03	5 m	Residential receivers, with some commercial and medical receivers directly adjacent to the project alignment.
	NCA04	5 m	Residential receivers except for Westmead Church and Wesley Lodge.
	NCA05	5 m	Mostly medical receivers (facilities and patients) associated with The Children's Hospital at Westmead and Cumberland Hospital (West) including the Children's Medical Research Institute (CMRI) and Kids Research, together with some residential receivers.
Parramatta North	NCA06	5 m	Predominantly medical receivers (facilities and patients) associated with Cumberland Hospital (East) and some residential receivers. Adjacent to Parramatta Park and the Grey-headed flying fox colony.
	NCA07	5 m	Residential and commercial receivers.

Precinct	NCA	Minimum Distance (m) ¹	Description
Parramatta CBD	NCA08	5 m	Residential and commercial receivers as well as places of worship and educational receivers further from the project alignment. Outdoor dining areas associated with cafes and restaurants along Eat Street.
	NCA09	5 m	Commercial, educational and residential receivers are directly adjacent to the project alignment.
	NCA10	160 m	Residential receivers and educational receivers associated with Macarthur Girls High School are situated across the river from the project alignment.
Rosehill and Camellia	NCA11	5 m	Residential and commercial receivers.
	NCA12	5 m	Commercial receivers as well as residential receivers further from the project alignment. Rosehill Racecourse.
	NCA12 A	900 m	Mixed commercial, industrial and residential receivers surrounding Clyde Junction. Educational receivers associated with Granville Boys High School.
	NCA13	5 m	Commercial and industrial receivers.
Carlingford	NCA14	10 m	Mostly commercial receivers and educational receivers associated with Western Sydney University (Parramatta), as well a small group of residential receivers.
	NCA15	5 m	Residential receivers, however also commercial receivers and educational receivers associated with Dundas Public School.
	NCA16	5 m	Residential receivers.
	NCA17	5 m	Residential receivers.
	NCA18	5 m	Residential receivers.
	NCA19	5 m	Residential and some commercial receivers.

Note 1: Approximate minimum horizontal distance from track centre to nearest receiver building facade (receiver of any type).

7.3 Sensitive receivers

The sensitivity of receivers to noise and vibration is dependent upon the occupancy type and the nature of the activities performed within the affected premises. Sensitivity to noise is a subjective response varying for different individuals and can depend on the existing noise environment.

For this assessment, receivers potentially sensitive to noise and vibration are categorised as:

- Residential dwellings
- Commercial and industrial properties
- Other – education institutions
- Other – childcare centres
- Other – medical (hospital wards or other uses including medical centres)
- Other – aged care facilities (including nursing homes)
- Other – places of worship
- Other – outdoor open areas (passive and active recreation)
- Other (such as theatres, public buildings, hotels/motels, bars/cafes, etc).

These are depicted in the land use receivers map included in Appendix B.

Small business receivers (i.e. childcare centres, cafes/bars/restaurants, etc) that are potentially sensitive to impacts from the project have been identified and considered in both the construction and operational assessments.

The Grey-headed flying fox camp in Parramatta Park is also considered a noise and vibration sensitive receiver that must be considered in the programming of works in accordance with the Grey-headed flying fox Monitoring Program.

Receivers sensitive to noise and vibration (other than residential dwellings or commercial premises) identified in proximity to the proposed alignment are detailed in **Table 7-3**.

Table 7-3: Other Noise and Vibration Sensitive Receivers

Precinct	NCA	Description ³	Address ¹	Type
Westmead	NCA01	Westmead Public School	10 Grand Avenue, Westmead	Educational
	NCA02	Parramatta Marist High School	2 Darcy Road, Westmead	Educational
		Western Sydney University (Westmead)	160 Hawkesbury Road, Westmead	Educational
		Westmead Hospital	Hawkesbury Road, Westmead	Medical
		Westmead Institute for Medical Research	176 Hawkesbury Road, Westmead	Medical

Precinct	NCA	Description ³	Address ¹	Type
	NCA03	Medical Centre	7 Ashley Lane, Westmead	Medical
	NCA04	Wesley Lodge	175 Hawkesbury Road, Westmead	Hotel
		Westmead Church	37 Queens Road, Westmead	Place of Worship
	NCA05	Cumberland Hospital West campus	Hainsworth Street, Westmead	Medical ²
				Magistrate Tribunal ²
		The Children's Hospital of Westmead	Redbank Road, Westmead	Medical
		Children's Medical Research Institute	214 Hawkesbury Road, Westmead	Medical
		Kids Research Institute	178 Hawkesbury Road, Westmead	Medical
Parramatta North	NCA06	Cumberland Hospital East campus	Fleet Street, Westmead	Medical
		Hope Hostel	2B Fleet Street, North Parramatta	Aged Care
		Southern Cross Care Marian Nursing Home	2A Fleet Street, North Parramatta	Aged Care
		Uniting Lilian Wells North Parramatta	2 Fennell Street, Parramatta	Aged Care
		Grey-headed Flying fox colony	Parramatta Park	Wildlife
	NCA07	All4Kids Family Day Care / After School Care	465 Church Street, North Parramatta	Child Care

Precinct	NCA	Description ³	Address ¹	Type
		Parramatta North Public School	8 Harold Street, Parramatta	Educational
		15 Harold Street	15 Harold Street, Parramatta	Aged Care
		Café Lipari	440 Church Street, Parramatta	Café/bar
Parramatta CBD	NCA08	St Patrick's Primary	8 Ross Street, Parramatta	Educational
		Our Lady of Mercy College	2 Victoria Road, Parramatta	Educational
		Riverside Theatres	353 Church Street, Parramatta	Theatre
		Various café/bars	Church Street, Parramatta	Café/bar
	NCA09	Parkroyal	30 Phillip Street, Parramatta	Hotel
		Parramatta Local Court	12 George Street, Parramatta	Court
		Woolpack Hotel	19 George Street, Parramatta	Hotel
		UNE Future campus	211 Church Street, Parramatta	Educational
		St John's Anglican Cathedral Church	195 Church Street, Parramatta	Place of Worship
		Leigh Memorial Church	119 Macquarie Street, Parramatta	Place of Worship
		Parramatta Town Hall	95 Macquarie Street, Parramatta	Public Building
		UWS One Parramatta Square	Parramatta Square	Educational
		Arthur Phillip High School	175 Macquarie Street, Parramatta	Educational

Precinct	NCA	Description ³	Address ¹	Type
		Parramatta Public School	3 Marist Place, Parramatta	Educational
		Rowland Hassall School	34 Hassall Street, Parramatta	Educational
		Guardian Childcare and Education	163 George Street, Parramatta	Childcare
		Church of St John the Baptist	163 George Street, Parramatta	Place of Worship
		Various café/bars	Church/Eat Street, Parramatta	Café/bar
	NCA10	-	-	-
Rosehill and Camellia	NCA11	-	-	-
	NCA12	Mecure Sydney Parramatta	106 Hassall Street, Rosehill	Hotel
		Rosehill Community Preschool	103 Hassall Street, Rosehill	Educational
	NCA12A	Granville Boys High	14 Mary Street, Granville	Educational
		Milcom Institute	1/47 Parramatta Road, Granville	Educational
		The Cottage Pre- School	6-8 Factory Street, Granville	Child Care
		Granville World of Learning	20/22 Alfred Street, Granville	Child Care
		Berea Holy Joy Church	32 George Street, Clyde	Place of Worship
		St Athanasius Ukrainian Orthodox Church	45 William St, Granville	Place of Worship

Precinct	NCA	Description ³	Address ¹	Type
		St Marks Anglican Church	39 Jamieson St, Granville	Place of Worship
		Granville Community Baptist Church	104 South St, Granville	Place of Worship
		Granville Memorial Park	Enid Ave, Granville	Active recreation
	NCA13	-	-	-
Carlingford	NCA14	Western Sydney University Parramatta	Parramatta	Educational ²
				Child Care ²
				Auditorium ²
				Library ²
	NCA15	Dundas Public School	85 Kissing Point Road, Dundas	Educational
	NCA16	Uniting Church in Australia	139 Kissing Point Road, Dundas	Place of Worship
	NCA17	Sydney Young Nak Presbyterian Church	7 Manson Street, Telopea	Place of Worship
		Telopea Christian Centre	16 Shortland Street, Telopea	Place of Worship
	NCA18	-	-	-
	NCA19	Carlingford Branch Library	17 Lloyds Avenue, Carlingford	Public Building

Note 1: Address is approximate and has been generated from a NSW Land and Property Information (LPI) database and has not been verified on site.

Note 2: Where multiple receiver types have been identified in the same campus, the appropriate criteria have been applied to each individual building.

Note 3: Lists land use survey ID number specific to land use receivers

7.4 Heritage buildings

Heritage listed items identified within the cosmetic damage screening criteria minimum working distances are listed in **Table 7-4**.

Table 7-4: Heritage Items Identified Within Cosmetic Damage Minimum Safe Working Distance

NCA	Item	Location
NCA05	Cumberland Hospital including Wisteria Gardens	Cumberland Hospital (West)
NCA06	Stone kerbing and tree planting	Fleet Street
	Heritage brick drain	Cumberland Hospital (East)
	Cumberland Hospital including Wisteria Gardens	Cumberland Hospital (East)
NCA07	Norfolk House and potential archaeological site	Church Street
	Single storey residence and potential archaeological site	Church Street
	Roman Catholic Cemetery	Church Street
	Former bakery and potential archaeological site	Church/Harold Street
	Bicycle shop	Church/ Fennell Street
	Shop	Church Street
	Commercial building	Church Street
	Stable and potential archaeological site	Church Street
NCA08	Alfred Square and potential archaeological site	Church Street
	Anthony Malouf and Co	Church Street
	Horse Trough	Church Street
	Lennox Bridge	Church Street
	Royal Oak Hotel and stables and potential archaeological site	Church/Ross Street
	St Peter's Uniting Church and potential archaeological site	Church/Palmer Street
NCA09	Archaeological terrestrial	Church Street
	Former ANZ bank and potential archaeological site	Church Street
	Sandstone and brick wall	Church Street

NCA	Item	Location
	Telstra House (former post office) and potential archaeological site	Church Street
	HMV (former Commonwealth Bank) and potential archaeological site	Church Street
	Archaeological/terrestrial	Church Street
	Various Shops	Church Street
	Parramatta House and potential archaeological site	Church Street
	Archaeological/terrestrial	Church Street
	Shop and potential archaeological site	Church Street
	Shops and potential archaeological site	Church Street
	Former court house wall, sandstone cellblock and potential archaeological site	Church Street
	Horse parapet facade and potential archaeological site	Church Street
	Archaeological/terrestrial	Church Street
	Shop and potential archaeological site	Church Street
	Shop, office and potential archaeological site	Church Street
	Shop and potential archaeological site	Church Street
	Shop and potential archaeological site	Church Street
	Shop and potential archaeological site	Church Street
	Westpac Bank	Church Street
	Shop and potential archaeological site	Church Street
	Former David Jones Department Store	Church Street
	Shops and offices	Church Street
NCA 10	Bicentennial Square and adjoining buildings	Macquarie Street
	Convict barracks wall	Macquarie Street
	Kia Ora and potential archaeological site	Macquarie Street
	Bicentennial Square and adjoining buildings	Macquarie Street
	Convict drain	Macquarie Street

NCA	Item	Location
	Centennial memorial clock	Macquarie Street
	Arthur Phillip High School and potential archaeological site	Macquarie Street
	Murrays' Building and potential archaeological site	Macquarie Street
	Leigh memorial Uniting Church	Macquarie Street
	Cottages and potential archaeological site	Barrack Lane
	Convict barracks wall	Barrack Lane
	Robin Thomas Reserve	Harris Street
	HMAS Parramatta shipwreck and memorials	George Street
	Tara (also known as Ellengowan)	George Street
	Queen's Wharf Reserve and stone wall and potential archaeological site	George Street
NCA11	Cottage	George Street
	Trees in median strip	George Street
	Bulimba	George Street
	Residential flats and houses	George Street
NCA12	Sewage Pumping Station 67	Grand Avenue
	Tram alignment	Grand Avenue
	Grave of Eliner Magee & child	Carlingford Line
	Clyde Carlingford Rail Bridge abutments	Carlingford Line
NCA12A	Granville Town Hall, 10 Carlton Street, Granville	Rosehill and Camellia
	The Barn, 138 Parramatta Road, Granville	Rosehill and Camellia
	Chateau Blanc, 51 South Street, Granville	Rosehill and Camellia
	3-5 A'Beckett Street, Granville	Rosehill and Camellia
	Latalda, 20 A'Beckett Street, Granville	Rosehill and Camellia
	Conjoined residences, 22, 24 A'Beckett Street, Granville	Rosehill and Camellia
	Conjoined residences, 42 Onslow Street, Granville	Rosehill and Camellia
	Conjoined residences, 34, 36 Kemp Street, Granville	Rosehill and Camellia

NCA	Item	Location
	Duck Creek Bridge, Great Western Highway, Granville	Rosehill and Camellia
	Granville Boys High School, 10 Mary Street, Granville	Rosehill and Camellia
	Granville Marsh Brothers Tannery Archaeological Site, Junction of main western line and Carlingford branch line, Duck Creek Near Memorial Drive	Rosehill and Camellia
	Granville Railway Station Group, Bridge Street, Granville	Rosehill and Camellia
	Granville RSL Club, 5 Memorial Drive, Granville	Rosehill and Camellia
	Granville Swimming Pool, 1 Memorial Drive, Granville	Rosehill and Camellia
	Granville War Memorial, 1 Memorial Drive, Granville	Rosehill and Camellia
	Monuments, 5 Memorial Drive, Granville	Rosehill and Camellia
	Mount Beulah Hall, 37 Cowper Street, Granville	Rosehill and Camellia
	Parramatta Archaeological Management Unit 3047, Parramatta Road, Granville	Rosehill and Camellia
	Rosehill Hotel, 91 Parramatta Road, Granville	Rosehill and Camellia
	Shop (former), 6-8 Factory Street, Granville	Rosehill and Camellia
	Terrace Housing, 5-23 Arthur Street, Granville	Rosehill and Camellia
NCA14	Wetlands	Carlingford Line
	UWS Parramatta Campus (former Rydalmere Hospital & Female Orphan School)	Carlingford Line
	Clyde Carlingford Rail Bridge abutments	Carlingford Line
NCA15	Dundas Railway Station Group	Carlingford Line
NCA16	Victorian house	Carlingford Line
NCA18	K13 Memorial	Carlingford Line
NCA19	Carlingford Stock Feeds	Carlingford Line

8 Environmental aspects and impacts

8.1 Environmental aspects

Relatively high noise levels are predicted from the construction works in most catchments along the alignment. Noise levels are typically higher for receivers which have a direct line of sight to the works and where construction works are situated near receivers. The highest noise levels and greatest impacts are associated with activities that utilise noise intensive plant.

To assess the level of potential impact on noise and vibration sensitive receivers, the broad categories of construction activity likely to interact with these receivers are:

- Site establishment
- Clearing and grubbing
- Demolition
- Excavation, earthworks (with rock breakers) and drainage
- Bridgeworks (piling)
- Rock breaking
- Paving and concrete saw cutting
- Ballast track works
- Road furnishing.

8.2 Environmental impacts

People are usually more tolerant to noise and vibration impacts during the construction phase of a project than during normal long-term operation, due to the recognition that the construction impacts are of a temporary nature. For this reason, acceptable noise and vibration levels are normally higher during construction than during operations.

Construction often requires the use of heavy machinery which can generate high noise and vibration levels at nearby buildings and receivers. For some equipment, there is limited opportunity to mitigate the noise and vibration levels in a cost-effective manner and hence the potential disturbance impacts are typically minimised as much as practicable through management techniques.

At any location the potential impacts can vary greatly depending on factors such as the relative proximity of sensitive receivers, the overall duration of the construction works, the intensity of the noise and vibration levels, the time at which the construction works are carried out and the character of the noise or vibration emissions.

The potential construction noise impacts at any location would vary greatly depending on factors including the following:

- The type of equipment in use
- The number of equipment simultaneously in use
- Ground conditions
- Topography and other physical barriers
- Proximity to sensitive receivers
- The condition of sensitive receivers

- Hours/duration of construction works
- Intensity/character of noise levels
- Proximity of heavy traffic areas such as the highway.

Noise levels at sensitive receivers may also be significantly lower than the worst-case scenario when the construction works move to a more distant location in a works area.

Relevant aspects and the potential for related impacts have been considered in a risk assessment within Appendix A2 of the CEMP. Section 11 provides a suite of mitigation measures that will be implemented to avoid, minimise and/ or manage impacts of the Infrastructure Works on the receiving community and/or built environment.

8.2.1 Construction noise impacts

Sound power levels for the typical operation of construction equipment applied in the modelling are listed in **Appendix C**. A range of construction scenarios are presented **Appendix C** consisting of likely combinations of plant operating concurrently.

A summary of the predicted noise levels (without additional mitigation) in each of the NCAs for the various construction scenarios, as developed in the EIS, is presented in **Appendix D**. The noise levels are representative of the worst-case impacts, at that particular receiver type, and are intended to give an overview of the likely noise levels from the construction works. The tables colour the predicted noise levels based on the exceedance of the NML during that period and for that receiver type.

A qualitative description of the NML exceedance bands is given below, noting that the impact of these potential exceedances would depend on the period in which they were to occur (i.e. the night-time period is typically more sensitive than the daytime or evening for most people):

- Noise levels 1 to 10 dB above NML – impacts would typically be marginal to minor
- Noise levels 11 dB to 20 dB above NML – impacts would typically be moderate
- Noise levels >20 dB above NML – impacts would typically be high.

For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted at the most-exposed receiver, as the noise levels presented in this Sub-Plan are based on a realistic worst-case assessment.

8.2.2 Construction ground-borne noise

For the purposes of this assessment, potential ground-borne noise impacts have been predicted at the nearest building for each receiver within each precinct because of rock breaking activities along the light rail alignment. While the assessment may predict impacts at certain receivers:

- Not all areas of the various facilities are expected to be sensitive to potential noise impacts
- Rock breakers would only be operated for relatively short durations and the predicted ground-borne noise levels would only be apparent for short periods while the works are conducted outside each building
- Sensitive areas may be located at some distance away from the front facade
- Buildings with higher levels of sound insulation may mitigate airborne construction noise impacts.

Feasible and reasonable measures will be implemented to minimise ground-borne noise where exceedances are predicted and will be informed by further consultation with stakeholders concerning the building design and the use of internal areas.

Respite periods and additional mitigation measures to address exceedances in ground-borne noise will be implemented in accordance with Section 11.2 and 11.3.

Table 8-1: Predicted ground-borne noise impacts from rock-breaking activities

Precinct	NCA	Description ³	Type	Indicative Distance to Nearest Works (m)	Predicted Ground-borne Noise L _{Aeq(15min)} (dBA)
Westmead	NCA01	Westmead Public School	Educational	120 to 240	<30
	NCA02	Parramatta Marist High School	Educational	220 to 400	<30
		Western Sydney University (Westmead)	Educational	45 to 120	40 to <30
		Westmead Hospital	Medical	75 to 300	<30
		Westmead Institute for Medical Research	Medical	10 to 100	70 to <30
	NCA04	Wesley Lodge	Hotel	15 to 50	60 to 35
		Westmead Church	Place of Worship	20 to 60	55 to 35
	NCA05	Cumberland Hospital West campus	Medical	10 to 200	70 to <30
			Magistrate Tribunal	90 to 160	<30
		The Children's Hospital of Westmead	Medical	10 to 60	70 to <30
		Children's Medical Research Institute	Medical/Research	10 to 100	70 to <30
		Kids Research Institute	Medical/Research	60 to 100	35 to <30
Parramatta North	NCA06	Cumberland Hospital East campus	Medical	10 to 200	70 to <30
	NCA07	Parramatta North Public School	Educational	60 to 160	35 to <30

Precinct	NCA	Description ³	Type	Indicative Distance to Nearest Works (m)	Predicted Ground-borne Noise L _{Aeq(15min)} (dBA)
Parramatta CBD	NCA08	Riverside Theatres	Theatre	30 to 50	45 to 35
	NCA09	Parramatta Local Court	Court	70 to 120	30 to <30
		UNE Future campus	Educational	10 to 20	70 to 55
		Leigh Memorial Church	Place of Worship	10 to 40	70 to 40
		UWS One Parramatta Square	Educational	5 to 50	85 to 35
		Arthur Phillip High School	Educational	10 to 90	70 to <30
		Parramatta Public School	Educational	10 to 90	70 to <30
		Rowland Hassall School	Educational	15 to 70	60 to 30
		Church of St John the Baptist	Place of Worship	60 to 100	35 to <30
		Guardian Childcare and Education	Childcare	60 to 100	35 to <30
Carlingford	NCA14	Western Sydney University Parramatta	Educational	15 to 300	60 to <30
	NCA15	Dundas Public School	Educational	120 to 200	<30

8.2.3 Construction vibration impacts

The level of vibration potentially experienced at a receiver depends on the vibration energy generated by the source, the predominant frequencies of vibration, the localised geotechnical conditions and the interaction of structures and features that can dampen vibration.

For most of the project construction equipment, the separation distance(s) between the construction works and the nearest sensitive receiver(s) would likely be sufficient to comply with the safe working distances required to avoid 'cosmetic damage' and 'human comfort (response) impacts' from construction vibration (as identified in British Standard BS 7385 Part 2 – 1993 – Evaluation and measurement for vibration in buildings. For most sources of intermittent vibration during construction, such as rock breakers, the predominant vibration energy occurs at frequencies usually in the 10 Hz to 100 Hz range. On this basis, and with reference to BS7385:2, a vibration damage screening level of 7.5 millimetres per second was adopted for assessing potential impacts from continuous vibration for the project.

However, some items of construction equipment would be required to operate within close proximity of residential receivers and may occur within recommended safe working distances.

In relation to human comfort (response) to vibration, several receivers adjacent to the construction areas have been identified as likely to perceive vibration impacts at times during construction works. This is expected to be primarily due to works associated with rock breakers, vibratory rollers and other high vibration plant items. In practice, vibration impacts from most construction activities would be intermittent within the duration of the project. For this reason, higher vibration levels that occur over shorter periods are typically permitted under BS 6472-1.

With respect to heritage listed items identified within the precinct, the potential impacts on these items would be considered on a case by case basis, and detailed inspections and ongoing monitoring of heritage listed structures would be carried out for all potentially affected heritage structures prior to and during works. Heritage listed items identified within the cosmetic damage screening criteria minimum working distances are shown in Section 7.4.

The assessment identifies the number of buildings that could potentially occur within the cosmetic damage and human response safe working distances during the use of a large rock breaker. In practice, it is unlikely that a rock breaker would be required in all areas and therefore, the vibration impacts presented for each precinct in this Section should be considered a worst-case scenario.

Table 8-2 provides a summary of the number of these receivers within each noise catchment areas.

Mitigation and management measures to address potential construction vibration impacts are discussed in Section 11.

Table 8-2: Construction vibration assessment summary (assuming use of a large rock breaker)

Precinct	NCA	Number of buildings within working distance	
		Cosmetic damage (7.5mm/s screening)	Human response
Westmead	NCA01	0	0
	NCA02	1	4
	NCA03	11	20
	NCA04	22	43
	NCA05	16	30

Precinct	NCA	Number of buildings within working distance	
		Cosmetic damage (7.5mm/s screening)	Human response
Parramatta North	NCA06	18	38
	NCA07	46	96
Parramatta CBD	NCA08	20	36
	NCA09	52	93
	NCA10	0	0
Rosehill and Camellia	NCA11	26	67
	NCA12	14	24
	NCA12A	0	0
	NCA13	0	0
Carlingford	NCA14	2	22
	NCA15	23	152
	NCA16	29	111
	NCA17	8	85
	NCA18	27	115
	NCA19	5	13

9 Construction noise and vibration assessment

9.1 Construction Noise and Vibration Impact Statements

Construction Noise and Vibration Impact Statements (CNVIS) will be prepared and implemented for each construction site (based on the five precincts in the Infrastructure Works in the Staging Report) before construction noise and vibration impacts commence and include specific mitigation measures identified through consultation with affected sensitive receivers. Each CNVIS will be provided to the ER and AA for review and endorsement in accordance with Condition A23(d) and Condition A29(e), respectively. CNVIS will supplement this Sub-plan and address each of the major construction sites and must include but not be limited to:

- A description of the proposed activities (construction scenarios), duration and associated plant proposed to be used
- Predicted noise and vibration levels based on background noise levels
- Examination of alternative methods of construction or innovative technologies that would potentially reduce noise and vibration if the potential noise and vibration exceeds the relevant criteria
- Description and commitment to work practices which limit noise and vibration
- Description of site specific noise and vibration mitigation treatments and time restrictions, including respite periods, duration, and frequency
- Justification for any activities to be undertaken outside the specified construction hours defined in Conditions E21 and E22
- 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
- Assessment of potential noise from the proposed construction methods including noise from construction vehicles and noise impacts from required traffic diversions
- Measures to coordinate the JV works with other PLR contract works, or other construction and infrastructure projects
- Community consultation and notification
- Examination of all reasonable and feasible measures including any suggested by the AA, ER or TfNSW
- Additional noise and vibration mitigation measures as negotiated with affected residents and other sensitive receivers.

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.

The potential impacts arising from minor construction activities or ancillary facilities may be assessed in CNVIS or using the TfNSW noise calculator where impacts are likely to be short term or low impact. These assessments will be provided to the AA for review and endorsement.

10 Operational noise and vibration

10.1 Operational Noise and Vibration Assessment

The PLR Stage 1 must be designed and operated with the objective of not exceeding the air-borne and ground-borne noise trigger levels as defined in the Rail Infrastructure Noise Guideline (EPA, 2012) and the vibration levels defined in the Assessing Vibration: A Technical Guideline (DEC, 2006).

Relevant to the Infrastructure Works, the JV will design and install embedded trackforms with "normal", "high-attenuation" and "very high attenuation", a grass trackform and ballasted track with ballast mats or sleeper pads. The location of each trackform type is specified in the Scope and Performance Requirements (SPR).

TfNSW (through the SOM Works contractor) will prepare an Operational Noise and Vibration Review (ONVR) to confirm noise and vibration mitigation measures that would be implemented for the operation of the PLR Stage 1. The JV will provide relevant documents and information to support the preparation of the ONVR.

11 Environmental control measures

11.1 Cumulative Impacts

Delivery of PLR Stage 1 will be through five key packages (refer to Section 1.2.3 for more detail). This will be in addition to other construction and infrastructure projects that will be active along the Project alignment concurrently with the PLR Infrastructure Works.

The JV will take reasonable steps to coordinate with other PLR contract works, or other construction and infrastructure projects, to minimise cumulative impacts of noise and vibration and maximise respite for affected sensitive receivers. The level of coordination required to manage cumulative impacts will be dependent on the level of concurrent works within each precinct. When concurrent works are occurring within a precinct, the JV will coordinate information sharing through regular meetings, sharing of OOHW schedules, sharing stakeholder information (sensitivity awareness) and combining community notifications. The AA will provide oversight over all packages and will assist in identifying periods of concurrent works.

Measures to coordinate the JV works with other PLR contract works, or other construction and infrastructure projects, will be included in the CNVIS that are provided to the AA. Where relevant, the activities of other contractors that will be known to be working concurrently with in the same precinct will be addressed in CNVISs and or the programming of works.

11.2 Respite periods

Where works are undertaken outside hours specific in Condition E21 and E22 and construction noise levels result in sleep disturbance (i.e. exceed 65 dB(A) LAeq (15 mins) at the façade of the building of a residential receiver), works will only be scheduled for a maximum of 4 nights in any 7-day period. The preferred 4 nights working block will be informed by community consultation referenced in Condition E39.

In accordance with Condition E39, in order to undertake work under an EPL, appropriate work and respite periods for the works will be developed in consultation with the community at each affected precinct at three monthly intervals. This consultation will be ongoing and include (but not be limited to) providing the community with:

- 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 Works Protocol)
- 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 Works Protocol)
- The potential works, location and duration
- The noise characteristics and likely noise levels of the works
- Likely mitigation and management measures.

Consultation will be undertaken using a range of consultation methods to optimise community engagement across different land use types identified in the land use survey. This will include phone calls, door knocks, calling cards, emails or community information sessions. Questions to assess the criteria in E39 will also be asked in response to all community complaints to encourage engagement from adversely affected receivers.

The affected community's preference for alternative hours and/or durations will be considered when confirming the schedule. The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour works will be provided to the AA, ER and the Secretary in E39 Consultation reports that will be prepared for each precinct on a quarterly basis (or more frequently if required).

The JV will ensure respite is coordinated with other contractors, including those undertaken by utility contractors, for the delivery of the CSSI and the JV will participate in TfNSW Out of Hours Working Group(s) to coordinate with other PLR Package Works.

The provision of respite periods should not preclude the application of other construction noise management measures, including the provision of at receiver treatments and or alternate accommodation.

11.3 Additional Noise and Vibration Mitigation Measures

In circumstances where following the application of standard mitigation measures, the construction noise and vibration objectives (refer to Section 6) are exceeded, additional noise and vibration mitigation will be required. Additional mitigation and management measures generally refer to community notifications and/or alternate accommodation and will include one or more of the following:

- **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 will form a resource for members of the community to seek further information, including CNVPs 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** – An email distribution list will be used to disseminate project information to interested stakeholders.
- **Signage** – Signage on construction sites will be provided to notify stakeholders of project details and project emergency or enquiry information.
- **Specific notifications** – Specific notifications will 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. Specific notification would include details of the location, scope, dates and times of work.
- **Phone calls** – Phone calls may be made to identified/affected stakeholders within seven days of proposed work. 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).
- **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 JV 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).
- **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 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.

- **Project specific respite offer** – Residents subjected to lengthy periods (such as specific phase of the construction work extended for more than 24hr of continuous works) 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.
- **Alternative accommodation** – As described in the CNVS, provision of alternative accommodation for residents will be offered where noise and vibration impacts are predicted during the night-time period (between 10 pm and 7 am) that exceed the sleep disturbance criteria for more than two consecutive nights. As the project is likely to require night-time works at many locations including the Parramatta CBD precinct, provision of alternative accommodation in all cases may not always be feasible or reasonable. During the preparation of CNVIS, an assessment will be undertaken to determine whether alternative accommodation is reasonable and feasible.
- Each CNVIS will be provided to the AA for review and endorsement in accordance with Condition A29(e). Where alternate accommodation is not accepted by the receiver, other Additional Noise and Vibration Mitigation Measures should be explored in consultation with the receiver.
- **Notification Emergency Works** - On becoming aware of the need for emergency out-of-hour works, the JV will notify the ER of the need for those activities or works as soon as becoming aware of the works. The JV will also make best endeavours to notify all affected sensitive receivers of the likely impact and duration of those works.

The additional mitigation measures required will be determined based on the time period works are being undertaken and the level of exceedance. **Table 11-1**, as derived from the TfNSW Construction Noise and Vibration Strategy, provides a guide to the application of additional measures based on the construction hours and level of exceedance of the NML.

Table 11-1: Noise and vibration management and mitigation measures

Construction Hours	Receiver Perception	db(A) above RBL	db(A) above NML	Additional mitigation measures
Standard Construction Hours Monday to Friday (7am – 7pm) Saturday (8am – 6pm)	Noticeable	5 to 10	0	-
	Clearly Audible	>10 to 20	>10	-
	Moderately Intrusive	>20 to 30	>20	PN, V
	Highly Intrusive	>30	>20	PN, V

Construction Hours	Receiver Perception	db(A) above RBL	db(A) above NML	Additional mitigation measures
Standard Highly Noise Affected hours ¹ Monday to Friday (7am – 6pm) Saturday (8am – 1pm)	75 dBA or greater	n/a	n/a	PN, V, SN
OOHW Period 1 Monday to Friday (6pm – 10pm) Saturday (7am – 8am, 1pm – 10pm) Sunday / PH (8am – 6pm)	Noticeable	5 to 10	>5	-
	Clearly Audible	>10 to 20	5 - 15	PN
	Moderately Intrusive	>20 to 30	15 to 25	PN, V, SN, RO
	Highly Intrusive	>30	>25	PN, V, SN, RO, RP, DR
OOHW Period 2 Monday to Saturday (12am – 7am, 10pm – 12am) Sunday / PH (12am – 8am, 6pm-12am)	Noticeable	5 to 10	>5	PN
	Clearly Audible	>10 to 20	5 - 15	PN, V
	Moderately Intrusive	>20 to 30	15 to 25	PN, V, NS, RP, DR
	Highly Intrusive	>30	>25	PN, V, SN, AltA, RP, DR

Notes:

1. 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.

Additional Mitigation Measures

PN = Project Notification

V = Verification Monitoring

RR = Respite Period

AltA = Alternate Accommodation

SN = Specific Notification / individual briefing or phone call

DR = Duration Reduction

RO = Project Specific Respite Offer

11.4 Other Noise and Vibration Consultation Requirements

Communication Action Plans (CAPs) will be developed for all stakeholder consultation in accordance with the JV's Communication and Engagement Management Plan. The outcomes of consultation will be incorporated into the requirements of the noise and vibration mitigation measures in the CNVIS.

Consultation requirements for noise and vibration include the following:

- Property owners during the preparation of the Land Use Survey where land use cannot be assessed from public space or access to the property is required
- Property owners and facility managers identified from the Land Use Survey to require Building Condition Survey Reports
- 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)

- Nearby childcare centres to potentially avoid noisy works during rest periods at the centres (where possible)
- Within the Westmead Research Zone with the affected facilities to determine periods when noise and/or vibration intensive works can occur with least impact
- Affected businesses along Eat Street to establish construction outside the hours identified in Condition E21 along 'Eat Street' as outlined in the Business Activation Plan required by Condition E110
- The community when planning to undertake out-of-hours work described in Condition E25 (c) and (d) to identify appropriate work and respite periods at each affected precinct at three monthly intervals. The following information will be provided which undertaking this consultation:
 - A schedule of likely out-of-hours work for a period of no less than two (2) months for medium to high risk work
 - A schedule of likely out-of-hours work for a period of no less than seven (7) days for low risk work
 - The potential works, location and duration
 - The noise characteristics and likely noise levels of the works
 - Likely mitigation and management measures
 - Responses will be provided to community members of the outcomes of the consultation.
- With affected receivers when seeking community agreement for works outside of standard construction hours in accordance with an EPL
- With affected receivers in accordance with the Additional Noise and Vibration Mitigation Measures in Section 11.3
- With 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) to determine sensitive periods when noise generating activities cannot be undertaken
- 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
- With Sydney Coordination Office and Roads and Maritime Services for hours of when construction deliveries and spoil removal would be undertaken within the Parramatta CBD and Rosehill and Camellia precincts.

11.5 Hierarchy of Preferred Working Hours

Where OOHW is planned to take place, the following hierarchy of preferred working hours must be considered unless otherwise agreed with the affected community through consultation (Condition E39).

1. Saturday afternoon periods between 1pm and 6pm (Standard hours, applicable to HNIW)
2. Sunday and public holiday day periods between 8am and 6pm (Period 1 Day)
3. Weekday evening periods between 7pm and 10pm (Period 1 Evening)
4. Weekend evening periods between 6pm and 10pm (Saturdays Period 1 Evening/Sundays Period 2)
5. Weekend night periods between 10pm and 8am (Period 2)

6. Work during the weekday evening and night and scheduling the noisiest or vibration intensive work first (between 6pm and 10pm) to minimise sleep disturbance impacts in the night period between 10pm and 7am) – read in conjunction with E27 (Period 1 Evening & Period 2)
7. All other times outside recommended standard hours.

For Eat Street, the listed OOHW hierarchy of working hours include:

1. Weekday night periods (Monday-Thursday) between 10pm and 7am (Period 2)
2. Sunday and public holiday day periods between 7am and 11am (Period 1 Day)
3. Weekend night periods (Friday, Saturday and Sunday) between 10pm and 7am (Period 2)
4. Sunday and public holiday day periods between 11am and 6pm (Period 1 Day)
5. All other times outside recommended standard hours as advised by consultation.

This Hierarchy does not apply to emergency work. This should be undertaken in accordance with CoA E26; on becoming aware of emergency works the ER and TfNSW must be notified. It is the responsibility of the JV to use best endeavours to contact affected sensitive receivers and advise of the likely impact and duration of such works. See Section 11.3 for more details.

Road Traffic Noise

When planning OOHW, consideration must be given to minimising road traffic noise caused by construction of PLR, including but not limited to:

- Restricting heavy vehicle movements to standard hours (Section 5); and/or
- Planning heavy vehicle haulage routes that have fewer sensitive receivers.

11.6 Management and Mitigation Measures

Specific and standard measures and requirements to address contract specifications, CoA and REMMMs in relation to impacts from noise and vibration are outlined in **Table 11-2**.

Table 11-2: Noise and vibration management and mitigation measures

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV01	All employees, contractors and subcontractors will receive an induction, including: • All relevant noise and vibration mitigation measures • Relevant licence and approval conditions • Permissible hours of work • Any limitations on noise generating activities with special audible characteristics • Location of nearest sensitive receivers • Construction employee parking areas • Designated loading/unloading areas and procedures • Site opening/closing times (including deliveries) • Environmental incident procedures	Project training program (induction, toolbox or specific training)	Construction	Environmental Coordinator	CoA E33

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV02	A register of most affected noise and vibration sensitive receivers will be kept on site. The register will include the following details for each sensitive receiver: - Address of receiver - Category of receiver (e.g. residential or commercial etc.) - Contact name and phone number	Sensitive receiver register derived from the Land Use Survey	Construction	Environment and Sustainability Manager Environmental Coordinator to maintain register	CoA E33 EPO-NV-2
NV03	Where feasible and reasonable, construction will be carried out during the standard daytime working hours.	CNVIS	Construction	Environmental Advisor	CoA E33
NV04	For construction concentrated in a single area, such as at the stops, worksites and bridge sites, temporary acoustic fencing/barriers around the site perimeter will be considered where feasible and reasonable to mitigate off-site noise levels.	Acoustic fencing / barriers to be identified in the specific mitigation measures of the CNVIS. To be verified during site inspections and noise verification monitoring.	Construction	Environmental Advisor Foreman	REMMM NV-2

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV05	Given the potentially high noise levels at residential receivers, adherence to daytime construction hours will be observed where possible 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).	CNVIS OOHW to be limited through the application of the EPL and OOHW Permits	Construction	Environmental Advisor	REMMM NV-2
NV06	Where possible, noisy works will 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. Construction hours along 'Eat Street' must be established through consultation with affected businesses as outlined in the Business Activation Plan required by Condition E110 (refer to Section 5.2).	CNVIS Business Activation Plan Consultation reports OOHW to be limited through the application of the EPL and OOHW Permits	Construction	Environmental Advisor Community Place Coordinator	REMMM NV-2 CoA E24

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV07	For any work that will take place outside the approved construction hours (refer to Section 5.1) until an EPL is issued, the Out of Hours Works Protocol outlined developed in accordance with CoA E28 will be implemented. The JV was issued EPL Number 21347 on the 3 January 2020. The Out of Hours Works Protocol does not apply to works subject to EPL.	Out of Hours Works permits to ensure EPL compliance	Construction	Environmental Advisor Foreman	CoA E28
NV08	Out of hours works will be programmed to minimise the number of consecutive out of hour work periods impacting the same receptors.	Out of Hours Works permits to ensure EPL compliance	Construction	Environmental Advisor	REMMM NV-2
NV09	Consultation will 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).	Land Use Survey to identify schools and other educational facilities CNVIS CAPs to guide consultation with local schools	Construction	Environment and Sustainability Manager Place Manager	REMMM NV-2
NV10	Consultation with nearby childcare centres will be carried out to discuss avoidance of noisy works during rest periods at the centre.	Land Use Survey to identify nearby childcare centres CNVIS CAPs to guide consultation with childcare centres	Construction	Environmental Advisor Place Manager	REMMM NV-2

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV11	Simultaneous operation of noisy plant near sensitive receptors will be avoided (where possible).	Project training (induction, toolbox or specific training) To be verified during site inspections and noise verification monitoring.	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2 EPO-NV-1
NV12	Equipment which is used intermittently will be shut down when not in use.	Project training (induction, toolbox or specific training) To be verified during site inspections and noise verification monitoring	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2
NV13	Where possible, the offset distance between noisy plant items and nearby noise sensitive receptors will be as great as possible.	To be addressed in CNVIS. Project training (induction, toolbox or specific training) To be verified during site inspections and noise verification monitoring	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2
NV14	Where possible, equipment with directional noise emissions will be oriented away from sensitive receptors.	Project training (induction, toolbox or specific training) To be verified during site inspections and noise verification monitoring	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV15	Construction compounds will use 2.4-metre-high hoarding of solid construction where required to minimise noise on sensitive receivers, where safe to do so. Construction hoardings in the Cumberland Precinct to be determined in consultation with HAC to maintain consumer safety and manage clinical risks.	CNVIS to model predicted impacts of each main construction compound. 2.4-metre-high hoarding around construction compounds where required. To be verified during site inspections and noise verification monitoring	Pre-construction Construction	Environmental Advisor Foreman	REMMM NV-2 EPO-NV-1
NV16	Structures will be used to shield residential receivers from noise such as site shed placement, earth bunds, fencing and erection of operational stage noise barriers (where practicable).	Shielding structures To be verified during site inspections and noise verification monitoring	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2 EPO-NV-1
NV17	Site topography will be considered when situating plant to reduce noise and vibration impact.	Opportunities will be assessed in CNVIS Project training (induction, toolbox or specific training) To be verified during site inspections and noise verification monitoring	Construction	Environmental Advisor Foreman	CoA E33

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV18	Stationary noise sources (such as pumps, compressors, fans etc) should be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained. (Note: Appendix F of AS 2436: 1981 lists materials suitable for shielding).	Acoustic fencing / barriers to be identified in the specific mitigation measures of the CNVIS. To be verified during site inspections and noise verification monitoring.	Construction	Environmental Advisor Foreman	CoA E33 REMM NV-2
NV19	Regular compliance checks for noise emissions from all plant and machinery used for the project will be carried out to indicate whether noise emissions from plant items are higher than predicted. This will also identify defective silencing equipment on the items of plant.	Noise and Vibration Monitoring Program to include regular spot checks of plant and machinery.	Construction	Environmental Advisor	REMMM NV-2
NV20	Ongoing noise monitoring will be carried out during construction at sensitive receptors during critical periods to identify and assist in managing high risk noise events.	Noise and Vibration Monitoring Program	Construction	Environmental Advisor	REMMM NV-2
NV21	Where possible heavy vehicle movements will be limited to daytime hours.	CNVIS Project training (induction, toolbox or specific training)	Construction	Environmental Advisor	REMMM NV-2

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV22	Reversing of equipment will be minimised to prevent nuisance caused by reversing alarms, which will be limited to the use of non-tonal reversing alarms.	Non-tonal reversing alarms Compound layout and TCP To be verified during site inspections and noise verification monitoring.	Construction	Environmental Advisor	REMMM NV-2
NV23	Loading and unloading will be carried out away from sensitive receptors, where practicable.	Project training (induction, toolbox or specific training) To be verified during site inspections and noise verification monitoring.	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2
NV24	Dedicated loading/unloading areas will be shielded if close to sensitive receivers.	CNVIS To be verified during site inspections and noise verification monitoring.	Construction	Environmental Advisor	CoA E33
NV25	Delivery vehicles will be fitted with straps rather than chains for unloading, wherever possible.	Straps fitting Supplier awareness training Subcontractor contracts	Construction	Environmental Advisor	CoA E33

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV26	Work will be scheduled to provide respite periods from the Highly Noise Intensive Works, and residents will be communicated with to clearly explain the dates and duration of noise levels for the work. Refer to Section 11.2 for process to determine suitable respite periods through ongoing community consultation.	CNVIS to identify activities and locations where respite periods are required. Project training (induction, toolbox or specific training) To be verified during site inspections and noise verification monitoring.	Construction	Environmental Advisor	CoA E27 REMMM NV-2
NV27	In the event of predicted exceedances of the noise goals, particularly during out-of-hours works, community notifications outlined in Section 11.3 will be implemented. Complaints will be managed in accordance with Section 3.6.5 of the CEMP.	CNVIS will identify predicted exceedance TfNSW Community Communication Strategy approved under Condition B3 Place Managers to record consultation in Consultation Manager	Construction	Environmental Advisor	REMMM NV-3
NV28	For sensitive receivers that operate outside standard construction hours, for example hospitals which operate on a 24-hour basis, feasible and reasonable noise mitigation options and measures will be developed in consultation with the sensitive receiver.	CAPs to guide consultation with sensitive receivers Outcomes of consultation to be included in CNVIS OOHW Permit to be issued in accordance with the CNVIS	Construction	Place Manager Environmental Advisor	REMMM NV-4

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV29	The use of noise intensive plant items will be scheduled for normal working hours where possible. If the works cannot be carried out during the daytime, it has been recommended to complete them before 11 pm, where practicable. This will be particularly relevant for works impacting the following noise catchment areas (NCAs) where several activities have been predicted to result in high impacts on many residential receivers during the night-time: • NCA04 in the Westmead precinct • NCA06 and NCA07 in the Parramatta North precinct • NCA11 in the Rosehill and Camellia precinct. If works are required outside normal working hours, the affected receivers are to be determined through noise modelling and community consultation in accordance with Condition E39 must be considered in scheduling of the works and respite periods. The predicted impacts and proposed scheduling of the works and respite periods are to be reported in CNVIS to determine additional mitigation measures.	CNVIS to identify activities and locations where noise intensive plant items will be restricted to normal working hours E39 Consultation reports Locations to be included on ECMs OOHW Permit to be issued in accordance with the CNVIS Project training (induction, toolbox or specific training)	Construction	Environmental Advisor	REMMM NV-5 CoA E39

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV30	Opportunities to reduce road traffic noise during construction will be investigated, including restricting heavy vehicle movements to standard construction hours and/or to routes with fewer sensitive receivers.	Traffic, Transport and Access Management Sub-plan	Construction	Environmental Advisor	CoA E33 REMMM NV-6
NV31	Traffic controllers will be used to minimise occurrences of vehicles queuing, idling or reversing near noise sensitive receivers as much as practical.	Land Use Survey to identify areas with noise sensitive receivers Traffic Control Plans (TCP) to identify suitable queuing locations Traffic controllers	Construction	Traffic Manager	Best practice
NV32	Traffic flow, parking and loading/unloading areas will be planned to minimise reversing movements within the site.	Traffic, Transport and Access Management Sub-plan	Construction	Traffic Manager	CoA E33
NV33	The speed of vehicles will be limited and the use of engine compression brakes will be avoided.	Site Vehicle Movement Plans (VMP)	Construction	Traffic Manager	CoA E33
NV34	Vehicles will be 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.	Plant inspection and plant register National Transport Commission's 'In-service test procedure' and standard	Construction	Plant Manager	CoA E33

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV35	The on-site storage capacity will be maximised to reduce the need for truck movements during sensitive times.	On-site storage areas to be identified on ECMs To be verified during site inspections	Construction	Environmental Advisor Foreman	CoA E33
NV36	Where possible, noise from mobile plant will be reduced through additional fittings including: - Residential grade mufflers - Air Parking brake engagement is silenced. This will be mandatory where the relevant NML is exceeded.	Supplier / subcontractor awareness training or contracts Plant inspection and plant register	Construction	Environmental Advisor Plant Manager	CoA E33 EPO-NV-1
NV37	Where practicable, materials will be pre-fabricated/prepared off-site to reduce noise with special audible characteristics occurring on site. Materials will then be delivered to site for installation.	Environmental Design Review Reports	Design	Design Manager	CoA E33

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV38	Where vibration intensive construction activities are proposed within 100 metres of sensitive receivers, these works will be confined to the less sensitive daytime period where possible. If vibration intensive construction are required outside normal working hours, the affected receivers are to be determined through noise modelling and community consultation in accordance with Condition E39 must be considered in scheduling of the works and respite periods. The predicted impacts and proposed scheduling of the works and respite periods are to be reported in CNVIS to determine additional mitigation measures.	Land Use Survey to identify sensitive receivers CNVIS to identify locations where vibration intensive construction activities are proposed within 100 metres of sensitive receivers Locations to be included on ECMs Verification through construction vibration monitoring	Construction	Environmental Advisor	REMMM NV-7
NV39	Vibration generating plant and equipment will be relocated to areas within the site to lower the vibration impacts.	CNVIS to identify locations where vibration intensive construction activities are proposed within 100 metres of sensitive receivers Locations to be included on ECMs	Construction	Environmental Advisor	REMMM NV-7 REMMM NV-8

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV40	The feasibility of rescheduling the hours of operation of major vibration generating plant and equipment will be investigated. The scheduling must be completed with reference to the outcomes of the E39 Consultation.	CNVIS to identify activities and locations where rescheduling the hours of operation of major vibration generating plant and equipment should be considered Locations to be included on ECMs	Construction	Environmental Advisor	REMMM NV-7 CoA E39
NV41	Lower vibration generating items of excavation plant and equipment (e.g. smaller capacity rock breaker hammers) will be used.	CNVIS to identify activities and locations where lower vibration generating items are to be used	Construction	Environmental Advisor Foreman	REMMM NV-7 EPO-NV-2
NV42	Consecutive works in the same locality will be minimised (if applicable).	Noise modelling of predicted impacts in CNVIS Out of Hours Works permits to ensure EPL compliance To be verified during noise monitoring	Construction	Environmental Advisor Foreman	REMMM NV-7
NV43	Dampened rock breakers such as “City” Model Rammer Hammers will be used to minimise the impacts associated with rock breaking works where ground borne noise or vibration is predicted to exceed the relevant vibration criteria	Supplier / subcontractor awareness training or contracts Dampened rock breakers	Construction	Environmental Advisor Foreman	REMMM NV-7

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV44	If vibration intensive works are required within the safe working distances, vibration monitoring or attended vibration trials will be carried out to ensure that levels remain below the cosmetic damage criterion.	The location and type of sensitive receivers will be identified through the Land Use Survey. Works within the safe working distances will be identified in the CNVISs. Applicable areas will be illustrated on ECMs Noise and Vibration Monitoring Program	Construction	Environmental Advisor	CoA E33 REMMM NV-7 EPO-NV-2
NV45	Building condition surveys will 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. Building condition reports will identify buildings at risk of vibration damage (refer to Section 12.3.2).	Land Use Survey to identify buildings requiring building condition surveys Building Condition Survey Reports (dilapidation reports)	Pre-construction Post-construction	Environmental Coordinator	CoA E33 CoA E45 REMMM NV-7 EPO-NV-2
NV46	Consultation with the affected facilities within the Westmead Research Zone will be carried out to determine periods when noise and/or vibration intensive works can occur with least impact.	CAPs to guide consultation with sensitive receivers Outcomes of consultation to be included in CNVIS OOHW Permit to be issued in accordance with the CNVIS	Construction	Environmental Coordinator	REMMM NV-8

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV47	Consultation will be completed with facilities with vibration sensitive equipment to inform them of the predicted vibration impacts associated with each stage of works to determine suitable mitigation measures which may include relocation or vibration isolation of sensitive equipment by the facility owners prior to the commencement of vibratory works. This would include: (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 Works 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 Works Protocol (Condition E28)).	CAPs to guide consultation with sensitive receivers Outcomes of consultation to be included in CNVIS	Construction	Environmental Coordinator Community Place Managers	REMMM NV-8
NV48	Unattended noise and vibration monitoring will be carried out within the facilities to ensure noise and/or vibration levels are within acceptable levels.	Noise and Vibration Monitoring Program	Construction	Environmental Coordinator	REMMM NV-8 EPO-NV-2

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV49	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) will not be timetabled within sensitive periods, unless otherwise agreed with the affected institutions, and at no cost to the affected institution. This will be determined through ongoing consultation with the community during construction. Works within the proximity of mental health services and accommodation in Cumberland Hospital will be managed in consultation HAC with a focus on the specific clinical risks associated with functioning mental health facility. Risks identified in through joint risk assessments with HAC will be included in the Environmental Risk Assessments (CEMP Appendix A2) and used to inform the recommendation of scheduling and respite in the CNVIS.	Land Use Survey to inform CNVIS CAPs to guide consultation with sensitive receivers Outcomes of consultation to inform recommendations to CNVIS	Construction	Environmental Coordinator Place Manager	CoA E31

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV50	Noise with special audible characteristics and vibration generating activities (including jack and rock hammering, sheet and pile driving, rock breaking and vibratory rolling) will only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block. 'Continuous' includes any period during which there is less than a 1-hour respite between ceasing and recommencing any of the work.	Land Use Survey to inform CNVIS CNVIS to identify areas where noise with special audible characteristics and vibration generating activities will impact sensitive receivers Respite period to be communicated in E39 Reports To be verified through noise monitoring or inspections	Construction	Environmental Coordinator Foreman	CoA E27 CoA E33
NV51	No dropping of materials from height and throwing of metal items will be allowed.	Project training (induction, toolbox or specific training) To be verified through noise monitoring or inspections	Construction	Environmental Coordinator Foreman	CoA E33
NV52	No excessive revving of plant and vehicle engines will be allowed.	Project training (induction, toolbox or specific training) To be verified through noise monitoring or inspections	Construction	Environmental Coordinator Foreman	CoA E33

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV53	Piling activities that affect sensitive receivers will be undertaken using quieter alternative methods than impact or percussion piling, such as bored piles or vibrated piles, where practicable.	Requirements Verification Traceability Matrix to allocation requirement to relevant design packages for permanent works (refer to CEMP Section 1.5.3 for further details of this process). CNVIS to identify locations where quieter piling activities area required for temporary works	Design Manager Construction	Design Manager Environmental Coordinator Foreman	CoA E33 CoA E34
NV54	Blasting will not be undertaken at any time.	No blasting is proposed.	Construction	Environmental Coordinator	CoA E35
NV55	Respite periods will be provided for sensitive receivers where any construction activity during the approved construction hours (refer to Section 5.1) results in noise levels that exceed the Highly Noise Affected Level of 75 dB (LA _{eq} , 15 minute).	CNVIS to identify activities and locations where construction noise impacts are predicted to exceed 75dB Respite periods to be included in the E39 Reports	Construction	Environmental Coordinator	CoA E36 CoA E39

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV56	Where works are undertaken outside approved construction working hours and construction noise levels exceed 65 dB(A) LA_{eq} (15 minutes) at the façade of the building of a residential receiver, or ground borne noise exceeding 35 dBA LA_{eq} (15minute), works will only be carried out for 4 nights in any 7-day period.	CNVIS to predict construction noise impacts Out of Hours Works permits to ensure EPL compliance	Construction	Environmental Coordinator	CoA E37
NV57	Relocation of work following 4 nights of works in any 7-day period will be sufficiently removed to provide clear respite of 3 days.	CNVIS to predict construction noise impacts Out of Hours Works permits to ensure EPL compliance	Construction	Environmental Coordinator	CoA E37
NV58	No more than two consecutive nights of noise with special audible characteristics and/or vibration generating work may be undertaken in the same NCA over any 7-day period, unless otherwise approved by the relevant authority.	CNVIS to predict construction noise impacts Out of Hours Works permits to ensure EPL compliance	Construction	Environmental Coordinator	CNVS Table 5
NV59	Works in areas of respite will 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).	CNVIS to predict construction noise impacts Out of Hours Works permits to ensure EPL compliance	Construction	Environmental Coordinator	CoA E37

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV60	Noise generated by construction will not 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 85 dB(A) for any employee working at a location near the CSSI.	CNVIS to predict construction noise impacts and inform programming of works	Construction	Environmental Coordinator	CoA E41
NV61	Vibration testing will be conducted before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage.	Baseline vibration monitoring of vibration generating activities in non-sensitive areas	Construction	Environmental Coordinator	CoA E43
NV62	If the vibration testing and monitoring shows that the preferred dose values for vibration are likely to be exceeded, the construction methodology will be reviewed, and if necessary, additional mitigation measures will be implemented.	Results of baseline vibration monitoring of vibration generating activities in non-sensitive areas to inform CNVIS CNVIS to inform construction planning and methodology	Construction	Environmental Coordinator	CoA E43
NV63	The advice of a heritage specialist will be used on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures.	Heritage specialist report for each instance where vibration, movement and noise monitoring equipment is proposed to be installed on a heritage-listed structures	Construction	Environmental Coordinator	CoA E44 EPO-NV-2

ID	Measure / Requirement	How Implemented	When to implement	Responsibility	Reference
NV64	If the predicted ground-borne vibration levels exceed the cosmetic damage objectives in Section 6.4.2, a different construction method with lower source vibration levels must be used where feasible and reasonable. Otherwise construction works should not proceed unless attended vibration measurements are undertaken at the commencement of the works to determine if there is risk of exceeding of the cosmetic damage objective; or a permanent vibration monitoring system is installed, to warn plant operators (for example via flashing light, audible alarm, SMS) when vibration levels are approaching the cosmetic damage objective.	CNVIS to identify areas where the minimum working distances for vibration intensive activities cannot be achieved. CNVIS to inform construction planning and methodology Vibration monitoring to include attended and permanent vibration monitoring system with means to alert plant operator of exceedances of vibration objectives.	Construction	Environmental Coordinator	NV-3 EPO-NV-2
NV65	Assess noise generating works within 300m of the Grey-headed Flying Fox camp in Parramatta Park.	Refer to the GHFF Mitigation Application Procedure presented in Grey-headed Flying-fox Construction Monitoring Program (ECOSURE, August 2019) ECM	Construction	Trained Ecologist	C9(c)

12 Compliance management

12.1 Roles and responsibilities

The JV Project 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 are of this Sub-plan are outlined below.

12.1.1 CPBD JV Environment and Sustainability Manager

The Environment and Sustainability Manager is a member of the JV Senior Management Team and is accountable for the environmental and sustainability performance of the Infrastructure Works. Key responsibilities associated with this Sub-plan are detailed as follows:

- Develop and implement the Noise and Vibration Management Sub-plan
- Oversee noise and vibration monitoring in accordance with this Sub-plan
- Oversee the preparation of CNVISs
- Oversee compliance tracking and reporting
- Oversee the keeping of all environmental records
- Engage suitably qualified consultants to support implementation of this Sub-plan
- In consultation with the Project Director and Senior Construction Manager, oversee the investigation and reporting of environmental incidents arising from noise and/or vibration
- Regularly engage with the Great River City Light Rail consortium and other interface contractors to achieve environmental alignment (e.g. out of hours works, cumulative impacts) in accordance with the Interface Management Plan.

12.1.2 Environmental Coordinator

Environmental Coordinators report to the JV Environment and Sustainability Manager and are accountable for implementing the environmental requirements during the planning and execution of the Infrastructure Works. Key responsibilities associated with this Sub-plan are detailed as follows:

- Implement the Noise and Vibration Management Sub-plan including preparing and reviewing Out-of-Hours Works Permits
- Direct the preparation of CNVISs by the Acoustic Consultant
- Complete noise and vibration monitoring and reporting with the assistance of the Acoustic Consultant where required (subject to technical expertise)
- Direct suitably qualified consultants to support implementation of this Sub-plan
- Assist the JV Environment and Sustainability Manager with the investigation and reporting of environmental incidents arising from noise and/or vibration.

12.1.3 Acoustic Consultant

Acoustic consultants will be engaged to implement tasks required by the Noise and Vibration Management Sub-plan that require specialist knowledge. Key responsibilities of the Acoustic consultants are detailed as follows:

- Prepare and maintain the Land Use Study required under Condition E20
- Complete the Assessment System and Baseline Study and ambient baseline vibration monitoring

- Prepare Construction Noise and Vibration Assessments in accordance with E42
- Provide and / or verify a construction phase noise model to predict the cumulative impacts of construction noise and vibration impacts
- Undertaken noise and vibration monitoring as directed by the Environmental Coordinator.

12.1.4 Community Place Managers

Community Place Manager are the key point of contact between the Project and the affected community (including both residential and non-residential receivers). Key responsibilities of the Community Place Manager are detailed as follows:

- Consult with the affected community to determine preference for working hours and respite in accordance with Condition E39.
- Consult with affected businesses on Eat Street in accordance with the Business Activation Plan required by Condition E110 to determine Construction outside the hours identified in Condition E21
- Consult with other PLR works packages, other major project and utilities to ensure that respite is coordinated to provide affected receivers with agreed respite periods
- Prepare of E39 Consultation Summary Reports detailing the affected communities' preferences and considerations for scheduling of works and respite
- Implement the determined additional mitigation measures (excluding monitoring) described in Section 11.3 as determined in the CNVIS.
- Respond to community complaints including complaints resulting from noise and vibration impacts.

12.1.5 Site Supervisors

Site Supervisors are responsible for the implementation of the standard and specific mitigation measures that are determined to be reasonable and specified in OOHW Permits.

Site Supervisors are also responsible for directing works only during the working hours that have been approved in by the OOHW Permits or High Noise Impact Working Hours Permits.

12.1.6 Acoustics Advisor

A suitably qualified and experienced Acoustics Advisor (AA) has been engaged for the duration of construction and for no less than six months following completion of construction of the CSSI. The AA has been engaged by TfNSW and approved by DPIE.

The AA will provide a statutory declaration to the Secretary that they are independent of the design and construction personnel. The Proponent will cooperate with the AA by:

- Providing access to noise and vibration monitoring activities as they take place;
- Providing for review noise and vibration plans, assessments, monitoring reports and data analyses undertaken; and
- Considering any recommendations to improve practices and demonstrating, to the satisfaction of the AA, why any recommendation is not adopted.

The AA will meet the following minimum requirements:

- Relevant experience in the last ten years as a senior acoustic specialist on major infrastructure projects, including a fieldwork and construction management component;
- Tertiary qualifications in an acoustic related discipline or equivalent experience; and

- 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.

The Proponent will notify the Department in writing on the engagement of the AA including demonstrating the requirements of Conditions A26 and A27.

The AA must:

- Receive and respond to communication from the Secretary about the performance of the CSSI in relation to noise and vibration;
- Consider and inform the Secretary on matters specified in the terms of this approval relating to noise and vibration;
- Consider and recommend, to the Proponent, improvements that may be made to work practices to avoid or minimise adverse noise and vibration impacts;
- Consider consultation outcomes with affected receivers to determine the adequacy of noise mitigation and management measures including work hours and respite periods;
- 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), including:
 - The Land Use Survey (Section 12.3.1)
 - Building Condition Survey Reports (Section 12.3.2)
 - Measurements of existing ambient vibration levels (Section 12.3.4)
 - CNVISs (Section 9.1)
 - Communication Action plans and Consultation Records in accordance (Section 11.4)
 - Noise and Vibration Noise Complaint reports (CEMP Section 3.6.4)
 - Noise and Vibration Monitoring Report (Section 12.5).
- 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. The JV will facilitate the AA to attend inspections, monitoring or audits as requested by the AA.
- In conjunction with the ER, the AA must:
 - 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;
 - 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;
 - 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;
 - Assess the noise impacts of minor construction ancillary facilities; and
 - 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.

12.1.7 Environmental Representative (ER)

The primary role of the ER is to independently oversee compliance with the Planning Approval and act as the principle point of advice in relation to environmental performance. Engaged by the Independent Certifier, the role of the ER is specified in Schedule 2, Part A of the Planning Approval, specifically CoA A19 to A25.

In accordance with CoA A23 (a-i) and CoA C7, the responsibilities of the approved ER as related to this Sub-plan are summarised as follows:

- Receive and respond to communication from the Secretary in relation to the environmental performance of the CSSI
- Consider and inform the Secretary on matters specified in the terms of this approval
- Endorse the Construction Monitoring Programs including the Noise and Vibration Monitoring program in accordance with C9(b) included within this Subplan.
- Consider and recommend to the Proponent any improvements that may be made to work practices to avoid or minimise adverse impact to the environment and the community
- Review documents identified in Table 2 [of the Planning Approval] and any other documents that are identified by the Secretary, for consistency, in the opinion of the ER, with requirements in or under this approval
- Regularly monitor the implementation of the documents listed in Table 2 [of the Planning Approval] to ensure implementation is being carried out in accordance with the document and the terms of this approval
- Assist the Department in the resolution of community complaints
- Endorse the CEMP which is then submitted to the Secretary for approval no later than one month before the commencement of construction
- Approve low and moderate risk out of hours activities in consultation with the AA.

12.2 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
- Relevant legislation
- Standard construction hours
- Out of hours works process, including consultation
- Location of noise sensitive areas
- Complaints reporting
- General noise and vibration management measures.

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in noise and vibration management. Examples of training topics include, but are not limited to:

- Placement of equipment and machinery away from sensitive receivers

- Heavy vehicle movements
- Operation of noisy plant
- Application of specific noise shielding around site plant.
- Specific responsibilities to minimise impacts on the community and built environment from noise and vibration associated with the works.

Mitigation measures that require toolbox talks or specific training are identified in Section 11.5.

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

12.3 Inspection and monitoring

A Construction (Noise and Vibration) Monitoring Program in accordance with CoA C9(b) has been developed in consultation with the relevant government agencies and Council (refer to Section 4). The Noise and Vibration Monitoring Program has been endorsed by the AA, ER and was submitted to the Secretary for information at least one month before commencement of construction. Construction shall not commence until the Secretary has received all the required Construction Monitoring Programs. The Construction Monitoring Programs, including any minor amendments approved by the ER, will be implemented for the duration of the Project and for any longer period set out in the monitoring program or specified by the Secretary, whichever is greater.

The following sections summaries the various elements of the Noise and Vibration Monitoring Program. Section 6.2, 6.3 and 6.4 outline the relevant air borne noise criteria, ground bourn noise criteria and vibration criteria for the Construction (Noise and Vibration) Monitoring Program.

12.3.1 Land Use Survey

A detailed land use survey has been undertaken to confirm sensitive receivers potentially exposed to construction noise and vibration, construction ground-borne noise and operational noise and vibration. The key objective of the land use survey is to identify all sensitive receivers in proximity to the PLR Stage 1 alignment which may potentially be exposed to noise and vibration (construction and operations).

The land use assessment has been undertaken using a combination of on-site site visual inspections and desktop reviews of Local Government Land Use Maps, NearMap, Google Street View, Land and Property Information databases and other data provided in the EIS. The land use area considers buildings within an approximate distance of 300 m of the alignment on both sides. This distance of 300 m is adequate to cover sensitive receivers potentially exposed to construction noise and vibration during standard construction hours and out of hours work (OOHW) periods.

The completed Land Use Survey is provided in **Appendix B**.

12.3.2 Building Condition Survey

Prior to the commencement of any construction, and with the agreement of the landowners, building condition surveys will be conducted on all buildings identified as being at risk of damage. This will be undertaken by a structural engineer. Buildings will be considered as being at risk of vibration damage if they are located within the minimum safe working distances for vibration intensive activities for cosmetic damage. Based on the criteria building conditions surveys will be completed on all buildings within 50 metres of construction activities involving vibration intensive plant or demolition.

The results of the surveys will be documented in a Building Condition Survey Report for each building surveyed. Copies of the reports will be provided to the landowners of the buildings surveyed, and if agreed by the landowner, the relevant council within three weeks of completing the survey and no later than one month before the commencement of construction.

Buildings will be identified as being at risk of cosmetic damage if they are located within the recommended safe working distances for vibration intensive plant (based on BS7385:2 Evaluation

and Measurement for Vibration in Buildings Part 2: Guide to Damage Levels from Ground-borne Vibration, 1993). For most sources of intermittent vibration during construction, such as rock breakers, the predominant vibration energy occurs at frequencies usually in the 10 Hz to 100 Hz range. On this basis, and with reference to BS7385:2, a vibration damage screening level of 7.5 mm/s has been adopted for assessing potential impacts from continuous vibration.

After completion of construction and with the agreement of the landowner, building condition surveys of all buildings for which building condition surveys were undertaken in accordance with Condition E45 of the Planning Approval must be undertaken by a structural engineer.

The results of the surveys will be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports will be provided to the landowners of the buildings surveyed, and if agreed by the landowner, the relevant Council within three weeks of completing the surveys and no later than three months following the completion of construction.

The JV will review the pre- and post- Building Condition Survey Reports and prepare a root cause analysis for each damage claim received. The JV will be responsible for the repair or compensation to the owner for any physical property damage caused by the Infrastructure Works. Repair or compensation shall occur within a timeframe agreed to by the property owner with the costs borne by the JV.

In the event that the root cause analysis determines that the damage is not attributable to the Infrastructure Works and the outcome is disputed by the property owner, the JV will engage an independent structural engineer to assist in resolving the dispute.

12.3.3 Baseline noise monitoring

A comprehensive noise monitoring program was undertaken for the EIS which has established baseline noise levels (RBL). This data is presented above in Section 7.1 and has been used to establish the noise management levels for each noise catchment.

Changes in land use with reference to the EIS noise catchment areas will be reviewed in the Land Use Survey (refer to Section 9.1). Where changes in land use are identified that may result in changes to the noise management levels established in the EIS, revised baseline monitoring will be completed prior to the commencement of construction works. If revised baseline noise monitoring is undertaken it will be provided to the DPIE in accordance with the requirements of CoA C14.

12.3.4 Baseline vibration monitoring

TfNSW completed surveys of receivers along the alignment in 2017 to identify businesses and institutions that contain equipment that may be sensitive to noise and vibration. Numerous baseline noise and vibration assessments were completed of these facilities. Consultation with businesses and institutions was reviewed during the development of the Land Use Survey prepared in accordance with Condition E20.

Based on the Land Use Survey and consultation with facilities with vibration sensitive scientific and medical equipment, measurements of existing ambient vibration levels will be carried out at receivers with vibration sensitive equipment where no existing baseline data exists. The ambient vibration monitoring will be undertaken for a minimum of one week at the identified locations prior to the commencement of vibration intensive activities.

The data from the existing ambient vibration levels monitoring will be used to form site specific vibration criteria for each of the identified facilities. Within the Westmead, Cumberland East and Cumberland West Health Precincts, an Assessment System and Baseline Study will be prepared in consultation with Health Administration Corporation to identify equipment and spaces sensitive to noise and /or vibration, determine and agree on specific vibration criteria and develop the TfNSW Funded HAC Protection and Relocation. Data from the Baseline Study will be provided to the asset HAC and TfNSW.

12.3.5 Construction noise monitoring

Noise monitoring will be undertaken throughout the construction phase of the Project in accordance with the following requirements:

- **Verification monitoring upon commencement** – upon commencement of a new activity to verify the accuracy of prediction in Appendix D or a CNVIS
- **Monthly verification monitoring** – at the sixteen ambient noise survey locations identified in the EIS Technical paper 13 - Noise and Vibration Impact Assessment (refer to **Table 12-1**) during months including construction activities occurring during standard construction hours for verification of the predicted worst-case noise levels in **Appendix D**
- **Out of Hours Works Verification Monitoring** – where specified as an additional mitigation measures within a CNVIS, verification monitoring will occur at the most affected receiver of each receiver type
- **Potential or predicted high noise impact works** – to verify high impact works (above >75dB(A) at the nearest sensitive receiver including the Grey Headed Flying Fox camp in Parramatta Park) to confirm if respite periods are required
- **Complaint investigation** – in response to complaints the JV must include an offer to the complainant to undertake noise or vibration monitoring at their premises if the JV is not in possession of noise monitoring data representative of the complainant's location and of the subject works and activities being undertaken on the licensed premises.

Construction noise monitoring in addition to the above may also be undertaken to assist in identifying and/ or managing high risk noise events, such as during school examination periods, or as required by an EPL.

Task specific noise goals will be established for each task based on the criteria in Section 6.2 and the application of additional mitigation measures determined in each CNVIS to accommodate the predicted noise impacts. If noise monitoring identifies an exceedance of the established specific noise goals the following will occur:

- Construction activities will be assessed to determine if the alternate mitigation measures (e.g. reduction of the number of plant or installation of additional shielding) can be implemented to achieve the specific noise goals. In this case monitoring will be repeated following the implementation or application of alternate mitigation measures
- If the alternate mitigation measures reduce the noise impact to below the specific noise goals, the works will continue
- If the alternate mitigation measures are unable to reduce the noise impact to below the specific noise goals, the works will continue only to the extent to make the site safe.

Table 12-1: Ambient Noise Monitoring Locations

ID	Precinct	NCA	Noise Monitoring Location
WM02	Westmead	NCA02	157 Hawkesbury Rd, Westmead
WM03		NCA03	199 Hawkesbury Rd, Westmead
WM04		NCA04	Cumberland Hospital East
PN05	Parramatta North	NCA05	55 O'Connell St, North Parramatta
PN06		NCA06	St Patricks Cemetery, North Parramatta

ID	Precinct	NCA	Noise Monitoring Location
CPB07	Parramatta CBD	NCA07	20 Victoria Rd, Parramatta
CBD08		NCA08	Arthur Phillip Highschool, Parramatta
RC09	Rosehill and Camellia	NCA09	9 Noller Pde, Parramatta
RC10		NCA10	5 Hope St, Rosehill
CA11	Carlingford	NCA11	14 Dudley St, Rydalmere
CA12		NCA12	Dundas Station
CA13		NCA13	22 Adderton Rd, Telopea
CA14		NCA14	Telopea Station
CA15		NCA15	89 Marshall Rd, Telopea
CA16		NCA16	Carlingford Station

Noise monitoring methods

Noise monitoring equipment used will be at least Type 2 instruments as described in AS IEC 61672.1 2004 'Electroacoustic – Sound Level Meters – Specifications' and calibrated to standards that are traceable to Australian Physical Standards held by the National Measurement Laboratory (CSIRO Division of Applied Physics). The calibration of the monitoring equipment will be checked in the field before and after the noise measurement period in accordance with Standards Australia AS/IEC 60942:2004/IEC 60942:2003–Electroacoustic – Sound Calibrators.

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

- Time Constant - FAST (i.e. 125 milliseconds)
- Frequency Weightings - A-weighting
- Sample Period - 15 minutes.

The noise loggers will be programmed to accumulate LA90, LA10, LAeq and LMax data and will be assessed against applicable noise levels. Measurements of noise will be disregarded when it is raining and / or the wind speed is greater than 5m/s (18km/HR).

Outdoor noise monitoring is to be undertaken at least 3.5 m from any reflecting structure other than the ground. The preferred measurement height is 1.2 to 1.5m above the ground. Where the noise monitors are placed within 3.5 m of building facades, walls or cliffs, then a reflection correction of up to -2.5dB(A) shall be applied to remove the effect of increased noise due to sound reflections from such structures.

Measurements inside buildings will be at least 1 m from the walls or other major reflecting surfaces, 1.2 to 1.5 m above the floor, and about 1.5 m from windows.

The following information will be recorded within the noise monitoring record template:

- Date and time of measurements
- Type and model number of instrumentation
- Results of field calibration checks before and after measurements

- Description of the time aspects of each measurement (i.e. sample times, measurement time intervals and time of day)
- Location of the nearest sensitive receiver
- Sketch map of area
- Measurement location details and number of measurements at each location
- Weather conditions during measurements
- Operation and load conditions of the noise sources under investigation
- Any adjustment made for presence or absence of nearby reflecting surfaces
- Noise due to other sources (e.g. traffic, aircraft, trains, dogs barking, insects etc.).

12.3.6 Construction vibration monitoring

Vibration monitoring is to be undertaken throughout the Project in accordance with the following requirements:

- **Trial vibration testing** – attended vibration monitoring of vibration intensive activities undertaken in non-sensitive areas and at a range of distances from the source to assess safe working distances for cosmetic damage. The results of the trial monitoring would be compared against predicted vibration levels and the potential for impact refined, if deemed appropriate.
- **Verification monitoring upon commencement of new vibratory activity** – attended vibration monitoring will be undertaken at the commencement of vibration generating activities located near sensitive receivers to confirm that vibration levels are within the acceptable range to prevent cosmetic building damage or vibration levels are predicted to be greater than the maximum values for human comfort because of works
- **Unattended vibration monitoring** – vibration monitoring equipment with alarm systems (visual beacon / alarm or telemetry where suitable) will be used when vibratory works are occurring within a potential range for cosmetic damage to buildings or heritage items or disruption to sensitive scientific or medical equipment
- **Vibratory works near heritage listed items** – vibration testing will be conducted before (attended) and during (unattended) vibration generating activities that have the potential to impact on heritage listed items. If the vibration criteria are likely to be exceeded, construction methodology will be reviewed
- **Out of Hours Works Verification Monitoring** – where specified as an additional mitigation measures within a CNVIS
- **Complaint investigation** – in response to complaints where the complaint suggest impacts are greater than the predicted levels in the CNVIS
- **EPL** – vibration monitoring will also be undertaken where required by an EPL such as in response to complaints or as directed by an authorised officer of the EPA.

In the event of an exceedance of vibration criteria, works will cease or be modified at the direction of the Environment and Sustainability Manager or delegate. Modification or substitution of work methods will be undertaken wherever possible, including but not limited to, with additional measures to undertake monitoring as required:

- Equipment / plant substitution
- Selective use of enhanced equipment / plant.

Vibration monitoring methods

Vibration monitoring will be undertaken in accordance with the vibration measurement requirements stipulated in the legislative standards and guidelines, and will include the following:

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

The following procedure is to be followed by personnel suitably qualified and experienced in undertaking vibration measurements. Data that is collected will be compared against applicable criteria and baseline data. All vibration monitoring equipment is to be calibrated at least once every two years by an ISO 17025 accredited laboratory that holds NATA or ILAC accreditation for completion of vibration calibrations. The monitoring system will also have a measurement frequency range down to 1 Hz.

All short-term vibration monitoring will be recorded over 15-minute sample intervals. The magnitude of vibration is to be recorded at a minimum rate of 10 samples per second. The following minimum range of vibration metrics will be stored in memory and reported:

- Vibration Dose Values (VDVs)
- Root-mean-square (rms) – maximums and statistical levels
- Peak-particle velocity (ppv) – maximums and statistical levels.
- In addition to measuring and reporting overall vibration, statistical vibration will also be measured and reported in third-octave band frequencies from 1Hz to 250Hz.

The following information will be recorded within the vibration monitoring record template:

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

12.4 Monitoring and inspection schedule

The monitoring and inspections requirements relevant to the noise and vibration are summarised in **Table 12-2**.

12.5 Reporting

Reporting requirements relevant to the noise and vibration are identified in **Table 12-3**.

Table 12-2: Inspection and Monitoring Requirements

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
Land Use Survey	Assessment of each sensitive receivers potentially exposed to construction noise and vibration, construction ground-borne noise and operational noise and vibration. Changes in land use with reference to the EIS land use will be reviewed and highlighted.	Pre-construction	To be updated during construction if significant changes in land use are identified during construction	Environment and Sustainability Manager Acoustic Engineer (consultant)	Land Use Survey Data to be used in the development of the NVMP, CNVIS, GIS and ECM
Pre-construction Building Condition Survey	A pre-construction structural condition assessment of each building identified as being at risk of damage (refer to Section 12.3.1)	Pre-construction	Once	Structural Engineer	Building Condition Survey Report for each building
Post-construction Building Condition Survey	A post-construction structural condition assessment of each building identified as being at risk of damage (refer to Section 12.3.1)	No later than three (3) months following the completion of construction	Once (or in response to complaints of building cracking following the commencement of construction)	Structural Engineer	Building Condition Survey Report for each building
Ambient vibration monitoring	Ambient vibration monitoring at facilities with vibration sensitive scientific and medical equipment for a minimum of one week at the identified locations prior to the commencement of vibration intensive activities.	Prior to the commencement of vibration intensive activities	Once	Environment and Sustainability Manager Acoustic Engineer (consultant)	Ambient vibration monitoring reports

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
HAC Baseline Noise and Vibration Study	Within the Westmead, Cumberland East and Cumberland West Health Precincts, baseline study to identify equipment and spaces sensitive to noise and /or vibration and determine ambient noise and vibration levels	Prior to Construction	Once	Environment and Sustainability Manager Acoustic Engineer (consultant)	Assessment System and Baseline Study
Construction Noise Monitoring	Verification monitoring upon commencement	Construction	Upon commencement of a new activity	Environment Coordinator	Monthly environmental monitoring report
	Monthly verification monitoring	Construction	Monthly (during months including construction activities are occurring)	Environment Coordinator	Annual Environment report
	Out of Hours Works Verification Monitoring	Construction	Where specified as an additional mitigation measures within a CNVIS	Environment Coordinator	
	Potential or predicted high noise impact works verification	Construction	When high noise impact works are predicted	Environment Coordinator	

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
	Noise and Vibration Complaint investigation. Subject to EPL Condition M2.4, the JV must include an offer to the complainant to undertake noise or vibration monitoring at their premises if the JV is not in possession of noise monitoring data representative of the complainant's location and of the subject works and activities being undertaken on the licensed premises.	Construction	Each complaint where the complaint suggest impacts are greater than the predicted levels in the CNVIS	Environment Coordinator	Complaint report Monthly environmental monitoring report Annual Environment report
	Noise monitoring undertaken by direction of an authorised officer of the EPA.	Construction	As directed by an authorised officer of the EPA	Environment Coordinator	Preliminary Investigation Report Follow-Up Investigation Report
Construction vibration monitoring	Trial vibration testing	Construction	As required to assess each vibratory plant / equipment	Environment Coordinator	Monthly environmental monitoring report Annual Environment report

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
	Verification monitoring upon commencement	Construction	At the commencement of vibration generating activities located near buildings and/or sensitive receivers	Environment Coordinator	
	Unattended vibration monitoring	Construction	When vibratory works are occurring within a potential range for cosmetic damage to buildings or heritage items or disruption to sensitive scientific or medical equipment	Environment Coordinator	
	Vibratory works near heritage listed items	Construction	Before (attended) and during (unattended) vibration generating activities that have the potential to impact on heritage listed items	Environment Coordinator	

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
	Out of Hours Works Verification Monitoring	Construction	When specified as an additional mitigation measures within a CNVIS	Environment Coordinator	
	Noise and Vibration Complaint investigation. Subject to EPL Condition M2.4, the JV must include an offer to the complainant to undertake noise or vibration monitoring at their premises if the JV is not in possession of noise monitoring data representative of the complainant's location and of the subject works and activities being undertaken on the licensed premises.	Construction	Each complaint where the complaint suggest impacts are greater than the predicted levels in the CNVIS	Environment Coordinator	Complaint report Monthly environmental monitoring report Annual Environment report
	Vibration monitoring undertaken by direction of an authorised officer of the EPA.	Construction	As directed by an authorised officer of the EPA	Environment Coordinator	Preliminary Investigation Report Follow-Up Investigation Report

Item	Scope	Timing	Frequency	Responsibility	Records / Reporting
Daily visual observations	Daily site checks of source and standard noise mitigation measures between weekly inspections.	Construction	During any works	Site Supervisors	Report by exception in Daily Diary Notification of issues / incidents / non-compliance to Environmental Coordinator
Weekly Inspections	Inspection of the environmental controls and implementation of the noise and vibration mitigation measures outlined in Table 6-1.	Construction	Weekly	Environmental Coordinator & Site Supervisor, TfNSW, ER or AA where required.	Weekly Environmental Inspection Checklist ER Inspection Report Fortnightly AA Inspection Report

Table 12-3: Reporting Requirements

Report	Scope	Timing	Frequency	Responsibility	Submission ¹
Land Use Survey	Assessment of each sensitive receivers potentially exposed to construction noise and vibration, construction ground-borne noise and operational noise and vibration. Changes in land use with reference to the EIS land use will be reviewed and highlighted.	Pre-construction	To be updated during construction if significant changes in land use are identified during construction	Environment and Sustainability Manager Acoustic Engineer (consultant)	AA TfNSW
Environmental Design Review Reports	Reports to accompany each design package that will demonstrate consideration of environmental impacts including, where relevant, noise and vibration impacts	Design	With each stage of each design package	Environment and Sustainability Manager with input from JV's Arborist	Independent Certifier
Pre-construction Building Condition Survey Reports	A factual report of the pre-construction structural condition of each building identified as being at risk of damage (refer to Section 12.3.1)	Pre-construction	Report to be provided within three weeks of completing the surveys	Structural Engineer	Landowners of the buildings surveyed, Relevant Council (if agreed by the landowner) AA

Report	Scope	Timing	Frequency	Responsibility	Submission ¹
Post-construction Building Condition Survey Reports	A factual report of the post-construction structural condition of each building identified as being at risk of damage (refer to Section 12.3.1)	Post-construction	Report to be provided within three weeks of completing the surveys	Structural Engineer	Landowners of the buildings surveyed, Relevant Council (if agreed by the landowner) AA
Assessment System and Baseline Study	Assessment System and Baseline Study will be prepared in consultation with Health Administration Corporation to identify equipment and spaces sensitive to noise and /or vibration and develop the TfNSW Funded HAC Protection and Relocation Activities The Assessment System and Baseline Study form part of the monitoring program	Pre-construction	Once	Environment and Sustainability Manager	Health Administration Corporation TfNSW AA DPIE (subject to consent from Health Administration Corporation)
Ambient vibration monitoring reports	Existing ambient vibration level reports for each applicable institution or building	Pre-construction	Once	Environment and Sustainability Manager	Landowners of the facilities with sensitive equipment or spaces AA

Report	Scope	Timing	Frequency	Responsibility	Submission ¹
Monthly Environmental Monitoring Report	Summary of months: • Ambient vibration monitoring • Construction noise monitoring • Construction vibration monitoring • Issues / incidents / non-compliances	Construction	Monthly, within seven Business Day after the end of the relevant calendar month.	Environment and Sustainability Manager	TfNSW IC EPA ER, AA Relevant Councils Made publicly available (https://www.cpbcon.com.au/en/our-priorities/environment)
AA Monthly Noise and Vibration Report	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).	Construction	Within seven days following the end of each month for the duration of construction of the CSSI	AA	DPIE
Quarterly Environment Report (Compliance Tracking Program)	Compliance reporting against the Planning Approval and CEMP including the requirements identified in this plan (Table 3-2 and Table 3-3).	Pre-construction Construction	Within seven Business Days after the relevant quarter end	Environment and Sustainability Manager	TfNSW IC

Report	Scope	Timing	Frequency	Responsibility	Submission ¹
Annual Environment Report	Annual review of the monitoring and reporting requirements of the CEMP Sub-plans including this Sub-plan and with reference to the obligations of Condition C16.	Construction	Within ten Business Days after the end of the relevant calendar year	Environment and Sustainability Manager	TfNSW IC DPIE
Emergency construction 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. In accordance with the TfNSW CNVS, emergency OOHV will be recorded as an environmental incident (refer to the CEMP, Section 3.7).	Pre-construction Construction	On becoming aware of the need for emergency construction works	Environment and Sustainability Manager	TfNSW IC EPA for works under and EPL

Report	Scope	Timing	Frequency	Responsibility	Submission ¹
EPL Monthly Report	In accordance with the POEO Action Section 66(6), EPL monitoring data that relates to pollution including discharge data and any non-compliances relating to Pollution of Waters.	Within 14 days of obtaining monitoring data For duration of period in possession of EPL	Monthly	Environment and Sustainability Manager	EPA Publicly available on company website
EPL Annual return	On the anniversary of the EPL, an Annual Return must be provided including a summary of monitoring requirement applicable to the EPL including noise and vibration monitoring and any non-compliances	Construction	Annually	Environment and Sustainability Manager	EPA
Noise or vibration complaint investigation	Subject to EPL Condition M2.4, advise each complainant of the results of noise or vibration investigation including monitoring results and any proposed remedial action	Construction	In response to acceptance by complainant to undertake noise or vibration monitoring at their premises	Environment and Sustainability Manager	Each complainant

Report	Scope	Timing	Frequency	Responsibility	Submission ¹
Preliminary Investigation Report (Noise and Vibration)	Subject to EPL Condition R4.2, upon request of an authorised officer, the licensee must submit a Preliminary Investigation Report to the EPA in respect of any noise or vibration monitoring undertaken in accordance with the requirements of this licence.	Construction	Submitted to the EPA by 4:30pm on the afternoon of the next working day following any noise or vibration monitoring	Environment and Sustainability Manager	EPA
Follow-Up Investigation Report (Noise and Vibration)	Subject to EPL Condition R4.3, in the event of any construction related exceedance of the noise goals or limits identified through the Preliminary Investigation Report (Noise and Vibration) request by an authorised EPA officer.	Construction	Submitted to the EPA within 5 business days of any noise or vibration monitoring having been undertaken (unless otherwise approved by the EPA)	Environment and Sustainability Manager	EPA

Noted: 1 Submission of report to nominated stakeholders will be electronically (email) unless otherwise requested.

12.6 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.

Audit requirements are detailed in Section 3.8.4 of the CEMP.

The AA in conjunction with the ER, 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.

12.7 Licences and permits

Environment Protection Licence requirements are identified in Attachment A1 of the CEMP and will apply to this Project in relation to noise and vibration management. No additional permits or licences are expected to be required in relation to the management of noise and vibration on the Project.

13 Review and improvement

13.1 Continuous improvement

Continuous improvement of this Sub-plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets to 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.

13.2 Update and amendment

The processes described in Section 3.8 to Section 3.12 of the CEMP may result in the need to update or revise this Sub-plan. This will occur as needed.

Only the Environment and Sustainability Manager, or delegate, has the authority to change any of the environmental management documentation. In conjunction with the ER, the AA must consider relevant minor amendments made to the CEMP, this Sub-plans and noise and vibration monitoring programs and, if satisfied such amendment is necessary, endorse the amendment.

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 3.10.2 of the CEMP.

Appendix A – Out of Hours Work Protocol

The current revision of the Out of Hours Works Protocol is available on the TfNSW Parramatta Light Rail internet site:

https://s3.ap-southeast-2.amazonaws.com/data-new.parramattalightrail.nsw.gov.au/s3fs-public/2020-03/PLR%20OOHW%20Protocol%20Rev8.8_Website.pdf

Appendix B – Land Use Survey

Appendix C – Construction Works and Sound Power Levels for Construction Equipment

Plant Item			Asphalt Milling Machine ¹	Ballast Regulator	Ballast Tamper	Bobcat	Compressor	Concrete Pump	Concrete Saw ¹	Concrete Truck / Agitator	Elevated Working Platform	Excavator (10 tonne)	Excavator (40 tonne)	Excavator (Breaker) ¹	Frame Crane	Front End Loader	Generator	Hand Tools	Line Marking Plant	Mobile Crane (50 tonne)	Piling Rig (Bored)	Piling Rig (Vibratory) ¹	Roller (non-vibratory) ¹	Semi Trailer	Slip Form Machine	Suction Truck	Truck (10 tonne)	Truck (25t)	Vibratory Roller (10 - 12 t) ¹
			111	118	118	104	95	106	115	106	97	94	109	121	99	112	101	94	98	100	108	116	100	106	102	100	98	98	109
			15	15	15	15	15	7.5	5	7.5	15	15	15	7.5	15	15	15	15	15	15	7.5	7.5	15	5	15	15	15	15	15
Works ID	Scenario	Activity																											
W.0001	Demolition	Demolition					X										X	X									X		
W.0002		Demolition (with Breaker)					X							X			X	X									X	X	
W.0003	Compounds - 24/7 Operation	Site Establishment						X		X					X					X			X				X		X
W.0004		Services & Utilities				X			X				X													X	X		
W.0005		Hoarding				X									X			X											
W.0006		Site Deliveries													X					X				X					
W.0007	Compounds – Daytime Only	Site Establishment						X		X					X					X			X				X		
W.0008		Services & Utilities				X			X				X													X	X		
W.0009		Hoarding													X			X									X		
W.0010		Site Deliveries																		X				X			X		
W.0011	Spoil & Ballast	Screening & Crushing											X			X												X	
W.0012	Substations	Site Establishment													X					X							X		
W.0013		Construction & Installation						X		X		X			X					X				X		X	X	X	
W.0014	Mainline - Embedded Track	Earthworks											X				X									X	X		
W.0015		Earthworks (with Breaker/saw)							X				X	X			X										X		
W.0016		Concrete Works						X		X					X					X							X		
W.0017		Trackworks													X			X		X							X		
W.0018		Steel Erection & Wiring									X				X			X		X				X			X		

Plant Item			Asphalt Milling Machine ¹	Ballast Regulator	Ballast Tamper	Bobcat	Compressor	Concrete Pump	Concrete Saw ¹	Concrete Truck / Agitator	Elevated Working Platform	Excavator (10 tonne)	Excavator (40 tonne)	Excavator (Breaker) ¹	Franna Crane	Front End Loader	Generator	Hand Tools	Line Marking Plant	Mobile Crane (50 tonne)	Piling Rig (Bored)	Piling Rig (Vibratory) ¹	Roller (non-vibratory) ¹	Semi Trailer	Slip Form Machine	Suction Truck	Truck (10 tonne)	Truck (25t)	Vibratory Roller (10 - 12 t) ¹
Sound Power Level (LAeq)			111	118	118	104	95	106	115	106	97	94	109	121	99	112	101	94	98	100	108	116	100	106	102	100	98	98	109
Minutes Used in Worst-case 15 Minute Period ²			15	15	15	15	15	7.5	5	7.5	15	15	15	7.5	15	15	15	15	15	15	7.5	7.5	15	5	15	15	15	15	15
W.0019	Mainline - Ballast Track	Earthworks										X				X												X	X
W.0020		Concrete Works						X		X					X				X							X	X		
W.0021		Trackworks										X			X			X		X								X	
W.0022		Trackworks - Tamping		X	X																								
W.0023		Steel Erection & Wiring									X				X			X		X				X				X	
W.0024	Stops	Excavation										X					X									X	X		
W.0025		Excavation (with Breaker/saw)							X			X	X				X										X		
W.0026		Concrete Works						X		X					X			X		X							X		
W.0027		Finishing Works									X	X			X			X						X			X		
W.0028	Bridges	Site Establishment													X					X			X				X		
W.0029		Piling																		X	X	X					X		
W.0030		Construction & Installation									X				X					X				X			X		
W.0031		Concrete Works						X		X					X			X		X							X		
W.0032	Stabling and Maintenance Facility	Piling																		X	X	X					X		
W.0033		Concrete Works						X		X					X			X		X							X		
W.0034		Steel Erection									X				X			X		X				X			X		
W.0035	Off Corridor Roadworks	Excavation										X					X										X	X	
W.0036		Excavation (with Breaker)										X	X				X										X		
W.0037		Pavement Works	X			X		X		X						X							X		X		X	X	
W.0038		Signage and Line Marking													X			X	X								X		

Note 1: The ICNG requires that activities identified as particularly annoying (such as jackhammering, rockbreaking and power saw operation) have a 5 dB 'penalty' added to predicted noise levels when using the quantitative method.

Note 2: This refers to the amount of time in minutes that individual items of equipment would be in use for during the worst-case 15 minute assessment period, based on site observations. Some items of plant, such as rockbreakers and semi-trailers, are not typically used in a continuous manner.

Appendix D – Predicted worst-case noise levels

NCA	NML	Demolition	Demolition (w. breaker)	Site establishment	Services and utilities	Hoarding	Site deliveries	Site establishment	Services and utilities	Hoarding	Site deliveries	Screening & crushing	Site establishment	Construction & Instal.	Earthworks	Earthworks (w. Breakers)	Concrete Works	Trackworks	Steel Erection & wiring	Earthworks	Concrete works	Trackworks	Trackworks - Tamping	Steel Erection & Wiring	Excavation	Excavation (w. Breaker)	Concrete Works	Finishing Works	Site Establishment	Piling	Construction & Instal	Concrete Works	Piling	Concrete Works	Steel Erection	Excavation	Excavation (with Breaker)	Pavement Works	Signage and Line Marking	
Residential – Standard daytime																																								
NCA01	59	48	62	56	58	50	49	33	38	<30	<30	<30	45	51	54	63	52	48	51	<30	<30	<30	<30	<30	54	63	52	55	33	42	34	36	<30	<30	<30	41	50	54	43	
NCA02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
NCA03	61	65	79	73	75	67	66	30	35	<30	<30	<30	65	71	78	87	76	72	75	<30	<30	<30	<30	<30	58	67	56	59	35	44	36	38	<30	<30	<30	42	51	68	70	
NCA04	59	73	87	58	60	52	51	78	83	71	74	<30	34	40	79	88	77	73	76	<30	<30	<30	<30	<30	74	83	72	75	46	55	47	49	<30	<30	<30	78	87	84	74	
NCA05	59	68	82	68	70	62	61	42	47	35	38	<30	30	36	72	81	70	66	69	<30	<30	<30	<30	<30	42	51	40	43	47	56	48	50	<30	<30	<30	76	85	82	70	
Residential – Evening																																								
NCA01	52	-	-	56	58	50	49	-	-	-	-	<30	-	-	54	63	52	48	51	-	-	-	-	-	-	-	-	-	33	42	34	-	<30	<30	<30	41	50	54	43	
NCA02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
NCA03	53	-	-	73	75	67	66	-	-	-	-	<30	-	-	78	87	76	72	75	-	-	-	-	-	-	-	-	-	35	44	36	-	<30	<30	<30	42	51	68	70	
NCA04	53	-	-	58	60	52	51	-	-	-	-	<30	-	-	79	88	77	73	76	-	-	-	-	-	-	-	-	-	46	55	47	-	<30	<30	<30	78	87	84	74	
NCA05	53	-	-	68	70	62	61	-	-	-	-	<30	-	-	72	81	70	66	69	-	-	-	-	-	-	-	-	-	47	56	48	-	<30	<30	<30	76	85	82	70	
Residential – Night																																								
NCA01	42	-	-	56	58	50	49	-	-	-	-	<30	-	-	54	63	52	48	51	-	-	-	-	-	-	-	-	-	33	42	34	-	<30	<30	<30	41	50	54	43	
NCA02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
NCA03	48	-	-	73	75	67	66	-	-	-	-	<30	-	-	78	87	76	72	75	-	-	-	-	-	-	-	-	-	35	44	36	-	<30	<30	<30	42	51	68	70	
NCA04	52	-	-	58	60	52	51	-	-	-	-	<30	-	-	79	88	77	73	76	-	-	-	-	-	-	-	-	-	46	55	47	-	<30	<30	<30	78	87	84	74	
NCA05	52	-	-	68	70	62	61	-	-	-	-	<30	-	-	72	81	70	66	69	-	-	-	-	-	-	-	-	-	47	56	48	-	<30	<30	<30	76	85	82	70	
Commercial																																								
NCA01	70	37	51	45	47	39	38	<30	31	<30	<30	<30	37	43	39	48	37	33	36	<30	<30	<30	<30	<30	39	48	37	40	<30	<30	<30	<30	<30	<30	<30	31	40	45	40	
NCA02	70	43	57	51	53	45	44	41	46	34	37	<30	<30	30	70	79	68	64	67	<30	<30	<30	<30	<30	58	67	56	59	30	39	31	33	<30	<30	<30	<30	37	40	50	
NCA03	70	70	84	78	80	72	71	35	40	<30	31	<30	67	73	80	89	78	74	77	<30	<30	<30	<30	<30	76	85	74	77	32	41	33	35	<30	<30	<30	<30	38	45	43	
NCA04	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
NCA05	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Other Sensitive receivers ²																																								
NCA01	-	44	58	52	54	46	45	<30	<30	<30	<30	<30	37	43	50	59	48	44	47	<30	<30	<30	<30	<30	50	59	48	51	<30	<30	<30	<30	<30	<30	<30	<30	<30	37	41	30
NCA02	-	59	73	67	69	61	60	53	58	46	49	<30	55	61	77	86	75	71	74	<30	<30	<30	<30	<30	65	74	63	66	37	46	38	40	<30	<30	<30	<30	34	43	49	51
NCA03	-	72	86	80	82	74	73	<30	31	<30	<30	<30	72	78	79	88	77	73	76	<30	<30	<30	<30	<30	69	78	67	70	34	43	35	37	<30	<30	<30	<30	31	40	48	48
NCA04	-	33	47	40	42	34	33	31	36	<30	<30	<30	<30	30	36	77	86	75	71	74	<30	<30	<30	<30	<30	65	74	63	66	33	42	34	36	<30	<30	<30	<30	38	46	62
NCA05	-	72	86	73	75	67	66	65	70	58	61	<30	34	40	79	88	77	73	76	<30	<30	<30	<30	<30	72	81	70	73	65	74	66	68	<30	<30	<30	<30	65	74	71	59

Source: Table 19 to Table 23 in Technical Paper 13 – Noise and Vibration Impact Assessment, Volume 6

(1) Colouring indicates the range of predicted NML exceedances (red >20 dB, orange 11 - 20 dB, yellow 1-10 dB above NML) based on the controlling time period for the given activity as below:

1-10 dB above NML (minor impacts) 11-20 dB above NML (moderate impacts) >20 dB above NML (high impacts)

(2) Predicted Worst Case refers to L_{max}(15min) Noise Level (D_BA)

(3) Other sensitive' receiver NMLs are dependent on classification. The most affected 'other sensitive' receiver type may change between each activity resulting in different NMLs.

NCA	NML	Demolition	Demolition (w. breaker)	Site establishment	Service and utilities	Hoarding	Site deliveries	Site establishment	Service and utilities	Hoarding	Site deliveries	Screening & crushing	Site establishment	Construction & Instal.	Earthworks	Earthworks (w. Breaker)	Concrete Works	Trackworks	Steel Erection & wiring	Earthworks	Concrete works	Trackworks	Trackworks - Tamping	Steel Erection & Wiring	Excavation	Excavation (w. Breaker)	Concrete Works	Finishing Works	Site Establishment	Piling	Construction & Instal	Concrete Works	Piling	Concrete Works	Steel Erection	Excavation	Excavation (with Breaker)	Pavement Works	Signage and Line Marking		
Residential – Standard Daytime																																									
NCA06	52	73	87	59	61	53	52	33	38	<30	<30	<30	51	57	78	87	76	72	75	<30	<30	<30	<30	<30	72	81	70	73	39	48	40	42	<30	<30	<30	78	87	84	72		
NCA07	61	66	80	74	76	68	67	32	37	<30	<30	<30	66	72	77	86	75	71	74	<30	<30	<30	<30	<30	74	83	72	75	38	47	39	41	<30	<30	<30	80	89	86	74		
Residential – Evening																																									
NCA06	46	-	-	59	61	53	52	-	-	-	-	<30	-	-	78	87	76	72	75	-	-	-	-	-	-	-	-	-	39	48	40	-	<30	<30	<30	78	87	84	72		
NCA07	55	-	-	74	76	68	67	-	-	-	-	<30	-	-	77	86	75	71	74	-	-	-	-	-	-	-	-	-	38	47	39	-	<30	<30	<30	80	89	86	74		
Residential – Night																																									
NCA06	46	-	-	59	61	53	52	-	-	-	-	<30	-	-	78	87	76	72	75	-	-	-	-	-	-	-	-	-	39	48	40	-	<30	<30	<30	78	87	84	72		
NCA07	44	-	-	74	76	68	67	-	-	-	-	<30	-	-	77	86	75	71	74	-	-	-	-	-	-	-	-	-	38	47	39	-	<30	<30	<30	80	89	86	74		
Commercial																																									
NCA06	70	48	62	49	51	43	42	35	40	<30	31	<30	41	47	53	62	51	47	50	<30	<30	<30	<30	<30	51	60	49	52	39	48	40	42	<30	<30	<30	77	86	83	71		
NCA07	70	66	80	74	76	68	67	34	39	<30	30	<30	66	72	77	86	75	71	74	<30	<30	<30	<30	<30	76	85	74	77	37	46	38	40	<30	<30	<30	77	86	84	71		
Other Sensitive receivers ²																																									
NCA06	-	73	87	71	73	65	64	35	40	<30	31	<30	42	48	82	91	80	76	79	<30	<30	<30	<30	<30	80	89	78	81	65	74	66	68	<30	<30	<30	60	69	66	54		
NCA07	-	64	78	72	74	66	65	<30	32	<30	<30	<30	<30	35	80	89	78	74	77	<30	<30	<30	<30	<30	73	82	71	74	38	47	39	41	<30	<30	<30	78	87	84	72		

Source: Table 19 to Table 23 in Technical Paper 13 – Noise and Vibration Impact Assessment, Volume 6

(1) Colouring indicates the range of predicted NML exceedances (red >20 dB, orange 11 - 20 dB, yellow 1-10 dB above NML) based on the controlling time period for the given activity as below:

1-10 dB above NML (minor impacts) 11-20 dB above NML (moderate impacts) >20 dB above NML (high impacts)

(2) Predicted Worst Case refers to $L_{Aeq(15min)}_{max}$ Noise Level (DBA)

(3) Other sensitive² receiver NMLs are dependent on classification. The most affected 'other sensitive' receiver type may change between each activity resulting in different NMLs.

NCA	NML	Demolition	Demolition (w/ breaker)	Site establishment	Services and utilities	Hoarding	Site deliveries	Site establishment	Services and utilities	Hoarding	Site deliveries	Screening & crushing	Site establishment	Construction & Install	Earthworks	Earthworks (w/ Breaker)	Concrete Works	Trackwork	Steel Erection & wiring	Earthworks	Concrete works	Trackwork	Trackwork - Tamping	Steel Erection & Wiring	Excavation	Excavation (w/ Breaker)	Concrete Works	Finishing Works	Site Establishment	Piling	Construction & Install	Concrete Works	Piling	Concrete Works	Steel Erection	Excavation	Excavation (with Breaker)	Pavement Works	Signage and Line Marking	
Residential – Standard daytime																																								
NCA08	69	58	72	66	68	60	59	<30	<30	<30	<30	<30	33	39	78	87	76	72	75	<30	<30	<30	<30	<30	66	75	64	67	35	44	36	38	<30	<30	<30	78	87	84	72	
NCA09	68	42	56	53	55	47	46	<30	<30	<30	<30	<30	45	51	80	89	78	74	77	<30	<30	<30	<30	<30	78	87	76	79	36	45	37	39	<30	<30	<30	81	90	87	75	
NCA10	53	40	54	49	51	43	42	37	42	30	33	<30	35	41	56	65	54	50	53	49	46	47	58	44	50	59	48	51	42	51	43	45	<30	<30	<30	54	63	60	48	
Residential – Evening																																								
NCA08	62	-	-	66	68	60	59	-	-	-	-	<30	-	-	78	87	76	72	75	-	-	-	-	-	-	-	-	-	-	35	44	36	-	<30	<30	<30	78	87	84	72
NCA09	58	-	-	53	55	47	46	-	-	-	-	<30	-	-	80	89	78	74	77	-	-	-	-	-	-	-	-	-	-	36	45	37	-	<30	<30	<30	81	90	87	75
NCA10	45	-	-	49	51	43	42	-	-	-	-	<30	-	-	56	65	54	50	53	-	-	-	-	-	-	-	-	-	-	42	51	43	-	<30	<30	<30	54	63	60	48
Residential – Night																																								
NCA08	51	-	-	66	68	60	59	-	-	-	-	<30	-	-	78	87	76	72	75	-	-	-	-	-	-	-	-	-	-	35	44	36	-	<30	<30	<30	78	87	84	72
NCA09	48	-	-	53	55	47	46	-	-	-	-	<30	-	-	80	89	78	74	77	-	-	-	-	-	-	-	-	-	-	36	45	37	-	<30	<30	<30	81	90	87	75
NCA10	39	-	-	49	51	43	42	-	-	-	-	<30	-	-	56	65	54	50	53	-	-	-	-	-	-	-	-	-	-	42	51	43	-	<30	<30	<30	54	63	60	48
Commercial																																								
NCA08	70	71	85	79	81	73	72	34	39	<30	30	<30	<30	35	79	88	77	73	76	<30	<30	<30	<30	<30	76	85	74	77	38	47	39	41	<30	<30	<30	79	88	85	73	
NCA09	70	36	50	80	82	74	73	<30	<30	<30	<30	<30	72	78	81	90	79	75	78	<30	<30	<30	<30	<30	81	90	79	82	38	47	39	41	<30	<30	<30	81	90	87	75	
NCA10	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Other sensitive receivers ²																																								
NCA08	-	67	81	75	77	69	68	<30	<30	<30	<30	<30	30	36	78	87	76	72	75	<30	<30	<30	<30	<30	59	68	57	60	37	46	38	40	<30	<30	<30	78	87	84	72	
NCA09	-	38	52	74	76	68	67	<30	<30	<30	<30	<30	61	67	82	91	80	76	79	40	37	38	49	35	81	90	79	82	39	48	40	42	<30	<30	<30	81	90	87	75	
NCA10	-	35	49	43	45	37	36	<30	<30	<30	<30	<30	<30	<30	50	59	48	44	47	<30	<30	<30	<30	<30	47	56	45	48	32	41	33	35	<30	<30	<30	52	61	58	46	

Source: Table 21, Table 22 and Table 23 in Technical Paper 12 – Noise and Vibration Impact Assessment, Volume 6

(1) Colouring indicates the range of predicted NML exceedances (red >20 dB, orange 11 – 20 dB, yellow 1-10 dB above NML) based on the controlling time period for the given activity as below:

1 – 10 dB above NML (minor impacts) 11 – 20 dB above NML (moderate impacts) >20 dB above NML (high impacts)

(2) Predicted Worst Case refers to L_{Aeq(15min)} Noise Level (DBA)

(3) Other sensitive' receiver NMLs are dependent on classification. The most affected 'other sensitive' receiver type may change between each activity resulting in different NMLs.

NCA	NML	DEMOLITION	DEMOLITION (W. BREAKER)	SITE ESTABLISHMENT	SERVICES AND UTILITIES	HOARDING	SITE DELIVERIES	SITE ESTABLISHMENT	SERVICES AND UTILITIES	HOARDING	SITE DELIVERIES	SCREENING & CRUSHING	SITE ESTABLISHMENT	CONSTRUCTION & INSTAL.	EARTHWORKS	EARTHWORKS (W. BREAKER)	CONCRETE WORKS	TRACKWORKS	STEEL ERECTION & WIRING	EARTHWORKS	CONCRETE WORKS	TRACKWORKS	TRACKWORKS - TAMPING	STEEL ERECTION & WIRING	EXCAVATION	EXCAVATION (W. BREAKER)	CONCRETE WORKS	FINISHING WORKS	SITE ESTABLISHMENT	PILING	CONSTRUCTION & INSTAL	CONCRETE WORKS	PILING	CONCRETE WORKS	STEEL ERECTION	EXCAVATION	EXCAVATION (WITH BREAKER)	PAVEMENT WORKS	SIGNAGE AND LINE MARKING		
Residential – Standard Daytime																																									
NCA11	53	63	77	71	73	65	64	30	35	<30	<30	<30	38	44	77	86	75	71	74	46	43	44	55	41	76	85	74	77	61	70	62	64	<30	<30	<30	49	58	55	43		
NCA12	61	61	75	46	48	40	39	<30	<30	<30	<30	45	41	47	75	84	73	69	72	46	43	44	55	41	56	65	54	57	70	79	71	73	44	38	37	40	49	46	34		
NCA13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Residential – Evening																																									
NCA11	45	-	-	71	73	65	64	-	-	-	-	<30	-	-	77	86	75	71	74	-	-	-	-	-	-	-	-	-	61	70	62	-	<30	<30	<30	49	58	55	43		
NCA12	53	-	-	46	48	40	39	-	-	-	-	45	-	-	75	84	73	69	72	-	-	-	-	-	-	-	-	-	70	79	71	-	44	38	37	40	49	46	34		
NCA13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Residential – Night																																									
NCA08	51	-	-	66	68	60	59	-	-	-	-	<30	-	-	78	87	76	72	75	-	-	-	-	-	-	-	-	-	35	44	36	-	<30	<30	<30	78	87	84	72		
NCA09	48	-	-	53	55	47	46	-	-	-	-	<30	-	-	80	89	78	74	77	-	-	-	-	-	-	-	-	-	36	45	37	-	<30	<30	<30	81	90	87	75		
NCA10	39	-	-	49	51	43	42	-	-	-	-	<30	-	-	56	65	54	50	53	-	-	-	-	-	-	-	-	-	42	51	43	-	<30	<30	<30	54	63	60	48		
Commercial																																									
NCA11	70	58	72	66	68	60	59	<30	<30	<30	<30	<30	36	42	76	85	74	70	73	46	43	44	55	41	75	84	73	76	60	69	61	63	<30	<30	<30	42	51	48	36		
NCA12	70	63	77	54	56	48	47	38	43	31	34	65	49	55	76	85	74	70	73	74	71	72	83	69	68	77	66	69	71	80	72	74	64	58	57	39	48	45	33		
NCA13	70	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30		
Other Sensitive receivers ²																																									
NCA11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
NCA12	-	54	68	49	51	43	42	<30	<30	<30	<30	44	39	45	60	69	58	54	57	46	43	44	55	41	52	61	50	53	55	64	56	58	43	37	36	39	48	45	33		
NCA13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

Source: Table 21, Table 22 and Table 23 in Technical Paper 13 – Noise and Vibration Impact Assessment, Volume 6

(1) Colouring indicates the range of predicted NML exceedances (red >20 dB, orange 11 - 20 dB, yellow 1-10 dB above NML) based on the controlling time period for the given activity as below:

1-10 dB above NML (minor impacts) 11-20 dB above NML (moderate impacts) >20 dB above NML (high impacts)

(2) Predicted Worst Case refers to Leq(15min) Noise Level (DBA)

(3) 'Other sensitive' receiver NMLs are dependent on classification. The most affected 'other sensitive' receiver type may change between each activity resulting in different NMLs.

NCA	NML	Demolition	Demolition (w. breaker)	Site establishment	Services and utilities	Hoarding	Site deliveries	Site establishment	Services and utilities	Hoarding	Site deliveries	Screening & crushing	Site establishment	Construction & Initial	Earthworks	Earthworks (w. Breaker)	Concrete Works	Trackworks	Steel Erection & wiring	Earthworks	Concrete works	Trackworks	Trackworks - Tamping	Steel Erection & Wiring	Excavation	Excavation (w. Breaker)	Concrete Works	Finishing Works	Site Establishment	Piling	Construction & Initial	Concrete Works	Piling	Concrete Works	Steel Erection	Excavation	Excavation (with Breaker)	Pavement Works	Signage and Line Marking	
Residential – standard daytime																																								
NCA14	55	57	71	40	42	34	33	68	73	61	64	44	32	38	36	45	34	30	33	65	62	63	74	60	63	72	61	64	53	62	54	56	<30	<30	<30	<30	<30	<30	<30	
NCA15	55	70	84	41	43	35	34	69	74	62	65	<30	59	65	<30	<30	<30	<30	<30	81	78	79	90	76	76	85	74	77	70	79	71	73	<30	<30	<30	<30	<30	<30	<30	
NCA16	56	49	63	<30	<30	<30	<30	76	81	69	72	<30	45	51	<30	<30	<30	<30	<30	81	78	79	90	76	55	64	53	56	71	80	72	74	<30	<30	<30	<30	<30	<30	<30	
NCA17	53	65	79	<30	<30	<30	<30	72	77	65	68	<30	66	72	<30	<30	<30	<30	<30	79	76	77	88	74	70	79	68	71	35	44	36	38	<30	<30	<30	<30	<30	<30	<30	
NCA18	52	50	64	<30	<30	<30	<30	50	55	43	46	<30	49	55	<30	<30	<30	<30	<30	81	78	79	90	76	49	58	47	50	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	
NCA19	62	65	79	<30	<30	<30	<30	74	79	67	70	<30	64	70	<30	<30	<30	<30	<30	73	70	71	82	68	71	80	69	72	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	
Residential – Evening																																								
NCA14	48	-	-	40	42	34	33	-	-	-	-	44	-	-	36	45	34	30	33	-	-	-	-	-	-	-	-	-	53	62	54	-	<30	<30	<30	<30	<30	<30	<30	
NCA15	48	-	-	41	43	35	34	-	-	-	-	<30	-	-	<30	<30	<30	<30	<30	-	-	-	-	-	-	-	-	-	70	79	71	-	<30	<30	<30	<30	<30	<30	<30	
NCA16	47	-	-	<30	<30	<30	<30	-	-	-	-	<30	-	-	<30	<30	<30	<30	<30	-	-	-	-	-	-	-	-	-	71	80	72	-	<30	<30	<30	<30	<30	<30	<30	
NCA17	45	-	-	<30	<30	<30	<30	-	-	-	-	<30	-	-	<30	<30	<30	<30	<30	-	-	-	-	-	-	-	-	-	35	44	36	-	<30	<30	<30	<30	<30	<30	<30	
NCA18	45	-	-	<30	<30	<30	<30	-	-	-	-	<30	-	-	<30	<30	<30	<30	<30	-	-	-	-	-	-	-	-	-	<30	<30	<30	-	<30	<30	<30	<30	<30	<30	<30	
NCA19	52	-	-	<30	<30	<30	<30	-	-	-	-	<30	-	-	<30	<30	<30	<30	<30	-	-	-	-	-	-	-	-	-	<30	<30	<30	-	<30	<30	<30	<30	<30	<30	<30	
Residential – Night																																								
NCA14	43	-	-	40	42	34	33	-	-	-	-	44	-	-	36	45	34	30	33	-	-	-	-	-	-	-	-	-	53	62	54	-	<30	<30	<30	<30	<30	<30	<30	
NCA15	42	-	-	41	43	35	34	-	-	-	-	<30	-	-	<30	<30	<30	<30	<30	-	-	-	-	-	-	-	-	-	70	79	71	-	<30	<30	<30	<30	<30	<30	<30	
NCA16	39	-	-	<30	<30	<30	<30	-	-	-	-	<30	-	-	<30	<30	<30	<30	<30	-	-	-	-	-	-	-	-	-	71	80	72	-	<30	<30	<30	<30	<30	<30	<30	
NCA17	36	-	-	<30	<30	<30	<30	-	-	-	-	<30	-	-	<30	<30	<30	<30	<30	-	-	-	-	-	-	-	-	-	35	44	36	-	<30	<30	<30	<30	<30	<30	<30	
NCA18	37	-	-	<30	<30	<30	<30	-	-	-	-	<30	-	-	<30	<30	<30	<30	<30	-	-	-	-	-	-	-	-	-	<30	<30	<30	-	<30	<30	<30	<30	<30	<30	<30	
NCA19	44	-	-	<30	<30	<30	<30	-	-	-	-	<30	-	-	<30	<30	<30	<30	<30	-	-	-	-	-	-	-	-	-	<30	<30	<30	-	<30	<30	<30	<30	<30	<30	<30	
Commercial																																								
NCA14	70	62	76	52	54	46	45	75	80	68	71	43	35	41	44	53	42	38	41	70	67	68	79	65	67	76	65	68	63	72	64	66	44	38	37	<30	<30	<30	<30	
NCA15	70	52	66	41	43	35	34	74	79	67	70	<30	67	73	<30	<30	<30	<30	<30	75	72	73	84	70	58	67	56	59	47	56	48	50	<30	<30	<30	<30	<30	<30	<30	
NCA16	70	47	61	<30	<30	<30	<30	48	53	41	44	<30	43	49	<30	<30	<30	<30	<30	55	52	53	64	50	53	62	51	54	45	54	46	48	<30	<30	<30	<30	<30	<30	<30	
NCA17	70	64	78	<30	<30	<30	<30	62	67	55	58	<30	55	61	<30	<30	<30	<30	<30	72	69	70	81	67	70	79	68	71	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	
NCA18	70	57	71	<30	<30	<30	<30	51	56	44	47	<30	57	63	<30	<30	<30	<30	<30	72	69	70	81	67	59	68	57	60	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	
NCA19	70	67	81	<30	<30	<30	<30	78	83	71	74	<30	66	72	<30	<30	<30	<30	<30	81	78	79	90	76	79	88	77	80	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	

NCA	NML		Demolition	Demolition (w. breaker)	Site establishment	Services and utilities	Hoarding	Site deliveries	Site establishment	Services and utilities	Hoarding	Site deliveries	Screening & crushing	Site establishment	Construction & Instal.	Earthworks	Earthworks (w. Breaker)	Concrete Works	Trackworks	Steel Erection & wiring	Earthworks	Concrete works	Trackworks	Trackworks - Tamping	Steel Erection & Wiring	Excavation	Excavation (w. Breaker)	Concrete Works	Finishing Works	Site Establishment	Piling	Construction & Instal	Concrete Works	Piling	Concrete Works	Steel Erection	Excavation	Excavation (with Breaker)	Pavement Works	Signage and Line Marking		
Other Sensitive receivers ⁽²⁾																																										
NCA14	59	73	66	68	60	59	61	66	54	57	43	38	44	45	54	43	39	42	76	73	74	85	71	59	68	57	60	60	69	61	63	40	34	33	<30	<30	<30	<30	<30	<30		
NCA15	41	55	<30	<30	<30	<30	52	57	45	48	<30	37	43	<30	<30	<30	<30	<30	58	55	56	67	53	47	56	45	48	51	60	52	54	<30	<30	<30	<30	<30	<30	<30	<30	<30		
NCA16	45	59	<30	<30	<30	<30	48	53	41	44	<30	43	49	<30	<30	<30	<30	<30	54	51	52	63	49	51	60	49	52	40	49	41	43	<30	<30	<30	<30	<30	<30	<30	<30	<30		
NCA17	42	56	<30	<30	<30	<30	49	54	42	45	<30	36	42	<30	<30	<30	<30	<30	55	52	53	64	50	46	55	44	47	33	42	34	36	<30	<30	<30	<30	<30	<30	<30	<30	<30		
NCA18	35	49	<30	<30	<30	<30	40	45	33	36	<30	37	43	<30	<30	<30	<30	<30	50	47	48	59	45	40	49	38	41	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30		
NCA19	62	76	<30	<30	<30	<30	62	67	55	58	<30	54	60	<30	<30	<30	<30	<30	70	67	68	79	65	68	77	66	69	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	

Source: Table 19 to Table 23 in Technical Paper 13 – Noise and Vibration Impact Assessment, Volume 6

(1) Colouring indicates the range of predicted NML exceedances (red >20 dB, orange 11 - 20 dB, yellow 1-10 dB above NML) based on the controlling time period for the given activity as below:

1 – 10 dB above NML (minor impacts) 11 – 20 dB above NML (moderate impacts) >20 dB above NML (high impacts)

(2) Predicted Worst Case refers to LAeq(15min) Noise Level (DBA)

(3) Other sensitive' receiver NMLs are dependent on classification. The most affected 'other sensitive' receiver type may change between each activity resulting in different NMLs.

Appendix E – Consultation Evidence

Table E-1: Log of consultation with City of Parramatta Council as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19&20/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended).
Out	21/06/19, 17:36	Email	Issue of Noise and Vibration Management Sub-plan for review.
In	05/07/19, 17:01	Email	Response to CEMP and Sub-plan review received. No comments provided for the Noise and Vibration Management Sub-plan.

Table E-2: Log of consultation with Cumberland Council as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended).
Out	21/06/19, 18:40	Email	Issue of Noise and Vibration Management Sub-plan for review.
In	11/07/19, 17:01	Email	Response to CEMP and Sub-plan review received. No comments provided for the Noise and Vibration Management Sub-plan.
Out	16/07/19, 19:16	Email	Email requesting confirmation that Cumberland Council has no feedback on the Noise and Vibration Management Sub-plan.
In	17/07/19, 9:11	Email	Email confirming that Cumberland Council has no feedback on the Noise and Vibration Management Sub-plan.

Table E-3: Log of consultation with EPA as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended)
Out	21/06/19, 18:40	Email	Issue of Noise and Vibration Management Sub-plan for review.
In	09/07/19, 17:21	Email	Response to CEMP and Sub-plan review received with comments on the Noise and Vibration Management Sub-plan.
Out	17/07/19, 19:53	Email	JV response to EPA with details on how comments raised had been incorporated into the Sub-plan.
In	31/07/19, 9:30	Email	Additional remarks provided on alternative accommodation.
Out	31/07/19, 10:47	Email	JV response to EPA proposing revised text on alternative accommodation.
Out	31/07/19, 11:23	Email	JV response to EPA proposing revised text on alternative accommodation.
in	31/07/19, 15:00	Email	Additional remarks provided on alternative accommodation.
Out	2/08/19, 10:13	Email	JV response to EPA proposing revised text on alternative accommodation.
Out	9/08/19	Email	JV response to EPA proposing final revised text on alternative accommodation and request for a meeting.
In	17/10/19	Email	Email from EPA confirming that EPA does not endorse or improve Management Plan documents, however we appreciate the opportunity to provide comments.

Table E-4: Log of issues raised by EPA as per A5 (d) and (e)

Reference	Comment	How addressed	Management plan reference location
1.01	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: Suggest this is amended to read: <i>Except as permitted by an EPL, or through the Out-of-Hours Work Protocol (where an EPL does not apply)"...</i>	This is a quote from the conditions of approval and therefore cannot be changed. It is provided for reference only.	Table 3-1, E27
1.02	"A schedule of likely out of hours work for a period of no less than two (2) month for medium to high risk works" Suggest that this includes specific dates. E.g. <i>"A schedule of likely out of hours work, including dates, for a period of no less than two (2) month for medium to high risk works"</i>	The wording in this list of bullet points is taken directly from the planning condition E39. Providing dates of this longer time scale is difficult with and can lead to confusion. We will revise the notification requirements based on the requirements of the EPL once applied for and issued.	Section 11.2
1.03	"Periodic Notifications" suggest inclusion of dates of upcoming work	Period notification are more general updated to include dates. This suggestion has been added to the 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. Specific notification would include details of the location, scope, dates and times of work	Section 11.3 - Additional Noise and Vibration Mitigation Measures

Reference	Comment	How addressed	Management plan reference location
1.04	"Project specific Respite Offer" Suggest that more clarity is included to confirm what constitutes as "Lengthy periods of noise and vibration" i.e. provide length of time applicable	The wording of Project specific Respite Offer including reference to 'Lengthy periods' is derived from the TfNSW Construction Noise and Vibration Strategy. This has been qualified as '(such as specific phase of the construction work extended for more than 24hr of continuous works)'. 	Section 11.3 - Additional Noise and Vibration Mitigation Measures
1.05	Alternative Accommodation: Regarding the line "Provision of alternative accommodation in all cases may not always be reasonable and feasible" Alternative Accommodation should be provided in all cases and advanced notice of dates of work provided to sensitive receivers.	This commitment is retained as it acknowledges that there are receivers who may not want or be able to take Alternative Accommodation and in which case, if Alternative Accommodation is rejected, other Additional Noise and Vibration Mitigation Measures should be explored in consultation with the receiver.	Section 11.3 - Additional Noise and Vibration Mitigation Measures
1.06	"Consultation with nearby childcare centres will be carried out to potentially avoid noisy works during rest periods at the centre (where possible)" Suggest amended to - "Consultation with nearby childcare centres will be carried out to discuss avoidance of noisy works during rest periods at the centre"	Suggested rewording included in plan.	Section 11.6, NV10

Reference	Comment	How addressed	Management plan reference location
1.07	"Work will be scheduled to provide respite periods from the noisiest activities, and impacted residents will be communicated with to clearly explain the duration and noise levels for the works." Suggest sentence be amended to include "residents will be communicated with to clearly explain the dates and duration of noise levels for the work"	Suggested rewording included in plan.	Section 11.6, NV26

Table E-5: Log of consultation with Parramatta Park Trust as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended)
Out	21/06/19, 18:40	Email	Issue of Noise and Vibration Management Sub-plan for review.
In	05/07/19, 15:27	Email	Response to CEMP and Sub-plan review received with comments on the Noise and Vibration Management Sub-plan.
Out	17/07/19 19:02	Email	JV response to Parramatta Park Trust with details on how comments raised had been incorporated into the Sub-plan.
In	29/07/19 8:27	Email	Response confirming that the Parramatta Park Trust is satisfied with the response to the comments.

Table E-6: Log of issues raised by Parramatta Park Trust as per A5 (d) and (e)

Reference	Comment	How addressed	Management plan reference location
1.01	This should include Grey-headed Flying Fox as a receiver and strengthen references to them – it needs to do more than point to other documents. The biggest issue with GHFF will be the impact of noise and so if those monitoring and managing noise have it at top of mind then it's going to be managed better. It should include that the traditional human triggers for noise are not relevant and that frequency needs to be monitored as high-pitched noises can impact even at low volume.	Reference to the Grey-headed flying fox camp as a sensitive receiver has been included in Section 3 Precinct Specific Sensitive Receivers Summary and the following mitigation measures has been included in the mitigation measures table to direct the readers to the Grey-headed flying Fox Mitigation Measure Application Procedures presented in the recently revised GGFF Monitoring Program (refer to attached).	Section 7.2 and 7.3 Section 11.6

Table E- 7: Log of consultation with Health NSW – Cumberland Hospital as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended).
Out	21/06/19, 18:40	Email	Issue of Noise and Vibration Management Plan for review.
Out	26/06/19: 12:30	Meeting	The USB memory stick delivered with full CEMP, each sub-plan, SEMP and briefing sessions presentation.
In	09/07/19, 15:21	Email	Response to Noise and Vibration Management Plan review with comments register.
Out	01/08/19, 9:53	Email	Return of updated comments register and request for confirmation that NSW Health – Cumberland Hospital is satisfied with the response.
In	4/9/19, 6:43	Email	Consolidated comments received from PwC on behalf of Health NSW – Cumberland Hospital including comments previously received from Cumberland Hospital (Table E-8).

In / Out	Date and time	Method of contact	Details of contact
Out	23/10/19	Email	Draft Noise and Vibration Assessment System (methodology) for baseline surveys was issued to HAC for review. The Assessment System addressed a number of the comments raised relating to the Noise and Vibration Management Plan.
-	24/10/19, 8:00	Workshop	PLR Cumberland Hospital risk assessment workshop facilitated by HAC with representation from key facilities (buildings) within Cumberland Hospital. A number of key issues were discussed in this session relating to how matters raised in the consultation comments would be communicated and negotiated during planning and construction of the PLR works.
Out	28/10/19, 18:18	Email	Formal response to the consolidated comments provided on the 4/9/19.
In	1/11/19 7:30	Email	Initial response from PWC on behalf of HAC including confirmation from Cumberland Hospital the information previously provided in Cumberland Hospital.zip is still current and accurate.
Out	1/11/19 10:01	Email	JV response to the initial response from 1/11/19, 7:30.
In	1/11/19 17:02	Email	Final response from PWC on behalf of HAC / NSW Health confirming that with respect to content in pre-construction management plans, NSW Health at the Westmead campus (HAC and WSLHD) are satisfied that they have been provided an opportunity to consult on PLR CPBDJV's (Package 4) CEMP, SEMP and Sub-plans and that their requests have either been addressed through the proposed changes in the document or are comfortable that the issues will be managed through the consultation forums now established.

Table E- 8 Log of issues raised by Health NSW – Cumberland Hospital as per A5 (d) and (e)

Reference	Comment	How addressed	Management plan reference location
1.01	Sleep disturbance clause – “Where construction is required to be undertaken during the night-time period the potential for sleep disturbance will be assessed. The current approach to identifying potential sleep disturbance impacts is to set a screening criterion 15 dB above the RBL during the night-time period (10.00 pm to 7.00 am)”. Thus, Page 71 implies that noise works near inpatients could commence from 7am. • I can see that for <u>Westmead Hospital</u> -- this is addressed on page 100, section 7.2.1 • For <u>Cumberland Hospital</u> – this is further addressed on page 102. It’s noted that the standard daytime construction hours of Monday to Friday 7am to 6 pm and Saturdays 8 am to 12 pm For TfNSW reference, in the PLR related capital program that I current manage at Cumberland West, contractors “standard daytime construction” has been amended from 7am to 8am as requested by Mental Health Executives. We would appreciate your considerations and respite.	This request will be accommodated through Condition of Approval E31 (Table 3-1) and Mitigation Measure NV28 and NV49 (Table 11-2). In accordance with CPBDJV’s Community and Engagement Management Plan, a Communication Action Plan (CAP) will be prepared with Cumberland Hospital to capture specific request such as this that will then be included in CNVIS and timetabling of works.	Table 3-1 Table 11-2
1.02	Page 71, Page 73 section 4.3.1 and page 79 Section 4.4.7 - there are errors/reference source	Noted. The error references in the plan template have been fixed.	-

Reference	Comment	How addressed	Management plan reference location
1.03	We request that WSLHD Disruption Process (especially Cumberland campus) will also need to be used throughout the process.	We have received similar comments from CHW. An Executive Briefing is to be completed to map contact points and clarify the consultation and notification protocols. This is beyond the scope of the NVMP however will influence how PRL consult with Westmead Hospital and Cumberland Hospital.	-
1.04	Page 102 – taller construction hoardings in work zones – We request consultations and engagement on consumer safety topic and about clinical risks.	Noted – this can be documented in a Communication Action Plan (CAP). NV15 updated to include specific commitment for construction hoardings in the Cumberland Precinct to be determined in consultation with HAC.	Table 11-2, NV15
1.05	Noise sensitivity is a recognised problem for people with psychosis and particularly schizophrenia. Difficulty managing repetitive sound is one of the largest known genetic risk factors for schizophrenia. Studies have shown that noise has an adverse effect on the cognition of people with schizophrenia. The majority of patients in the nonacute and subacute units have schizophrenia and will have lengths of stay measured in months to years and be involuntary under the mental health act – so we cannot rely on rapid discharge as a way of helping them avoid noise at Cumberland. One 2016 study published in Schizophrenia Research concluded: “noise management, such as reducing exposure to noise where feasible, may improve the lives of people with psychotic disorders.” The usual criterion of ‘sleep disturbance’ needs to be expanded to include assessment of noise across	Thank you for providing information regarding the specific needs of the residents. This assists CPBDJV in understanding the specific needs of Cumberland Hospital in managing their clients. CPBDJV are committed to developing a functional consultation and notification systems. For the NVMP, this commitment is captured in the mitigation measure NV28 - For sensitive receivers that operate outside standard construction hours, for example hospitals which operate on a 24-hour basis, feasible and reasonable noise mitigation options and measures will be developed in consultation	

Reference	Comment	How addressed	Management plan reference location
	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. In relation to vibration, people with schizophrenia are commonly more sensitive to the range of sensory stimuli which includes vibration but I am not aware of any specific studies into impact. You could reasonably extrapolate from published studies into how people with schizophrenia experience sensory stimuli, that the additional impact of vibration on people with schizophrenia should be considered and mitigated where ever feasible. The notice re disruption to site is critical. As involuntary patients prepare for longer periods of leave from the units, they are initially granted 'ground leave' which means that they are permitted to leave the units for short periods of time (such as 30 minutes) during which they are free to wander across the grounds of Cumberland Hospital (i.e. east and west). For the forensic patients, this leave is under the legal order of the Mental Health Tribunal. We will have to be able to manage on a daily basis the movements of patients across the campus. We need to keep reminding transport that another characteristic of our patient population is that they are rarely confined to bed during the day – they are mobile and where they have the capacity to manage leave from the unit they have a legal right to leave the units and use the grounds of the hospital. This then tests their capacity to manage longer periods of leave away from the campus which would be the next stage in granting them leave whilst they remain involuntary under the mental health act.	with the sensitive receiver. This will be developed further through the development and implementation of the Communication Action Plan (CAP) for Cumberland Hospital. An Executive Briefing is also to be completed to map contact points and clarify the consultation and notification protocols.	

Reference	Comment	How addressed	Management plan reference location
1.06	We need to keep their focus on the clinical risks and how they will manage. There is a specific patient group impacted significantly by this works. This needs to include the risks of construction and site access on a functioning mental health facility.	Noted. As outlined above, a Communication Action Plan (CAP) will be prepared with Cumberland Hospital to capture specific request such as this that will then be included in CNVIS and timetabling of works.	-

Table E- 9: Log of consultation with Health NSW – Westmead Precinct as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	19& 20/06/19	Workshops	PLR Infrastructure Package CEMP and Sub-plan briefing sessions (attended).
Out	21/06/19, 18:40	Email	Issue of Noise and Vibration Management Sub-plan for review.
Out	10/07/19 11:02	Email	Request for comments or update on when comments may be received.
Out	17/07/19 20:03	Email	Request for comments or update on when comments may be received.
In	29/07/19 17:27	Email	Response with comment on the Noise and Vibration Management Sub-plan.
Out	05/08/19, 12:53	Email	Response on comments raised and confirmation that recommendations had been incorporated into the plan (as required).
In	4/9/19, 6:43	Email	Consolidated comments received from PwC on behalf of Health NSW – Westmead Precinct including comments previously received from Children’s Hospital (Table E-8).
Out	23/10/19	Email	Draft Noise and Vibration Assessment System (methodology) for baseline surveys was issued to HAC for review. The Assessment System addressed a number of the comments raised relating to the Noise and Vibration Management Plan.
Out	28/10/19, 18:18	Email	Formal response to the consolidated comments provided on the 4/9/19.

In / Out	Date and time	Method of contact	Details of contact
In	1/11/19 17:02	Email	Final response from PWC on behalf of HAC / NSW Health including Westmead Precinct confirming that with respect to content in pre-construction management plans, NSW Health at the Westmead campus (HAC and WSLHD) are satisfied that they have been provided an opportunity to consult on PLR CPBDJV's (Package 4) CEMP, SEMP and Sub-plans and that their requests have either been addressed through the proposed changes in the document or are comfortable that the issues will be managed through the consultation forums now established.

Table E- 10: Log of issues raised by Health NSW – Westmead Precinct as per A5 (d) and (e)

Reference	Comment	How addressed	Management plan reference location
1.01	Noise and vibration in relation to the research facilities and health services will be sensitive and we would like to be involved in this planning.	As part of the Land Use Study, we have been engaging with SCHM and other hospitals to identify facilities and equipment that are sensitive to vibration (refer to Section 12.3.1 of the Noise and Vibration Management Sub-plan). As per control measures NV02 (Table 11-2), a register of most affected noise and vibration sensitive receivers will be kept on site. If vibration intensive works are required within the safe working distances, vibration monitoring or attended vibration trials will be carried out to ensure that levels remain below the cosmetic damage criterion (Table 11-2, control measure NV44). Any such trials will occur in consultation with SCHW.	Table 11-2

Table E- 11: Log of consultation with Health NSW via PwC Capital Projects as per A5(b) and (c)

In / Out	Date and time	Method of contact	Details of contact
Out	27/08/19	Workshop	Executive briefing with Health NSW Cumberland Hospital and PwC.
In	4/9/19, 6:43	Email	Consolidated comments received from PwC on behalf of Health NSW – Cumberland Hospital. Refer to Table E-11 and E-12.
Out	23/10/19	Email	Draft Noise and Vibration Assessment System (methodology) for baseline surveys was issued to HAC for review. The Assessment System addressed a number of the comments raised relating to the Noise and Vibration Management Plan.
Out	28/10/19, 18:18	Email	Formal response to the consolidated comments provided on the 4/9/19.
In	1/11/19 17:02	Email	Final response from PWC on behalf of HAC / NSW Health confirming that with respect to content in pre-construction management plans, NSW Health at the Westmead campus (HAC and WSLHD) are satisfied that they have been provided an opportunity to consult on PLR CPBDJV's (Package 4) CEMP, SEMP and Sub-plans and that their requests have either been addressed through the proposed changes in the document or are comfortable that the issues will be managed through the consultation forums now established.

Table E- 12 Log of issues raised by Health NSW – Westmead Precinct as per A5 (d) and (e)

Reference	Comment	How addressed	Management plan reference location
1.01	INFRA to confirm if Table 7-2 should include Research Institutes (WIMR, CMRI, KR) in one of the NCA	The Research Institutes (WIMR, CMRI, KR) have been added to the relevant NCAs in Table 7-2.	Table 7-2
1.02	INFRA to confirm Figure 7-1 doesn't show location of NCA05.	NCA05 label has been added to Figure 7-1.	Figure 7-1

Reference	Comment	How addressed	Management plan reference location
1.03	INFRA to confirm extent of monitoring – only noise monitoring is raised. What about vibration monitoring? More detail required on both noise and vibration monitoring. Will this be 24/7 monitoring? How will stakeholder and INFRA be notified of exceedances above thresholds? How will monitoring locations be identified?	Further detail on the noise and vibration monitoring requirements have been detailed in the HAC Noise and Vibration Assessment System that has been drafted in accordance with Schedule 7 of the Development Agreement. A draft revision of the Assessment System has been issued to Health on the 24/10/19 for review and comment. Collection of baseline data has also commenced as summaries in a letter report to HAC dated 12/09/19 (Renzo Tonin and Associates).	Section 12.3.4
1.04	INFRA to confirm a noise and vibration protocol will be established and used similar to the one used for the Westmead Redevelopment. This details the contacts and escalation process if there is an exceedance in monitoring thresholds.	The noise and vibration protocol will be determined in the Baseline Study report that will be developed in accordance with Schedule 7 of the Development Agreement.	-
1.05	INFRA to confirm how noise and vibration exceedances will be tracked and communicated on weekends and out of hours when Research Institute or Hospital staff are not present.	The noise and vibration exceedances notification process will be outlined as an outcome of the Baseline Study report that will be developed in accordance with Schedule 7 of the Development Agreement.	-
1.06	INFRA to confirm when construction noise and vibration levels will be presented to Westmead Stakeholders. Currently not clear what the impact of construction work will be.	In accordance with Planning Approval Condition E43, Construction Noise and Vibration Impact Statements (CNVIS) will be prepared for each construction activity. The predicted impacts from the CNVIS will be provided to Westmead Stakeholders as part of the ongoing consultation process to determine scheduling and respite periods.	-

Reference	Comment	How addressed	Management plan reference location
1.07	INFRA to confirm noise and vibration levels during operation of light rail.	The operational noise and vibration impacts of the light rail will be determined by the Package 5 SOM Contractor.	-

Appendix F – Acoustic Advisor and Environmental Representative Endorsement

Air Noise Environment Pty Ltd

Level 6, 69Reservoir Street
Surrey Hills
NSW 2010
T: 02 8217 0706
E: ane@ane.com.au

ACN 081 834 513
ABN 13 081 834 513

Attention: Transport for NSW (PLR)

Ref: PLR1INF-CPBD-ALL-NV-PLN_Rev11_AA_Endorsement_26Nov2021

26 November 2021

RE: PLR1INF-CPBD-ALL-NV-PLN_000001 NVMP Rev10 Adequacy for Submission (AA Review)

Beau Weyers, BEng(Mech), MAAS, RPEQ 09343, appointed Acoustic Advisor (AA), reviewed the following documentation with regard to the PLR – Stage 1 project:

Title:	Document Reference:	Version Status
Appendix B3 Noise and Vibration Management Sub Plan Infrastructure Works Stage 1 Parramatta Light Rail – Stage 1	PLR1INF-CPBD-ALL-NV-PLN-000001	Revision 3, 13 Aug 2019
		Revision 6, 05 Nov 2019
		Revision 7, 10 Feb 2020
		Revision 8, 1 May 2020
		Revision 10, 9 Nov 2020
		Revision 11, 26 Nov 2020

The amendments to the aforementioned document are editorial in nature. These amendments are classified as minor and are approved in accordance with Condition of Approval C8. Pursuant to Conditions of Approval A29, the review confirms the documents have been reviewed for consistency by the AA, and the document remains in agreement with 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



Beau Weyers BE(Mech), MAAS, RPEQ
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



26 November 2021

Transport for NSW

Attention to: [REDACTED]
Senior Manager Environment
Parramatta Light Rail
130 George St, Parramatta, NSW 2150

**Review of Appendix B3 - Noise and Vibration Management Sub Plan.
Infrastructure Works (Package 4) - Parramatta Light Rail Stage 1
(PLR1INF-CPBD-ALL-NV-PLN-000001 Rev 11)**

Pursuant to SSI8285 Condition of Approval A23 (d) i), as the approved Environmental Representative, I confirm that I have reviewed the updated document Appendix B3 - Noise and Vibration Management Sub Plan, Infrastructure Works (Package 4), Parramatta Light Rail - Stage 1 (PLR1INF-CPBD-ALL-NV-PLN-000001, Rev 11), dated 26/11/2020, prepared by Parramatta Connect, for consistency with the requirements of the Conditions of Approval.

The amendments to the aforementioned document are editorial in nature. These amendments are classified as minor and are approved in accordance with Condition of Approval C8, noting the Acoustic Advisor endorsement under CoA A29 (g). The document continues to be consistent with the requirements included in or required under the terms of the Conditions of Approval for the Parramatta Light Rail (Stage 1) development.

Yours sincerely,

Australian Quality Assurance & Superintendence Pty Ltd (AQUAS)

A handwritten signature in black ink, appearing to be 'John'.

[REDACTED]

Filename : *AQ1148.05 PLR CPBD NVMP rev11 endorsement 211126*

For more information about the Parramatta Light
Rail project, visit Parramattalightrail.nsw.gov.au

Call: 1800 139 389

Email: Parramattalightrail@transport.nsw.gov.au

