Sub-Plan

Construction Noise and Vibration Management Sub Plan

Supply, Operate and Maintain Contract (ISD-17-6720)

Parramatta Light Rail – Stage 1

January 2021

PLR1SOM-GLR-ALL-PM-PLN-000034 Rev 1

NSW GOVERNMENT

Contents

About this release

Title	Supply, Operate, Maintain Construction Noise and Vibration Management Plan

Version control

Revision	Date	Description	Approval (Position)
A	24/12/2019	Draft	-
B	16/03/2020	Update to TfNSW template, internal review	-
C	23/04/2020	Update for TfNSW comments	-
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0	9/11/2020	Updated for DPIE submission	
1	13/01/2021	Updated with DPIE comments	

Glossary/ Abbreviations

Abbreviations	Expanded text
AA	Acoustics Advisor
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.
Annoying activities	As defined in the Interim Construction Noise Guideline (DECC, 2009)
BOCC	Back-up Operational Control Centre
CBD	Central Business District
CCTV	Closed Circuit Television
CEMP	Construction Environmental Management Plan
CEP	Communication and Engagement Management Plan
CNVMP	Construction Noise and Vibration Management Plan
CNVS	TfNSW's Construction Noise and Vibration Strategy
CoA	Condition of Approval
CSELR	CBD and Sydney East Light Rail
CSO	Customer Service Operator
CTTAMP	Construction Traffic, Transport and Access Management Plan
CWG	Completions Working Group
D&C	Design and Construction
dBA	Decibels using the A-weighted scale measured according to the frequency of the human ear.
DECC	Department of Environment and Climate Change (now EPA)
DPIE	NSW Department of Planning, Industry and Environment (functions of the former Department of Planning and Environment and Office of Environment and Heritage (OEH) are now administered by the Department of Planning, Industry and Environment)
Eat Street	The section of Church Street between Palmer and George Streets.
ECM	Environmental Control Map
ECP	Environmental Control Plans
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.

Abbreviations	Expanded text
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.
EPA	Environment Protection Authority
EPL	Environment Protection Licence (under schedule 1 of the POEO Act.
EPO	Environmental Performance Outcomes
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.
ERAP	Environmental Risk Action Plans
Environmental target	Defined by AS/NZS ISO 14001:2015 as a detailed performance requirement, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.
EPA	NSW Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
ER	Environmental Representative
ERG	Environmental Review Group
ESP	Emergency Services Personnel
ETS	Electronic Ticketing System
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.
GRCLR	Greater River City Light Rail
High Noise Intensive activity or works (HNIW)	Means rock breaking, rock hammering, sheet piling, pile driving and particularly annoying activities as described in ICNG (section 4.5).
Highly Noise Affected (HNA)	Activities that result in a noise level that exceed 75 dB(A)
Heritage item	As defined by the for the CSSI, a place, building, work, relic, archaeological site, tree, movable object or precinct of heritage significance, that is listed under one or more of the following registers: the State Heritage Register under the Heritage Act 1977 (NSW), a state agency heritage and conservation register under section 170 of the Heritage Act 1977 (NSW), a Local Environmental Plan under the EP&A Act, the World, National or Commonwealth Heritage lists under the Environment Protection and Biodiversity Conservation Act 1999 (Cth), and an "Aboriginal object" or "Aboriginal place" as defined in section 5 of the National Parks and Wildlife Act 1974 (NSW).

Abbreviations	Expanded text
HSEQ	Health, Safety, Environment and Quality
IC	Independent Certifier
ICNG	Interim Construction Noise Guidelines
IMS	Integrated Management System
Interface Contractor	Any relevant Rail Transport Agency, RMS (and its contractors), the Infrastructure Contractor, the Remediation Contractor, the Enabling Works Contractor, the RTR Contractor, and the ETS Contractor
IWLR	Inner West Light Rail
KPI	Key Performance Indicator
LAeq	The A-weighted equivalent continuous (energy average) sound pressure level. For the purpose of assessing or measuring construction noise, this is related to the construction works under consideration over a defined period (such as 15-minutes, shown as LAeq(15 minute)). Note that during verification monitoring the LAeq should exclude other sources such as from industry, road, rail and the community.
LAmax	The “Maximum Noise Level” for an event, used in the assessment of potential sleep disturbance during night-time periods. The subscript “A” indicates that the noise levels are filtered to match normal human hearing characteristics (i.e. A-weighted)
LRV	Light Rail Vehicle
LORAC	Laing O’Rourke Australia Construction Pty Ltd
NML	Noise Management Level
Noisy or Noise Affected	Activities that result in a noise level that exceed the Noise Management Level (NML)
O&M	Operations and Maintenance
OCC	Operations Control Centre
OEH	Office of Environment and Heritage
ONRSR	Office of the National Rail Safety Regulator
OPAM	Operational Performance and Asset Management
ORP	Operational Readiness Plan
ORT	Operational Readiness Team
PAS	Public Address System
PLR	Parramatta Light Rail
PLRC	Parramatta Light Rail Corridor
POEO	Protection of the Environment Operations Act 1997
Project	Construction of the PLR light rail systems, high-voltage power supply and stops above slab level, and the stabling and maintenance facility
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)

Abbreviations	Expanded text
REMMM	Revised Environmental Mitigation and Management Measure
RSNL	Rail Safety National Law (NSW)
RSW	Rail Safety Worker
RTBU	Rail Tram and Bus Union
SaMF	Stabling and Maintenance Facility
Sensitive receiver	As defined by the CSSI, which includes residences, temporary accommodation such as caravan parks and camping grounds, and health care facilities (including nursing homes, hospitals) including within the Health Administration Corporation (HAC) received. Also includes the following, when in use: educational institutions (including preschools, schools, universities, TAFE colleges), religious facilities (including churches), child care centres, passive recreation areas, commercial premises (including film and television studios, research facilities, entertainment spaces, restaurants, office premises and retail spaces), and others as identified by the Secretary
SLR	Sydney Light Rail
SOM	Supply, Operate and Maintain
SPIR	Submissions and Preferred Infrastructure Report
SPL	Sound Pressure Level
SWL	Sound Power Level
T&C	Testing and Commissioning
TCP	Traffic Control Plan
TED	Traffic Event Database
TMC	Transport Management Centre
VMP	Site Vehicle Movement Plans

1 Introduction

1.1 Context

This Construction Noise and Vibration Management Sub Plan (CNVMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the Parramatta Light Rail Stage 1 Package 5 Supply, Operate and Maintain (SOM) Contract.

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

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

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

In summary, the key features of the project include:

- A new dual track light rail network of 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 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).

Detailed environmental impact assessments have been carried out and approved by the Minister for Planning. The Planning Approval for the project is described in Section 1.2.3.

1.2.3 Parramatta Light Rail Planning Approval

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

The CSSI was approved by the Minister for Planning on 29 May 2018.

Modifications of the CSSI Infrastructure Approval have been approved twice on:

- 21 December 2018 (Modification 1)
- 25 January 2019 (Modification 2)

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

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

1.2.4 Stage 1 Delivery Strategy

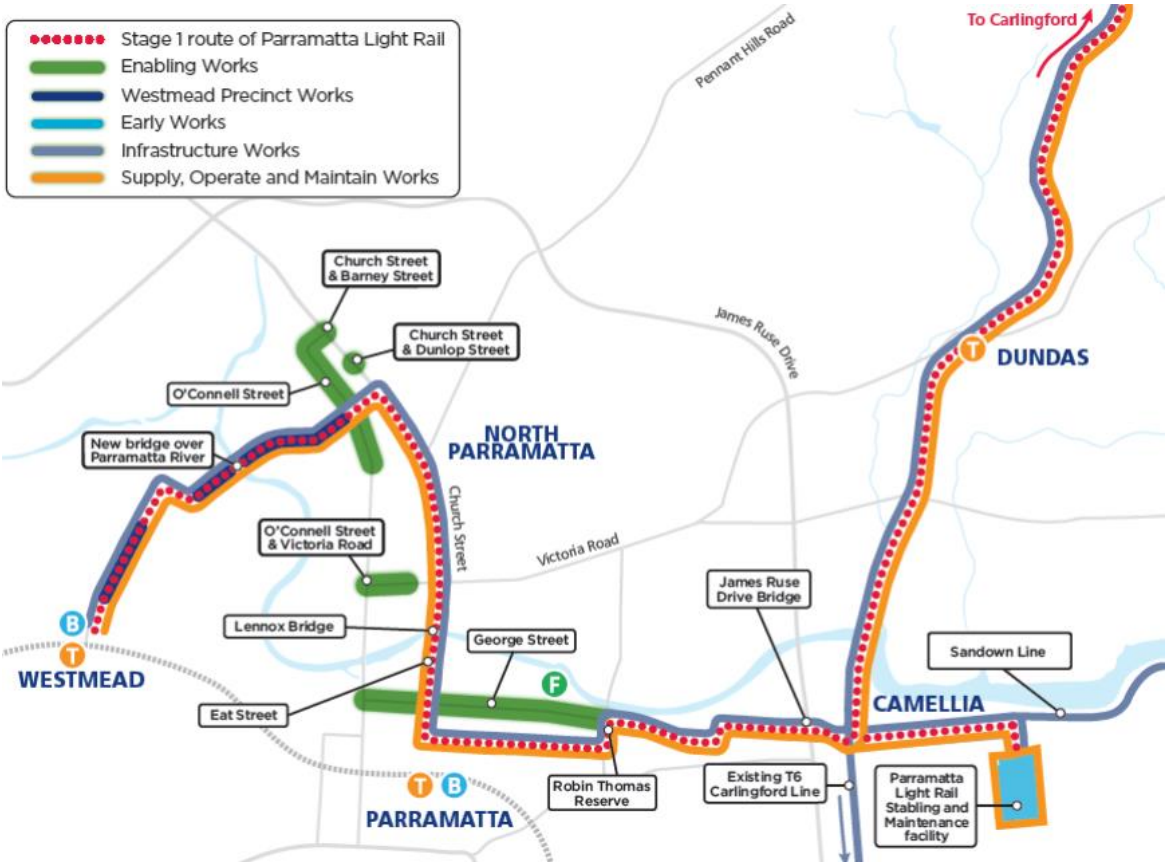
The Parramatta Light Rail (PLR1) – Stage 1 comprises approximately 12km alignment from Westmead to Carlingford via Camellia and consists of a mix of both on-street and dedicated corridor.

PLR1 is being delivered under five contracts:

- Enabling Works (Package One)
- Westmead Precinct Works (Package Two)
- Early Works – Remediation (Package Three)
- Infrastructure Works (INFRA) (Package Four)
- Supply, Operations and Maintenance (SOM) (Package Five) – the subject of this sub-plan.

Each package of work is to be delivered under separate contracts on behalf of the proponent Transport for NSW (TfNSW). 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 Delivery Strategy



1.2.5 SOM Works

Great River City Light Rail (GRCLR) have been engaged to deliver SOM Works (Package 5). As System Integrator for PLR, GRCLR's Activities include:

- Delivery Activities
- LRV Procurement
- Operation and Maintenance (O&M).

The delivery activities include all investigation, selection, specification, design, approvals, construction, manufacture, installation, testing & commissioning, operational readiness and activities to transition from the Delivery Phase to the Operations Phase.

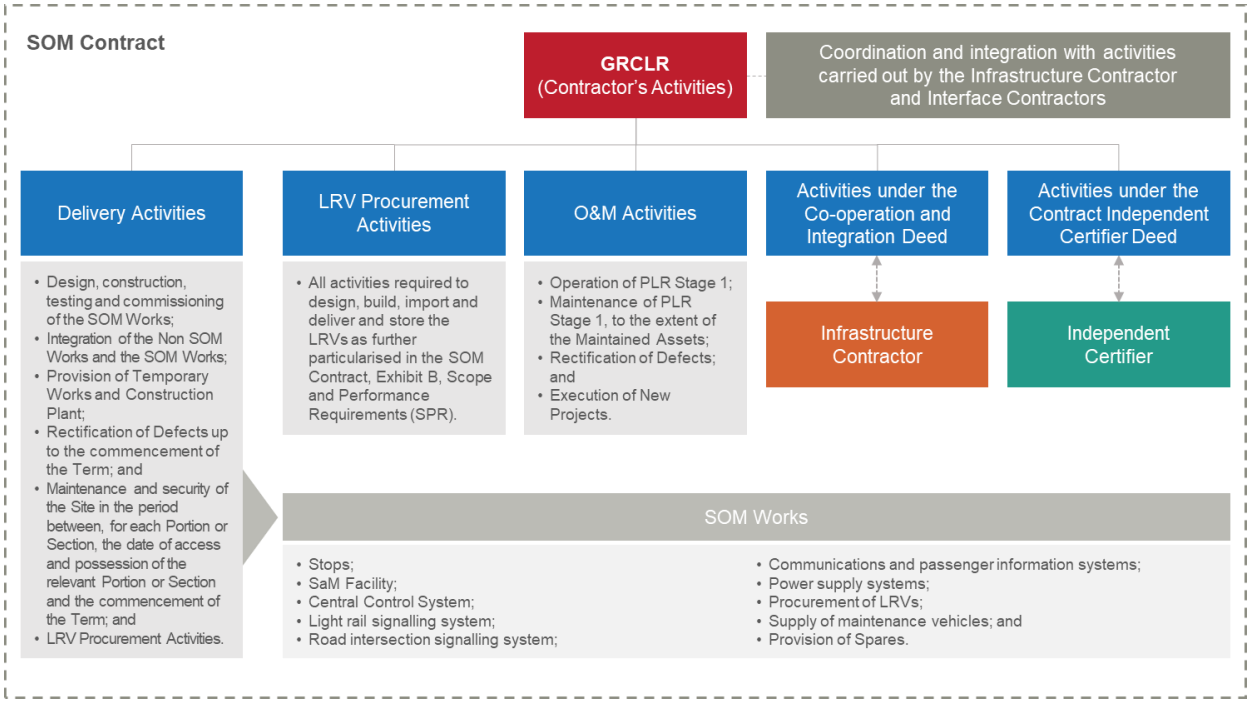
In summary works include:

- All works above and additional to the platform concrete foundation slab at all stops
- Stabling & Maintenance Facility (SaMF)
- Central Control System
- Light Rail signalling system
- Elements of the road intersection signalling system
- Communications and passenger information systems
- Power Supply system
- Procurement of Light Rail Vehicles (LRV)
- Maintenance plant and machinery for the LRVs

- Earthing & bonding, electrolysis and electromagnetic compatibility
- Electronic Ticketing system (ETS) for top up or Ticket Machine and Fixed Location Reader.

Figure 1-3 further details these activities.

Figure 1-3: SOM Contractor's Activities for PLR Stage 1



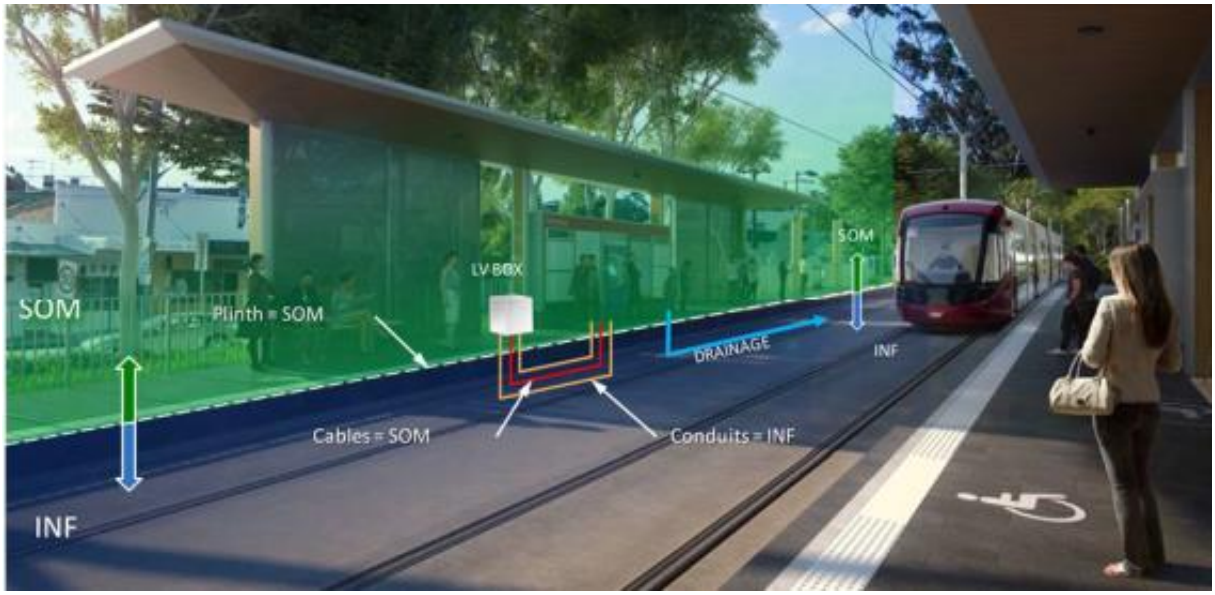
1.2.6 Relationship with other Packages

Infrastructure Works (Package 4)

The Infrastructure Works Package is closely aligned to the Package 5, SOM Works. A graphical representation of the split in scope between the two packages is depicted in **Figure 1-4**. The reason for dividing this work into two packages 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 PLR and will not trigger the operational conditions, except for those that relate to detailed design.

An interface between the two packages 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-compliance management.

Figure 1-4: Relationship between Infrastructure Works and SOM Works



Early Works Remediation Contractor – Ventia (Package 3)

The SOM contract is dependent on the completion of the remediation works at the stabling and maintenance facility (SaMF) site, by the remediation contractor.

The SaMF site is subject to historical contamination and is a listed contaminated site by the Environment Protection Authority (EPA). The works have been split to ensure that appropriately qualified contractor, experienced in remediating heavily contaminated sites, is managing the remediation of the site. The remediation contractor will complete their works and provide GRCLR a remediated site, complete with a site audit statement, and supporting management documentation, fit for purpose for site establishment, construction and operational activities associated with PLR.

The remediation works will deliver the remediated site, including any details of any ongoing management requirements, and will not trigger the construction and operational conditions, except for those that relate to detailed design. The Remediation Contractor will provide GRCLR with a Long Term Environmental Management Plan (LTEMP) for the SaMF, the LTEMP will include all operation, management, maintenance and monitoring requirements for the SaMF. GRCLR will implement the requirements relevant to the construction of the Stabling and Maintenance facility.

Ongoing management for the remedial works on the SaMF site will be implemented through a Long Term Environmental Management Plan (LTEMP) which will be approved by the Site Auditor, as part of the issuing of the Site Audit Statement (SAS) for the site. The LTEMP will be a stand-alone document, and all monitoring and reporting will be managed through the processes and procedures in the LTEMP, and not through the SOM CEMP.

An interface between the two packages has been established to ensure the remediated site meets the design requirements for the construction, operation and maintenance of the site.

1.3 Scope of the Sub-Plan

The Sub-plan outlines how GRCLR proposed to minimise and manage potential noise and vibration impacts during design and construction of the SOM Works, while complying with relevant approval, statutory and contract requirements. Sections 3.2, 3.3 and 3.4 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 SOM 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 GRCLR. All GRCLR 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.

1.4 Environmental management systems overview

The environmental management system overview is described in section 4.1 of the CEMP.

This Plan is a sub-plan of the Construction Environmental Management Plan (CEMP) (PLR1SOM-GLR-ALL-PM-PLN-000014 Rev B). It has also been prepared with reference to the following documents from the GRCLR Environment Management System (EMS):

- GRCLR Environment and Sustainability Policy
- CEMP
- Environmental Management Subplans
- Environmental Work Method Statements (EWMS)
- Environmental Control Maps (ECMs)
- Procedures, protocols, registers and forms

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)
- Heritage Management Sub-plan (PLR1SOM-GLR-ALL-PM-PLN-000037) – details the management controls and requirements for managing potential vibration impacts on identified heritage items
- Health Administration Corporation (HAC) Assessment System – outlines the process for managing noise and vibration impacts on the Westmead Health and Education Precinct (including Westmead Hospital, research institutes, the Children's Hospital and Cumberland Hospital)

- 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
- Construction Noise and Vibration Monitoring Plan (Appendix F of this Plan) – details how construction noise and vibration will be monitored in order to compare against requirements the actual performance during all construction associated with the Project.

2 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to describe how the GRCLR proposes to manage potential noise and vibration impacts during construction of the SOM Works.

2.2 Objectives

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

- EIS prepared for Parramatta Light Rail – Stage 1
- SPIR prepared for Parramatta Light Rail – Stage 1
- Conditions of Approval (CoA) granted to the Project on 29 May 2018 and modifications
- Transport for NSW's Construction Noise and Vibration Strategy
- PLR Stage 1 Supply, Operate and Maintain (SOM) Contract Project Deed (Project Deed).

Additional objectives of the Sub-plan include:

- Minimise noise and vibration impacts to the community resulting from construction
- Avoid any damage to buildings, services, 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
- Implement feasible and reasonable noise mitigation measures with the aim of achieving the construction noise management levels detailed in the Interim Construction Noise Guideline (DECC, 2009)
- Manage works to avoid working within the minimum working distances for structural damage to buildings caused by vibration, in particular for heritage buildings
- Avoid recurring or major exceedances of vibration goals for human comfort criteria
- Minimal complaints from the community and stakeholders through effective management of noise and vibration during the construction stage
- No divergence from the noise management process

3 Environmental requirements

3.1 Relevant legislation

3.1.1 Legislation

Legislation relevant to noise and vibration management for this Project includes:

- Environmental Planning and Assessment Act 1979
- Protection of the Environment Operations Act 1997.

3.1.2 Guidelines

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

- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- NSW Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- NSW Road Noise Policy, Dept. of Environment, Climate Change and Water 2011
- NSW Noise Policy for Industry, Environment Protection Authority 2017
- NSW Industrial Noise Policy, Environment Protection Authority 2000
- IS Technical Manual Version 1.2, Infrastructure Sustainability Council of Australia (ISCA) 2016
- 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).

Note that the EIS and the SEARs referenced the INP, which was superseded by the NSW Noise Policy for Industry (NPfI) in October 2017. CoA A7 states that "References in the terms of this approval to any guideline, protocol, Australian Standard or policy are to such guidelines, protocols, Standards or policies in the form they are in as at the date of this approval, unless agreed with the Secretary". The instrument of approval is dated post October 2017. Furthermore, the operational noise requirements in CoA E52 and E57 identify the NPfI as the appropriate criteria guideline. As such, the NPfI has been adopted as the relevant reference guideline in this CNVMP.

3.1.3 Standards

The main Standards relevant to this Plan include:

- Australian Standard AS/NZS 2107:2000 Acoustics - Recommended design sound levels and reverberation times for building interiors
- Australian Standard AS 2187.2 Explosives - Storage and use - Part 2 Use of explosives
- Australian Standard AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites
- Australian Standard 2834-1995 Computer Accommodation, Chapter 2.9 Vibration
- British Standard BS 6472-2008, Evaluation of human exposure to vibration in buildings (1-80Hz)
- British Standard 7385: Part 2-1993 Evaluation and measurement of vibration in buildings

- German Standard DIN4150-1999 Structural vibration Part 3: Effects of vibration on Structures
- ASHRAE Applications Handbook (SI) 2003, Chapter 47 Sound and Vibration Control.

3.2 Minister's Conditions of Approval

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

Table 3-1: Minister's Conditions of Approval

CoA No.	Condition Requirements	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).	This document (CNVMP) – Implementation of requirements for construction noise and vibration documented in this document	This document detailed where and how the terms of the Planning Approval (based on the consolidated conditions following MOD 2), the REMMMs and EPOs in the SPIR have been addressed. Detail of how compliance is addressed in Section 3.2, 3.3 and 3.4 of this CNVMP.
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;	Section 4 **PLR1SOM-GLR-ALL-EN-RPT-001004** (A5 Consultation Report)	A summary of consultation carried out during the development of this Sub-plan is provided in Section 4. A separate, stand-alone document detailing the consultation undertaken and outcomes has been prepared and submitted to DPIE together with this CNVMP.

CoA No.	Condition Requirements	Document Reference	How Addressed
A5 (*contin.*)	(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).		
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 8.1 Appendix A	The CNVIS will assess the potential construction impacts including duration. They would address cumulative or consecutive construction impacts. The CNVIS will be used in the development of construction works program. The CNVIS will detail the implementation of the OOHW protocol for the various works, and the process to minimise the duration of impacts on nearby sensitive receivers.

CoA No.	Condition Requirements	Document Reference	How Addressed
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 10.1.2	A suitably qualified and experienced Acoustics Advisor has been appointed to the Project and has been approved by the DPIE (see Section 10.1.2).
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 10.1.2	A suitably qualified and experienced Acoustics Advisor has been appointed to the Project and has been approved by the DPIE.

CoA No.	Condition Requirements	Document Reference	How Addressed
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 10.1.2	The Acoustics Advisor has been appointed to the Project and has been approved by the DPIE.
A29	The AA must:	Section 10.1.2	The responsibilities of the AA are outlined in Section 10.1.2
	(a) receive and respond to communication from the Secretary about the performance of the CSSI in relation to noise and vibration;	Section 10.1.2	Details are included in the reference section.
	(b) consider and inform the Secretary on matters specified in the terms of this approval relating to noise and vibration;	Section 10.1.2	Details are included in the reference section.
	(c) consider and recommend, to the Proponent, improvements that may be made to work practices to avoid or minimise adverse noise and vibration impacts;	Section 10.1.2 Section 8.1 Section 9 Section 10.3 Section 11.2	The AA will review and endorse CNVIS, which will be provide the opportunity to recommend improvements that may be made to work practices. Additionally, the AA will review other noise and vibration assessment, management and monitoring documentation, which will provide an opportunity to review effectiveness and adequacy of work practices and of recommend improvements.
	(d) consider consultation outcomes with affected receivers to determine the adequacy of noise mitigation and management measures including work hours and respite periods;	Section 4 Section 9.4	The consultation outlined in Section 4 will inform the Project's mitigation and management measures. The Communication and Engagement Plan and Consultation Records will be made available

CoA No.	Condition Requirements	Document Reference	How Addressed
			to the AA. These measures will be revised as necessary.

CoA No.	Condition Requirements	Document Reference	How Addressed
A29 *(contin.)*	(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 10.1.2 Section 4 Section 5.1.1 Section 6.1 Section 8.1 Section 10.3 Section 10.6	The following noise and vibration documents will be provided to the AA for review, and endorsement where required: This Sub-plan - Land Use Survey (or subsequent updates to the Project wide land use survey) (Section 5.1.1) Building Condition Survey (or subsequent updates to the Building Condition survey) (Section9.6) Measurements of existing ambient N&V levels (Section 10.3) CNVIS (Section 8.1) Communication and Engagement Plan and Consultation Records (Section 4) Noise and Vibration Noise Complaint reports (CEMP Section 6.4) Noise and Vibration Monitoring Report (Section 10.6).

CoA No.	Condition Requirements	Document Reference	How Addressed
A29 *(contin.)*	(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;	Section 10.1.2	GRCLR will facilitate the AA to attend inspections, monitoring or audits as requested by the AA or Secretary. The AA will review and audit this CNVMP and associated management measures annually, or in the case of an incident or non-conformance, in accordance with Section 9 of the CEMP.
	(g) in conjunction with the ER, the AA must:	Section 10.1	-
	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;	Section 10.1.2 Section 10.5	Audits will be undertaken in accordance with Section 10.5. The AA will plan and attend these audits if requested by the Secretary. GRCLR will attend and provide all relevant information required to complete these audits.
	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;	Section 10.1.2 TfNSW Community Communication Strategy	GRCLR will cooperate with the AA and provide all relevant information required for the AA to assist in resolving conflicts between the Proponent and the community.

CoA No.	Condition Requirements	Document Reference	How Addressed
A29 *(contin.)*	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 10.1.2 Section 11.2	The CEMP will have a section called Review and Continuous Improvement (Section 9). The CNVMP will be subject to the same process as the CEMP.
	iv) assess the noise impacts of minor construction ancillary facilities; and	Section 8.1 Section 10.1.2	The potential impacts of minor construction ancillary facilities will be assessed in CNVIS or endorsed appropriate modelling tool where impacts are likely to be short term of low impact. These assessments will be provided to the AA for review and endorsement.
	(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 10.1.2	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 GRCLR will assist the AA in providing all documents, information and co-operation reasonably requested by TfNSW in relation to this reporting.

<table>
<tr><th>CoA No.</th><th>Condition Requirements</th><th>Document Reference</th><th>How Addressed</th></tr>
<tr><td>C3</td><td>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:
<table>
<tr><th></th><th>Required CEMP Sub-plan</th><th>Relevant authority(s) and council(s) to be consulted for each CEMP and Sub-plan</th></tr>
<tr><td>b)</td><td>Noise and Vibration</td><td>Relevant Council(s), EPA,
NSW Health</td></tr>
</table></td><td>Section 4</td><td>This CNVMP has been prepared in accordance with this condition and describes how GRCLR proposes to manage noise and vibration during construction of the Project.
A summary of consultation undertaken with the relevant government agencies during preparation of this Sub-Plan is provided in Section 4 and full details in a stand-alone separate document provided to DPIE together with the CNVMP.</td></tr>
<tr><td>C4</td><td>The CEMP Sub-plans must state how:</td><td></td><td></td></tr>
<tr><td></td><td>(a) The environmental performance outcomes identified in the documents listed in Condition A1 will be achieved;</td><td>Section 3.4
Section 9</td><td>This CNVMP was prepared in accordance with the environmental performance outcomes identified in the EIS and SPIR, and is evidenced primarily in Section 3.4 of this Sub-Plan.</td></tr>
<tr><td></td><td>(b) The mitigation measures identified in the documents listed in Condition A1 will be implemented;</td><td>Section 3.3
Section 9</td><td>A compliance table at Section 3.3 demonstrates where and how the relevant mitigation measures have been addressed in this CNVMP.</td></tr>
<tr><td></td><td>(c) The relevant terms of this approval will be complied with; and</td><td>(This section)
Section 3.2
Section 9</td><td>A compliance table at Section 3.2 demonstrates where and how the relevant terms of the CoA have been addressed in this CNVMP.</td></tr>
</table>

CoA No.	Condition Requirements	Document Reference	How Addressed
C4 *(contin.)*	(d) Issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	Section 7 Section 8 Section 9	Issues identified during the EIS that require management during construction are outlined in Section 7. Other issues will be identified through the CNVIS process, outlined in Section 8. The process for quantitative risk assessment for the Project is outlined in the CEMP Section 3.5. CEMP Appendix A2 is the environmental risk register for the construction activities associated with the Project. The risk register is reviewed at least every six months, and in response to significant issues, incidents and non-compliances (Section 9.2 of CEMP). The approaches for mitigation and management of these risks has been outlined in Section 9. These will be implemented during pre-construction, design 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	The CNVMP has been prepared in consultation with City of Parramatta Council, EPA and NSW Health. A summary of this consultation will be provided in a separate standalone consultation document provided to DPIE together with this Sub-Plan.

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 CNVMP will be submitted no later than one month prior to commencement of 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. *Note: the requirement to submit or have a CEMP or CEMP Sub-plan approved is specified in Condition C3*.	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 10.3	The Construction (Noise and Vibration) Monitoring Program has been prepared in consultation with City of Parramatta Council, EPA and NSW Health. A summary of this consultation is provided in a separate standalone consultation document provided to DPIE together with this Sub-Plan.
C10	Each Construction Monitoring Program must provide:	Section 10.3 Appendix F *(NVMonP)*	-

CoA No.	Condition Requirements	Document Reference	How Addressed
C10 (*contin.*)	(a) details of baseline data available;	Section 10.3 Appendix F *(NVMonP)*	Details of baseline data are addressed in the Noise and Vibration Monitoring program (NVMonP) (Appendix F) construction noise.
	(b) details of baseline data to be obtained and when;	Section 10.3 Appendix F *(NVMonP)*	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 10.3 Appendix F *(NVMonP)*	The NVMonP is included in Appendix F which includes a schedule of the inspection and monitoring to be undertaken.
	(d) the parameters of the project to be monitored;	Section 10.3 Appendix F *(NVMonP)*	The parameters to be measured during construction works are detailed in the NVMonP in Appendix F.

CoA No.	Condition Requirements	Document Reference	How Addressed
C10 (*contin.*)	(e) the frequency of monitoring to be undertaken;	Section 10.3 Appendix F *(NVMonP)*	The timing and frequency of the noise and vibration monitoring is included in the NVMonP in Appendix F.
	(f) the location of monitoring;	Section 10.3 Appendix F *(NVMonP)*	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 are detailed in the NVMonP in Appendix F.
	(g) the reporting of monitoring results against relevant criteria;	Section 10.3 Appendix F *(NVMonP)*	Details of the reporting requirement of the noise and vibration monitoring are included in the NVMonP in Appendix F.
	(h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and	Section 10.3 Appendix F *(NVMonP)*	The NVMonP provides actions to be implemented in the event of exceedance of the predicted impacts.
	(i) any consultation to be undertaken in relation to the monitoring programs.	Section 4	The NVMonP Sub-plan was provided to EPA, NSW Health and City of Parramatta Council for consultation.

CoA No.	Condition Requirements	Document Reference	How Addressed
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 10.3 Appendix F *(NVMonP)*	A schedule of the reporting of the noise and vibration monitoring program is presented in the NVMonP provided in Appendix F. 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	The NVMonP for noise and vibration is included in this Sub-plan and was provided to EPA, NSW Health and City of Parramatta Council for consultation.
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	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 10.1.2 Appendix F *(NVMonP)*	Construction activities, involving noise and vibration, will not commence until the Noise and Vibration Monitoring Program has been endorsed by the ER, AA and submitted to DPIE for information, and relevant noise and vibration, and all the necessary baseline data for the monitoring program has been collected.

CoA No.	Condition Requirements	Document Reference	How Addressed
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	The Noise and Vibration Monitoring Program will be implemented for the duration of the construction of the Project, or as otherwise required by the Secretary.
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 10.3 Appendix F *(NVMonP)*	A schedule of the reporting of the noise and vibration monitoring program is presented in the NVMonP provided in Appendix F. 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 10.3 Appendix F *(NVMonP)*	The construction NVMonP is incorporated into this CNVMP in Appendix F.
C19	Boundary fencing that incorporates screening must be erected around all construction ancillary facilities that are adjacent to sensitive receivers for the duration of site establishment and construction of the CSSI unless otherwise agreed with Relevant Council(s), affected residents, business operators and/or landowners and in accordance with Condition B2(b).	Section 8.1	All boundary fencing would be adopted as required and incorporated into the Construction Noise and Vibration Impact Statements for each site as relevant.

CoA No.	Condition Requirements	Document Reference	How Addressed
C20	Boundary screening required under Condition C19 of this approval must reduce visual, noise and air quality impacts on adjacent sensitive receivers.	Section 8.1	As noted above, boundary fencing will be reviewed in the development of the Construction Noise and Vibration Impact Statements and adopted as appropriate for each site.
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 5.1 Appendix B-1 *(Land use survey)*	A land use survey was prepared for the SOM Works and is attached to the CNVMP in Appendix B. The results of the land use survey have been used in the development of this Sub-plan and will be used to inform noise and vibration management decisions during 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; and (c) at no time on Sundays or public holidays.	Section 6.1	Construction activities will be undertaken during the approved construction hours as outlined in Section 6.1.

CoA No.	Condition Requirements	Document Reference	How Addressed
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 6.1	Construction activities will be undertaken during the approved construction hours as outlined in Section 6.1.
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 6.1 Appendix A *(OOHW Protocol)*	Construction activities will be undertaken during the approved construction hours as outlined in Section 6.1. An Out of Hours Works Protocol (Appendix A) has been developed to assess works proposed to be undertaken outside of standard construction hours against the Conditions of Approval and the EPL.
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 6.1.2 Section 9.4 Appendix A *(OOHW Protocol)*	The Business Activation Plan (BAP) developed to satisfy CoA E110 will direct the consultation with businesses of Eat Street to determine works period that minimise disruption to the businesses. Consultation will be undertaken with affected sensitive receivers as described in Section 9.4
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	Section 6.1.2 Appendix A *(OOHW Protocol)*	An Out of Hours Works Protocol has been developed to assess works proposed to be undertaken outside of standard construction hours against the Conditions of Approval prior to works not subject to an EPL.

CoA No.	Condition Requirements	Document Reference	How Addressed
E25 (*contin.*)	(b) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm; or (c) where different hours of works are permitted or required under an EPL in force in respect of the CSSI; or (d) works approved under an Out-of-Hours Work Protocol for works not subject to an EPL; or (e) construction that causes 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.	Appendix A *(OOHW Protocol)*	TfNSW and the ER will be notified verbally immediately in the event of an environmental incident, and in writing within 4 hours, in accordance with the *TfNSW Environmental Incident Classification and Reporting Procedure (9TP-PR-105).* Depending upon the emergency, further appropriate departments, regulators and sensitive receivers will be notified of any emergency works occurring as outlined in Section 7 of the CEMP. When the EPL is sought for signalling works it will also be outlined in the Pollution Incident Response Management Plan (PIRMP).
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: 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	Section 8.1 Appendix A *(OOHW Protocol)*	Predicted noise and vibration impacts will be assessed in the CNVIS in accordance with Section 8.1. The hours of works and respite will be programmed to comply with the Out of Hours Works Protocol or an EPL.

CoA No.	Condition Requirements	Document Reference	How Addressed
	and recommencing any of the work that are the subject of this condition. *Note: A trial period of the Highly Noise Intensive Work undertaken with the approval of the Out of Hours Work Protocol may be established.*		

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 6.1.2 Appendix A *(OOHW Protocol)*	An Out of Hours Works Protocol has been prepared by TfNSW and approved by DPIE. The Out of Hours Works Protocol provides a process for the consideration for out-of-hours works and identification of mitigation and management measures to be implemented including community notifications prior to out-of-hours works. The Out-of-Hours Protocol will include an Out-of-Hours Works Permit procedure. All works occurring outside of the standard working hours will require an Out-of-Hours Works Permit.

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: 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 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 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 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 Where Sydney Trains (or other rail authority) has advised the Proponent in writing that a Rail Possession is required.	Section 6.1.2 Appendix A *(OOHW Protocol)*	An Out-of-Hours-Work Protocol has been prepared by TfNSW and approved by DPIE. For OOHW that is subject to an EPL, the EPL conditions will dictate the approval process.

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: Evening (6.00pm to 10.00pm) – internal LAeq (15 minute): 40 dBA; and 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 6.1.2 Section 6.4 Section 9.1 Section 9.7 Appendix A *(OOHW Protocol)*	The ground-borne noise criteria is outlined in Section 6.4 as noise objectives. Exceedance of the ground-borne noise level criteria 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. An Out-of-Hours-Work Protocol has been prepared by TfNSW and approved by DPIE. For OOHW that is subject to an EPL, the EPL conditions will dictate the approval process.
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 5.1 Section 8.1 Section 9.4 Appendix B-1 *(Land use survey)*	Non-residential noise and vibration sensitive receivers have been identified in the Land Use Survey and summarised in Sections 5.1 and Appendix B. 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. Consultation will be undertaken with affected sensitive receivers as described in Section 9.4

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 9.4	Consultation will be undertaken with proponents or applicants of other State Significant development (SSD) and infrastructure works (SSI) near the CSSI to coordinate respite periods. The exact nature of the consultation will be determined on a case by case basis in accordance with the GRCLR'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 8.1 Section 8.3 Section 9	The impact assessment procedures in Figure 8-1 will be incorporated into the development of CNVIS. The mitigation and management measures outlined in Section 9 will be incorporated as part of the CNVIS process.
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 8.1 Section 9.1	This has been included in Section 9.1 as mitigation measure NV31. 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 6, Table 6-1	No blasting is proposed for the Project works.

CoA No.	Condition Requirements	Document Reference	How Addressed
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 9.1 Section 9.3	Section 9.3 outlines the respite periods and the applicable CoA for noise impacts for the project on sensitive receivers. This is included in mitigation measures presented in Section 9.1
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. 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 8.1 Section 9.1 Section 9.3 Section 9.4 Appendix A *(OOHW Protocol)*	CNVIS will be prepared to predict the noise and vibration impacts at sensitive receivers. CNVIS outcomes will be used to inform programming of works. This is included in mitigation measures presented in Section 9.1 Where construction noise levels are predicted to exceed 65 dB(A) LAeq (15 min) at the façade of the building of a residential receiver, works would be programmed to only occur for 4 nights in any 7 day period. Required respite for impacted receivers is detailed in Section 9.3. This is also informed by community consultation (detailed in Section 9.4) that will be undertaken where there are out of hours works required.

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: schedule any works to provide respite to impacted noise sensitive receivers so that all respite periods are achieved; or consider the provision of alternative mitigation, including the provision of at receiver treatments and alternative accommodation to impacted noise sensitive receivers; and provide documentary evidence to the AA in support of any decision made by the Proponent in relation to respite or mitigation.	Section 8.1 Section 9.3 Section 9.7 Section 10.1.2	Predicted noise and vibration impacts will be assessed in the CNVIS as described in the Section 8.1, including consideration of cumulative and consecutive Project impacts. Section 9.3 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 9.7. The AA will be provided the CNVIS for review and comment.
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) c) the potential works, location and duration;	Section 9.3.3 Appendix A *(OOHW Protocol)*	Consultation will occur with affected receivers as outlined in Section 9.3.3. Appropriate work and respite periods will be informed by this consultation as appropriate. The outcomes of the consultation will be incorporated in the mitigation measures determined in the CNVIS and provided to community members as appropriate. TfNSW, the Secretary, AA and ER will be provided with the outcomes of the community consultation, and subsequent construction respite periods and scheduling of OOHW.

CoA No.	Condition Requirements	Document Reference	How Addressed
E39 (*contin.*)	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 9.3	Section 9.3 outlines the respite periods for the project. Mitigation measures will be implemented even together with respite periods as determined through the preparation of the CNVIS as a wholistic approach to noise and vibration mitigation.
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 6.8 Section 9.1	Construction noise will be managed to 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 9.1 as mitigation measure NV58.

E42 E42 (*contin.)*	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, 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;	Section 8.1	Construction Noise and Vibration Impact Statements will be prepared and implemented for each construction site before construction commences. Section 8.1 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
	(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. 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.		
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 6.6.3 Section 9.1 Section 10.3 Appendix F *(NVMonP)*	Vibration testing will be undertaken as outlined in the Noise and Vibration Monitoring Program.
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 9.1 Appendix B-2 *(Heritage items)*	Identified heritage structures potentially impacted by the project are listed in Appendix B-2. A heritage specialist will be engaged when vibration, movement and noise monitoring of heritage-listed structures will occur, as outlined in Section 9.1 in NV52. This has also been referenced in the noise and vibration monitoring methods.

CoA No.	Condition Requirements	Document Reference	How Addressed
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 9.1 Section 9.6 Appendix B-2 *(Heritage items)* Appendix F *(NVMonP)*	Building Condition Survey Reports will be undertaken prior to the commencement of construction as detailed in Section 9.6. Structures at risk of damage will be identified as per Section 9.6 (NV53) and the monitoring protocol for structural damage presented in Figure 4-2 of the Noise and Vibration Monitoring Program (Appendix F).
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 9.1 Section 9.6 Section 10.3 Appendix F *(NVMonP)*	Building Condition Survey Reports will be undertaken after construction where required as detailed in Section 9.6. Structures at risk of damage requiring pre-construction inspections were identified as per E45.

CoA No.	Condition Requirements	Document Reference	How Addressed
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 9.6 Section 10.3 Appendix F *(NVMonP)*	The GRCLR will review the pre-construction and post-construction Building Condition Survey Reports. In the case that issues are identified through these surveys, GRCLR will review the pre-construction and post-construction 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 SOM Works and the outcome is disputed by the property owner, the GRCLR will engage an independent structural engineer to assist in resolving the dispute.
E49	Noise mitigation measures as identified in Condition E48 that will not be physically affected by works must be implemented within eighteen (18) months of the commencement of construction in the vicinity of the impacted receiver to minimise construction noise impacts, and detailed in the Construction Noise and Vibration Management Sub-plan for the CSSI.	Section 9.1 Section 9.2	During construction planning, the operational noise mitigation measures identified in the Project's Operational Noise and Vibration Review (ONVR) will be reviewed to determine what identified mitigation measures would be feasible and reasonable to install during the early construction stages, and where operational the noise mitigation measures will not be physically affected by works. This will take into consideration heritage aspects of the any buildings proposed to be modified as part of these mitigation measures.

CoA No.	Condition Requirements	Document Reference	How Addressed
E69	Before installing acoustic treatment at any heritage item identified in the documents listed in Condition A1 the advice of a suitably qualified heritage architect or heritage engineer with specific experience in built heritage must be obtained and implemented to ensure any such work does not have an adverse impact on the heritage significance of the item.	Section 9.2 Section 10	An approved heritage consultant would be appointed to review and endorse any modifications required to heritage items as part of installing acoustic treatments.

3.3 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 CNVMP

Ref #	Commitment	Timing	CNVMP	How Addressed
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: …. Noise and vibration management.	Pre-construction Construction	CEMP and this Sub-plan	The CEMP provides a central reference document for how the project will address all potential environmental impacts and provide the framework for assessment, mitigation and management of environmental impacts throughout the construction of the Project.
GEN-2	A construction compounds plan would be prepared for the project as part of the overall CEMP. This sub-plan would set out details for each of the approved construction compounds, including stockpile areas, laydown areas and other ancillary activities required to construct the project. The sub-plan would supplement, in greater detail, the information provided in the main body of the CEMP. The	Pre-establishment	SEMP.	A Site Establishment Management Plan (SEMP) for the Project has been prepared and approved by DPIE separately to the CEMP and Sub-plans. The SEMP relates only to the establishment of the construction ancillary sites, and

Ref #	Commitment	Timing	CNVMP	How Addressed
GEN-2 *(contin.)*	objectives and strategies of the construction compounds and ancillary facilities management sub-plan would include the following: » Minimise the impact of construction compounds on surrounding land uses and sensitive receivers. » Locate construction compounds away from sensitive land uses and receivers, wherever practical and feasible, or configure internal compound layouts in a manner that considers noise and light sensitive receivers (e.g. use of buildings to shield noisy activities, minimising the requirement for reversing vehicles, or locating noise intensive activities to maximise the distance to noise sensitive receivers). … … » Locate construction compounds away from (or able to be managed in such a way so as to not impact on) heritage items and high retention value trees. … » Situate construction compounds and ancillary facilities on relatively level ground, and avoid excavation in construction compounds where risk of heritage impacts or disturbance of contaminated material. ... …			addresses noise and vibration requirements for the establishment activities. All other noise and vibration requirements related to the construction phase are addressed in this CNVMP, CEMP and EPL.

Ref #	Commitment	Timing	CNVMP	How Addressed
GEN-2 *(contin.)*	Environmental management measures for construction compounds would be developed as part of the overall CEMP, with the construction compounds sub-plan identifying where such measures are documented within the CEMP. [This additional mitigation and management measure is from section 17.2.9 of the EIS].			
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 working hours and for all out-of-hours construction activities (refer to Section 17.2.3 of the EIS). The CNVMP would also provide the framework and mechanisms for:	Construction	This Sub-plan Section 3.1.2 Section 6 Section 6.7 Section 9	The CNVMP provides a central reference document for how the project will address all construction noise and vibration requirements outlined in the CoA, REMMM, EPO's, TfNSW CNVS and EPA ICNG. The CNVMP will: • detail construction noise and vibration requirements across the project (Section 6) • detail how site specific construction noise and vibration impact statements (CNVIS) would be prepared to mitigate and manage impacts associated within each site or set of construction works (Section 8.1 and Section 9) • Appendix A details the OOHW Protocol which addresses how construction works outside of standard construction hours would be mitigated and managed (Section 9 and Appendix A).
	» The mitigation and management of the noise and vibration impacts from the project.	Construction	Section 9	
	» Development of site specific construction noise management plans.	Construction	Section 8.1	
	» Out-of-hours work associated with the project.	Construction	Section 6.1.2 Section 9 Appendix A	

Ref #	Commitment	Timing	CNVMP	How Addressed
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	This Sub-plan Section 3.1.2 Section 9 Section 9.7	This CNVMP has been developed to address all the requirements outlined in the CoA, REMMM, EPO's, TfNSW CNVS and EPA ICNG, which are covered in the mitigation and management measures presented in Section 9.
	» 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 8.1 Section 9	This CNVMP details how CNVIS would be prepared for each works area or activity. Specific mitigation measures, including site hoarding, would be assessed and included in the design following the process outlined in Section 8.1 and Figure 8-1, as detailed in mitigation measure NV44.
	» Given the potentially high noise levels at residential receivers, adherence to daytime construction hours would be used for excavation, demolition or rock breaking activities, and for activities concentrated in a single area (i.e. activities that do not move along the alignment, and do not require out-of-hours activities for safety reasons or to minimise disruption to road networks).	Construction	Section 8.1 Section 9	As part of the CNVIS process, construction hours for high noise activities would be prioritised to standard hours where feasible and reasonable, and detailed in mitigation measure NV8.
	» 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 6.1 Section 8.1 Section 9 Section 9.4	The scheduling of works on Eat Street will be determined through consultation with affected businesses through the Business Activation Plan and Communications and Engagement Plan in accordance with CoA

Ref #	Commitment	Timing	CNVMP	How Addressed
				E24. This has been included as mitigation measure NV7.
NV-2 (*contin.*)	» Out of hours works would be programmed to minimise the number of consecutive out of hour work periods impacting the same receptors.	Construction	Section 9.4 Appendix A (*OOHW Protocol*)	Out-of-Hours-Work will be determined in accordance with the Out-of-Hours-Work Protocol, included in Appendix A. This has been included as mitigation measure NV12.
	» 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 8.1 Section 9 Section 9.4	Consultation with schools, other educational facilities and childcare centres would be undertaken to ensure impacts are minimised during sensitive periods (ie. exam periods or childcare rest times). This has been included as mitigation measure NV15.
	» Simultaneous operation of noisy plant in close proximity to sensitive receptors would be avoided (where possible).	Construction	Section 9	Where possible, the operation of multiple noisy plant items will be avoided in close proximity to sensitive receptors. This has been included as mitigation measure NV33. Toolbox talks and daily pre-start briefings will ensure these measures are communicated for implementation construction personnel.
	» Equipment which is used intermittently would be shut down when not in use.	Construction	Section 9	Equipment which is used intermittently would be shut down when not in use. This has been included as mitigation measure

Ref #	Commitment	Timing	CNVMP	How Addressed
				NV34. Toolbox talks and daily pre-start briefings will ensure these measures are communicated for implementation construction personnel.
NV-2 (*contin.*)	» Where possible, the offset distance between noisy plant items and nearby noise sensitive receptors would be as great as possible.	Construction	Section 8.1 Section 9	During the CNVIS process and during construction work planning the offset distance between noisy plant items and nearby noise sensitive receptors would be as far as is practical maximised. This has been included as mitigation measure NV43. Toolbox talks and daily pre-start briefings will ensure these measures are communicated for implementation construction personnel.
	» Where possible, equipment with directional noise emissions would be oriented away from sensitive receptors.	Construction	Section 8.1 Section 9	During the CNVIS process and during construction work planning equipment with directional noise emissions would where practical be oriented away from sensitive receptors. This has been included as mitigation measure NV35. Toolbox talks and daily pre-start briefings will ensure these measures are communicated for implementation construction personnel.

Ref #	Commitment	Timing	CNVMP	How Addressed
	» 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 8.1 Section 9	Specific mitigation measures would be detailed in each CNVIS, including such things as site hoarding. These would be assessed and included in the design following the process outlines in Section 8.1 and Figure 8-1, as detailed in mitigation measure NV44 where required.
NV-2 (*contin.*)	» Structures such as site sheds would be positioned to further shield sensitive and residential receivers from works activities.	Pre-construction Construction	Section 8.1 Section 9	Site layouts to maximise shielding to nearby noise sensitive receivers would be assessed as part of each CNVIS following the process outlined in Section 8.1 and Figure 8-1, as detailed in mitigation measure NV42. This will be captured in ECMs.
	» 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 9 Section 10.3	Compliance checks for noise emissions from all plant and machinery used for the project, including rental equipment, would be carried out to ensure they are no greater than assumed in the CNVIS and TfNSW CNVS requirements, in mitigation measure NV54 and NV55.
	» 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 Section 9.7 Section 10.3	Ongoing noise monitoring and verification would be undertaken during construction to manage high risk noise impacts at sensitive receivers (NV56). Verification of noise levels would also be undertaken as an additional mitigation

Ref #	Commitment	Timing	CNVMP	How Addressed
				measures in accordance with the TfNSW CNVS (Section 9.7)
	» Where possible heavy vehicle movements should be limited to daytime hours.	Construction	Section 9	Out-of-hours deliveries will be minimised where possible, with heavy vehicle movements limited to daytime hours where feasible and reasonable (NV23).
NV-2 (*contin.*)	» 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.	Pre-construction Construction	Section 8.1 Section 9	This will be considered during compound layout design and the CNVIS, and will be included in the Construction Traffic, Transport and Access Management Plan (CTTAMP). Implementation will be verified during site inspections and noise verification monitoring.
	» Loading and unloading should be carried out away from sensitive receptors, where practicable.	Pre-construction Construction	Section 8.1 Section 9	This will be managed through Site Vehicle Movement Plans. During the CNVIS process and during construction work planning the offset distance between noisy plant items and nearby noise sensitive receptors would be maximised. This has been included as mitigation measure NV43. Toolbox talks and daily pre-start briefings will ensure these measures are communicated for implementation construction personnel.
	» Work should be scheduled to provide respite periods from the noisiest activities, and impacted	Construction	Section 9	Coordination of works within the SOM project and with infrastructure works will

Ref #	Commitment	Timing	CNVMP	How Addressed
	residents should be communicated with to clearly explain the duration and noise levels for the works.		Section 9.3 Section 9.4	occur to provide nearby sensitive receivers sufficient respite and to respond to community consultation throughout the project (Section 9.3). Updates such as email updates, signage, and newsletters will be provided to communicate with the community, and the community information line will provide feedback (Section 9.4) (NV13). This has been included as mitigation measure NV14 in Section 9.1.
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 8.1 Section 9 Section 9.7 Appendix A *(OOHW Protocol)*	Predicted noise impacts will be assessed in the CNVIS, following the process outlines in Section 8.1 and Figure 8-1. The frameworks for application of additional mitigation measures is outlined in Section 9.7. These are the basis of how residual impacts will be addressed following the CNVIS process. The planning of Out of Hours Works will be undertaken in accordance with the Out of Hours Works Protocol (Appendix A)
	» *Periodic notifications* – These include regular newsletters, letterbox drops or advertisements in local papers to provide an overview of current and upcoming works and other topics of interest.	Construction	Section 9.4 Section 9.7	The community will be informed of OOHW and other updates at monthly and quarterly intervals through various forms of communication. This has been included as mitigation measure NV13.

Ref #	Commitment	Timing	CNVMP	How Addressed
	» *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 9.4	The community will be informed of Project construction works via website updates. The website will provide a variety of information regarding the project including a schedule of out-of-hours work. This has been included as mitigation measure NV13.
NV-3 (*contin.*)	» 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 9.4	A Project Info-line has been set up by TfNSW as a single contact point for enquires and complaints for the project.
	» Email distribution list – An email distribution list would be used to disseminate project information to interested stakeholders.	Construction	Section 9.4	A project stakeholders email list will be developed in order to regularly notify stakeholders of upcoming construction works.
	» Signage – Signage on construction sites would be provided to notify stakeholders of project details and project emergency or enquiry information.	Construction	Section 9.4	Signage around the construction works areas will be implemented to notify the community of important project details.
	» Specific notifications – Specific notifications would be letterbox dropped or hand distributed to the	Construction	Section 9.7	Specific receptors may be notified within seven days of construction works, having

Ref #	Commitment	Timing	CNVMP	How Addressed
	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.			been identified as potentially noise impacted as part of the CNVIS process (NV48).
NV-3 (*contin.*)	» 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 9.7	Specific receptors may be called via phone within seven days of construction works, having been identified as potentially noise impacted as part of the CNVIS process (NV48).
	» 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 9.7	Specific receptors may be provided with an individual briefing, at least 48 hours prior construction works, having been identified as potentially noise impacted as part of the CNVIS process (NV48).

Ref #	Commitment	Timing	CNVMP	How Addressed
NV-3 (*contin.*)	» *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 9.7	Noise verification monitoring would be undertaken to verify the noise levels that have been predicted at specific potentially impact sensitive receivers as part of the CNVIS process (NV48). Details of the Noise and Vibration Monitoring Program are included in Appendix F
	» *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	Construction	Section 9.7	Specific receptors may be provided with a project specific respite offer having been identified as potentially noise or vibration impacted as part of the CNVIS process (NV48).

Ref #	Commitment	Timing	CNVMP	How Addressed
	weekend noise environment in the Parramatta CBD precinct.			
NV-3 (*contin.*)	» *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 9.7	Specific receptors may be provided with an offer of alternative accommodation having been identified as potentially noise or vibration impacted as part of the CNVIS process (NV48).
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 8.1 Section 9.4	The Communication and Engagement Plan (Section 9.4) will detail how consultation will occur with various sensitive receivers, and the nature and potential impacts of construction works to be explained clearly and timely. The outcomes of the consultation will be incorporated into the CNVIS (NV16).
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,	Construction	Section 8.1 Section 9.7	The approach detailed Section 8.1 and the standard mitigation and management measures in this CNVMP will typically achieve this requirement. Where noise

Ref #	Commitment	Timing	CNVMP	How Addressed
	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.			intensive activities are required after 11pm additional mitigation measures would be implemented as feasible and reasonable in accordance with the TfNSW CNVS (Section 9.7). This is as detailed in NV9.
NV-6	Opportunities to reduce road traffic noise during construction would be investigated during construction planning, including restricting heavy vehicle movements to standard construction hours and/or to routes with fewer sensitive receivers.	Pre-construction Construction	Section 6.5 Section 9.1	Measures to mitigate and manage construction road traffic noise impacts are detailed in Section 6.5 and Section 9.1 (NV19 to NV28) and are included in the project CTTAMP.
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 8.1 Section 9.1 Section 9.5 Section 10.3	Vibration impacts will be assessed as part of the CNVIS process outlined in Section 8.1 and Figure 8-1 for each construction area. Appropriate mitigation and management measures would be implemented in the case that vibration sensitive structures/buildings are identified within the minimum working distances, which are detailed in mitigation measure NV51. Where vibration intensive construction activities are proposed within 100 metres of sensitive receivers, these works will be confined to

Ref #	Commitment	Timing	CNVMP	How Addressed
				the less sensitive daytime periods where feasible and reasonable (NV40).
NV-7 *(contin.)*	» Relocate vibration generating plant and equipment to areas within the site in order to lower the vibration impacts.	Construction	Section 8.1	Vibration impacts will be assessed as part of the CNVIS process outlined in Section 8.1 and Figure 8-1 for each construction area. Appropriate mitigation and management measures would be implemented in the case that vibration sensitive structures/buildings are identified within the minimum working distances, which are detailed in mitigation measure NV51.
	» Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment.	Construction	Section 8.1	Vibration impacts will be assessed as part of the CNVIS process outlined in Section 8.1 and Figure 8-1 for each construction area. Vibration generating plant and equipment with the potential to disturb nearby sensitive building occupants or items, where feasible and reasonable, would be scheduled to provide respite (NV11), or where applicable during agreed periods when vibration intensive works can occur with least impact (NV17).

Ref #	Commitment	Timing	CNVMP	How Addressed
NV-7 *(contin.)*				Appropriate mitigation and management measures would be implemented in the case that vibration sensitive structures/buildings are identified within the minimum working distances, which are detailed in mitigation measure NV51.
	» Use lower vibration generating items of excavation plant and equipment (e.g. smaller capacity rock breaker hammers).	Construction	Section 8.1	Where feasible and reasonable, lower vibration generating plant and equipment would be selected for construction works (NV30)
	» Minimise consecutive works in the same locality (if applicable).	Construction	Section 8.1	Vibration impacts will be assessed as part of the CNVIS process outlined in Section 8.1 and Figure 8-1 for each construction area. Appropriate mitigation and management measures would be implemented in the case that vibration sensitive structures/buildings are identified within the minimum working distances, including minimising consecutive works in the same locality, which are detailed in mitigation measure NV51.
	» Use dampened rock breakers to minimise the impacts associated with rock breaking works.	Construction	Section 8.1	Vibration impacts will be assessed as part of the CNVIS process outlined in Section 8.1 and Figure 8-1 for each construction area. Appropriate mitigation and management measures would be implemented in the

Ref #	Commitment	Timing	CNVMP	How Addressed
NV-7 *(contin.)*				case that vibration sensitive structures/buildings are identified within the minimum working distances, including reviewing the size and methodology of rock-breakers to minimise impacts, which are detailed in mitigation measure NV51.
	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 9.5 Appendix F *(NVMonP)*	See mitigation measures NV51. Vibration monitoring would be used to verify vibration levels at sensitive buildings/structures.
	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 9.6 Section 10.3	See mitigation measures NV52 and NV53.
	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 8.1 Section 10.3 Appendix F *(NVMonP)*	Measurements of existing ambient vibration levels would be carried out at receivers with vibration sensitive equipment during the detailed design as part of the Noise and Vibration Monitoring Plan (Appendix F) and would be considered as part of the CNVIS process.

Ref #	Commitment	Timing	CNVMP	How Addressed
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:	Pre-construction Construction	Section 4 Section 9.4 Appendix F *(NVMonP)*	The Communication and Engagement Plan (Section 9.4) will detail how consultation will occur with the various facilities within the Westmead Research Zone. This is in order for consultation to occur, and the nature and potential impacts of construction works to be explained in a clear and timely fashion, and reasonable and feasible mitigation and management measures for impacted sensitive spaces to be developed. The outcomes of the consultation will be incorporated into the CNVIS (NV16). Unattended noise and vibration monitoring as part of the Noise and Vibration Monitoring Plan (Appendix F), would be used to verify noise and vibration impacts for sensitive receivers within the Westmead Research Zone facilities (NV57).
NV-8 *(contin.)*	» Consultation with the affected facilities to determine periods when noise and/or vibration intensive works can occur with least impact.	Construction		
	» Relocation of vibration sensitive equipment to less impacted locations within the facilities.	Construction		
	» Vibration isolation of sensitive equipment predicted to have potential impacts.	Construction		
	» Unattended noise and vibration monitoring within the facilities to ensure noise and/or vibration levels are within acceptable levels.	Construction		

Ref #	Commitment	Timing	CNVMP	How Addressed
HE-22	The construction methodology (including for demolition of existing buildings and/or structures) would be developed to minimise direct and indirect impacts on adjacent and/or adjoining heritage items. This would include consideration of potential (vibration related impacts, where identified in the Construction Noise and Vibration Management Plan).	Pre-construction Construction	Section 8.1 Section 9 Section 9.5	Vibration impacts will be assessed as part of the CNVIS process outlined in Section 8.1 and Figure 8-1 for each construction area. Appropriate mitigation and management measures, including monitoring and building surveys, would be implemented in the case that vibration sensitive structures/buildings are identified within the minimum working distances, which are detailed in mitigation measure NV50 to NV52.
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 4 Section 9	Consultation with the Sydney Coordination Office and Roads and Maritime Services as part of project planning to determine feasible and reasonable hours for construction deliveries and spoil removal (NV19).

3.4 Environmental Performance Outcomes

Relevant EPOs are listed in Table 3-3 below, to satisfy CoA C4. 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 3-3: Environmental Performance Outcomes relevant to this CNVMP

ID Ref#	Environmental Performance Outcome	Timing	CNVMP 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 8.1 Section 9 Section 10	Construction Noise and Vibration Impact Statements (CNVIS) (see Section 8.1) would be prepared to assess Project impacts against Project objectives (Section 6) as per the Construction Noise and Vibration Management Plan (this Sub-Plan) and that feasible and reasonable noise and vibration mitigation and management measures for the Project (Section 9) are implemented to achieve these objectives. This includes reviewing, auditing and monitoring the effectiveness of these mitigation and management measures (Section 10)
EPO-NV-2	The project would avoid any damage to buildings or heritage items from vibrations.	Construction	Section 6.6.2 Section 6.6.3 Section 9.5	Construction Noise and Vibration Impact Statements (CNVIS) for each work site identifying how works and activities at each worksite will be managed to satisfy specific vibration goals Implement the processes in Section 6.6.3

4 Consultation

The following sections summarises the consultation undertaken as part of developing this CNVMP.

4.1 Consultation Requirements under the Infrastructure Approval

In accordance with the CoA C5, this CNVMP as a Sub-plan to the CEMP is required to be developed in consultation with the relevant government agencies and councils, which include the NSW Environment Protection Authority (EPA), NSW Health, and City of Parramatta Council.

The consultation is intended to assist in the development and finalisation of the Sub-plan. Table 4-1 summarises the consultation undertaken for this CNVMP with the relevant stakeholder and their responses. A standalone consultation report, fulfilling the requirements of CoA A5 will be prepared and submitted with this CNVMP.

This CNVMP will be endorsed by the Environmental Representative (ER) and the Acoustics Advisor (AA) as per CoA C7 and A29(e) respectively, and then submitted to the Secretary for approval no later than one month prior to the commencement of construction. The Sub-plan, as submitted to Secretary, including any minor amendments approved by the ER and the AA, will be implemented for the duration of construction.

Table 4-1: Summary of Agency Consultation

Agency	Consultation Dates	Response Received	Issue Raised	Where Addressed
NSW Environment Protection Authority (EPA)	23 June 2020 and concluded 24 July 2020.	Yes – 24 July 2020.	No comments.	N/A
Health NSW – Westmead Precinct	23 June 2020 and concluded 30 July 2020.	Yes – 30 July 2020.	HAC Issued interim questions relating to: • Monitoring; • HAC receiver locations; and • Operational noise.	A5 Consultation Report [PLR1SOM-GLR-ALL-EN-RPT-001004].
City of Parramatta Council	7 August 2020 and concluded 9 October 2020.	9 October 2020.	One question relating to: • The Construction Noise and Vibration Monitoring Program, not the CNVMP.	A5 Consultation Report [PLR1SOM-GLR-ALL-EN-RPT-001004].

5 Existing environment

5.1 Sensitive receivers

The Project will take place within the urban environment of Westmead, North Parramatta, Parramatta CBD and Camellia. The majority of the project between Westmead and Camellia is within established road transportation corridors. The remainder of the project between Camellia and Carlingford will also use the existing heavy rail corridor of the Carlingford Line, travelling through the suburbs of Dundas, Telopea and Carlingford.

The Project is being constructed within a developed urban area, which means that it is surrounded by a variety of sensitive receivers. In addition to the residential, commercial and industrial receivers, several other sensitive receivers (OSR) (including educational facilities, childcare centres, recording studios and medical facilities) were identified as being potentially impacted by the Project (refer to Appendix B-1).

The Table 1 of the CSSI-8285 Infrastructure Approval defines 'sensitive receiver' as including:

- residences, temporary accommodation such as caravan parks and camping grounds, and healthcare facilities (including nursing homes and hospitals) and
- when they are in use, educational institutions (including preschools, schools, universities, TAFE colleges), religious facilities (including churches), childcare centres, passive recreation areas, commercial premises (including film and television studios, research facilities, entertainment spaces, restaurants, office premises and retail spaces), and others as identified by the Secretary.

5.1.1 Land Use Survey

CoA E20 requires a detailed land use survey to be completed to confirm sensitive receivers potentially exposed to construction noise and vibration. The Land Use Survey has been completed by the Infrastructure Contractor and is presented in Appendix B-1 of this CNVMP. Sensitive receivers have been classified as identified in **Figure 5-1**.

Figure 5-1: Land Use Survey classifications

Heritage items relevant to the project have also been identified as part of this land use survey.

The Land Use Survey is current at the time of submission of this CNVMP. It remains an active part of the CNVMP and will continue to be updated where land uses changes over the course of the Project.

5.1.2 Precincts and Noise Catchment Areas

To facilitate the assessment of noise impacts, the Project has been divided into five precinct areas, which reflect the changing land uses adjacent to the project. Each precinct is also made up of a number of Noise Catchment Areas (NCAs) that have been used to represent each of the various areas within the precincts. NCAs group individual sensitive receivers by common traits such as existing noise environment and location in relation to the Project alignment. The EIS identified a total of 19 NCAs around the Project. An additional NCA (NCA12A) has been added within the Rosehill and Camellia Precinct to account for works being undertaken in the rail corridor at Clyde Junction and Clyde Station.

The NCAs for the Project are presented in Table 5-1 with a description of the noise characteristics of each area, and presented on maps in Appendix B-1.

Table 5-1: Precincts and Noise Catchment Areas

Precinct[1]	NCAs[1]	Minimum Distance (m)[2]	Description[1]
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.
	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 associated with The Children's Hospital at Westmead and Cumberland Hospital (West), together with some residential receivers.
Parramatta North	NCA06	5 m	Predominantly medical receivers associated with Cumberland Hospital (East) and some residential receivers.
	NCA07	5 m	Residential and commercial receivers.
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.

Precinct[1]	NCAs[1]	Minimum Distance (m)[2]	Description[1]
Parramatta CBD *(continued)*	NCA11	5 m	Residential and commercial receivers.
Rosehill and Camellia	NCA12	5 m	Commercial receivers as well as residential receivers further from the project alignment. Rosehill Racecourse.
	NCA12A	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.

Notes:

1. Source: Section 2 of the EIS: Technical Paper – Noise and Vibration Impact Assessment, with the exception of NCA12A
2. Approximate minimum horizontal distance from track centre to nearest receiver building facade (receiver of any type).

5.1.3 HAC community

The PLR route passes through the Westmead Health and Education Precinct as shown in the Land Use Survey figures in Appendix B-1 of this CNVMP. The Precinct is managed by the Health Administration Corporation (HAC) and includes Westmead Hospital, research institutes, the Children's Hospital and Cumberland Hospital.

The Westmead Health and Education Precinct Development Agreement Parramatta Light Rail (Transport for New South Wales, *Westmead Health and Education Precinct Development Agreement Parramatta Light Rail*, 8 February 2018) is a third party agreement between HAC and TfNSW. The HAC Assessment System (see Section 1.4) has been developed by the Infrastructure Contractor in conjunction with HAC and TfNSW to manage noise and vibration impacts to HAC's sensitive equipment and operations.

The processes described in the HAC Assessment System will be incorporated into the CNVIS prepared under this CNVMP.

5.2 Existing acoustic environment

As part of the EIS process, noise monitoring was conducted between in October 2016 at a total of 16 locations in order to quantify and characterise the existing ambient noise environment across the receivers potentially impacted by the Project. The detailed results from this noise monitoring survey are presented in the *EIS: Technical Paper – Noise and Vibration Impact Assessment* and a summary of the noise monitoring results relevant to the Project is provided in Table 5-2. The monitoring locations were selected and considered to be representative of receivers potentially noise affected during the construction and operational stages of the Project.

The EIS noted that 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.

This noise monitoring was utilised to determine appropriate Rating Background Levels (RBLs) and Noise Management Levels (NMLs) (see Section 6.2 for further explanation) for each NCA. The RBLs for each area were determined for each of the day, evening and night periods as per the *Industrial Noise Policy* (INP) (EPA, 2000) and defined below:

- Day is defined as the period from 7:00am to 6:00pm Monday to Saturday and 8:00am to 6:00pm Sundays and public holidays,
- Evening is defined as the period from 6:00pm to 10:00pm,
- Night is defined as the period from 10:00pm to 7:00am Monday to Saturday and 10:00pm to 8:00am Sundays and public holidays,

These RBLs and the hours are consistent with the approach in the *Noise Policy for Industry* (EPA, 2017) which is the appropriate reference document for the project and superseded the INP in 2017.

The full details of the monitoring results are presented in the *EIS: Technical Paper – Noise and Vibration Impact Assessment*.

Table 5-2: Summary of Rating Background Levels (RBLs) at residential receivers[1]

Precinct	NCAs	Logger ID	Noise monitoring location	RBL Day	RBL Eve	RBL Ngt
Westmead	NCA01	BG01	8-12 Alexandra Ave, Westmead	49	47	37
	NCA02	BG02	157 Hawkesbury Rd, Westmead	51	48	43
	NCA03	BG02	157 Hawkesbury Rd, Westmead	51	48	43
	NCA04	BG03	199 Hawkesbury Rd, Westmead	49	48	47
	NCA05	BG03	199 Hawkesbury Rd, Westmead	49	48	47

Precinct	NCAs	Logger ID	Noise monitoring location	RBL Day	RBL Eve	RBL Ngt
Parramatta North	NCA06	BG04	Cumberland Hospital East	42	41	44
	NCA07	BG06	St Patricks Cemetery, North Parramatta	51	50	39
Parramatta CBD	NCA08	BG07	20 Victoria Rd, Parramatta	59	57	46
	NCA09	BG08	Arthur Phillip Highschool, Parramatta	58	53	43
	NCA10	BG09	9 Noller Pde, Parramatta	43	40	34
Rosehill and Camellia	NCA11	BG09	9 Noller Pde, Parramatta	43	40	34
	NCA12	BG10	5 Hope St, Rosehill	51	48	41
	NCA12A	BG17[2]	10-42 East Street, Granville	43	45	42
	NCA13	BG10	5 Hope St, Rosehill	51	48	41
Carlingford	NCA14	BG11	14 Dudley St, Rydalmere	45	43	38
	NCA15	BG12	Dundas Station	45	43	37
	NCA16	BG13	22 Adderton Rd, Telopea	46	42	34
	NCA17	BG14	Telopea Station	43	40	31
	NCA18	BG15	89 Marshall Rd, Telopea	42	40	32
	NCA19	BG16	Carlingford Station	52	47	39

Notes:

1. Source: *EIS: Technical Paper – Noise and Vibration Impact Assessment*, with the exception of NCA12A
2. Source: *Resonate Acoustics - Acoustic Planning Report: East and Cowper Streets Granville Residential Development* (S15235) July 2016

5.3 Heritage buildings

Heritage buildings are to 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.

Heritage items identified as part of the Land Use Survey (CoA E20) are presented in presented in Appendix B-2).

Heritage items are identified in the Land Use Survey (CoA E20) based upon the EIS and other information available at the time of survey. As noted in Section 5.1.1, the Land Use Survey remains an active part of the CNVMP and will continue to be updated as additional items are identified during the CNVIS process, in consultation with the Project heritage consultants.

As part of the CNVIS process, heritage items would be considered during assessment; and where the assessment identifies potential for vibration impacts, appropriate mitigation and management measures will be recommended, in accordance with CoA E43.

Additionally, if a receiver is identified in accordance with CoA E69 for the installation of at-property acoustic treatments, the advice of a suitably qualified heritage architect or heritage engineer with specific experience in built heritage must be obtained and implemented to ensure any such work does not have an adverse impact on the heritage significance of the item.

6 Noise and vibration criteria for NSW

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

- The Interim Construction Noise Guideline (ICNG)
- Assessing Vibration: a technical guideline (AVTG), published in February 2006
- The ANZECC, Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration.

The TfNSW Construction Noise and Vibration Strategy (see Section 3.1.2) also provides direction for establishing noise and vibration criteria.

Relevant elements of these documents are summarised and discussed in this Chapter. Key environmental impacts and the applicable documents to set noise and vibration management objectives are summarised in **Table 6-1**.

Table 6-1: Construction noise and vibration objectives – applicable documents

Environmental impact	Applicable documents to set construction noise and vibration objectives
Construction hours	• Conditions of Approval (CoA) • EPL (once approved – required for commencement of signalling works only. This would only be for works covered under the EPL)
Airborne noise	• ICNG • CoA
Sleep disturbance and maximum noise events	• Construction noise – NSW Environmental Criteria for Road Traffic Noise (ECRTN) and NSW Road Noise Policy (RNP) • Road traffic noise - NSW Road Noise Policy (RNP) and the RMS Environmental Noise Management Manual (ENMM) Practice Note 3.
Ground-borne noise	• ICNG • CoA • Australian Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors
Construction-related road traffic noise	• No specific guidelines, but guidance taken from the ICNG and the RNP.
Vibration (disturbance to building occupants)	• AVTG, which incorporates: • British Standard BS 6472-2008, Evaluation of human exposure to vibration in buildings (1-80Hz)

Environmental impact	Applicable documents to set construction noise and vibration objectives
Vibration (structural damage to buildings)	• British Standard 7385:1993 Evaluation and measurement of vibration in buildings – Part 2 Guide to damage from ground-borne vibration
Vibration (structural damage to buried services and screening criteria for heritage structures)	• German Standard DIN 4150:1999 – Part 3 Structural vibration in buildings – Effects on structures
Vibration (sensitive scientific and medical equipment) (guidance only)	• ASHRAE Applications Handbook (SI) 2003, Chapter 47 Sound and Vibration Control • Gordon GC 28 September 1999 Generic Vibration Criteria for Vibration Sensitive Equipment • Australian Standard 2834-1995 Computer Accommodation, Chapter 2.9 Vibration
Blast noise and vibration	• Blasting is not proposed or permitted as per CoA E35

6.1 Construction hours of work

6.1.1 Hours of Works

The construction hours for the Project are defined by the CoA E21 to E25 and E27. Table 6-2 below consolidates the information provided in the CoA regarding construction working hours generally for the Project. Permitted exceptions are detailed in CoA E24 through to E27.

Table 6-2: Working hours for PLR Stage 1 SOM Works construction

Construction activity	Project area	Relevant CoA	Working hours applicable to CoA		
			Monday to Friday	Saturday	Sunday/ Public holiday
Standard construction	Project (excluding Eat Street)	E21 & E22	7:00am to 7:00pm[3]	8:00am to 6:00pm	No work[1]
	Eat Street	E21 & E22	7:00am to 6:00pm	8:00am to 12:00pm	No work[1]
Highly noise intensive works	All locations	E27	8:00am to 6:00pm (+ respite[2])	8:00am to 1:00pm (+ respite[2])	No work[1]

Construction activity	Project area	Relevant CoA	Working hours applicable to CoA		
			Monday to Friday	Saturday	Sunday/ Public holiday
Out of Hours Work (OOHW)[6]	Project (excluding Eat Street) (See Note 7)	E21 & E22	7:00pm to 10:00pm 10:00pm to 7:00am	6:00pm to 10:00pm 10:00pm to 8:00am	8:00am to 6:00pm 6:00pm to 10:00pm 10:00pm to 7:00am
	Eat Street (See Note 4 and 7)	E21 & E22	6:00pm to 10:00pm[4] 10:00pm to 7:00am[4]	12:00pm to 10:00pm[4] 10:00pm to 8:00am[4]	8:00am to 6:00pm[4] 6:00pm to 10:00pm[4] 10:00pm to 7:00am[4]
	Camellia and Rosehill precincts	E23	7:00pm to 10:00pm 10:00pm to 7:00am[5]	6:00pm to 10:00pm 10:00pm to 8:00am[5]	8:00am to 6:00pm 6:00pm to 10:00pm 10:00pm to 7:00am[5]

Notes:

1. No work unless permitted unless approved in accordance with the CoA.
2. Minimum respite from highly noise intensive works of not less than one (1) hour between each continuous block of works not exceeding three (3)
3. The applicable NML for the 6pm to 7pm standard hours period is based upon the daytime RBL.
4. Construction hours outside of standard construction hours will be established through consultation with affected businesses at per CoA E24.
5. Provided construction noise levels are below the night NML at any residence between 10.00pm and 7.00am (see section 6.1.2).
6. OOHW periods are further broken up into additional time periods. These periods are the ranges shown in the table.
7. OOHW works are permitted subject to the requirements of CoA E37, where if construction noise levels exceed 65 dB(A) $L_{Aeq\ (15\ min)}$ at the façade of the building of a residential receiver, the Proponent must only work 4 nights in any 7 day period.

6.1.2 Works Outside of Standard Hours (OOHW)

Construction outside the standard hours identified in Section 6.1.1 along 'Eat Street' (defined as per CoA) will be established through consultation with affected business as outlined in the Business Activation Plan.

Works will also 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 ICNG, between 10:00 pm and 7:00 am.

Notwithstanding the approved construction hours, 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 15 dB(A) 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).

In accordance with CoA 28, an Out-of-Hours-Work Protocol (provided in Appendix A) has been prepared for the Project by TfNSW and approved by the Secretary. The Out-of-Hours-Work Protocol provides a process for the consideration for works to be undertaken outside of standard construction hours and identification of mitigation and management measures to be implemented including community notifications prior to out-of-hours works for construction works on the Parramatta Light Rail (PLR). The use of the OOHW protocol would be required for work outside the approved standard hours (with a few exceptions, as detailed above).

6.1.2.1 Works covered by an EPL

An Environment Protection Licence (EPL) will be required for the construction of the rail signalling construction works only.

Where different hours of works are permitted under an EPL, these hours only apply to works that are covered by the EPL.

6.1.3 Hierarchy of Preferred Working Hours

The Out-of-Hours-Work Protocol (Appendix A) details a hierarchy of preferred working hours, which has been reproduced below.

Where OOHW is planned to take place the following hierarchy of preferred working hours must be considered unless otherwise agreed with affected community through consultation (Section 9.3.3).

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.

The hierarchy of preferred working hours is based upon the TfNSW OOHW Protocol, and if an alternative OOHW Protocol is approved and adopted for the project then any hierarchy of preferred working hours included in this approved document will supersede this section.

No specific hierarchy of preferred working hours is specified for the Camellia and Rosehill precincts.

This hierarchy does not apply to emergency work.

6.1.4 Emergency works

Emergency works should be undertaken in accordance with Condition E26; on becoming aware of emergency works the ER and TfNSW must be notified. It is the responsibility of the contractor to use best endeavours to contact affected sensitive receivers and advise of the likely impact and duration of such works.

6.2 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.

6.3 Airborne construction noise management levels

6.3.1 Residential receivers

Table 6-3 below shows how NMLs at residences are determined and how they are to be applied during construction of the Project.

Table 6-3: NMLs at Residential Receivers

Time of Day	NML LAeq(15minute)	How to Apply
Standard hours Monday to Friday 7:00am to 7:00pm Saturday 8:00am to 6:00pm No work on Sundays or public holidays (see Note 3)	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.

	Highly Noise Affected
	75 dBA
	(see Note 4)
		• 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.
		• CoA E36 requires provision of respite periods for sensitive receivers where construction noise exceeds the HNA level

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.

Notes:

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 NPfI.
2. Standard construction hours for the project differ from those presented in the ICNG. Refer to Section 6.1.
3. Does not apply to 'Eat Street' as per CoA E22, where construction hours will be established through consultation with affected businesses as outlined in the Business Activation Plan (CoA E110), as per CoA E24.
4. CoA Table 1 (Definitions) defines "High Noise Intensive Works" differently from "Highly Noise Affected" (HNA). As per the glossary "High Noise Intensive works" is defined as "Means rock breaking, rock hammering, sheet piling, pile driving and particularly annoying activities as described in ICNG (Section 4.5)", and as such a noise level is not applicable. As such this is a different from HNA.

NML apply at the property boundary that is most exposed to construction noise, at a height of 1.5 metres above ground level. If the property boundary is more than 30 metres from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 metres of the residence.

Airborne construction NMLs for all NCAs are presented in Appendix C.

6.3.2 Sleep Disturbance

The ICNG recommends that where construction works are planned to extend over more than two consecutive nights, maximum noise levels and the extent and frequency of maximum noise level events exceeding the RBL should be considered for residential receivers. In line with the ICNG, further guidance is taken from the NSW Environmental Criteria for Road Traffic Noise (ECRTN, Environment Protection Authority 1999) (superseded by the RNP).

To assess the likelihood of sleep disturbance, an initial screening level of L_{Amax} or $L_{A1(1min))} \leq L_{A90(15min)} + 15$ dB(A) is used. In situations where this results in an external screening level of less than 55 dB(A), a minimum screening level of 55 dB(A) is set. Note that this is equivalent to a maximum internal noise level of 45 dB(A) with windows open.

Where there are noise events found to exceed the initial screening level, further analysis is made to identify:

- the likely number of events that might occur during the night assessment period
- Whether events exceed an 'awakening reaction' level of 55 dB(A) L_{Amax} (internal) that equates to NML of $L_{A1(1min)}$ 65 dB(A) (assuming open windows).

The ICNG recommends that where construction works are planned to extend over more than two consecutive nights, maximum noise levels and the extent and frequency that maximum noise levels exceed the RBL should be analysed.

Sleep disturbance NMLs for all NCAs are presented in Appendix C.

6.3.3 Other noise sensitive receivers

Noise management levels for various noise-sensitive land use developments, including commercial premises are adopted from the ICNG. Internal (or indoor) noise management levels for land uses not identified in the ICNG are referenced to the 'maximum' internal noise levels presented in Australian Standard AS2107. The noise management levels presented in Table 6-4 are applicable where the premises are in use.

Table 6-4 presents a detailed, but not exhaustive list of typical 'other' land uses identified along the Project route. Where a land use has not been identified in Table 6-4, a suitable noise management level can be determined by taking guidance from Australian Standard AS2107.

As identified for residential receivers, where the predicted or measured $L_{Aeq(15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The Project should also inform all potentially impacted receivers of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

As described within the ICNG, external noise levels in Table 3 of the ICNG (i.e. active and passive recreational areas) are to be assessed at the most affected point within 50 m of the area boundary. Internal noise levels are assessed at the centre of the occupied room. Where internal noise levels cannot be measured, external equivalent noise management levels may be used (see Table 6-4) and are to be assessed at building façade in accordance with AS1055-2018.

A highly-affected noise objective of $L_{Aeq(15min)}$ 75 dB(A) shall also apply at all 'other noise sensitive receivers', as noted in CoA E36. Construction activity noise above this level should be handled as described in Table 6-3.

Table 6-4: NMLs at other noise sensitive receivers

Receiver type	NML $L_{Aeq(15min)}$	Where NML applies	Referenced from:	Assumed façade loss[3] (conservative)	External equivalent NML $L_{Aeq(15min)}$
Studio building (music recording studio)	25 dB(A)	Indoors	AS2107 'upper range'	20 dB(A)	45 dB(A)
Studio building (film or television studio)	30 dB(A)	Indoors	AS2107 'upper range'	20 dB(A)	50 dB(A)
Cinema space	35 dB(A)	Indoors	AS2107 'upper range'	20 dB(A)	55 dB(A)
Theatre, auditorium[4]	30 dB(A)	Indoors	AS2107 'upper range'	20 dB(A)	50 dB(A)
Court / Tribunal[4]	35 dB(A)	Indoors	AS2107 'upper range'	20 dB(A)	55 dB(A)
Hotel (Sleeping areas: Hotels near major roads)	40 dB(A)	Indoors	AS2107 'upper range'	20 dB(A)	60 dB(A)
Classrooms at schools and other educational institutions	45 dB(A)	Indoors	ICNG	10 dB(A)[5]	55 dB(A)

Receiver type	NML $L_{Aeq(15min)}$	Where NML applies	Referenced from:	Assumed façade loss[3] (conservative)	External equivalent NML $L_{Aeq(15min)}$
Childcare centre [internal play area]	60 dB(A)	Indoors	ICNG outdoor passive recreation	10 dB(A) [5]	70 dB(A)
Childcare centre [sleeping areas]	40 dB(A)	Indoors	AS2107 for residential sleeping areas near to major roads[4]	10 dB(A) [5]	50 dB(A)
Hospital wards and operating theatres	45 dB(A)	Indoors	ICNG	20 dB(A)	65 dB(A)
Places of worship	45 dB(A)	Indoors	ICNG	10 dB(A)[5]	55 dB(A)
Library (reading areas)	45 dB(A)	Indoors	AS2107 ‘upper range’	20 dB(A)	65 dB(A)
Hotel (bars and lounges)	50 dB(A)	Indoors	AS2107 ‘upper range’	20 dB(A)	70 dB(A)
Café/ Restaurant/ Bar	50 dB(A)	Indoors	AS2107 ‘upper range’	20 dB(A)	70 dB(A)
Community centres – Municipal Buildings	50 dB(A)	Indoors	AS2107 ‘upper range’	10 dB(A) [5]	60 dB(A)
Public building	50 dB(A)	Indoors	AS2107 ‘upper range’	10 dB(A) [5]	60 dB(A)
Restaurant, bar (Bars and lounges / Restaurant)	50 dB(A)	Indoors	AS2107 ‘upper range’	20 dB(A)	70 dB(A)
Medical facilities	45 dB(A)	Indoors	AS2107 ‘upper range’	20 dB(A)	65 dB(A)
Railway platform and concourse areas	55 dB(A)	Indoors	AS2107 ‘upper range’	20 dB(A)	75 dB(A)
Café/ Restaurant/ Bar (outdoors)	60 dB(A)	Outdoors	AS2107 ‘upper range’	-	60 dB(A)
Passive recreation areas[1] (e.g. area used for reading, meditation)	60 dB(A)	Outdoors	ICNG	-	60 dB(A)
Active recreation areas[2] (e.g. sports fields)	65 dB(A)	Outdoors	ICNG	-	65 dB(A)

Receiver type	NML $L_{Aeq(15min)}$	Where NML applies	Referenced from:	Assumed façade loss[3] (conservative)	External equivalent NML $L_{Aeq(15min)}$
Commercial premises (including offices and retail outlets)	70 dB(A)	Outdoors	ICNG	-	70 dB(A)
Industrial premises	75 dB(A)	Outdoors	ICNG	-	75 dB(A)
Stables[4]	60 dB(A)	Outdoors	ICNG	-	60 dB(A)

Notes:

1. Passive recreation areas are characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion (e.g. reading, meditation).
2. Active recreation areas are characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.
3. The assumed building façade losses are used to determine the preliminary external equivalent noise management levels. These assumptions are conservative and used as screening levels to identify potential noise impacts. Once a sensitive receiver is identified, a building inspection is to be undertaken to determine the specific building façade loss and update, if required, its external noise management level.
4. As per EIS
5. Receiver conservatively assumed to have operable windows and a 10 dB(A) outside to inside façade noise loss.

The internal noise levels are to be assessed at the centre of the most affected occupied room. A conservative estimate of the difference between internal and external noise levels ranges from 10 dB (open window) to 20 dB (where windows are fixed and non-operable).

6.4 Ground-borne noise management levels

Ground-borne noise management levels (GNMLs) are based on the ICNG and Conditions of Approval.

6.4.1 Residential receivers

GNMLs for residences are nominated in the ICNG and CoA E30 and indicate when management actions would be implemented. Mitigation measures must be applied when residential ground-borne noise levels are exceeded in accordance with CoA E30.

GNMLs are only applicable when ground-borne noise levels are higher than airborne noise levels at a receiver. However, it should be noted that situations may occur where the construction airborne noise is shielded from a receiver (e.g. where there are noise barriers, or where a receiver is located on the opposite side of a building or within a building compared to the construction activity) which will result in reduced airborne noise levels. The GNMLs 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.

Table 6-5 below (taken from the ICNG) sets out the ground-borne noise management levels as per CoA E30 and how they are to be applied to residential receivers. GRCLR would inform all

potentially impacted receivers of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Table 6-5: Ground-borne Construction NMLs at Residential Receivers

Assessment Period	Time of Day	Ground-borne NML, $L_{Aeq(15minute)}$
Evening	6:00pm to 10:00pm	40 dB(A) internal
Night	10:00pm to 7:00am	35 dB(A) internal

6.4.2 Other noise sensitive receivers

For other sensitive receivers, including commercial receivers such as offices and retail areas, the ICNG does not provide guidance in relation to acceptable ground-borne noise levels. For the purpose of this CNVMP, a GNML has been derived from the airborne NML presented in the ICNG for commercial premises, assuming a minimum 20 dB(A) noise reduction from outside to inside with closed windows, consistent with the EIS.

For other noise sensitive receivers, such as cinema spaces and recording studios, guidance is taken from the recommended 'maximum' internal noise levels in AS/NZS 2107:2000 'Acoustics - Recommended design sound levels and reverberation times for building interiors' to determine suitable noise management levels. Refer to Table 6-4 for details.

The ground-borne noise objectives for ‘other’ noise sensitive land uses are identified below in Table 6-6.

Table 6-6: Ground-borne Construction NMLs at Other Sensitive Land Uses

Receiver type	Ground-borne NML, $L_{Aeq(15minute)}$	Where NML applies	Referenced from:
Classrooms at schools and other educational institutions	45 dB(A)	Internal noise level	ICNG
Places of worship	45 dB(A)	Internal noise level	ICNG
Commercial premises (including offices)	50 dB(A)	Internal noise level	ICNG
Commercial premises (including retail outlets)	55 dB(A)	Internal noise level	AS/NZS 2107:2000
Industrial premises	55-60 dB(A)	Internal noise level	ICNG and AS/NZS 2107:2000

6.5 Construction-related road traffic noise

The Project has developed a CTTAMP (PLR1SOM-GLR-ALL-PM-PLN-000032) which addresses heavy vehicle driver behaviours and conduct, to assist with managing driver behaviour both within construction works areas and on public roads.

When trucks and other vehicles are operating within the boundary of a construction site, road vehicle noise contributions are included in the overall predicted LAeq(15minute) construction site noise emissions and assessed against the ICNG NMLs.

When construction-related traffic moves onto the public road network a different noise assessment methodology is appropriate, as vehicle movements would be regarded as 'additional road traffic' rather than as part of the construction site and are assessed under the NSW Road Noise Policy (RNP), which superseded the Environmental Criteria for Road Traffic Noise (EPA 1999) referenced in the ICNG.

The RNP requires an initial screening test to be applied by evaluating whether noise levels would increase by more than 2 dB (an increase in the number of vehicles of approximately 60%) due to construction traffic or where road closure results in a temporary reroute of traffic. This represents a minor impact that is considered barely perceptible to the average person.

Where the road traffic noise levels are predicted to increase by more than 2 dB (i.e. 2.1 dB or greater) as a result of construction traffic, further assessment is required in using the criteria presented in the RNP, reproduced below in Table 6-7.

Table 6-7: RNP criteria for assessing construction vehicles on public roads

Road Category	Type of Project/Land Use	Assessment criteria[1]	
		Day (7am-10pm)	Night (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	60 (external) LAeq(15hour)	55 (external) LAeq(9hour)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	55 (external) LAeq(1hour)	50 (external) LAeq(1hour)

Notes:

1. Criteria applies at 1 metre from the most affected facade

6.6 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).

6.6.1 Disturbance to buildings occupants

Vibration, with the potential to disturb human occupants of buildings, is managed referencing DECC's Assessing Vibration: a technical guideline (DECC, 2006). This document provides criteria which are based on the British Standard BS 6472-2008 Evaluation of human exposure to vibration in buildings (1-80Hz).

Vibration sources are defined as Continuous, Impulsive or Intermittent. Table 6-8 provides a definition and examples of each type of vibration. It is noted that the EIS: Technical Paper – Noise and Vibration Impact Assessment only presented guidelines values for intermittent vibration. To cover the range of all potential vibration impacts across the project, the three types of vibration have been included.

Table 6-8: Types of vibration

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

Notes:

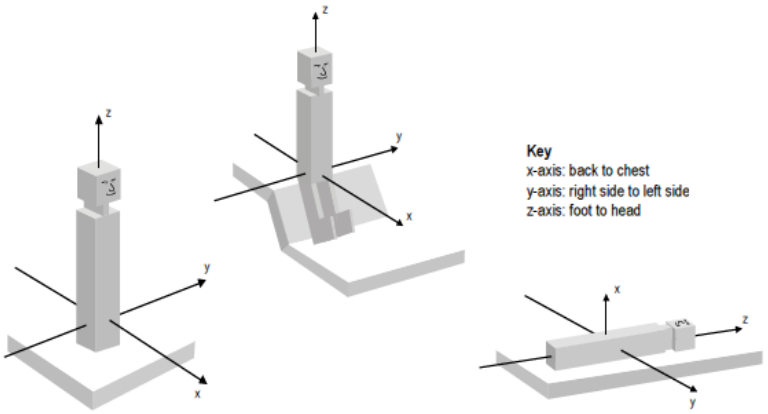
1. Source: AVTG

The criteria are to be applied to a single weighted root mean square (rms) acceleration source level in each orthogonal axis. Section 2.3 of the guideline states:

”Evidence from research suggests that there are summation effects for vibrations at different frequencies. Therefore, for evaluation of vibration in relation to annoyance and comfort, overall weighted rms acceleration values of the vibration in each orthogonal axis are preferred (BS 6472).”

When applying the criteria, it is important to note that vibration may enter the body along different orthogonal axes, i.e. x-axis (back to chest), y-axis (right side to left side) or z-axis (foot to head). The three axes are referenced to the human body. Thus, vibration measured in the horizontal plane should be compared with x- and y-axis criteria if the concern is for people in an upright position, or with the y- and z- axis criteria if the concern is for people in the lateral position.

Figure 6-1: Orthogonal axes for human exposure to vibration



Preferred and maximum values for continuous and impulsive vibration, based on weighted acceleration rms values (m/s^2) are presented in **Table 6-9**.

Table 6-9: Preferred and maximum continuous and impulsive vibration values for human comfort (Weighted RMS Acceleration, m/s2, 1-80Hz)

Location	Assessment period[1]	Preferred values		Maximum values	
		Z-axis	X- and Y-axis	Z-axis	X- and Y-axis
Continuous vibration (rms acceleration, m/s^2)					
Critical areas[2]	Day or night	0.005	0.0036	0.010	0.0072
Residences	Day	0.010	0.0071	0.020	0.014
Residences	Night	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day or night	0.020	0.014	0.040	0.028
Impulsive vibration (rms acceleration, m/s^2)					
Critical areas[2]	Day or night	0.005	0.0036	0.010	0.0072
Residences	Day	0.30	0.21	0.60	0.42
Residences	Night	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night	0.64	0.46	1.28	0.92

Notes:

1. Day is 7.00 am to 10.00 pm and night is 10.00pm to 7.00 am
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above.
3. Source: BS 6472-2008

Preferred values for intermittent vibration, based on the weighted Vibration Dose Values (VDV, $m/s^{1.75}$) are presented in **Table 6-10**.

Table 6-10: Preferred and maximum intermittent vibration values for human comfort (VDV, $m/s^{1.75}$, 1-80Hz)

Location	Assessment period[1]	Preferred values X-, Y- and Z-axis	Maximum values X-, Y- and Z-axis
Critical areas[2]	Day or night	0.10	0.20
Residences	Day	0.20	0.40
Residences	Night	0.13	0.26
Offices, schools, educational institutions and places of worship	Day or night	0.40	0.80
Workshops	Day or night	0.80	1.60

Notes:

1. Day is 7.00 am to 10.00 pm and night is 10.00pm to 7.00 am
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above.
3. Source: BS 6472-2008

To assess the potential for vibration impact on human comfort, an initial screening test will be undertaken during each detailed assessment based on peak velocity units, as this metric is also used for the cosmetic building damage vibration assessment. The screening test is conservative because it is based on the continuous vibration velocity criteria (i.e. vibration that continues uninterrupted for a defined assessment period) whilst construction works are mostly intermittent. The screening test will be based on the preferred peak values, as shown **Table 6-9**, for pseudo-continuous work activities such as bored piling and on maximum peak values for surface construction works, which are intermittent in nature. This approach has been adopted so that the screening test is not unduly stringent.

The initial screening test limits for vibration disturbance to building occupants, based on the maximum peak particle velocity (ppv, mm/s) are presented in **Table 6-11**. During the detailed assessment, where the predicted vibration exceeds the initial screening test, the total estimated Vibration Dose Value (i.e. eVDV) will be determined based on the level and duration of the vibration event causing exceedance.

Table 6-11: Construction vibration disturbance to building occupants – initial screening test

Location	Assessment period[1]	Maximum values X-, Y- and Z-axis
Critical areas[2]	Day or night	0.28
Residential buildings	Day (16 hour)	0.56
Residential buildings	Night (9 hour)	0.40

Location	Assessment period[1]	Maximum values X-, Y- and Z-axis
Offices, schools, educational institutions and places of worship	Day or night	1.10
Workshops	Day or night	2.20

Notes:

1. Day is 7.00 am to 10.00 pm and night is 10.00pm to 7.00 am
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above.

6.6.2 Structural damage to buildings

Potential structural damage of buildings caused by vibration is typically managed by ensuring vibration induced into the structure does not exceed certain limits and standards, including the structural damage vibration limits presented in British Standard 7385 Part 2 (1993) as recommended in are based on Australian Standard AS 2187: Part 2-2006 Explosives - Storage and Use - Part 2: Use of Explosives and adopted in the EIS.

BS7385 suggests levels at which ‘cosmetic’, ‘minor’ and ‘major’ categories of damage might occur.

The cosmetic damage levels set by BS 7385 are considered ‘safe limits’ up to which no damage due to vibration effects has been observed for certain particular building types. Damage comprises minor non-structural effects such as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks and separation of partitions or intermediate walls from load bearing walls. ‘Minor’ damage is considered possible at vibration magnitudes which are twice those given and ‘major’ damage to a building structure may occur at levels greater than four times those values.

Table 6-12 sets out the recommended limits from BS7385 for transient vibration to ensure minimal risk of cosmetic damage to residential, commercial and industrial buildings. This is shown graphically in **Table 6-12**.

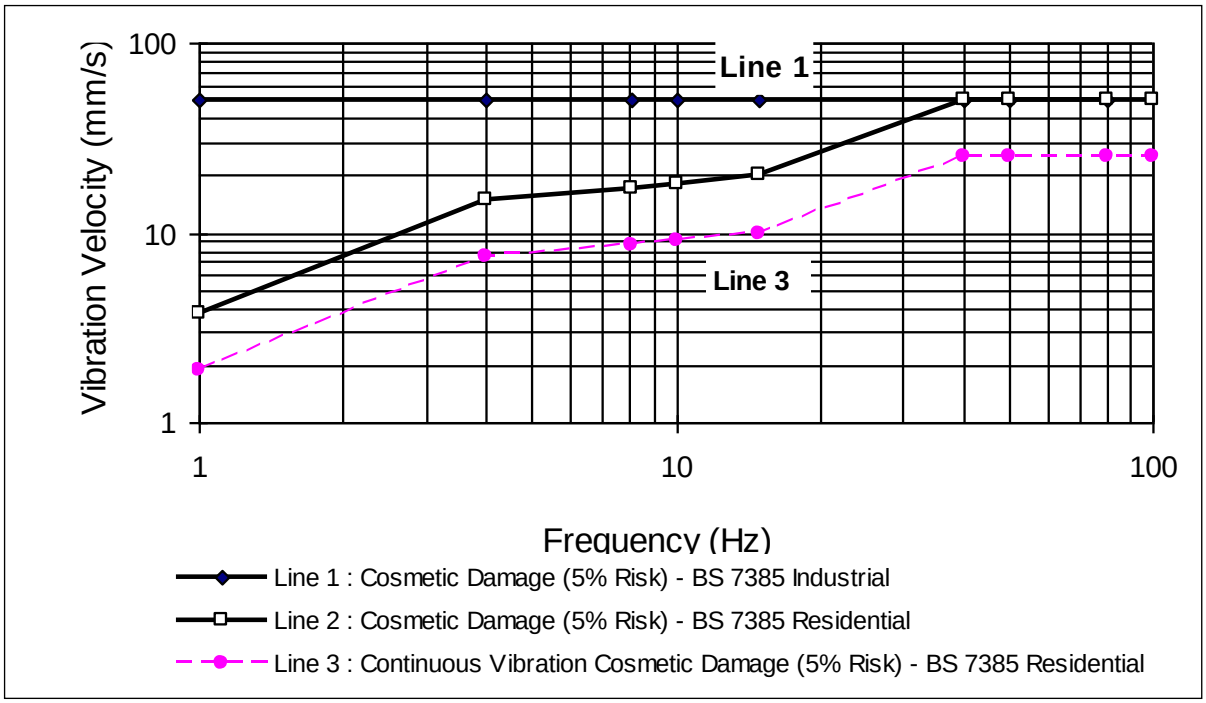
Table 6-12: Transient vibration guide values - minimal risk of cosmetic damage (BS 7385) - peak component particle velocity

Line	Type of structure	Frequency range 4 to 15 Hz	Frequency range 15 to 40 Hz	Frequency range 40 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s	50 mm/s	50 mm/s
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4Hz, increasing to 20 mm/s at 15Hz	20 mm/s at 15Hz, increasing to 50 mm/s at 40Hz	50 mm/s

BS7385 states that the guide values in **Table 6-12** relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification

due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in **Table 6-12** may need to be reduced by up to 50%, as shown by Line 3 of **Figure 6-2** for Residential Buildings.

Figure 6-2: Graph of Transient Peak Component Particle Velocity Vibration Guide Values for Cosmetic Damage



The British Standard states that the guide values in **Table 6-12** 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 in **Table 6-12** may need to be reduced by up to 50%. Rock breaking/hammering and sheet piling activities are considered to have the potential to cause dynamic loading in some structures (e.g. residences) and it may be appropriate to reduce the transient values by 50%.

For most construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers, excavators and the similar, 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 (Line 1, **Figure 6-2**): 25.0 mm/s
- Unreinforced or light framed structures (Line 2, **Figure 6-2**): 7.5 mm/s

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

6.6.3 Heritage structures

For heritage structures, BS7385-2:1993 does not provide numerical vibration levels to prevent structural damage, however, notes that:

"*A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.*"

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.

The approach to manage potential vibration impact shall be to:

1. Identify heritage items where the 2.5 mm/s peak component particle velocity objective may be exceeded during specific construction activities
2. Structural engineering report to be undertaken on identified heritage items, to confirm structural integrity of the building and confirm if item is 'structurally sound'
3. If item confirmed as 'structurally sound', the screening criteria in Section 6.6.2 shall be adopted, or
4. If item confirmed as 'structurally unsound', the more conservative cosmetic damage objectives of 2.5 mm/s peak component particle velocity would be adopted.

This approach is consistent with the EIS.

In accordance with CoA E43, as detailed in the Noise and Vibration Monitoring program (Appendix F), vibration monitoring 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.

In accordance with CoA E44, this would require advice of a heritage specialist when considering the methods and locations for installing vibration monitoring equipment.

6.6.4 Sensitive Scientific and Medical Equipment (guidance only)

Some scientific equipment (e.g. electron microscopes and microelectronics manufacturing equipment) can require more stringent 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 would be sourced from manufacturer's data prior to finalisation of the CNVIS. Where manufacturer's data is not available, generic vibration criterion (VC) curves as published by the Society of Photo-Optical Instrumentation Engineers (Colin G. Gordon - 28 September 1999) may be adopted as vibration goals. These generic VC curves are presented below in **Figure 6-3**.

Figure 6-3: Generic Vibration Criterion (VC) curves

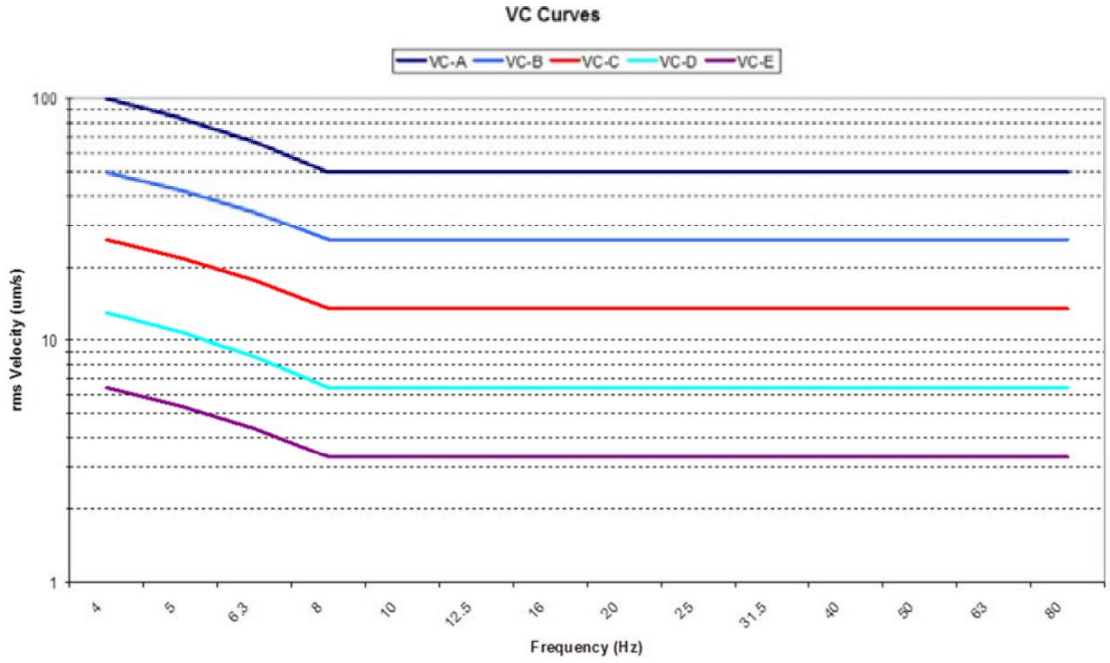


Table 6-13: Application and interpretation of the generic Vibration Criterion (VC) curves

Criterion curve	Max level (µm/sec, rms)[1]	Detail size (microns)[2]	Description of use
VC-A	50	8	Adequate in most instances for optical microscopes to 400X, microbalances, optical balances, proximity and projection aligners, etc.
VC-B	25	3	An appropriate standard for optical microscopes to 1000X, inspection and lithography equipment (including steppers) to 3 micron line widths.
VC-C	12.5	1	A good standard for most lithography and inspection equipment to 1 micron detail size.
VC-D	6	0.3	Suitable in most instances for the most demanding equipment including electron microscopes (TEMs and SEMs) and E-Beam systems, operating to the limits of their capability.
CV-E	3	0.1	A difficult criterion to achieve in most instances. Assumed to be adequate for the most demanding of sensitive systems including long path, laser-based, small target systems and other systems requiring extraordinary dynamic stability.

Notes:

1. As measured in one-third octave bands of frequency over the frequency range 8 to 100 Hz.
2. The detail size refers to the line widths for microelectronics fabrication, the particle (cell) size for medical and pharmaceutical research, etc. The values given consider the observation requirements of many items depend upon the detail size of the process.

6.6.5 Utilities and other vibration sensitive structures

Some structures and utilities located near the Project may be particularly sensitive to vibration. A vibration goal which differs from the cosmetic damage goals presented in Section 6.6.2 or Section 6.6.3 may need to be adopted. Examples of such structures and utilities include:

- Tunnels
- Gas pipelines
- Fibre optic cables

The British Standard BS 7385-2:1993 (page 5) notes that structures below ground are known to sustain higher levels of vibration and are very resistant to damage unless in very poor condition. Further guidance is taken from the German Standard DIN 4150-3:2016. Section 5.3 of DIN 4150: Part 3 sets out guideline values for vibration velocity to be used when evaluating the effects of vibration on buried pipework.

Table 6-14 presents the initial reference guideline for utilities and other buried pipework to evaluate the effects of short-term vibration impact. Specific vibration goals should be determined on a case-by-case basis as part of the CNVIS for each work site in consultation with a vibration engineer and structural engineer.

Table 6-14: DIN 4150-3 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on buried pipework

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

Notes:

1. Rock breaking/hammering and sheet piling activities are considered to have the potential to cause dynamic loading in some structures and it may therefore be appropriate to reduce the transient values by 50%.

6.7 Transport for NSW's Construction Noise and Vibration Strategy

Transport for NSW's Construction Noise Strategy (CNVS) provides practical guidance on how to minimise, to the fullest extent possible, the impacts of noise and vibration on the community. The document outlines feasible and reasonable mitigation measures that should be considered by the Project to reduce airborne noise, ground-borne noise and vibration during the construction of infrastructure projects.

The CNVS is a key reference document for the development of this Sub-plan and 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.

Construction noise mitigation measures are to be implemented in accordance with Tables 4, 5, 6 and 7 of the CNVS (CoA E33). 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 9.

6.8 National Standard for exposure to noise

In accordance with CoA E41, worksites will be managed to ensure that 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 LAeq,8hour, of 85 dB(A) for any employee working at a location near a Project worksite.

7 Environmental aspects and impacts

7.1 Environmental aspects

The Project will involve a range of construction activities incorporating various heavy machinery, plant and equipment that will operate in a number of locations across the Project. In order to assess the level of potential impact on noise and vibration sensitive receivers, the broad categories of construction activity likely to impact these receivers are identified below, based upon the five set of construction works required as part of the SOM construction works:

- **Stabling and Maintenance (SaM) facility construction works**
  - Installation of environmental controls (temporary fencing/ hoardings etc.),
  - Site clearing,
  - Earthworks
  - Establishment of construction facilities including site buildings, ,
  - Drainage
  - Earthworks
  - Concrete works
  - Maintenance building structures
  - Building installation
  - Building fit-out
  - Pavements
  - Furniture
  - Track infrastructure
  - Utility, signals, services works and connections
- **Light rail stops**
  - Integrated Service Cabinets (ISC)
  - Canopy Structures, Wind Break Screens, Fixtures and Finishes
  - LV Cabling, Lighting
  - Drainage
- **Traction Power Substation (TPS)**
  - TPS Substructure
  - Roadworks
  - Combined Services Routes (CSR), Drainage
  - Lighting, Earthing and Bonding
  - Architectural Screening, Fencing and Gates
  - Landscaping

- **Back Up Operating Centre (BOCC)**
  - Building substructure, superstructure, internal fitout and finishing works
  - Roadworks
  - Combined Services Routes (CSR), Drainage
  - Lighting, Earthing and Bonding
  - Architectural Screening, Fencing and Gates
  - Landscaping
- **Corridor OHW and Helper Cable works**
  - Overhead wiring (OHW)
  - Helper Cables

7.2 Environmental impacts

The potential for noise and vibration impacts on sensitive receivers or structures will depend on a number of factors. Typically, these might include:

- The type of equipment in use
- The number of equipment simultaneously in use
- Proximity to sensitive receivers
- Topography and other physical barriers
- Hours/duration of construction works
- Ground conditions and type around the works
- The condition of sensitive receivers
- Proximity of heavy traffic areas such as the highway
- Presence of existing background noise (e.g. from traffic on major arterial roads or existing industry)
- Proximity of other construction activities nearby to the subject construction works area.

Relevant aspects and the potential for related impacts have been considered in an Environmental Risk Register included in Appendix A4 of the CEMP.

Noise and vibration impacts attributable to the Project are anticipated. Section 8 of this CNVMP provides a framework for the assessment of noise and vibration impacts from the construction stages of the SOM works consistent with CoA E42.

Section 9 provides a suite of mitigation measures that will be implemented to avoid, minimise and/ or manage impacts of the SOM Works on the nearby noise and vibration sensitive receivers and vibration sensitive structures/items.

7.2.1 Airborne noise impacts

A summary of the highest potential construction 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 works that most closely fit with the SOM Works have been selected to provide an indication of the potential noise impacts from the SOM Works construction.

The noise levels are representative of the worst-case impacts within each NCA, at the receiver within the NCA with the highest predicted noise level for each receiver type. For other receivers within each NCA, that are further away or shielded from the construction works the impacts are expected to be lower. These noise levels are intended to give an overview of the likely noise levels from the construction works for variation proposed construction activities.

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 likely impact of the construction noise, based on the dB level above the RBL, based on the TfNSW Construction Noise and Vibration Strategy and the Out of Hours Works Protocol (see Appendix A).

- Noise levels 10 to 20 dB above RBL – would typically be clearly audible
- Noise levels 21 dB to 30 dB above RBL – would typically be moderate intrusive
- Noise levels >30 dB above RBL – would typically be high intrusive.

The noise levels presented in this CNVMP are based on a realistic worst-case assessment. For most construction activities, it is expected that during actual the construction noise levels experienced by most receivers would frequently be lower than predicted at the most-exposed receiver. The actual noise emissions from the works and resulting noise levels at nearby receiver buildings would be influenced by:

- The location/distance of the plant/equipment with respect to the receiver building
- The on/off time of the plant/equipment
- The intensity with which the plant/equipment is working.

Mitigation and management measures to address potential airborne construction noise impacts are discussed in Section 9.

7.2.2 Ground-borne noise impacts

Minimal ground-borne noise impacts are expected for the SOM Works, as vibration intensive activities are largely completed by the Infrastructure Works contractor. The exception is for the SaMF, where the SOM Works also incorporate civil infrastructure components within the ground. This is not the case for other SOM works locations.

It is noted that there are minimal sensitive receivers surrounding the SaMF. Nonetheless, mitigation and management measures are discussed in Section 9.

7.2.3 Vibration impacts

Minimal vibration impacts are expected for the SOM Works, as the majority of vibration intensive activities would be undertaken by the Infrastructure Works contractor. The exception is for the SaMF, where the SOM Works also incorporate civil infrastructure components within the ground which is not the case for other works locations.

Mitigation and management measures to address potential construction vibration impacts are discussed in Section 9.

8 Construction noise and vibration assessment

8.1 Construction Noise and Vibration Impact Statements

GRCLR will develop Construction Noise and Vibration Impact Statements (CNVIS) as key site management tools providing clear instructions for managing each construction site. In accordance with CoA E42, each CNVIS will 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. The CNVIS will be progressively prepared to supplement the CNVMP and refine impact predictions presented in the EIS. All CNVIS will be prepared by an appropriately qualified and experienced acoustic consultant. All CNVIS for construction sites will be reviewed and endorsed by the AA, in accordance with CoA A26.

This CNVMP establishes the minimum requirement for mitigating and managing construction noise and vibration impacts from the project, and how these will be addressed.

The CNVIS will provide detailed construction noise and vibration prediction, assessment, mitigation design outcomes and discussion of management measures to limit impacts to sensitive receivers.

Each CNVIS will be prepared before works that generate noise and vibration impacts commence and will set out the mitigation and management measures required for the construction stage, through consultation with affected sensitive receivers. They will address:

- Scope of construction work covered by CNVIS
    - Details of the proposed construction activities and methodology (including construction associated traffic)
    - Proposed hours for the construction works
- Justification for OOHW in accordance with the project approval (where required)
- Nearest noise and vibration sensitive receivers, based on land use survey
- Construction noise and vibration objectives (outlined in Section 6)
- Construction noise and vibration assessment
- Noise and vibration mitigation options and preferred management measures (including community consultation or notification)
- 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
- Noise and vibration monitoring requirements

Monitored noise and vibration levels will be analysed against the predictions made in the relevant CNVIS. This will allow for ongoing review and verification of the predictive model.

Physical noise mitigation measures such as noise barriers, acoustic enclosures around fixed plant and acoustic sheds will be outlined in the site specific CNVIS prepared for each ancillary facility, and compliance with CoA C19 and C20 will be demonstrated in these CNVIS.

Furthermore, alternative methods of construction (E42 (c)) specific management measures such as a staging of works, respite periods (E42 (e)), community consultation and notification (E42(i)) and the details of noise audit systems (E42(g)) will also be summarised and implemented.

The CNVIS will identify the sensitive receivers that GRCLR is required to notify regarding upcoming works. This notification will include the likely noise and vibration impacts during the assessed works, the duration of impact and any additional mitigation (e.g. respite periods) that may be required to manage noise and vibration impacts.

The process of assessment of construction noise and vibration impacts is summarised Figure 8-1.

Site-specific or activity-specific noise assessments will be prepared to assess all construction works for the Project.

The key CNVIS to be prepared under the CNVMP are summarised in Table 8-1**:** .

Table 8-1: CNVIS prepared under the CNVMP

Construction works are/ site	Construction activity
Stabling and Maintenance Facility (SaMF)	Civil works, services works and building construction works
Light rail stops	Civil works and electrical works
Traction Power Substation (TPS)	Electrical works, services works, building construction works and landscaping
Back Up Operating Centre (BOCC)	Electrical works, services works, building construction works and landscaping
Corridor OHW and Helper Cable works	Cables and OHW installation works

8.2 Tools for noise and vibration management

A surface works noise and vibration prediction and management tool will be developed for the purpose of assisting with managing impacts from specific sets of works associated with the construction of the Project. The tool will allow:

- Flexibility in assessing specific scenarios of local area and utility works,
- Assessment at a variety of locations, and
- Assessment of multiple combinations of equipment that may be used during each stage of works in the suburban environment that would be encountered.

The tool will be used to predict daytime and out of hours construction noise levels which will be compared against the Noise Management Level (NML) for each receiver. Appropriate mitigation and management measures can be adopted, as required by this CNVMP.

Verification and adjustment of the prediction tool will occur throughout construction via monitoring. Noise and vibration monitoring data will be collected in accordance with the Noise and Vibration Monitoring Program (Appendix F). This feedback loop will ensure the prediction tool is verified and adjusted as required to ensure accuracy across the various sections of the Project alignment.

8.3 Noise and vibration assessment process

Figure 8-1 sets out the process for assessing construction noise and vibration for the SOM Works. Outcomes of the assessment will be incorporated into a CNVIS, as noted in Section 8.1.

Figure 8-1: Process for assessing construction noise and vibration

1. Determine noise and vibration objectives

For each key construction area:

- Identify noise sensitive receivers
- Determine relevant noise and vibration objectives, with reference to Section 6.

Note: Assessment usually undertaken at locations considered to be representative of a group of receivers with a similar level of exposure to construction works.

2. Identify construction stages

For each key construction area:

- Identify construction aspects or stages and key activities for each stage
- Include:
  - the site location;
  - times of operation;
  - processes involved;
  - plant & equipment (including size / type).
- Identify other construction works in the vicinity of the project. Liaise with Proponent to ensure cumulative noise & vibration impacts are managed, in particular in relation to OOHW.

3. Predict noise and vibration impacts

Airborne construction noise

Determine $L_{Aeq(15\ minute)}$ sound power levels for plant and equipment based on operating scenarios to input into the noise model (see below).

- Establish noise model for construction activity/ component. The noise model should include:
  - Height and location of sources and receivers;
  - Distance attenuation (incorporating noise reflections and ground absorption);
  - Effects of noise shielding (topography, buildings, boundary fences, noise barriers etc);
  - Correction factors for particularly annoying activities, as defined by the ICNG;

	◦ Effects of standard noise mitigation measures; ◦ Where applicable, evaluate façade transmission loss of affected receivers to determine internal noise levels. • Calculate the $L_{Aeq(15minute)}$ noise levels from the proposed construction activities at each receiver and compare these with the construction noise objectives. • For night-time activities, calculate the $L_{A1, 1\ minute}$ noise levels and compare with the $L_{A90(15min)}$ + 15 dB(A) and $L_{A1, 1\ minute}$ 65 dB(A) sleep disturbance screening levels, applied at the external facade. • Identify areas near the CSSI where an employee may be exposed to construction generated noise that exceeds the LAeq,8h, of 85dB(A).
Ground-borne construction noise	• Determine the location of each plant or equipment item in relation to each receiver. • Determine the level of ground-borne noise at each building location based on ground-borne noise levels versus distance prediction curves for each plant item. For highly sensitive building occupancies, the assessment may need to incorporate the acoustic properties of the building space and the structural response of the building.
Construction vibration	• Determine the location of each plant or equipment item in relation to each receiver. • Where vibration intensive equipment could potentially be operating in close proximity to receivers, determine whether this is within the minimum working distances (Section 9.5). Minimum working distances may differ for heritage items; • Where plant & equipment may operate within minimum working distances: ◦ Use vibration level vs distance prediction curves for each plant item ◦ Determine the vibration likely to occur at each building location • For highly sensitive equipment, assessment may need to incorporate structural response of building & particular sensitivities of equipment.
Construction related road traffic noise	• Identify construction vehicle routes to be used to access site and confirm hourly construction traffic volumes (light and heavy vehicles) for day (7am to 10pm) and night (10pm to 7am).

	• Confirm existing traffic volumes on public roads accessed for truck haulage. • Predict traffic noise levels on public roads used by construction vehicles, both with and without construction traffic, for comparison against road traffic noise management levels. • Review and confirm sleep disturbance impacts from truck entry/ egress points and on public roads.

4. Assess noise and vibration impacts

Where predicted noise and vibration exceeds the objectives identified in Step 1:	• Identifying key hours of impact for affected sensitive receivers (see Section 6.1) • Implement appropriate reasonable and feasible standard mitigation and management measures (see Section 9) • Review the potential for cumulative noise impacts other construction works in the vicinity of the project and any implications for the adopted reasonable and feasible standard mitigation measures. • Examination of alternative methods of construction that would potentially reduce noise and vibration. • Predicted noise / vibration at receivers, incorporating nominated mitigation measures, based on the expected noise reduction from mitigation measures. • Additional mitigation measures may need to be considered Note: Assessment usually undertaken at locations considered to be representative of a group of receivers with a similar level of exposure to construction works.

9 Environmental control measures

9.1 Noise and vibration mitigation and management measures

In accordance with CoA E42, reasonable and feasible noise mitigation measures (such as those listed within Chapter 6 of the ICNG and Section 8 of the TfNSW CNVS) will be implemented with the aim of achieving the noise and vibration criteria specified in Section 6 of this CNVMP, as part of the CNVIS process.

Site and / or activity specific mitigation measures are documented in noise and vibration assessments (CNVIS) for each worksite, as outlined in Section 8.1. If required, the CNVMP will be progressively updated to account for changes in noise and vibration management issues and strategies, following the process outlined in Section 9.2 of the CEMP.

This information may be developed as design and construction planning progresses. The noise and vibration assessments will be document controlled separately from this CNVMP. Therefore, an update to these plans will not require this CNVMP to be updated.

Specific measures and requirements to address contract specifications, CoA and REMMMs in relation to impacts from noise and vibration are outlined in Table 9-1.

Table 9-1: Noise and vibration management and mitigation measures

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	General					
NV1	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	Project wide Land Use Survey to record sensitive receivers	Pre-construction Construction	Environment and Sustainability Manager Environmental Coordinator to maintain register	CoA E33 EPO-NV-2	Register of receivers
NV2	Training will be provided to relevant Project personnel, including relevant sub-contractors on noise and vibration requirements from this CNVMP through inductions, toolboxes, Environmental Control Plans (ECP) or targeted training.	Training materials	Prior to construction Construction	Environmental Advisor	CoA E33 GRCLR Practice	Training records
NV3	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	Induction materials, toolbox or specific training Environmental Control Maps (ECMs)	Construction	Environmental Coordinator	CoA E33	Site induction records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	• 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					
NV4	No swearing or unnecessary shouting or loud stereos / radios on site. Dropping of materials from height, throwing of metal items and slamming of doors will also be avoided.	Induction materials, toolbox or specific training	Construction	Supervisor/ Foreman	GRCLR Practice	Site inspection records
	General Construction Hours					
NV5	Construction activities associated with the Project will be carried out in accordance with the hours in Section 6.1 of this CNVMP.	CNVIS	Construction	Construction Project Managers	CoA E21 to E25 and E27 REMMM NV-2	Site inspection records
NV6	Where feasible and reasonable, noise or vibration generating construction works will be carried out during the standard daytime working hours.	CNVIS	Construction	Environmental Advisor	CoA E33	Construction program

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
NV7	Where feasible and reasonable, noise generating works on Eat Street would be scheduled to minimise impacts to adjacent businesses and commercial properties during lunch and dinner periods.	CNVIS	Construction	Construction Project Managers Environmental Advisor	REMMM NV-2	Site inspection records
NV8	Excavation, demolition or rock breaking activities that are 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) would be scheduled to take place during daytime construction hours where feasible and reasonable.	CNVIS	Construction	Construction Project Managers Environmental Advisor	REMMM NV-2	Site inspection records
NV9	Where OOHW is required to take place, it would be scheduled in accordance with the hierarchy of preferred working hours detailed in the OOHW Protocol and in accordance with the community consultation outcomes (CoA E39). The predicted impacts determined through the CNVIS process would determine the potential impacts at nearby sensitive receivers, in order to then establish the appropriate scheduling, respite and mitigation and management measures. Additionally, particular care will be taken during the CNVIS process to schedule works to be completed before 11pm where they are to occur	CNVIS OOHW Protocol	Construction	Construction Project Managers Environmental Advisor	REMMM NV-5 CoA E39	Site inspection records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	during the night-time and would result in high noise levels at residential receivers located in: • NCA04 in the Westmead precinct • NCA06 and NCA07 in the Parramatta North precinct • NCA11 in the Rosehill and Camellia precinct.					
NV10	Except as permitted by an EPL, or through the Out-of-Hours Work Protocol, Highly Noise Intensive Works (as defined by the CoA) that result in an exceedance of the applicable 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.	CNVIS	Construction	Construction Project Managers Environment and Sustainability Manager	CoA E27 REMMM NV-2	Site inspection records
NV11	Construction noise with special audible characteristics at the impacted noise sensitive receiver and vibration generating activities that will result in disturbance to building occupants at nearby occupied sensitive receivers (including	CNVIS Construction noise monitoring	Construction	Construction Project Managers Environment and	CoA E33 REMMM NV-2	Site inspection records Construction noise and vibration

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	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.	or inspections for verification		Sustainability Manager		monitoring records
NV12	OOHW is to be carried out in accordance with: • The Project's Out-of-Hours-Works Protocol (Appendix A); or • The Project's EPL (once issued for rail signalling works).	OOHW Protocol Project EPL	Construction	Construction Project Managers Environment and Sustainability Manager	CoA E28 CoA E29 CoA E30 REMMM NV-2	OOHW Permits Site inspection records
	Consultation and Complaints Management					
NV13	Periodic notification (monthly letterbox drop and website notification) detailing all upcoming construction activities delivered to sensitive receivers at least 7 days prior to commencement of relevant works in addition to a range of additional communication and consultation measures which are further detailed in Section 9.4.	CCS CEMP	Prior to construction Construction	Construction Project Managers/ Environment and Sustainability Manager	CoA E33 REMMM NV-3	Community notifications Website

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
NV14	Residences / sensitive receivers will be notified of construction activities that are likely to affect their noise and vibration amenity in accordance with the CoA E24, CoA E31, CoA E37 and as detailed in the OOHW Protocol CoA E39. Information provided will include: • The types of activities to be undertaken, • The timing of activities including expected start and finish, • The location of activities, and • Details of the community information line and how to make an enquiry and / or complaint.	CCS OOHW Protocol CEMP	Prior to construction Construction	Construction Project Managers/ Environment and Sustainability Manager/ Community Relations Manager Place Manager	CoA E24, E31, E33, E37 REMMM NV-2 GRCLR Practice	Community notifications
NV15	Consultation will be carried out with the following noise sensitive receivers where there is potential for noise intensive works to be above the relevant noise management level, to determine periods of use of these facilities that would be particularly sensitive to noise or vibration impacts in order to program works to away from sensitive time periods and ensure impacts are minimised during these sensitive periods. • Places of worship • Educational institutions (eg. school exam periods)	CNVIS CNVMP Section 9.4.	Prior to construction Construction	Construction Project Managers/ Environment and Sustainability Manager/ Community Relations Manager Place Manager	CoA E31 REMMM NV-2 REMMM NV-4	Consultation records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	• Childcare centres (rest periods)(where possible) • Noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories, operating theatres, and mental health services, Rosehill Racecourse and accommodation)					
NV16	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.	CNVIS CNVMP Section 9.4.	Prior to construction Construction	Construction Project Managers/ Environment and Sustainability Manager/ Community Relations Manager Place Manager	REMMM NV-4	Consultation records
NV17	Prior to the commencement of construction works that could result in noise or vibration impacts on sensitive receivers within the Westmead Research Zone, consultation would take place with the noise or vibration identified as potentially affected receivers/facilities within the Westmead Research Zone will be carried out. This will determine periods when noise and/or vibration intensive works can occur with	CNVIS	Prior to construction Construction	Construction Project Managers/ Environment and Sustainability Manager/	REMMM NV-8	Consultation records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	least impact and any appropriate mitigation or management measures that could be implemented (eg. relocation or vibration isolation of vibration sensitive equipment).			Community Relations Manager Place Manager		
NV18	Blasting will not be undertaken at any time.	No blasting is proposed.	Construction	Environmental Coordinator	CoA E35	-
	Construction Traffic Noise					
NV19	Project-related heavy-vehicle movements required to occur within the Parramatta CBD and Rosehill and Camellia precincts would only occur during the periods determined in consultation with the Sydney Coordination Office and Roads and Maritime Services.	Traffic and Transport and Access Management Sub-Plan	Construction	Environment and Sustainability Manager/ Construction Project Managers	REMMM TT-28	Vehicle movement plans
NV20	Drivers will be advised of designated vehicle routes, parking locations, acceptable delivery hours specific to the site and other relevant practices (i.e. minimising the use of engine brakes, no extended periods of engine idling, No excessive revving of plant and vehicle engines, and controlled release of compressed air.).	Traffic and Transport and Access Management Sub-Plan	Construction	Supervisor/ Foreman / Site Engineer	GRCLR practice	Vehicle movement plans Training records
NV21	The Project will implement the CTTAMP to assist with managing driver behaviour both	Training materials Traffic and Transport and	Construction	Supervisor / Foreman / Site Engineer	GRCLR practice	Training records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	within construction works areas and on public roads.	Access Management Sub-Plan		Traffic Manager		
NV22	The Project will implement the CTTAMP to assist with managing driver behaviour both within construction works areas and on public roads.	Training materials	Construction	Supervisor / Foreman / Site Engineer Traffic Manager	GRCLR practice	Training records
NV23	Vehicles associated with the construction works would use arterial roads as far as practicable. Opportunities to reduce the impact of traffic noise on the sensitive receivers adjacent to the access routes will be considered during the design process, including options such as selecting route options with fewer noise sensitive receivers and restricting use of local roads with sensitive residential receivers to daytime construction hours where feasible and reasonable.	Traffic and Transport and Access Management Sub-Plan	Pre-construction Construction	Supervisor/ Foreman / Site Engineer Traffic Manager	REMMM NV-6 GRCLR practice	Vehicle movement plans Training records
NV24	Out-of-hours deliveries will be minimised where possible, with heavy vehicle movements limited to daytime hours where feasible and reasonable. Where out of hours deliveries are required, due care will be taken to minimise impacts (ie no extended periods of engine idling, use of radios instead of shouting, non-tonal reversing beepers where possible).	CNVIS	Construction	Supervisor/ Foreman/ Site Engineer	CoA E33 GRCLR practice	Vehicle movement plans

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
NV25	Limit the speed of vehicles and avoid the use of engine compression brakes.	CNVIS	Construction	Supervisor/ Foreman/ Site Engineer	CoA E33 GRCLR practice	Site inspection records
NV26	Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard. Heavy vehicle vehicles using the sites should have RMS compliant silencer/muffler to control engine breaking noise.	CNVIS	Construction	Supervisor/ Foreman/ Site Engineer	CoA E33 GRCLR practice	Site inspection records Plant inspection records
NV27	Maximise on-site storage capacity to reduce the need for truck movements during sensitive times.	CNVIS	Construction	Supervisor/ Foreman/ Site Engineer	CoA E33 GRCLR practice	Site inspection records
NV28	Air brake silencer/muffler should be installed and fully operational for any heavy vehicles regularly used at worksite. This will reduce potential sleep disturbance impacts, especially at OOHW site exits.	CNVIS	Construction	Supervisor/ Foreman/ Site Engineer	CoA E33 GRCLR practice	Site inspection records Plant inspection records
	Source Controls					
NV29	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.	CNVIS	Design Construction	Design Manager Environmental Advisor	CoA E33 REMMM NV-2	Site inspection records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
				Foreman		Vehicle Movement Plans
NV30	Use quieter and less vibration emitting construction methods where feasible and reasonable, for example, wherever practicable use excavator with pulveriser instead of rockhammer; operate vibratory rollers with the vibratory mode switched off to reduce vibration impact.	CNVIS	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2	Site inspection records
NV31	Piling activities that affect sensitive receivers will be reviewed for quieter and less vibration emitting construction methods where feasible and reasonable. Where quieter alternative methods than impact or percussion piling, such as bored piles or vibrated piles, are to be investigated and implemented where practicable, feasible and reasonable.	CNVIS	Construction	Environmental Advisor Foreman	CoA E34 REMMM NV-2	Site inspection records
NV32	Non-tonal movement alarms (or equivalent warning mechanism) will be used in place of tonal reversing alarms for GRCLR owned plant and subcontract plant used at night or during the day for more than two weeks. As part of equipment hiring, preference would be given to equipment fitted with non-tonal alarms.	CNVIS	Construction	Environmental Advisor Foreman	CoA E33	Site inspection records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
NV33	Avoid the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receivers to reduce noise levels at these receivers.	CNVIS	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2	Site inspection records
NV34	Plant used intermittently to be throttled down or shut down.	CNVIS	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2	Site inspection records
NV35	Directional noise-emitting plant to be directed away from sensitive receivers where feasible and reasonable.	CNVIS	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2	Site inspection records ECMs
NV36	Loading and unloading of materials/deliveries is to occur as far as possible from noise sensitive receivers. Select site access points and roads as far as possible away from noise sensitive receivers. Dedicated loading/unloading areas to be shielded if close to noise sensitive receivers. Delivery vehicles to be fitted with or use straps rather than chains for unloading, wherever feasible and reasonable	CNVIS Induction materials, toolbox or specific training	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2	Site inspection records Vehicle Movement Plans
NV37	The minimising of noise emissions from mobile plant by fitting residential grade mufflers on all mobile plant regularly used at worksites.	CNVIS	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2	Site inspection records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	Ensure plant including the silencer is well maintained.					Plant inspection records
NV38	Ensure plant is regularly maintained, and repair or replace equipment that becomes noisy	CNVIS	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2	Site inspection records Plant inspection records
NV39	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.	CNVIS	Design	Design Manager	CoA E33 REMMM NV-2	Site inspection records
NV40	Where vibration intensive construction activities are proposed within 100 metres of sensitive receivers, these works will be confined to the less sensitive daytime periods where feasible and reasonable.	CNVIS	Construction	Environmental Advisor Foreman	REMMM NV-7	Site inspection records
NV41	The construction methodology of vibration intensive works (including for demolition of existing buildings and/or structures) would be developed to minimise direct and indirect impacts on adjacent and/or adjoining heritage items.	CNVIS	Design Construction	Design Manager Environmental Advisor Foreman	HE-22 REMMM NV-2	Site inspection records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	Path Controls					
NV42	Use site sheds and other structures within the worksite to provide additional noise barriers to receivers.	CNVIS	Design Construction	Design Manager Environmental Advisor Foreman	CoA E33 REMMM NV-2	Site inspection records
NV43	The offset distance between noisy plant items and nearby sensitive receivers should be as large as possible	CNVIS	Design Construction	Design Manager Environmental Advisor Foreman	CoA E33 REMMM NV-2	Site inspection records
NV44	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 will be considered where feasible and reasonable to mitigate off-site noise levels.	CNVIS	Construction	Environmental Advisor Foreman	REMMM NV-2	Site inspection records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
NV45	Construction work areas would use hoarding or temporary noise screens to shield noise sensitive receivers from noise generating works where reasonable and feasible. The height of noise screens would nominally be 2.4 metres, with noise screens heights and locations confirmed as part of the CNVIS process.	CNVIS	Design Construction	Design Manager Environmental Advisor Foreman	CoA E33 REMMM NV-2	Site inspection records
NV46	Stationary noise sources should be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained.	CNVIS	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2	Site inspection records
	Sensitive receivers					
NV47	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	Project wide Land Use Survey to record sensitive receivers	Construction	Community Relations Manager	CoA E33 EPO-NV-2	Project wide Land Use Survey (Appendix B)
NV48	As part of the CNVIS process, where noise l and/or vibration evels are still predicted to exceed the applicable noise or vibration management levels at sensitive receivers the	CNVIS	Design Construction	Design Manager Environmental Advisor	CoA E33 REMMM NV-3	Site inspection records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	additional mitigation measures detailed in the TfNSW CNVS will be implemented, as detailed in Section 9.7.			Foreman		
	Survey, Monitoring and Reporting					
NV49	Noise and vibration monitoring will be carried out in accordance with the Project's Construction Noise and Vibration Monitoring Program, as described in Section 10.3 and detailed in the Noise and Vibration Monitoring program included in Appendix F	Noise and Vibration Monitoring Program	Construction	Environmental Coordinator	CoA E9 to E17	Monitoring records
NV50	Vibration testing will be undertaken 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, review the construction methodology and, if necessary, implement additional mitigation measures.	Noise and Vibration Monitoring Program	Construction	Environmental Coordinator	CoA E43 EPO-NV-2	Monitoring records
NV51	If vibration intensive works are required within the safe working distances, vibration monitoring or attended vibration trials would be undertaken to ensure that levels remain below the cosmetic damage criterion.	Noise and Vibration Monitoring Program	Construction	Environmental Coordinator	REMMM NV-7 CoA E33 EPO-NV-2	Monitoring records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
	Where vibration monitoring identifies works may exceed the required vibration levels, then mitigation and management measures that would be implemented, such as: • Relocate vibration generating plant and equipment to areas within the site in order to lower the vibration impacts. • Rescheduling the hours of operation of major vibration generating plant and equipment. • Alternative methodologies, using plant and equipment with lower vibration levels. • Minimise consecutive works in the same locality • Review size and methodology of rock-breakers to minimise impacts.					
NV52	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.	Noise and Vibration Monitoring Program	Construction	Environmental Coordinator	CoA E44 EPO-NV-2	Monitoring records
NV53	Building condition surveys should be completed, where necessary with the consideration of the minimum safe working distances for vibration intensive activities for cosmetic damage, both before and after the works to identify existing damage and any damage due to the works.	CNVIS Noise and Vibration Monitoring Program	Construction	Environmental Coordinator	REMMM NV-7 CoA E45	Monitoring records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
NV54	The noise levels of plant and equipment, including rental equipment, must have operating Sound Power Levels compliant with the maximum noise levels in Appendix C of the TfNSW CNVS. Regular compliance checks on the noise emissions of all plant and machinery used for the project would indicate whether noise emissions from plant items were higher than predicted. This also identifies defective silencing equipment on the items of plant.	CNVIS	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2	Monitoring records
NV55	Prior to the applicable construction works, the noise levels of plant and equipment, including rental equipment, would be checked against the levels included in the CNVIS to ensure that equipment will operate at or below the assumed noise levels, noting that they may be below maximum operating Sound Power Levels in Appendix C of the TfNSW CNVS.	CNVIS	Construction	Environmental Advisor Foreman	CoA E33 REMMM NV-2	Monitoring records
NV56	Ongoing noise monitoring would be carried out during construction in accordance with the Project's Construction Noise and Vibration Monitoring Program, as described in Section 10.3, at sensitive receptors to ensure that noise levels are consistent with the applicable CNVIS.	CNVIS	Construction	Environmental Advisor Foreman	REMMM NV-2	Monitoring records

ID	Measure / Requirement	Resource needed	When to implement	Responsibility	Reference	Evidence
NV57	Unattended noise and vibration monitoring would be used to verify noise and vibration impacts for sensitive receivers within the Westmead Research Zone facilities.	CNVIS	Construction	Construction Project Managers/ Environment and Sustainability Manager/	REMMM NV-8 EPO-NV-2	Monitoring records Consultation records
NV58	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 Project construction works.	CNVIS	Construction	Environmental Coordinator	CoA E41	Monitoring records

9.2 Early implementation of operational noise mitigation measures

In accordance with CoA E49, construction noise impacts will be minimised by implementing operational noise mitigation measures identified in the Project's Operational Noise and Vibration Review (ONVR), within eighteen (18) months of the commencement of construction in the vicinity of the impacted receiver, where operational noise mitigation measures will not be physically affected by works.

In accordance with CoA E69, before installing acoustic treatment at any heritage item identified in the documents listed in CoA A1 the advice of a suitably qualified heritage architect or heritage engineer with specific experience in built heritage must be obtained and implemented to ensure any such work does not have an adverse impact on the heritage significance of the item.

9.3 Respite periods

9.3.1 Sensitive receivers

CNVIS will be prepared to predict the noise and vibration impacts at sensitive receivers. CNVIS outcomes will be used to inform programming of works. This is included in mitigation measures presented in Section 9.1.

The CoA relevant to respite as presented in **Table 9-2**. Where the provision of respite is required to be incorporated into construction works, this will be identified and addressed in the site or activity specific CNVISs and the associated programming of works.

As per CoA E36, respite periods would be provided 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).

All OOHW, as per CoA E25 (d), that are required for the Project would be undertaken in accordance with the Project OOHW Protocol developed in accordance with CoA E28. This would include addressing the respite and scheduling requirements outlined in CoA E37.

Table 9-2: CoA relevant to respite

Measure / Requirement	Resource needed
A29 The AA must: … (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;	Applicable to all works. The AA will review and comment through the CNVIS process on the work practices, to ensure that sufficient respite is provided to sensitive receivers, in accordance with the CoA requirements.

Measure / Requirement	Resource needed
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. ….	Applicable to all works. Respite is to be provided to all sensitive receivers, in accordance with CoA E36. Respite periods would be informed by consultation and coordination with other PLR contract works (including those undertaken by third parties) and nearby SSD/SSI projects. The hours of works and respite will be programmed to comply with the Out of Hours Works Protocol or an EPL.
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.	Applicable to all works.
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).	Applicable to all works. Applicable for the hours as identified in CoA E21.

Measure / Requirement	Resource needed
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. 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.	Applicable to all works. Applicable for OOHW periods as presented in **Table 6-2**.
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: schedule any works to provide respite to impacted noise sensitive receivers so that all respite periods are achieved; or consider the provision of alternative mitigation, including the provision of at receiver treatments and alternative accommodation to impacted noise sensitive receivers; and provide documentary evidence to the AA in support of any decision made by the Proponent in relation to respite or mitigation.	Applicable to all works during all periods.
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:	Applicable to all works. Applicable for OOHW periods as presented in **Table 6-2**

Measure / Requirement	Resource needed
(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) (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.	Applicable to all works. Applicable for OOHW periods as presented in **Table 6-2**.

9.3.2 Coordination with other construction works

A number of construction and infrastructure projects will be active along the Project alignment concurrently with the PLR SOM Works. In addition, various areas of the PLR SOM Works will be occurring concurrently.

In accordance with CoA E32, GRCLR will take feasible and reasonable steps for all works to consult and coordinate with other PLR contract works, or other State Significant development and infrastructure construction projects (including those undertaken by third parties such as utility contractors, as per CoA E38), 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 GRCLR will coordinate information sharing through regular meetings, sharing of OOHW schedules, sharing stakeholder information (sensitivity awareness) and combining community notifications.

Measures to coordinate the GRCLR works with other PLR contract works, or other construction and infrastructure projects, will be included in the CNVIS to address CoA relevant to respite as presented in **Table 9-2**. 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. To aid with the required contractor coordination, GRCLR will participate in the TfNSW Out of Hours Working Group(s) to coordinate with other PLR Package Works when required. The AA will assist with managing periods of concurrent works across all work packages, through participation in the Out of Hours Working Group and fulfilling their role as set out in A29.

The GRCLR will ensure respite is coordinated with other contractors, including those undertaken by utility contractors, for the delivery of the CSSI. 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.

9.3.3 Community consultation and respite

CSSI-8285 CoA E25 (c) and (d) require appropriate work and respite periods for the works to be developed in consultation with the community at each affected precinct. Consultation would occur at three monthly intervals throughout the works and would 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.

Furthermore, to satisfy CSSI-8285 CoA E37, where construction noise levels exceed 65 dB(A) LAeq (15 mins) at the façade of the building of a residential receiver, work must only occur for four nights in any seven day period. The four nights worked must be informed by community consultation required by CSSI-8285 CoA E39.

The affected community's preference for alternative hours and/or durations will be considered when confirming the schedule. Consultation reports will be prepared for each precinct on a quarterly basis, or as the nature of the works in each precinct changes. These reports will document the outcomes of consultation, including the identified respite periods and the scheduling of the likely out-of-hour works. These reports will be provided to the ER, AA and the Secretary as required by CoA 39.

The GRCLR will ensure respite is coordinated with other contractors, including those undertaken by utility contractors, for the delivery of the CSSI.

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. Any further mitigation or management measures that are to be implemented would be identified in the works specific CNVIS.

9.4 Communication and consultation

9.4.1 Proactive and responsive community consultation

GRCLR will develop positive, cooperative relationships with community stakeholders including businesses, schools, childcare centres, local residents and building owners, building on the relationships and processes initiated by Transport for NSW and the Infrastructure Contractor.

The methods and timeframes for community consultation are detailed within the Communication and Engagement Plan (PLR1SOM-GLR-ALL-PM-PLN-000007).

Consultation will be established with businesses along ‘Eat Street’ affected by construction works outside standard construction hours, to satisfy CoA E24, as outlined in the Business Activation Plan required by CoA E110.

Community consultation will be undertaken with potentially-affected 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) during construction to determine periods of sensitivity. Where practicable, noise generating works would not be timetabled within sensitive periods, unless otherwise agreed with the affected institutions, and at no cost to the affected institution, to satisfy CoA E31.

Community consultation in relation to construction activities and circumstances during which noise and vibration objectives will be exceeded are detailed below to ensure compliance with CoA E37, E39 and E42. Outcomes of the community consultation, the identified works and respite periods and the scheduling of the likely out-of-hours works would be provided to the AA, ER and the Secretary for information.

Using multiple communication channels, GRCLR will provide clear points of contact and face-to-face communication for those most affected by construction noise and vibration. With the scale of construction currently underway in Parramatta, the Project stakeholders and the community will be affected by multiple sources of impacts and information. When affected, stakeholders and the community may not understand which of Project or contractor should be contacted to address their issues.

A key feature of GRCLR’s communication strategy is collaboration with agencies and interface contractors to investigate opportunities to minimise cumulative impacts. Coordinated communications will serve to guide the community to the right points of contact for information and complaints, aiming to minimise frustration. GRCLR has dedicated Place Managers to disseminate information to businesses and residents affected by construction work.

Some of the key means of informing the community of the Project construction works, and receiving feedback will be through the following means:

- **Construction notifications –** Notifications outlining information about construction work will be provided to businesses and residents nearby construction work zones.
- **Website updates** – The Project website will form a resource for members of the community to seek further information, including 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). The number 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.

9.5 Vibration impacts screening

Properties at risk of cosmetic damage will be identified through the vibration screening process prepared based upon the limits presented in Section 6.6 to determine if construction activities may result in vibration levels at sensitive receivers above these vibration limits.

Presented in **Table 9-3**are the minimum working distances for typical items of vibration intensive plant. The minimum working distances are quoted for both “cosmetic” damage (refer BS 7385) and human comfort (refer OEH’s Assessing Vibration – a technical guideline).

These minimum working distances are to be used to determine if there is the potential for vibration impacts on nearby vibration sensitive receivers or buildings/structures. As per CoA E43,and in accordance with REMMM NV-7, further investigation, including vibration monitoring and trials would be considered to ensure that levels remain below the require vibration limits. Where vibration monitoring identifies works may exceed the required vibration levels then further mitigation and management measures that would be implemented.

Table 9-3: Recommended minimum working distances from vibration intensive equipment

Plant item	Approximate Size / Weight / Model	Minimum distance – Cosmetic damage (BS 7385)[2]	Minimum distance – Human response (AVTG)
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 18 tonne excavator)	7 m	23 m
Large Hydraulic Hammer	1600 kg (18 to 34 tonne excavator)	22 m	73 m
Pile Driver – Vibratory	Sheet piles	2 to 20m	20 m
Piling Rig – Bored	≤ 800 mm	2 m (nominally)	n/a
Piling Rig – Hammer	12 tonne down force	15m	50 m
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

Notes:

1. Table adapted from the TfNSW Construction Noise and Vibration Strategy
2. More stringent conditions may apply to heritage or other sensitive structures

9.6 Property surveys and issues rectification

GRCLR will offer and undertake building condition surveys prior to the commencement of any construction, and with the agreement of the landowners on all buildings identified as being at risk of cosmetic damage from construction vibration impacts. This will be undertaken by a suitably qualified structural engineer. Buildings will be considered as being at risk of vibration damage and would qualify for a building survey if they are located within the minimum safe working distances for vibration intensive activities for cosmetic damage considering the structural integrity of the building/structure/item.

As per CoA E45, 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 four weeks of completing the survey and no later than one month before the commencement of construction.

Non-heritage 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. Heritage building will undertake the process identified in Section 6.6.3 to determine the suitable vibration limits for the structure, and the minimum working distance will be based upon that vibration level.

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 CoA E45 (as above) will be undertaken by a suitably qualified 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 four weeks of completing the surveys and no later than three months following the completion of construction.

In the case that issues are identified through these surveys, GRCLR will review the pre-construction and post-construction Building Condition Survey Reports and prepare a root cause analysis for each damage claim received.

As per CoA E47, GRCLR will be responsible for the repair or compensation to the owner for any physical property damage determined to be caused by the SOM construction works. Repair or compensation shall occur within a timeframe agreed to by the property owner with the costs borne by GRCLR. Where the damage is not attributable to the SOM construction works and the outcome is disputed by the property owner, an independent structural engineer will be engaged to assist in resolving the dispute, as part of the complaints escalation process outlined in Appendix A to the TfNSW PLR Community Communications Strategy.

9.7 Additional noise and vibration mitigation measures

In instances where noise levels are still predicted to exceed the NML at receivers, after the application of noise mitigation and management measures (refer to Section 9.1), the CNVS directs that the Project should consider implementing the additional mitigation measures such as those presented in **Table 9-4**1 (refer to Section 8.2 of the TfNSW CNVS for more detail).

Table 9-4: Additional management measures

Additional management measures	Description
Periodic notification (letterbox drop or equivalent)	These include regular newsletters, letterbox drops, notification via an email distribution list or equivalent, to provide an overview of current and upcoming works and other topics of interest. For receivers that may be impacted by works this includes detailing work activities, time periods when these will occur, and potential impacts and mitigation measures.
Verification monitoring	Measurement (unattended or attended) of the background noise level and construction noise level at the affected or nominated receiver location. The purpose of the monitoring is to determine the construction noise/vibration level from the Project, and that they are consistent with the levels detailed in the CNVIS, that the mitigation and management measures are appropriate. Noise monitoring would be carried out by a person appropriately trained in the measurement and assessment of construction noise and vibration.
Specific notification	Specific notifications would be provided to give additional information about proposed Works to identified receivers potentially more highly affected than those covered by periodic notifications. These would be provided to the identified receivers no later than seven calendar 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 construction activities, time periods of when these will occur, and potential impacts and mitigation measures. These can take at minimum one of the following forms: • Specific notification letter, which provide additional information when relevant and informative to more highly affected receivers than covered in periodic notifications • Phone call, which detail relevant information to identified/affected stakeholders and provide personalised contact, tailored advice and the opportunity to comment on the proposed work • Individual briefing, which inform stakeholders about the impacts of high noise activities and mitigation measures, and provide personalised contact, tailored advice and the opportunity to comment on the proposed work. This should take place at least 48 hours ahead of the works that would potentially impact the receiver.

Additional management measures	Description
Alternative construction methodology	Where vibration impacts are identified as potentially resulting in structural damage to a nearby building/item/structure, then alternative construction methodologies are to be considered in order to achieve the identified structural damage vibration levels.
Respite offer	This is to provide receivers impacted by lengthy periods of construction noise/vibration from the Project with a specific offer to provide respite from the impacts. An example of a respite offer might be pre-purchased movie tickets, but would be determined on a case-by-case basis. Noting that the feasible and reasonable nature of different respite offers could vary depending upon the number of impacted receivers.
Respite periods	Respite periods would be provided to impacted receivers as detailed in the Project Out-of-Hours Works Protocol. The idea is to provide impacted receivers a clear periods without construction impacts in order to provide a period of respite. For HNA receivers, this is in accordance with CoA E36.
Duration reduction	Duration respite is which is where the work duration, number of evenings or nights is increased so that the Project can be completed more quickly. This would require consultation with the potentially impacted receivers.
Alternative accommodation	Provision of alternative accommodation for residents would be considered in accordance with the CNVS for receivers where highly intrusive noise impacts are predicted during the night-time period (between 10:00 pm and 7:00 am).

The standard hours and OOHW periods are depicted in Figure 9-1. The OOHW periods are further defined as OOHW Period 1 and 2, based on the CoA.

Figure 9-2, Figure 9-3 and Figure 9-4 detail the additional mitigation measures for airborne noise, ground-borne noise and vibration respectively, as recommended in the CNVS, for standard hours and out-of-hours work (OOHW). Where feasible and reasonable, this approach will be implemented.

Figure 9-1: Construction hours

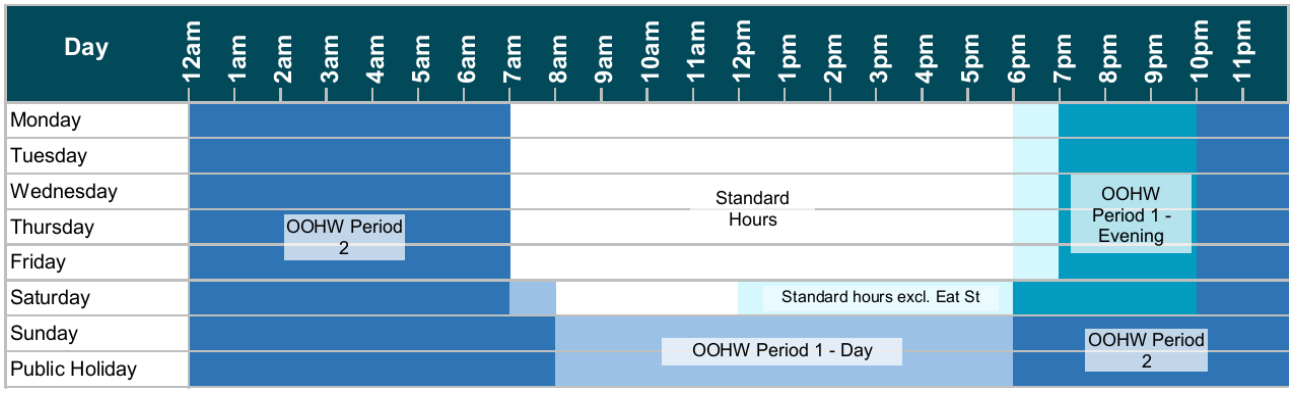


Figure 9-2: Triggers for Additional Mitigation Measures – Airborne Noise

When is the work being undertaken?	How much does the predicted noise level exceed the ANML by?	Receiver perception	Identify additional management measures to be implemented
Standard Hours M-F 7am to 7pm*^ Sat 8am to 6pm*	0 dB(A)	Noticeable	-
	≤ 10 dB(A)	Clearly audible	-
	> 10 to 20 dB(A)	Moderately intrusive	PN, V
	> 20 dB(A)	Highly intrusive	PN, V
	75 dB(A) or greater		PN, V, SN, RP+
OOHW Period 1 M-F 7pm to 10pm* Sat 6pm to 10pm* Sun/ PH 8am to 10pm	≤ 5 dB(A)	Noticeable	-
	> 5 to 15 dB(A)	Clearly audible	PN
	> 15 to 25 dB(A)	Moderately intrusive	PN, V, SN, RO
	> 25 dB(A)	Highly intrusive	PN, V, SN, RO, RP#, DR#
OOHW Period 2 M-F 10pm to 7am Sat 10pm to 8am Sun/ PH 6pm to 8am	≤ 5 dB(A)	Noticeable	PN
	> 5 to 15 dB(A)	Clearly audible	PN, V
	> 15 to 25 dB(A)	Moderately intrusive	PN, V, SN, RP, DR
	> 25 dB(A)	Highly intrusive	PN, V, SN, AA~, RP, DR

Notes: Use the abbreviation codes in the table above to confirm management measures required

PN = Project notification
V = Verification monitoring of predicted noise levels
SN = Specific notifications (personalised letter, phone call, email, individual briefing)
RO = Project specific respite offer
AA = Alternative accommodation
RP = Respite period
DR = Duration reduction

Respite periods and duration reduction are not applicable when works are carried out during OOHW Period 1 Day only

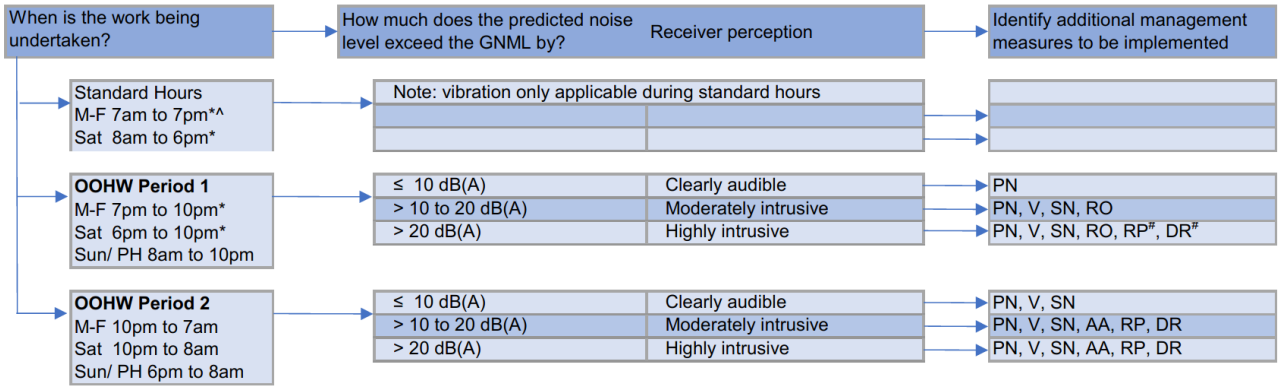
* This applies across the Project with the exception of Eat Street, as per CoA E21 to E24, and clairified in the OOHW Protocol Section 2.

^ The applicable ANML for the the 6pm to 7pm standard hours period Monday to Friday, is based upon the daytime RBL.

+ Respite periods for sensitive receivers to be provided in accordane with CoA E36

~ Where AA (Alternative accomodation) cannot be feasibly provided, and noise impacts are above the sleep disturbance criteria or are moderately intrusive for more than two consecutive nights, respite is required to be provided.

Figure 9-3: Triggers for Additional Mitigation Measures – Ground-borne noise



Notes: Use the abbreviation codes in the table above to confirm management measures required

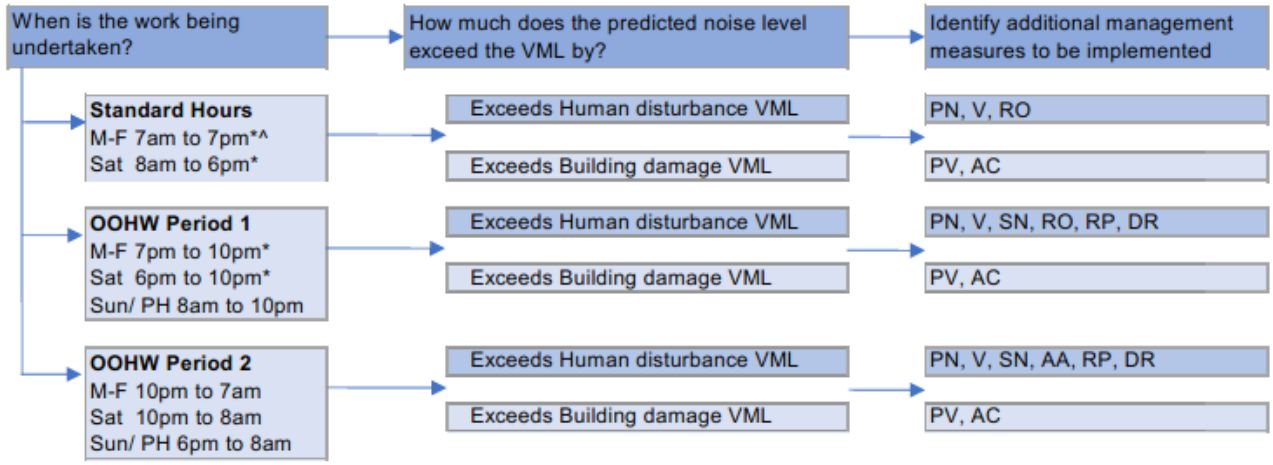
PN = Project notification
V = Verification monitoring of predicted noise levels
SN = Specific notifications (personalised letter, phone call, email, individual briefing)
RO = Project specific respite offer
AA = Alternative accommodation
RP = Respite period
DR = Duration reduction

Respite periods and duration reduction are not applicable when works are carried out during OOHW Period 1 Day only

* This applies across the Project with the exception of Eat Street, as per CoA E21 to E24, and clairified in the OOHW Protocol Section 2.

^ The applicable ANML for the the 6pm to 7pm standard hours period Monday to Friday, is based upon the daytime RBL.

Figure 9-4: Triggers for Additional Mitigation Measures – Vibration



Notes: Use the abbreviation codes in the table above to confirm management measures required

PN = Project notification
V = Monitoring of predicted vibration levels
SN = Specific notifications (personalised letter, phone call, email, individual briefing)
AC = Alternative construction methodology
RO = Project specific respite offer
AA = Alternative accommodation
RP = Respite period
DR = Duration reduction

* This applies across the Project with the exception of Eat Street, as per CoA E21 to E24, and clairified in the OOHW Protocol Section 2.

^ The applicable ANML for the the 6pm to 7pm standard hours period Monday to Friday, is based upon the daytime RBL.

10 Compliance management

10.1 Roles and responsibilities

The GRCLR Project Team's organisational structure and overall roles and responsibilities are outlined in Section 4.2 of the CEMP. Specific responsibilities for the implementation of aspects of this Plan are detailed below.

10.1.1 GRCLR Environment and Sustainability Manager

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

- Oversee development and implementation of the Construction 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 keeping of all environmental records
- Engage suitably qualified consultants to develop and support implementation of this Sub-plan
- In consultation with the Project Director and Construction Manager, oversee the investigation and reporting of environmental incidents arising from noise and/or vibration
- Regularly engage with the Parramatta Connect consortium and other interface contractors to achieve environmental alignment (e.g. out of hours works, cumulative impacts) in accordance with the Interface Management Plan

10.1.2 Acoustics Advisor

As required by CoA A26 through A29, a suitably qualified and experienced Acoustics Advisor (AA), who is independent of the design and construction personnel, has been engaged for the duration of construction of the Project and for no less than six (6) months following the completion of the construction of the Project.

The nominated AA has been engaged by TfNSW and approved by DPIE.

In relation to noise and vibration the AA must:

- Receive and respond to communication from the Secretary about GRCLR performance
- Consider and inform the Secretary on matters specified in the terms of this approval
- Consider and recommend improvements that may be made to GRCLR work practices to avoid or minimise adverse noise and vibration impacts
- Consider consultation outcomes with affected receivers to determine the adequacy of mitigation and management measures including work hours and respite periods
- Review documents prepared under the terms of CSSI-8285 and, where they are consistent, 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)

- Regularly monitor the implementation of noise and vibration documents prepared under CSSI-8285 to ensure implementation is in accordance with what is stated in the document and the approval terms

In conjunction with the ER, the AA must:

- Help plan, attend or undertake audits of noise and vibration management of the CSSI including briefings, and site visits, as requested by the Secretary
- If conflict arises between GRCLR 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 CSSI-8285 Condition B3 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 CSSI-8285 terms of 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 approval terms of CSSI-8285;
- 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).

GRCLR will cooperate with the AA by:

- Providing access to noise and vibration monitoring activities as they take place
- Providing noise and vibration plans, assessments, monitoring reports and data analyses undertaken for review and
- Considering any recommendations made by the AA to improve practices. Where recommendations are not adopted, this will be demonstrated to satisfy the AA.

10.1.3 Environmental Representative (ER)

The primary role of the ER is to independently oversee compliance with the CSSI-8285 CoA 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 CSSI-8285 Approval, specifically CoA A19 to A25.

The responsibilities of the approved ER as related to this Sub-plan, as required by CSSI-8285 CoA A23 (a-i) and CoA C7), are:

- 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
- 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 CSSI-8285 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 CSSI-8285 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 (CoA C7) which is then submitted to the Secretary for approval no later than one month before the commencement of construction
- Endorse the Construction Monitoring Program (Noise and Vibration Monitoring) (CoA C9(b)) in accordance with CoA C13, which is then submitted to the Secretary for information no later than one month before the commencement of construction
- Approve low and moderate risk out of hours activities in consultation with the AA.

10.1.4 Specialist Consultants

Renzo Tonin & Associates (RT&A) has been engaged to provide specialist noise & vibration advice and services in the preparation of this Plan.

GRCLR will ensure on-going noise and vibration services are provided by a qualified consultant in the development and implementation throughout the SOM Works to ensure that impacts can be avoided, minimised or appropriately mitigated, including:

- Undertaking noise and vibration modelling
- Preparing Construction Noise and Vibration Impact Statements
- Undertaking noise and vibration monitoring when required
- Assisting in stakeholder meetings when required
- Assisting in community consultation when required

10.1.5 Heritage specialist

SOM has engaged Artefact Heritage Consultants to advise on all matters relating to heritage and archaeology for the SOM scope of work. Heritage structures potentially impacted by works associated with the SOM scope of work will be identified in the CNVISs prepared as detailed in Section 8. Where noise or vibration monitoring is required on or within the heritage structure, the advice of the heritage specialist would be sought regarding methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures. This may be undertaken via site visit, or by desktop review of photographs, to be determined on a case by case basis.

10.2 Training

All personnel, including employees, contractors, sub-contractors and utility staff working on site will undergo site induction training relating to construction noise and vibration management issues.

The induction training or toolboxes will address elements related to noise and vibration management including:

- Existence and requirements of this CNVMP,
- Relevant legislation and guidelines,
- Normal construction hours and exemptions,
- The process for seeking approval for out-of-hours works in accordance with the OOHW Protocol, including consultation,
- Location of noise sensitive areas,
- Complaints reporting and recording,
- How to implement noise and vibration management measures as outlined in Section 9 along with site specific measures developed as part of the CNVIS process, and

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

Further details regarding staff induction and training are outlined in Section 5 of the CEMP.

10.3 Inspection and monitoring

Inspections of sensitive areas and activities with the potential to generate noise and vibration impacts will occur for the duration of the Project. Requirements and responsibilities in relation to monitoring and inspections are documented in Section 8 of the CEMP.

Noise and vibration monitoring will also occur routinely for the duration of the Project, in accordance with the Project's Noise and Vibration Monitoring Program (refer to Appendix F).

Monitored noise and vibration levels will be analysed against the predictions made in the relevant CNVIS or using the Project's construction noise and vibration management tools. Where monitored noise levels are found to be above modelling predictions or vibration goals are exceeded, the following actions will be undertaken:

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

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

10.4 Complaints

Complaints will be recorded and managed as detailed in Section 6.4 of the CEMP.

10.5 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub plan, CoA and other relevant approvals, licenses and guidelines and in accordance with GRCLR procedures (see **Table 3-2**).

Audit requirements are detailed in Section 8.3 of the CEMP.

10.6 Reporting

Reporting requirements and responsibilities are documented in Section 8 of the CEMP. Additional reporting will also be generated as required in assessment documents and as part of the Construction Noise Monitoring Program (presented in Appendix F).

Specific reports prepared in response to noise and vibration will include:

- Reporting required in accordance with the POEO Act and Regulations,
- Monthly Noise and Vibration Reports, prepared by the AA and submitted to the Secretary and other relevant regulatory agencies for information, which will detail the AA's actions and decisions on matters for which the AA was responsible in the preceding month, and

Construction Noise and Vibration Monitoring reports identified in the Noise and Vibration Monitoring Program (refer to Appendix F).

10.7 Licences and permits

An Environment Protection Licence (EPL) will be required for the construction of the rail signalling only, under schedule 1 of the Protection of the Environment Operations Act 1997. An EPL application will be lodged 60 days prior to the commencement of construction of the signalling.

This CNVMP will be updated, as required once the EPL is issued.

11 Review and improvement

11.1 Continuous improvement

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

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

11.2 Update and amendment

The processes described in Section 9.2 of the CEMP may result in the need to update or revise this CNVMP. This will occur as needed, in accordance with the process outlined in Section 9.2 of the CEMP.

In addition to these requirements, this Plan will be updated as required during the Delivery Phase to ensure it remains relevant, and reflects any:

- Changes to the operational or regulatory environment (ie. EPL required for signalling works)
- Updates to the SOM Program
- Feedback from key stakeholders.

As per CoA A29, the AA is to consider when suitable relevant minor amendments to the CNVMP and noise and vibration monitoring program that require updating or are of an administrative nature, and are consistent with the terms of the CoA and the corresponding management and monitoring programs, and if satisfied such amendment is necessary, endorse the amendment.

A copy of the updated CNVMP and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure, refer to Section 9 of the CEMP.

Appendix A – Out of Hours Work Protocol

The current revision of the TfNSW Out of Hours Works Protocol (Ref: PLR-TFNSW-CBD-PE-FRM-000002) 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 B-1 – Land use survey

GREAT RIVER CITY LIGHT RAIL

LIFE MORE LIVEABLE

GREAT RIVER CITY LIGHT RAIL

Design Report

Parramatta Light Rail

Report: LAND USE SURVEY

PLR1SOM-GLR-ALL-NV-RPT-001001

Client: Great River City Light Rail Pty Ltd

ABN: 60 622 239 605

Date: 11th June 2020

Version History Control Box

Date	Version Number	TeamBinder Revision	Author	Comments
4/3/2020	A	A	Various – Renzo Tonin	Issued for PDR
11/6/2020	B	B	Various – Renzo Tonin	Issued for PDR

Approval box

Action	Responsible Person
Reviewed by	

RENZO TONIN & ASSOCIATES
inspired to achieve

Acoustics
Vibration
Structural Dynamics

PARRAMATTA LIGHT RAIL

Land Use Survey (Condition E20)

12 June 2020

CAF

TK868-01F02 Land Use Survey (r2).docx

35 1982-2017 ACOUSTIC ENGINEERING EXCELLENCE

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Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Authorised
28.02.2020	First Issue	0	1			
05.05.2020	Updated addressing comments	-	2			

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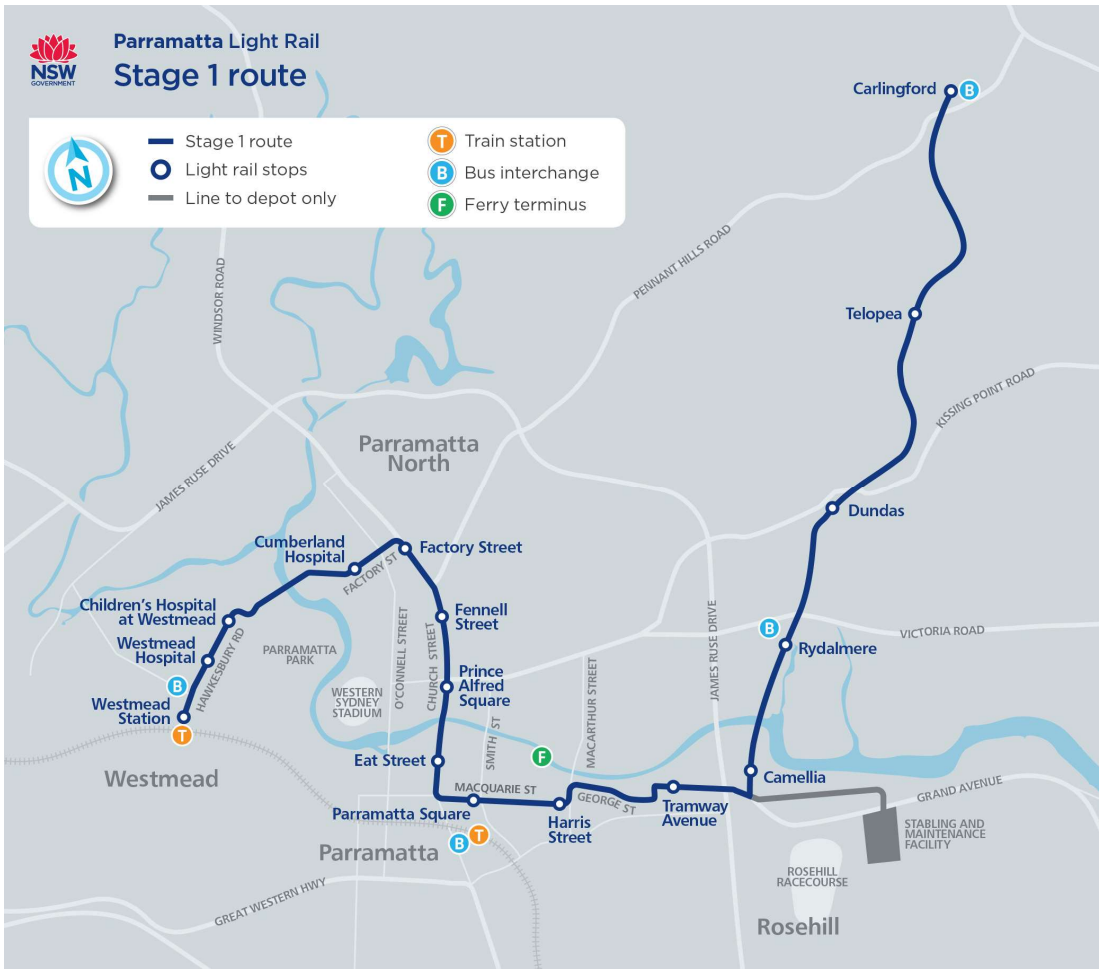
1 Introduction

Parramatta Light Rail (PLR) is one of the State Government's major public transport projects in Western Sydney. PLR Stage 1 will connect Westmead to Carlingford via Parramatta CBD and Camellia with a two-way track spanning 12 kilometres. The proposed route[1] is summarised in Figure 1.

Transport for NSW (TfNSW) is the proponent of the project and CAF as part of the Great River City Light Rail consortium has been awarded the contract for the PLR Stage 1 Supply, Operate and Maintain (SOM) works.

Renzo Tonin & Associates has been engaged by CAF to prepare a land use assessment for the PLR Stage 1 project to satisfy the requirements of Planning Approval Condition E20.

Figure 1 PLR Stage 1 route



[1] NSW Government Parramatta Light Rail http://www.parramattalightrail.nsw.gov.au/maps accessed 7/3/2019

1.1 Purpose

The purpose of this study is to prepare a land use survey in accordance with the requirements of Planning Approval Condition E20 of SSI 8285[2]. A copy of the condition is provided in the compliance matrix in Table 1.

Table 1 Compliance Matrix - SSI 8285

No.	Condition	Reference
E20	NOISE AND VIBRATION Land Use Survey	
	A detailed land use survey must be undertaken to confirm sensitive receivers (including critical working areas such as operating theatres, precision laboratories housing sensitive equipment and drama theatres) potentially exposed to construction noise and vibration, construction ground-borne noise and operational noise and vibration. The survey may be undertaken on a progressive basis but must be undertaken in any one area before the commencement of works which generate construction or operational noise, vibration or ground-borne noise in that area.	This report. Alignment maps and database of sensitive receivers provided in APPENDIX A and APPENDIX B.
	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.	See Noise and Vibration Management Sub Plan - PLR1SOM-GLR-ALL-PM-PLN-000034 Rev B
SPR 7.10.4.1 (a)	In addition to the requirements of the Planning Approval, the land use report must identify the land use category and the associated construction and operational noise and vibration criteria at all sensitive receivers potentially impacted by the PLR Stage 1, consistent with the relevant guidelines.	This report. Alignment maps and database of sensitive receivers provided in APPENDIX A and APPENDIX B.

The key objective of the operational 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.

1.2 Quality assurance

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

[2] NSW Government Department of Planning and Environment, Critical State Significant Infrastructure (CSSI) Approval SSI 8285 for Parramatta Light Rail (Stage 1), Conditions of Approval, MOD 2, 25 January 2019

2 Land use survey

In accordance with the requirements of Planning Approval Condition E20, a detailed land use survey has been undertaken to confirm the location of sensitive receivers that are potentially exposed to noise and vibration from the PLR Stage 1 works.

The land use assessment has been undertaken using a combination of on-site site visual inspections (including discussions with custodians of sensitive equipment and acoustic spaces), 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 following documents have been used to assist in preparing the land use assessment:

- Rail Alignment – The rail alignment of each track was provided by the CAF project team. Each track was converted into 5 m segments with the relevant track chainage assigned as a unique identifier for the start of each segment.
- A Cadastral Boundary layer, identifying the property boundaries of all parcels of land within the project area was provided by CAF.
- The outlines and heights of buildings were provided by the Project team.
- The most recent aerial photography from NearMap was utilised to create a receiver point on each building and generate X and Y coordinates. Where required, additional calculation points have been added to large buildings or buildings with mixed land uses. The distance between each receiver point and the rail alignment is to be used for information only.
- Land zoning was taken from the Parramatta City Council Local Environmental Plan 2011
- Site inspections to verify receiver land uses and surveys of sensitive equipment were conducted by the Project team on 25 June, 3 July, 10 July, 3 December and 5 December 2019.
- Additional land use information was sourced from the EIS, discussions with Local Councils, and other information available in the public domain.
- Reference has been made to the Parramatta River Grey –Headed Flying Fox Camp Management Plan (2008) prepared for Parramatta Park Trust and Sydney West Area Health Services in identifying the camp (Receiver ID 6249).

2.1 Receiver ID nomenclature and methodology

Consistent with the preliminary land use assessment undertaken as part of the EIS, the land use area considers buildings within an approximate distance of 300 m of the alignment on both sides and within 300 m of all fixed facilities.

This distance of 300 m is more than adequate to cover sensitive receivers potentially exposed to noise and vibration. In relation to LRV operational noise, potential noise and vibration impacts from PLR Stage 1 would be limited to buildings within 100 m of the alignment.

A Geographical Information System (GIS) database was developed to assist in capturing land use information. Within the database, each building is given a unique identification (ID) number. This allows other relevant information including its land use, geographical location, distance to the alignment and noise and vibration objectives to be assigned to each Building ID.

For each unique Building ID, the GIS database includes a Receiver ID which provides additional information in relation to its land use and location with respect to the alignment. The following nomenclature has been adopted for Receiver IDs within the database.

> Example Receiver ID **WUP1095-206-EDU**
> where
> **WUP1095** represents the location of the centre of the building relative to the alignment. **W** for Westmead to Parramatta, **C** for Carlingford to Parramatta and **S** for the stabling yard tracks. **UP** is the direction of the nearest track. **1095** is the chainage.
> **206** represents the distance from the centre of the building to the nearest track centreline (in metres)
> **EDU** represents the land use category (see below for receiver types)

The above nomenclature has been undertaken to generate a unique Receiver ID for each building, based on the coordinates of the geometric centre of the building. Table 2 provides a description of land use categories (receiver types) that have been identified within the project area.

Table 2 Land use categories

Land use code	Land use
ACU	Acoustic Space
ARC	Active Recreation
CHC	Child Care
CIN	Cinema
COM	Commercial (offices and retail outlets)
EDU	Educational Buildings and Schools
HOS	Hospital
HTL	Hotel
IND	Industrial
MED	Medical Buildings
PoW	Place of Worship
PRC	Passive Recreation
RES	Residential
EQU	Sensitive Equipment

A summary of the land use assessment is provided in Appendix B. A copy of the database (Microsoft Excel format) is provided as a separate deliverable. Table 3 provides a summary of the information included in the database for each receiver.

Table 3 Land use database legend

Shapefile Abbreviation	Description
ID	Unique ID Receivers within 300 m of alignment. IDs start from 1001
ReceiverID	Receiver ID composed of chainage, distance to track and land use
X	Coordinate (X)
Y	Coordinate (Y)
Address	Address
LU Code	Land use code
LandUse	Land use description
Levels	Number of building levels
Chainage	Chainage Main line Westmead to Parramatta format: **WXXXX** Main line Carlingford to Parramatta format: **CXXXX** Stabling yard line format: **SXXX**
NearTrack	Nearest track (U for Up, D for Down)
DistTrack	Distance to nearest track [m] (provided for information only, not to be used for calculations)
Precinct	Precinct area
NCA	Noise Catchment Area
Rail Day	External $L_{Aeq(15\ hour)}$ day period rail airborne noise trigger level
Rail Ngt	External $L_{Aeq(9\ hour)}$ night period rail airborne noise trigger level
Rail 1hr	$L_{Aeq(1\ hour)}$ 1 hour rail airborne noise trigger level (external for medical land uses, internal for all others)
Rail Lmax	External $L_{AFmax,95\%}$ rail airborne noise trigger level
Rail GBN	Internal rail ground-borne noise trigger level (L_{ASmax} or NR, worst-case period)
Ind Day	External $L_{Aeq(15\ min)}$ day period industrial airborne noise goal
Ind Eve	External $L_{Aeq(15\ min)}$ evening period industrial airborne noise goal
Ind Ngt	External $L_{Aeq(15\ min)}$ night period industrial airborne noise goal
Ind Int	Internal $L_{Aeq(15\ min)}$ industrial airborne noise goal (applies when in use)
SleepDist	Industrial noise sleep disturbance L_{AFmax} screening criteria
VDV Day	Operational Vibration Dose Value day period trigger level ($m/s^{1.75}$)
VDV Ngt	Operational Vibration Dose Value night period trigger level ($m/s^{1.75}$)
NML Day SH	Noise Management Level - daytime (standard construction hours) Standard construction hours from 7 am to 6 pm Monday to Friday and from 8 am to 6 pm Saturday
NML Day OH	Noise Management Level - daytime (out-of-hours works) Out-of-hours day period from 8 am to 6 pm Sunday and Public holidays - OOHW P1
NML Eve	Noise Management Level - evening (out-of-hours works) Evening period from 6 pm to 10 pm Monday to Sunday - OOHW P1

Shapefile Abbreviation	Description
NML Ngt	Noise Management Level - night (out-of-hours works) Night-time period from 10 pm to 7 am Monday to Friday, from 10 pm to 8 am Saturday, Sunday and Public holidays - OOHW P2
CGBN	Internal Construction Ground-Borne Noise management level (worst-case period)
CVOC Day	Construction Vibration Objective - Human Comfort (day) (VDV, $m/s^{1.75}$)
CVOC Ngt	Construction Vibration Objective - Human Comfort (night) (VDV, $m/s^{1.75}$)
CVDSL	Construction Vibration Damage Screening Level (Peak Component Particle Velocity, mm/s)
Heritage	Building description (heritage or non-heritage)
Facade	Assumed building façade loss, based on a survey of glazing types at sensitive receivers
EquipCrit	Sensitive equipment vibration criteria (ASHRAE curve or absolute level)
OrgName	Organisation that owns the equipment
ParentBld	A reference to the ID of the building in which the equipment is located

For vibration sensitive equipment the type of equipment is described in a comments field. The location of each receiver along the track alignment is shown graphically in APPENDIX A.

3 Operational noise and vibration objectives

3.1 Rail airborne noise trigger levels

The noise trigger levels for LRV operations are based on the Rail Infrastructure Noise Guideline[3] (RING) Table 2 and Table 3 and are consistent with the noise trigger levels in Scope and Performance Requirements[4] (SPR) Table 11 and Table 12. The airborne noise trigger levels for residential receivers is provided in Table 4, and for other sensitive land uses in Table 5. The noise trigger levels adopted are for new rail line developments as defined in the RING. Note that although residential criteria are not provided in the RING for redeveloped light rail lines (as is the case for the Project brownfield section) the other RING trigger levels are 5 dB higher for redevelopments of existing rail lines, compared to new developments.

For residential receivers, the RING noise trigger levels have two components:

- L_{Aeq}, which addresses the average level of train noise over the day, night of busiest 1-hour period; and
- L_{Amax}, which addresses the maximum noise level from train pass-by events. The L_{Amax} noise parameter is based on the 95th percentile passby level (1 in 20 trains can exceed the 95th percentile level).

For other noise-sensitive land uses, only L_{Aeq} is applied, as the focus is on speech interference and providing adequate acoustic protection to conduct the activities associated with those land uses.

Internal noise levels are calculated by considering the façade loss from outside to inside, as documented in the receiver database (see Table 2). The assumed façade losses and internal noise level calculations will be reviewed throughout the Project when assessing compliance with the internal noise criteria.

Table 4 Rail airborne noise trigger levels for residential land uses (based on RING Table 2)

Sensitive Land Use	Noise trigger levels, dB(A) External[1, 2, 3, 4, 5]	
	Day 7.00am to 10.00pm	Night 10.00pm to 7.00am
Residential	60 $L_{Aeq(15\ hour)}$ and 80 L_{Amax}	50 $L_{Aeq(9\ hour)}$ and 80 L_{Amax}

Note 1: Specified noise trigger levels refer to noise at the receiver location

Note 2: Noise trigger levels refer to noise from rail transportation only and do not include ambient noise from other sources

Note 3: The noise levels are external levels except where otherwise stated

Note 4: These numbers represent external levels of noise that trigger the need for an assessment of potential noise mitigation measures to reduce noise levels from a rail infrastructure project

Note 5: L_{Amax} refers to the maximum noise level not exceeded for 95 per cent of LRV pass-by events and is measured using the "fast" response setting on a sound level meter

[3] NSW Environmental Protection Authority, Rail Infrastructure Noise Guideline, May 2013

[4] TfNSW, Parramatta Light Rail Stage 1: Supply, Operate and Maintain Contract Exhibit B - Scope and Performance Requirements

Table 5 Rail airborne noise trigger levels for sensitive land uses other than residential (based on RING Table 3)

Sensitive Land Use	Noise trigger level, dB(A) (when in use) [1, 2, 3, 4, 5]
Schools, educational institutions and child care centres	40 $L_{Aeq(1\ hour)}$ internal
Places of worship	40 $L_{Aeq(1\ hour)}$ internal
Hospitals – wards and research facilities	35 $L_{Aeq(1\ hour)}$ internal
Hospitals – other uses	60 $L_{Aeq(1\ hour)}$ external
Open space – passive use (e.g. parkland, bush reserves)	60 $L_{Aeq(15\ hour)}$ external
Open space – active use (e.g. sports field, golf course)	65 $L_{Aeq(15\ hour)}$ external

Note 1: Specified noise trigger levels refer to noise at the receiver location

Note 2: Noise trigger levels refer to noise from rail transportation only and do not include ambient noise from other sources

Note 3: The noise levels are external levels except where otherwise stated

Note 4: For sensitive land uses, $L_{Aeq(1h)}$ means the highest 10th-percentile hourly A-weighted Leq during the period when the particular class of receiver building/place is in use. Alternatively, the highest $L_{Aeq(1h)}$ value can be used where insufficient data are available to provide a valid 10th-percentile level, provided that the value is representative.

Note 5: In assessing noise levels at passive and active open spaces as well as in hospital grounds, the noise level is assessed at the most affected point no closer than 50 m from the area boundary, i.e. within the passive or active open space area. Where passive and active open spaces have a boundary of less than 50 m, this provision is not applicable, and the proponent should select a more appropriate distance and provide justification for doing so.

Table 6 lists the project specific noise trigger levels that have been adopted for sensitive land uses not addressed in the RING.

Table 6 Rail project specific noise trigger levels for sensitive land uses

Sensitive Land Use	Noise trigger level, dB(A) (when in use)[1, 2]
Theatre / Auditorium / Cinema	30 $L_{Aeq(1\ hour)}$ internal[3]
Court / Tribunal	30 $L_{Aeq(1\ hour)}$ internal[4]
Medical (not hospital wards or research facility)	60 $L_{Aeq(1\ hour)}$ external[5]
Hotels	Same as RING residential trigger levels (see Table 4)

Note 1: Specified noise trigger levels refer to noise at the receiver location

Note 2: Noise trigger levels refer to noise from rail transportation only and do not include ambient noise from other sources

Note 3: Based on the AS 2107 guideline for cinemas

Note 4: Based on the AS 2107 guideline for court rooms

Note 5: Based on RING trigger level for "Hospital – other uses"

3.2 Rail ground-borne noise trigger levels

The ground-borne noise (GBN) trigger levels due to LRV operations are defined in the RING and SPR Clause 7.10.2.1 (b). The criteria for residential and other sensitive receivers are presented in Table 7.

For greenfield sections of the PLR Stage 1 alignment, noise mitigation is required to be considered at locations where GBN from rail traffic exceeds the noise trigger levels outlined in Table 7.

For brownfield sections of the PLR Stage 1 alignment, noise mitigation is required to be considered at locations where GBN from rail traffic exceeds the noise trigger levels outlined in Table 7 **AND** existing GBN levels increase by 3 dB(A) or more.

Table 7 Rail ground-borne noise trigger levels and residential and other sensitive receiver locations

Receiver type	Time of day	Internal noise trigger level, dB(A) [1, 4]
Receiver categories from RING		
Residential	Daytime 7.00am to 10.00pm Night time 10.00pm to 7.00am	40 L_{ASmax} 35 L_{ASmax}
Schools, educational institutions, places of worship	When in use	40-45 L_{ASmax} [2]
Medical	When in use	35 L_{ASmax}
Public buildings	When in use	40 L_{ASmax}
Theatres	When in use	NR 25 [3]
Receiver categories from SPR Clause 7.10.2.1 (b)		
Offices	Not specified, but assume applicable when in use	45 L_{ASmax}
Cinemas	When in use	35 L_{ASmax}
Public halls	When in use	35 L_{ASmax}
Lecture theatres	When in use	35 L_{ASmax}
Film / TV and music recording studios	When in use	NR 15 [3]
Other critical spaces	When in use	Satisfactory levels in AS/NZS2107:2000

General Note: *Ground-borne noise level values are relevant only where they are higher than the airborne noise from railways and where the ground-borne noise levels are expected to be, or are, audible within habitable rooms (RING, EPA 2013).*

Note 1: *L_{ASmax} refers to the maximum noise level not exceeded for 95 percent of rail pass-by events and is measured using the 'slow' response setting on a sound level meter.*

Note 2: *The lower value of the range is applicable where low internal noise levels are expected, such as in areas assigned to studying, listening and praying.*

Note 3: *NR curves are used for rating noise levels and are a set of octave band curves which provide limiting sound pressure level values. NR 15 is equivalent to approximately 20 dBA and NR 25 is approximately 30 dBA.*

Note 4: *For brownfield locations with existing rail movements, noise mitigation needs to be considered if GBN levels from rail traffic exceed the noise trigger levels AND existing GBN levels increase by 3 dB(A) or more*

3.3 Industrial airborne noise trigger levels

Industrial noise from the Project's fixed facilities are assessed based on the noise criteria in the Noise Policy for Industry (NPfI)[5]. The NPfI defines the intrusiveness noise level and the amenity noise level:

- The intrusiveness noise level ($L_{Aeq,15minute}$) is the Rating Background Level (RBL) + 5 dB(A)
- The amenity noise level ($L_{Aeq,\ period}$) is based on acceptable cumulative noise levels for the land use and location

[5] NSW Environmental Protection Authority, Noise Policy for Industry, October 2017

For residential receivers the project noise trigger level is the lower of the intrusiveness noise level and the amenity noise level. For other sensitive receivers only the amenity noise level applies. For residential receivers a sleep disturbance screening is set at L_{AFmax} 52 dB(A) or the RBL + 15 dB, whichever is greater.

The project noise trigger levels for non-residential receivers are provided in Table 8. The intrusive noise levels, amenity noise levels, project noise trigger levels and the sleep disturbance screening criteria for residential receivers are provided in Table 9.

Table 8 Industrial noise criteria for non-residential sensitive receivers

Receiver type	Time period	Location	Trigger level $L_{Aeq(15min)}$ dB(A)
Hotel	Day	Urban - External	65
	Evening	Urban – External	55
	Night	Urban – External	50
	Day	Suburban - External	60
	Evening	Suburban – External	50
	Night	Suburban - External	45
Educational buildings, schools and childcare	When in use	Internal	35
Places of worship	When in use	Internal	40
Hospital	When in use	External	50
Commercial (including non-hospital medical facilities)	When in use	External	65
Industrial	When in use	External	70
Passive recreation	When in use	External	50
Active recreation	When in use	External	55
Theatre / Auditorium / Cinema	When in use	Internal	30[2]
Court / Tribunal	When in use	Internal	30[2]

Note 1: Day: 07:00-18:00 Monday to Saturday & 08:00-18:00 Sundays & Public Holidays. Evening: 18:00-22:00 Monday to Sunday & Public Holidays. Night: 22:00-07:00 Monday to Saturday & 22:00-08:00 Sundays & Public Holidays

Note 2: Based on the AS 2107 guideline

Table 9 Industrial noise criteria for residential receivers

Fixed facilities	Monitoring location	Intrusive $L_{Aeq(15min)}$ dB(A)			Amenity $L_{Aeq(Period)}$ dB(A)			Trigger level $L_{Aeq(15min)}$ dB(A)			Sleep disturb. L_{AFmax}	Notes
		Day	Evening	Night	Day	Evening	Night	Day	Evening	Night		
TPS1 Westmead Terminus stop	BG02	56	53	48	53	53	47	53	53	47[2]	58	L_{Aeq} noise levels dominated by transportation noise. Amenity criteria set at L_{Aeq} -10 dB as per EIS.
Westmead Hospital and Children's Hospital stops	BG03	54	53	52	60	50	45	54	50	45	62	Amenity criteria set as 'Urban' residential area due to close proximity of industrial nose sources from Westmead Medical precinct.
TPS2 Factory Street stop	BG05	50	44	42	49	48	44	49	44	42[2]	52	L_{Aeq} noise levels dominated by transportation noise. Amenity criteria set at L_{Aeq} -10 dB as per EIS.
Fennel Street stop	BG06	56	55	44	54	55	50	54	54[3]	44	54	L_{Aeq} noise levels dominated by transportation noise. Amenity criteria set at L_{Aeq} -10 dB as per EIS.
Prince Alfred Square stop	BG07	64	62	51	59	58	54	59	58	51	61	L_{Aeq} noise levels dominated by transportation noise. Amenity criteria set at L_{Aeq} -10 dB as per EIS.
TPS3 Eat Street, Parramatta Square and Harris Street stops	BG08	63	58	48	59	57	52	59	57	48	58	L_{Aeq} noise levels dominated by transportation noise. Amenity criteria set at L_{Aeq} -10 dB as per EIS.
Tramway Avenue stop	BG09	48	45	39	46	43	40	46	43	39	52	L_{Aeq} noise levels dominated by transportation noise. Amenity criteria set at L_{Aeq} -10 dB as per EIS.
TPS4 and TPS8 SaM facility Camellia stop	BG10	56	53	46	52	48	47	52	48	46	56	L_{Aeq} noise levels dominated by transportation noise. Amenity criteria set at L_{Aeq} -10 dB as per EIS.
SaM facility – future receivers, Camellia Town Centre	RTA10	-	-	52	-	-	-	-	-	52	62	Attended measurements taken during worst-case night period have been used establish criteria for future residential receivers.
Rydalmere stop	BG11	50	48	43	50	48	46	50	48	43	53	L_{Aeq} noise levels dominated by transportation noise. Amenity criteria set at L_{Aeq} -10 dB as per EIS.
BOCC Dundas stop	BG12	50	48	42	55	45	40	50	45	40[2]	52	No existing industrial noise. Amenity criteria set as 'Suburban' residential area.
Telopea stop	BG14	48	45	36	48	47	44	48	45	36	52	L_{Aeq} noise levels dominated by transportation noise. Amenity criteria set at L_{Aeq} -10 dB as per EIS.
TPS7 Carlingford stop	BG16	57	52	44	50	48	46	50	48	44[2]	54	L_{Aeq} noise levels dominated by transportation noise. Amenity criteria set at L_{Aeq} -10 dB as per EIS.

Note 1: Day: 07:00-18:00 Monday to Saturday & 08:00-18:00 Sundays & Public Holidays. Evening: 18:00-22:00 Monday to Sunday & Public Holidays. Night: 22:00-07:00 Monday to Saturday & 22:00-08:00 Sundays & Public Holidays

Note 2: Condition of Approval E52 indicates that the residential night period criteria for the TPS facilities applies during all time periods.

Note 3: Monitored evening period level was found to be higher than the daytime level, therefore the evening period criteria has been reduced to match the day criteria for assessment purposes.

3.4 Ground-borne (tactile) vibration objectives

The ground-borne tactile vibration objectives are based on the "intermittent vibration" (preferred vibration dose values) specified in the *Assessing Vibration: A Technical Guideline* (AVTG) (DEC, 2006). These are defined in Table 2.4 of the guideline and are reproduced in Table 10.

Table 10 Acceptable vibration dose values for intermittent vibration (m/s$^{1.75}$)

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

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

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

3.5 Ground-borne vibration objectives for sensitive equipment

The vibration criterion (VC) goals for critical spaces with vibration sensitive equipment are those based on the curves contained in the *ANC Guidelines – Measurement and Assessment of Ground-borne Noise & Vibration, Association of Noise Consultants* (2012). The VC curves are summarised in Table 11 and illustrated in Figure 2.

Table 11 ASHRAE criteria for sensitive equipment (reproduced from ANC Guidelines, 2012)

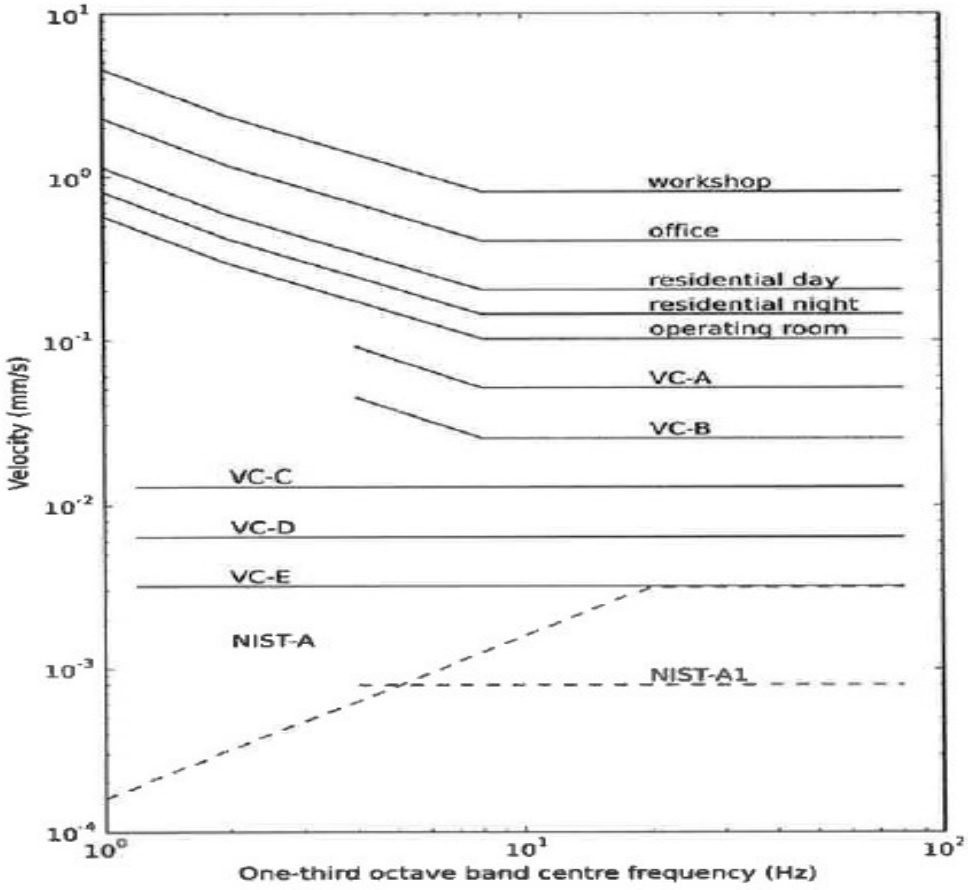
Equipment requirements	Curve[1] (rms velocity)
Adequate for computer equipment, probe test equipment, and microscopes less than 40 x magnification	0.203 mm/s residential night
Bench microscopes up to 100 x magnification; laboratory robots	0.102 mm/s operating room
Bench microscopes up to 400 x magnification; optical and other precision balances; coordinate measuring machines; metrology laboratories; optical comparators; microelectronics manufacturing equipment; proximity and projection aligners, etc.	0.051 mm/s VC-A
Microsurgery, eye surgery, neurosurgery; bench microscopes at magnification greater than 400 x; optical equipment on isolation tables; microelectronics manufacturing equipment, such as inspection and lithography equipment (including steppers) to 3 mm line widths.[2]	0.025 mm/s VC-B
Electron microscopes up to 30, 000 x magnification; microtomes; magnetic resonance imagers; microelectronics manufacturing equipment, such as lithography and inspection equipment to 1 mm detail size.[2]	0.013 mm/s VC-C
Electron microscopes at magnification greater than 30, 000 x; mass spectrometers; cell implant equipment; microelectronics manufacturing equipment, such as aligners, steppers and other critical equipment for photolithography with line widths of 1/2 pm; includes electron beam systems.[2]	0.0064 mm/s VC-D

Equipment requirements	Curve[1] (rms velocity)
Un-isolated laser and optical research systems; microelectronics manufacturing equipment, such as aligners, steppers, and other critical equipment for photolithography with line widths of 1/4 pm; includes electron beam systems.[2]	0.0032 mm/s VC-E

Note 1: See Figure 2 for corresponding curves

Note 2: Classes of microelectronics manufacturing equipment

Figure 2 ASHRAE and NIST criteria (from ANC Guidelines, 2012)



4 Construction noise and vibration objectives

Noise and vibration objectives are presented in Table 12. Residential NMLs are dependent on the Noise Catchment Area (NCA) of the residence which are presented in Table 13.

Table 12 Construction noise and vibration objectives

Land use	Airborne NML (external)				Ground-borne NML (internal)	Vibration objective human comfort		NML source	Vibration objective source
	Day (Standard Hours)	Day (out-of-hours) [dB(A)]	Evening [dB(A)]	Night [dB(A)]	Residential Eve/Night Others when in use [dB(A)]	Day 7am - 10pm [VDV, m/s$^{1.75}$]	Night 10pm – 7am) [VDV, m/s$^{1.75}$]		
Acoustic Spaces	50	50	50	50	30	0.8	0.8	Internal noise goal for theatres from AS2107, assuming a 20 dB outside-to-inside attenuation, as per EIS. The noise goals for critical acoustic spaces are to be established on an individual basis through community consultation, as per Condition E31.	DECC Assessing Vibration; a technical guideline "Adverse comment probable eVDV m/s$^{1.75}$"
Active Recreation	65	65	65	65	N/A	n/a	n/a	ICNG	
Child Care	50	50	50	50	45	0.4	0.8	AAAC - guideline for Child Care Centre Acoustic Assessment, assuming a conservative façade loss of 10 dB(A)	
Cinema	55	55	55	55	35	0.8	0.8	AS2107 'maximum', assuming a conservative façade loss of 20 dB(A)	
Commercial (offices and retail outlets)	70	70	70	70	Offices: 50 Retail: 55	0.8	0.8	ICNG	
Educational buildings and Schools	55	55	55	55	45	0.8	0.8	ICNG, assuming a conservative façade loss of 10 dB(A)	
Hotel	60	60	60	60	Evening: 40 Night: 35	0.4	0.26	AS2107 'maximum', assuming a conservative façade loss of 20 dB(A)	
Industrial	75	75	75	75	55 - 60	1.6	1.6	ICNG	
Medical Buildings	65	65	65	65	50	0.8	0.8	ICNG, assuming a conservative façade loss of 20 dB(A)	
Place of Worship	55	55	55	55	45	0.8	0.8	ICNG, assuming a conservative façade loss of 10 dB(A)	
Passive Recreation	60	60	60	60	N/A	n/a	n/a	ICNG	
Residential	RBL +10[1]	RBL +5[1]	RBL +5[1]	RBL +5[1]	Evening: 40 Night: 35	0.4	0.26	ICNG	

Note: 1. Refer Table 13

Table 13 Residential NMLs

NCA	Existing Noise Levels, dB(A)			Residential NMLs based on ICNG (external)			
	RBL Day	RBL Evening	RBL Night	Day[1] (Standard Hours)	Day[2] (out-of-hours)	Evening[3]	Night[4]
NCA01	49	47	37	59	54	52	42
NCA02	51	48	43	61	56	53	48
NCA03	51	48	43	61	56	53	48
NCA04	49	48	47	59	54	53	52
NCA05	49	48	47	59	54	53	52
NCA06	42	41	44	52	47	46	46
NCA07	51	50	39	61	56	55	44
NCA08	59	57	46	69	64	62	51
NCA09	58	53	43	68	63	58	48
NCA10	43	40	34	53	48	45	39
NCA11	43	40	34	53	48	45	39
NCA12	51	48	41	61	56	53	46
NCA13	51	48	41	61	56	53	46
NCA14	45	43	38	55	50	48	43
NCA15	45	43	37	55	50	48	42
NCA16	46	42	34	56	51	47	39
NCA17	43	40	31	53	48	45	36
NCA18	42	40	32	52	47	45	37
NCA19	52	47	39	62	57	52	44

Note: 1. Standard construction hours from 7 am to 6 pm Monday to Friday and from 8 am to 6 pm Saturday

2. Out-of-hours day period from 8 am to 6 pm Sunday and Public holidays - OOHW P1

3. Evening period from 6 pm to 10 pm Monday to Sunday - OOHW P1

4. Night-time period from 10 pm to 7 am Monday to Friday, from 10 pm am to 8 am Saturday, Sunday and Public holidays - OOHW P2

4.1 Construction vibration damage screening level

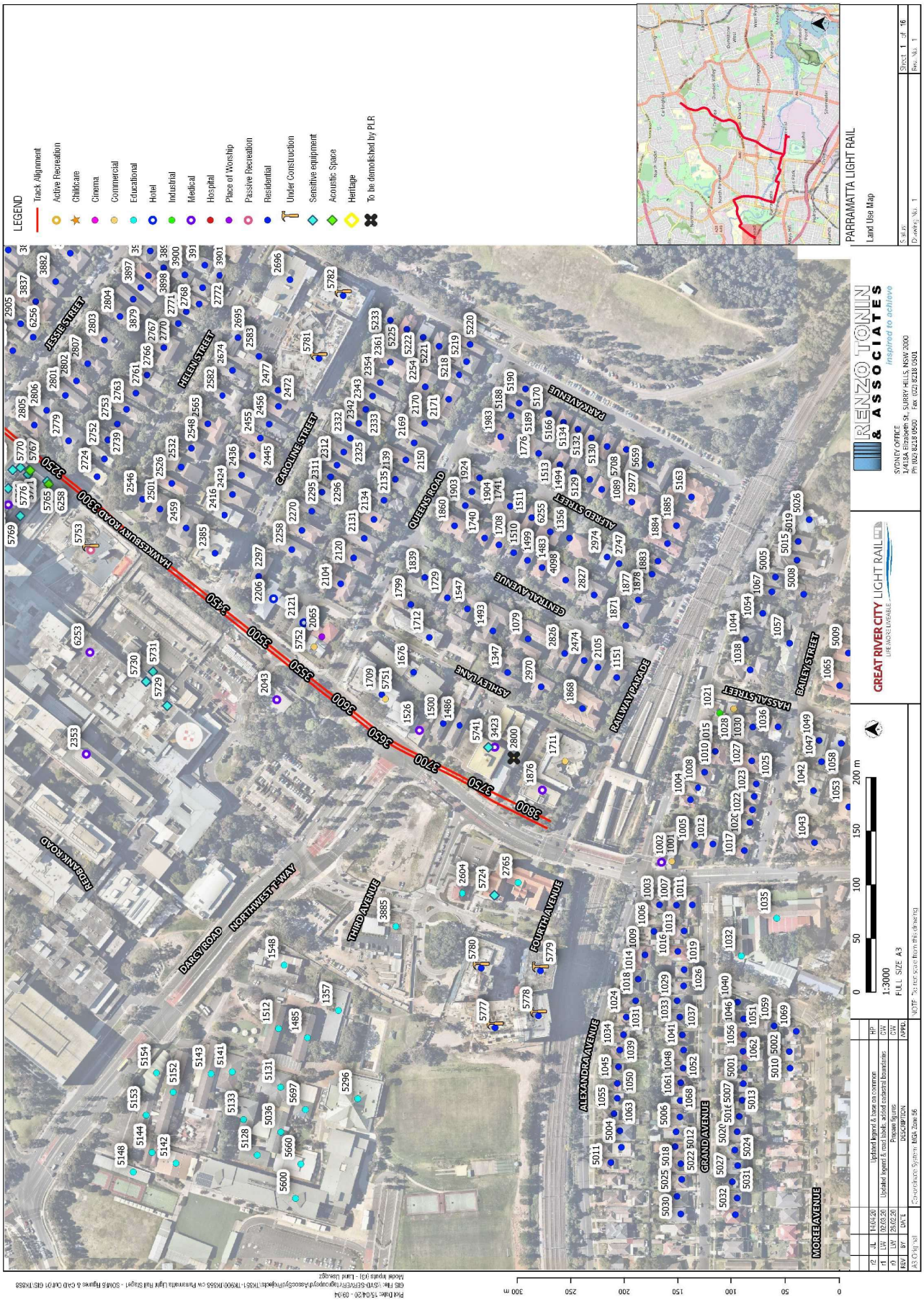
Vibration management levels to limit the potential for structural damage to buildings are outlined in Section A.3.3 and A.3.4 of the Transport for NSW Construction Noise and Vibration Strategy (CNVS). A conservative vibration damage screening level (peak component particle velocity) per receiver type is detailed in the CNVS and outlined below:

- Unreinforced or light framed structures: 7.5 mm/s (non-heritage buildings)
- Heritage structures (structurally unsound): 2.5 mm/s

4.2 Construction vibration criteria for sensitive equipment

The vibration criterion (VC) goals for critical spaces with vibration sensitive equipment are those based on the curves contained in the *ANC Guidelines – Measurement and Assessment of Ground-borne Noise & Vibration, Association of Noise Consultants* (2012). The VC curves are summarised in Table 11 and illustrated in Figure 2.

APPENDIX A Track alignment and land use drawings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FOURTH AVENUE
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QUEENS ROAD
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PARK AVENUE
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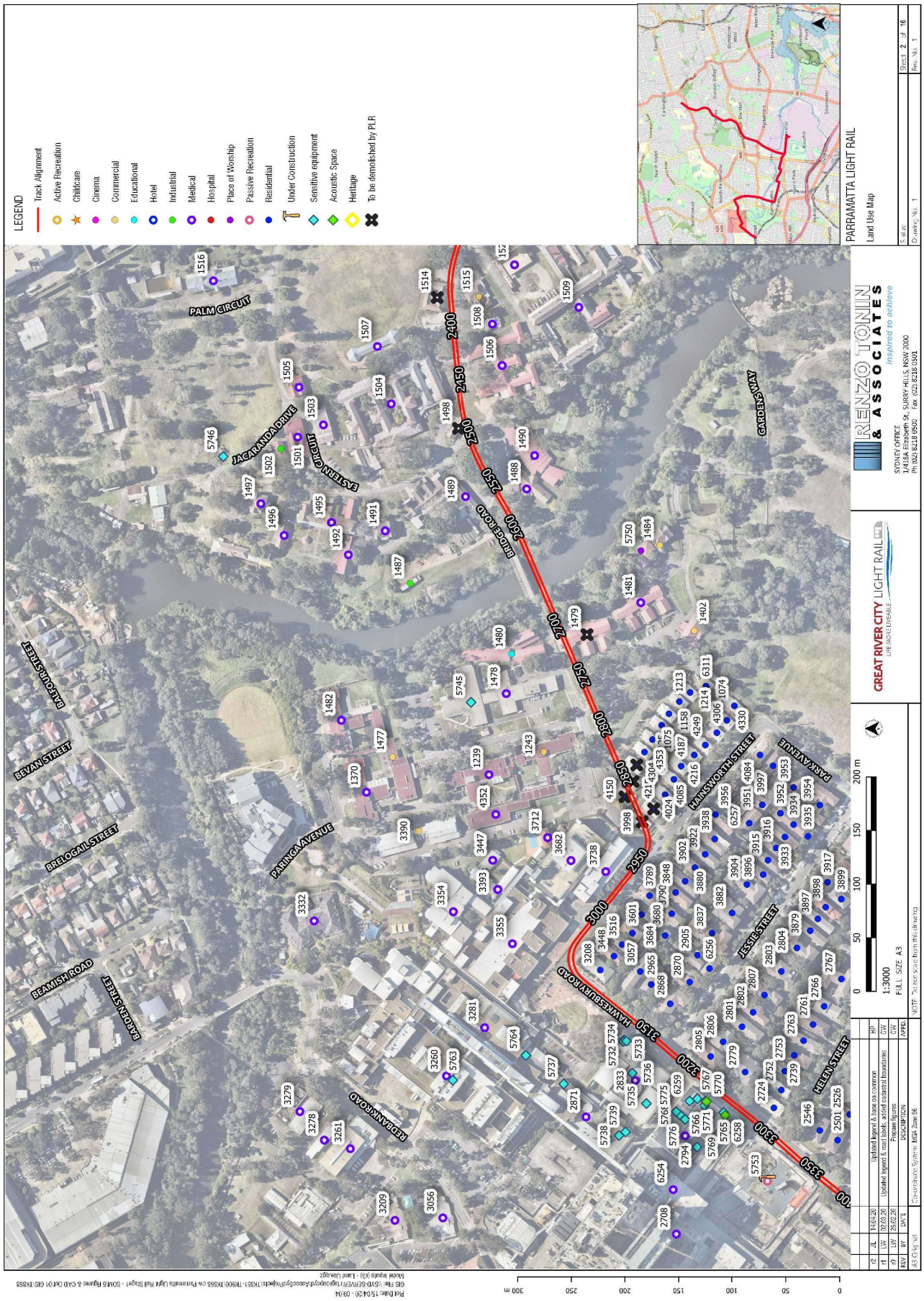
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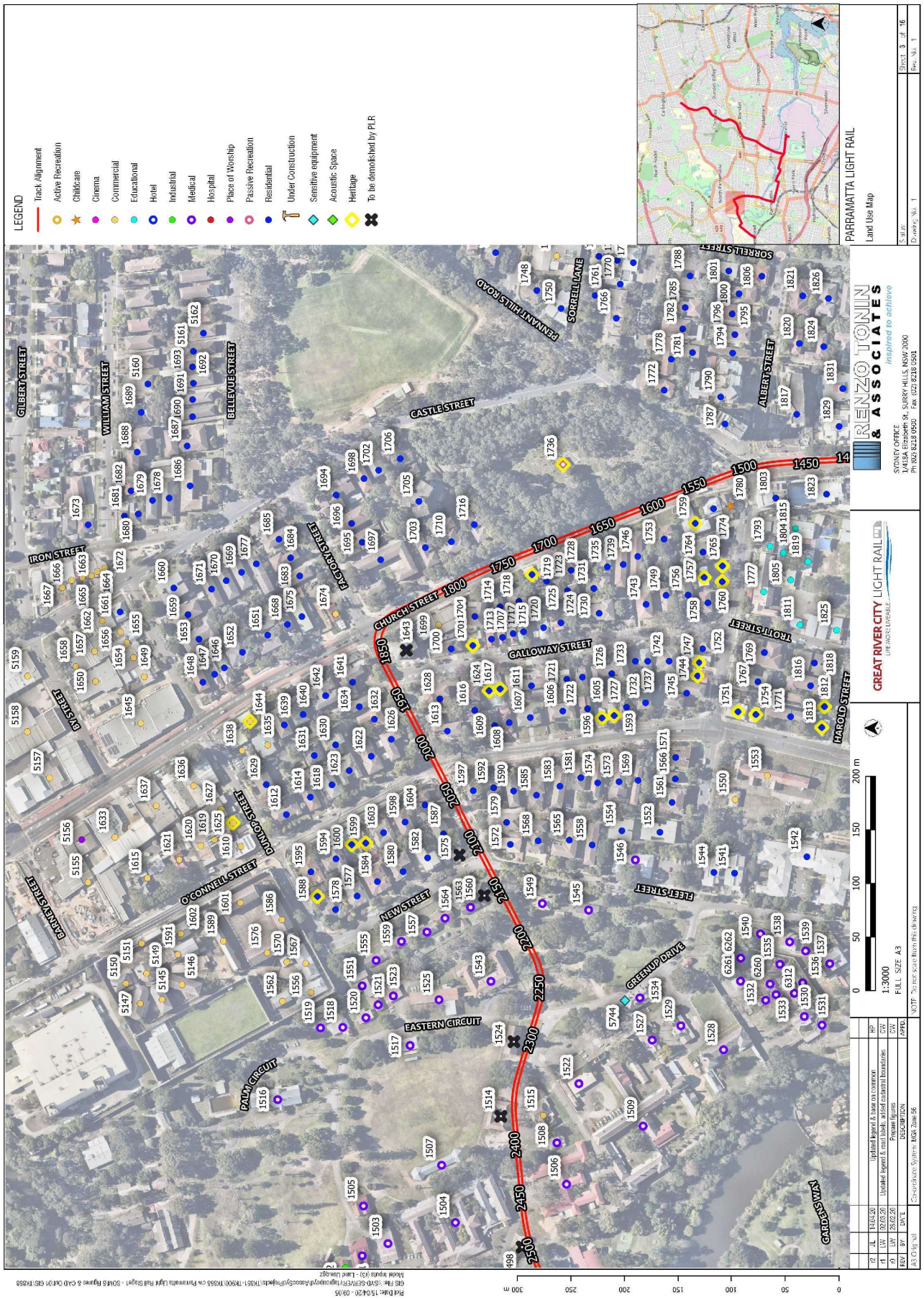
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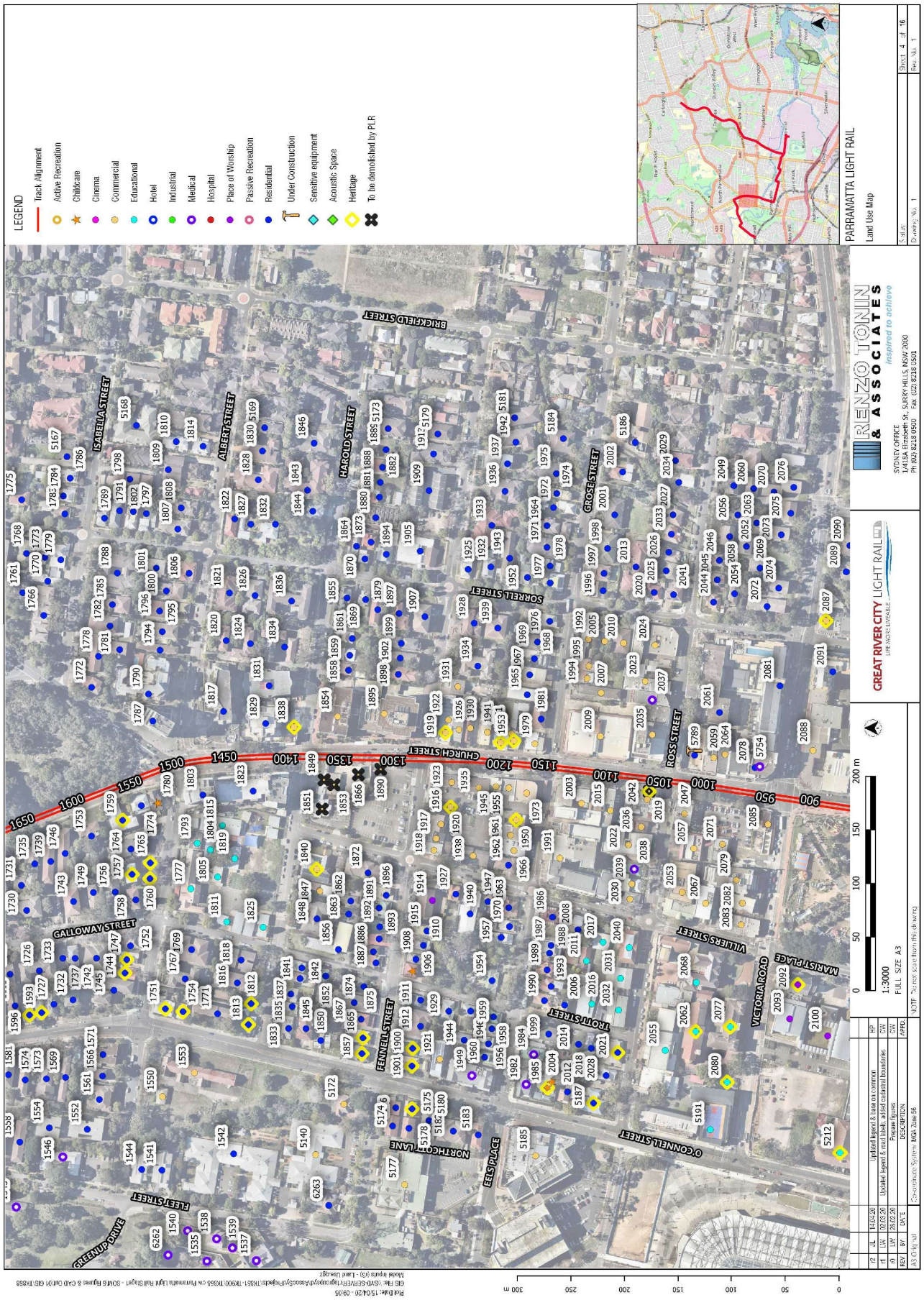
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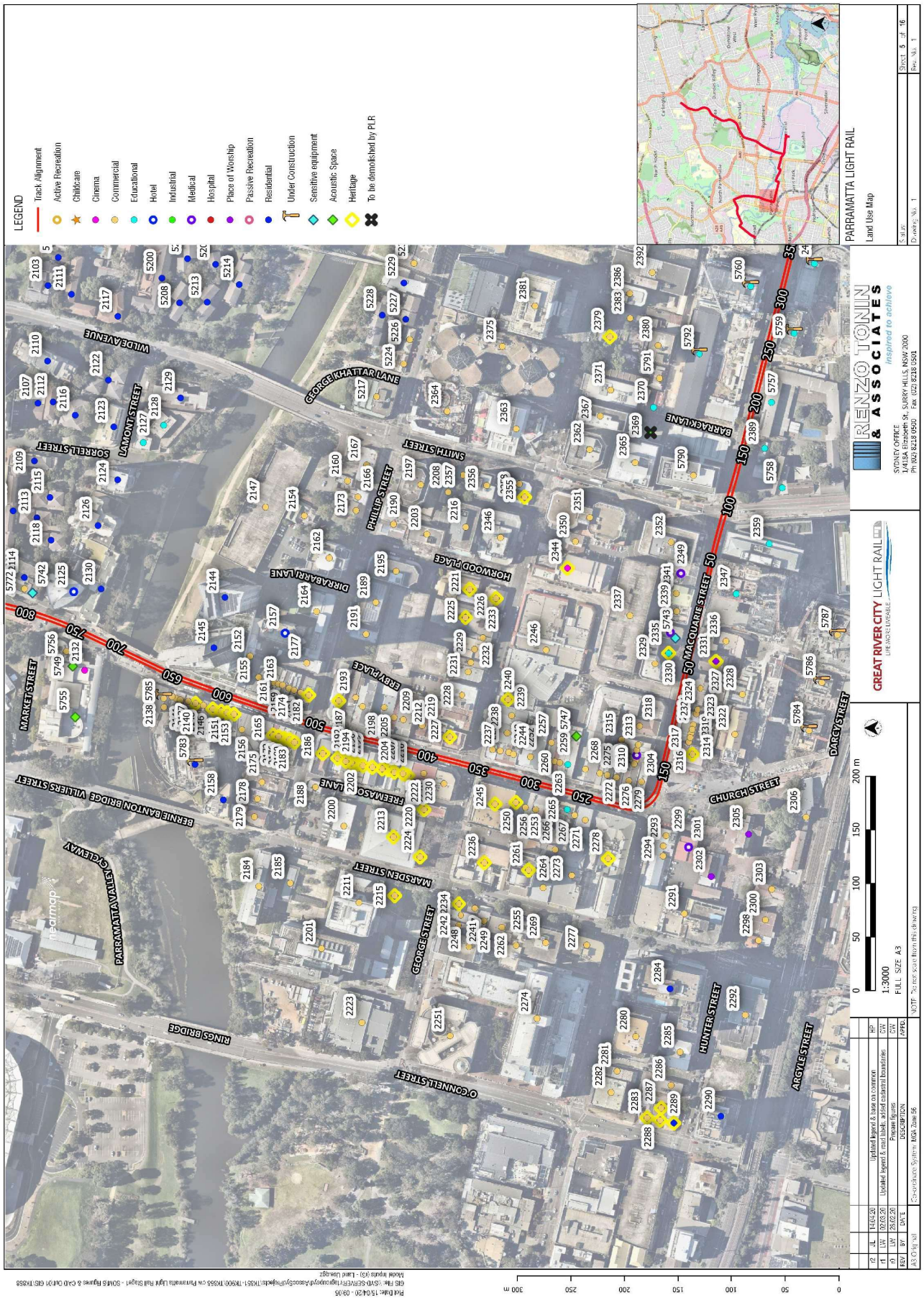
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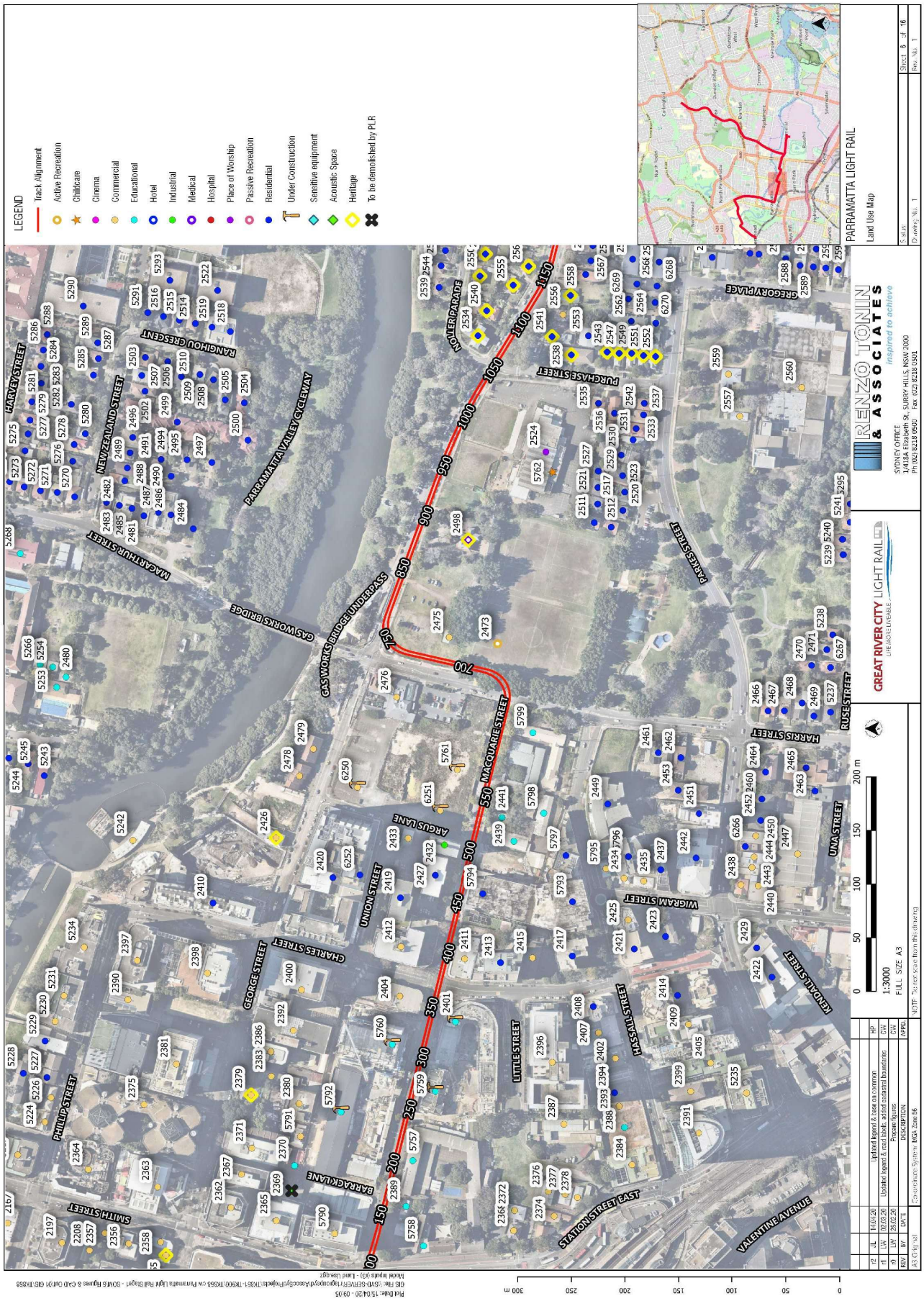
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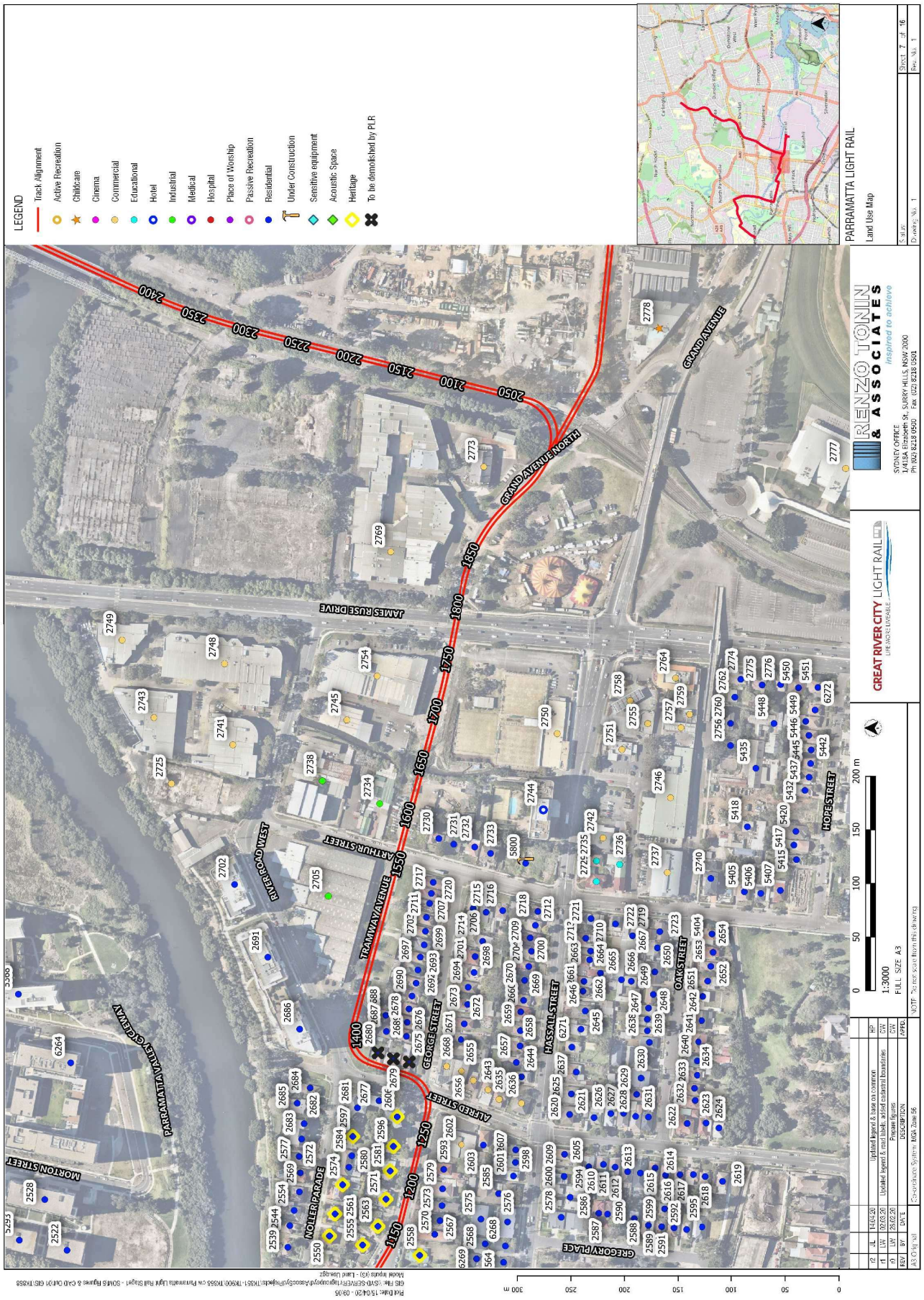
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TRAMWAY AVENUE
RIVER ROAD WEST
PARRAMATTA CYCLEWAY
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HASSALL STREET
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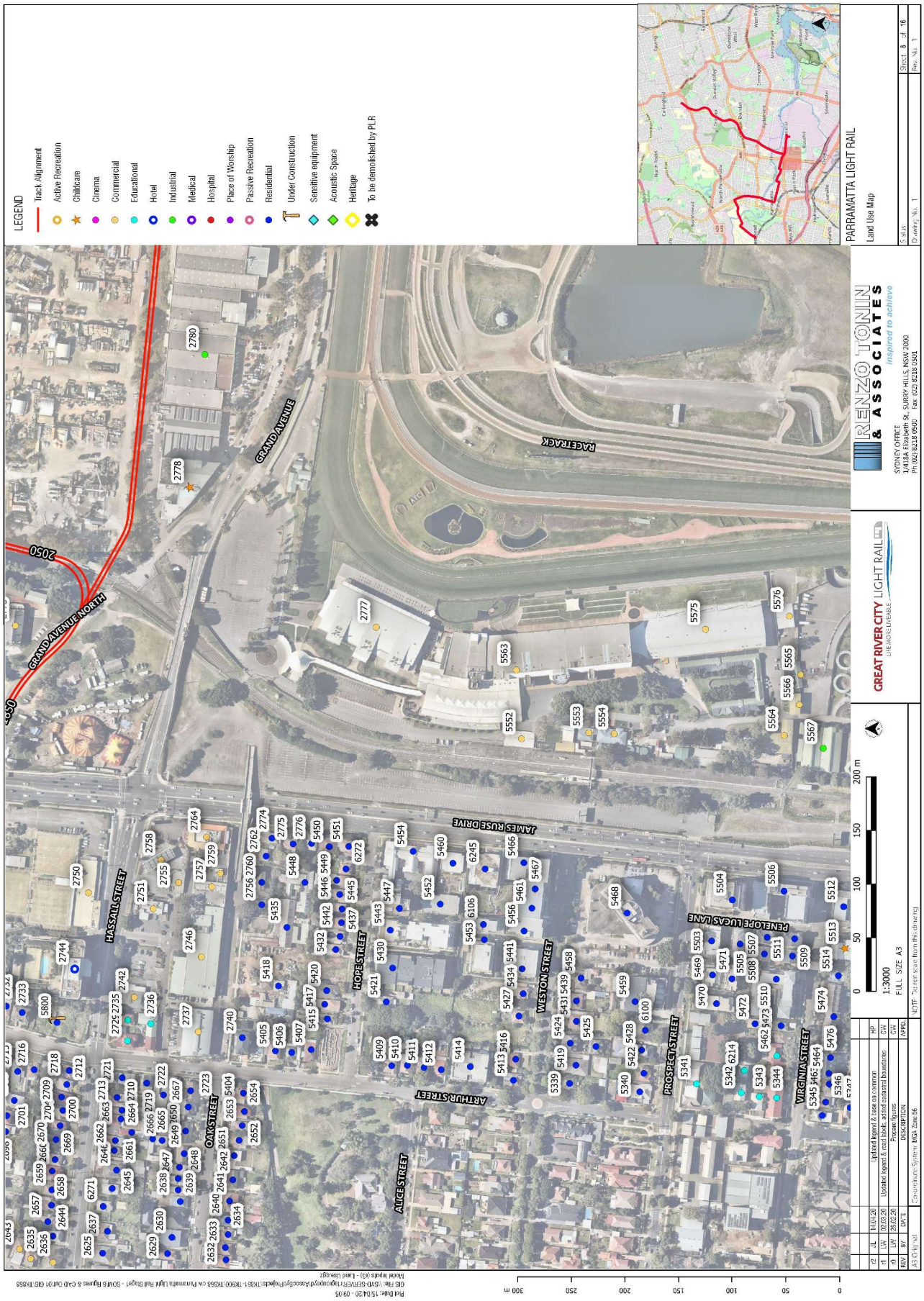
HOPE STREET
GREGORY PLACE
MOLLER PARADE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Place of Worship
Passive Recreation
Residential
Under Construction
Sensitive equipment
Acoustic Space
Heritage
To be demolished by PLR
PARRAMATTA LIGHT RAIL
Land Use Map
RENZO TONIN & ASSOCIATES
inspired to achieve
SYDNEY OFFICE
1/418A Elizabeth St, SURRY HILLS, NSW 2000
Ph (02) 8218 0500 Fax (02) 9218 0501
GREAT RIVER CITY LIGHT RAIL
LIFE MADE LIVEABLE
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GRAND AVENUE
GRAND AVENUE NORTH
RACETRACK
JAMES RUSE DRIVE
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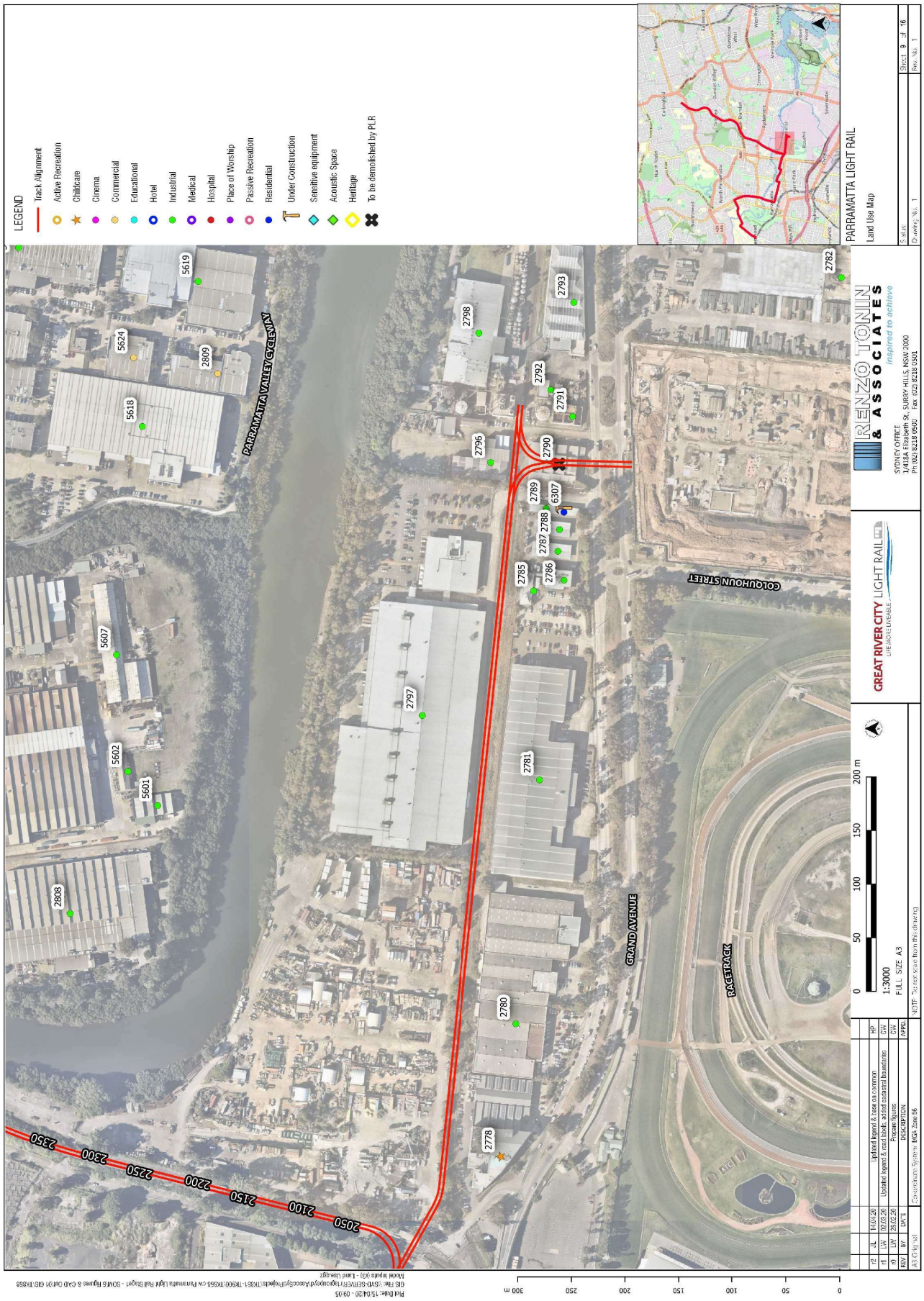
PROSPECT STREET
VIRGINIA STREET
OAK STREET
ALICE STREET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RENZO TONIN & ASSOCIATES
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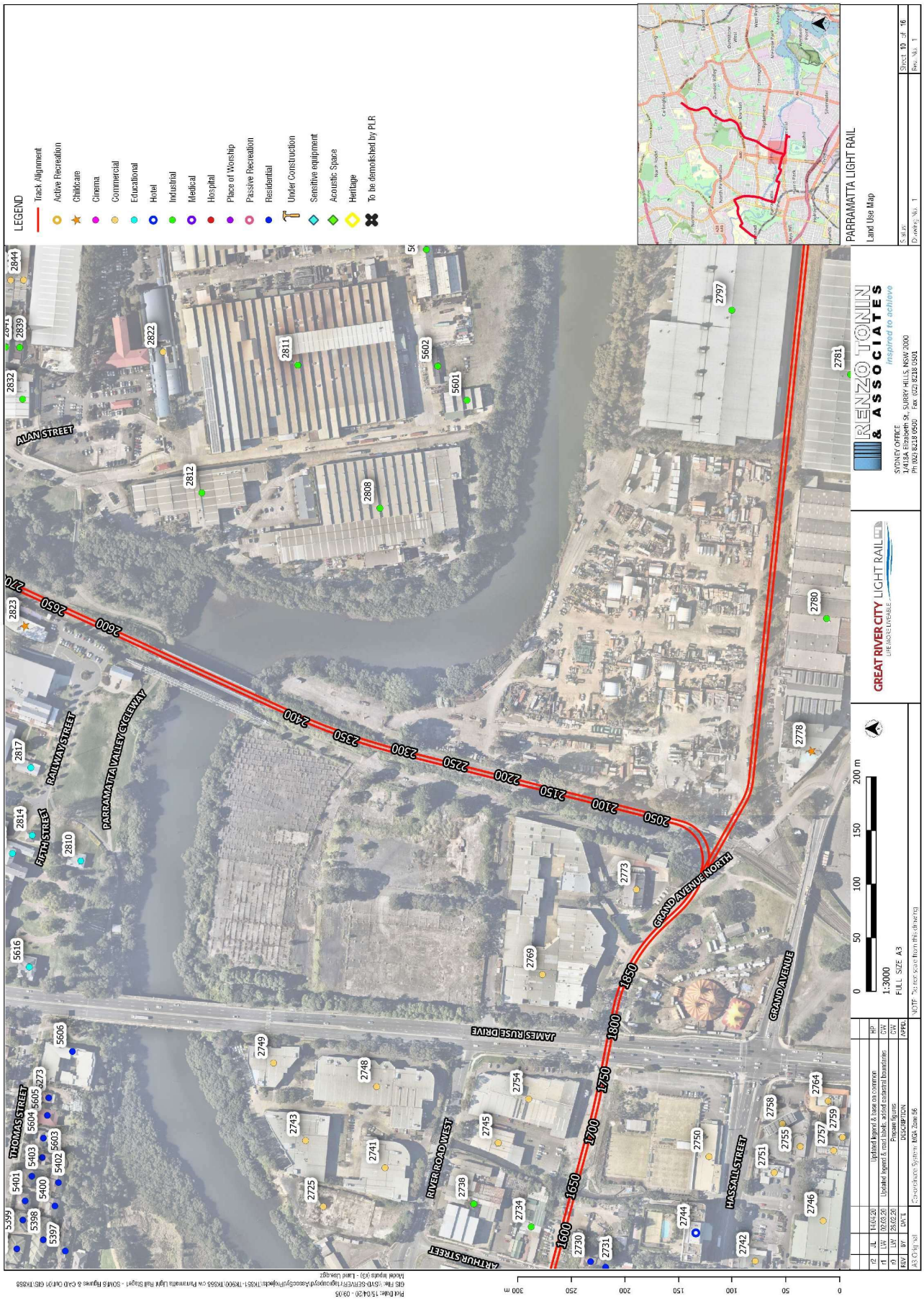
PARRAMATTA LIGHT RAIL
Land Use Map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GREAT RIVER CITY LIGHT RAIL
LIFE MADE LIVEABLE
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FULL SIZE A3
ALAN STREET
RAILWAY STREET
PARRAMATTA VALLEY CYCLEWAY
FIFTH STREET
THOMAS STREET
JAMES RUSE DRIVE
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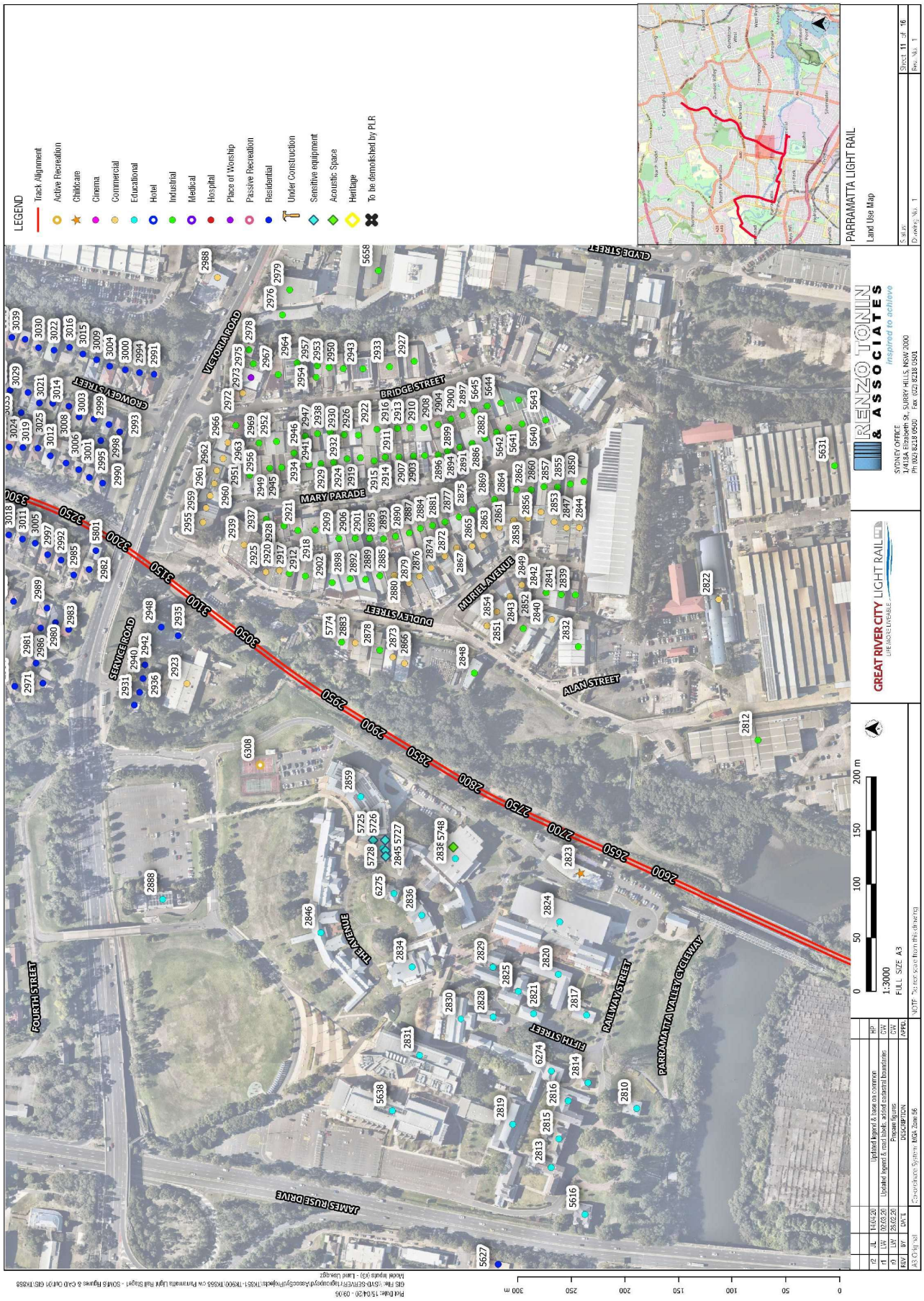
GRAND AVENUE
RIVER ROAD WEST
HASSALL STREET
ARTHUR STREET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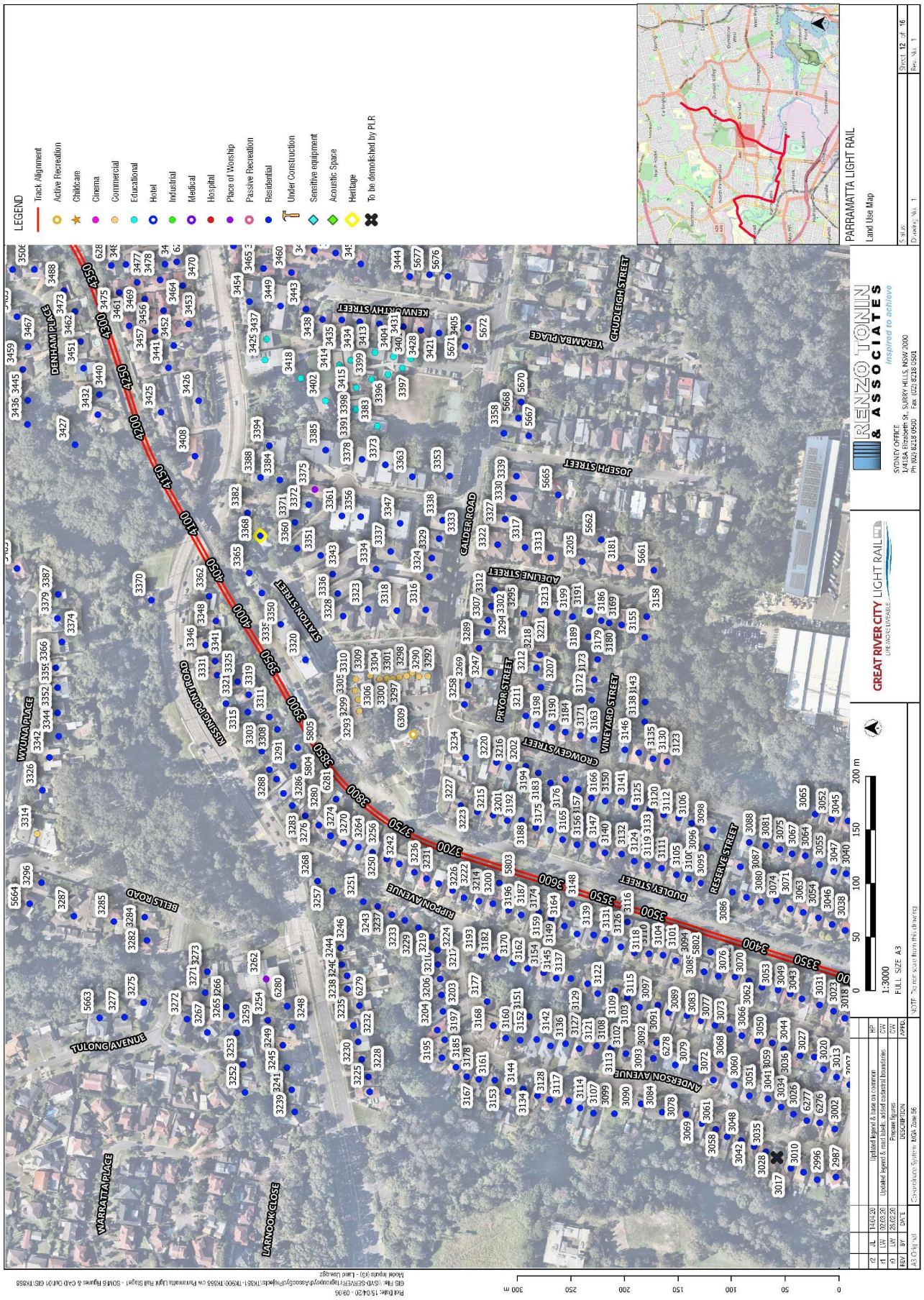
1/418A Elizabeth St, SURRY HILLS, NSW 2000
Ph (02) 8218 0500 Fax (02) 8218 0501
GREAT RIVER CITY LIGHT RAIL
LIFE MORE LIVEABLE
1:3000
FULL SIZE A3
Coordinate System: MGA Zone 56
Updated legend & note on common
Undated legend & mod labels, added residential boundaries
Preview figures
DESCRIPTION
VICTORIA ROAD
BRIDGE STREET
CROWLEY STREET
MARY PARADE
CLYDE STREET
SERVICE ROAD
DUDLEY STREET
MURIEL AVENUE
ALAN STREET
THE AVENUE
FOURTH STREET
FIFTH STREET
RAILWAY STREET
JAMES RUSE DRIVE
PARRAMATTA VALLEY CYCLEWAY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Ph (02) 8218 0500 Fax (02) 8218 0501
GREAT RIVER CITY LIGHT RAIL
LIFE MADE LIVEABLE
1:3000
FULL SIZE A3
0 50 100 150 200 m
TULONG AVENUE
BELLS ROAD
WARRATAH PLACE
LARNOOK CLOSE
WYUNA PLACE
KISSING POINT ROAD
STATION STREET
CALDER ROAD
ADELINE STREET
PRYOR STREET
CROWLEY STREET
VINEYARD STREET
RIPPON AVENUE
DUDLEY STREET
RESERVE STREET
ANDERSON AVENUE
JOSEPH STREET
VERAMBA PLACE
CHUDLEIGH STREET
KENWORTHY STREET
DENHAM PLACE
3700
3750
3800
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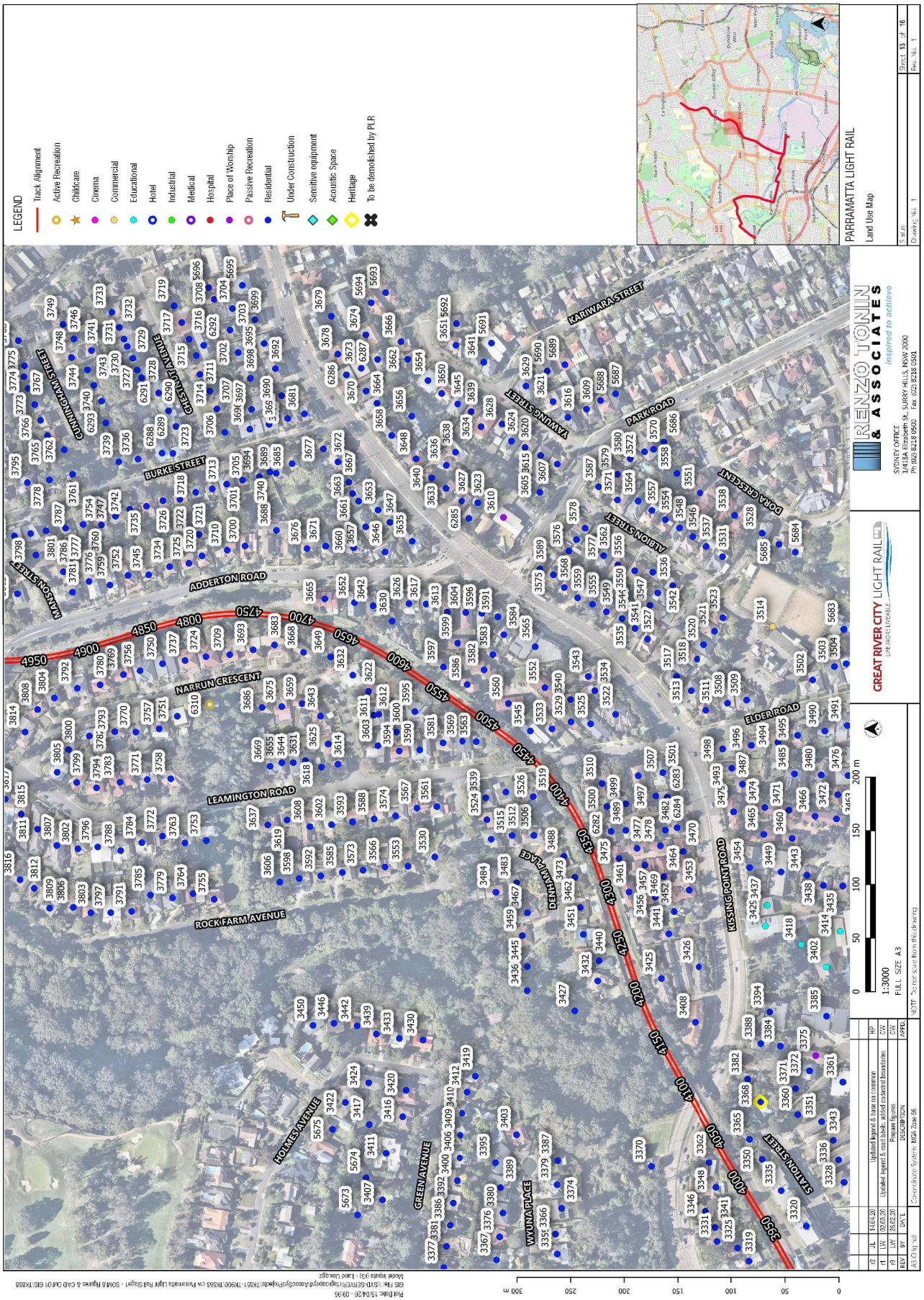
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Commercial
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PARRAMATTA LIGHT RAIL
Land Use Map
GREAT RIVER CITY LIGHT RAIL
RENZO TONIN & ASSOCIATES
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Ph (02) 8218 0500 Fax (02) 9218 0501
ADDERTON ROAD
NARRUN CRESCENT
LEAMINGTON ROAD
ROCKFARM AVENUE
HOLMES AVENUE
GREEN AVENUE
WYUNA PLACE
BURKE STREET
GUNNINGAH AVENUE
CHESTNUT AVENUE
MANSON STREET
KARIWARA STREET
PARK ROAD
YAWUNG STREET
ALBION STREET
DORA CRESCENT
ELDER ROAD
DENMAN PLACE
KISSING POINT ROAD
STATION STREET
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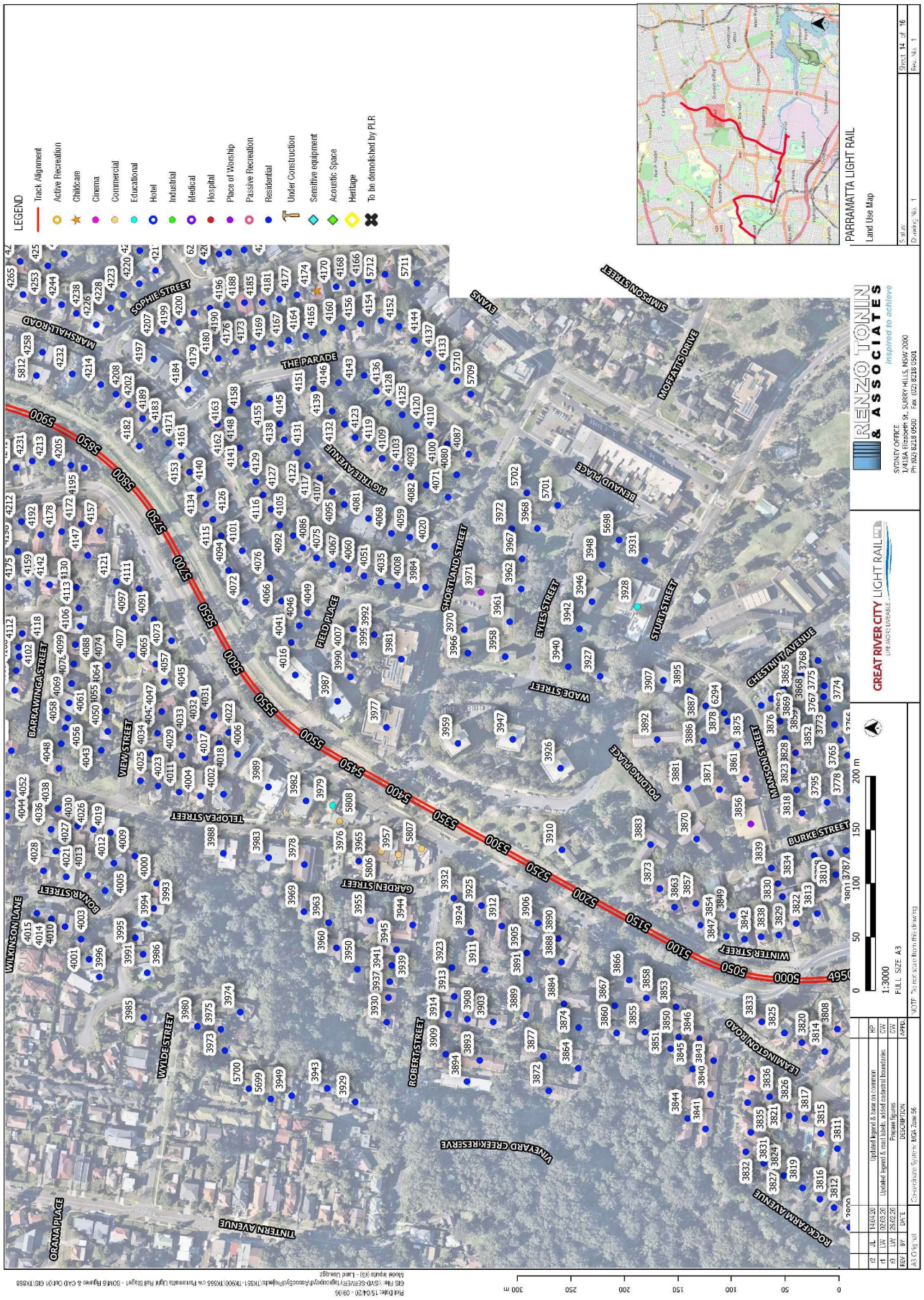
FULL SIZE A3


LEGEND
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Hospital
Place of Worship
Passive Recreation
Residential
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Acoustic Space
Heritage
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PARRAMATTA LIGHT RAIL
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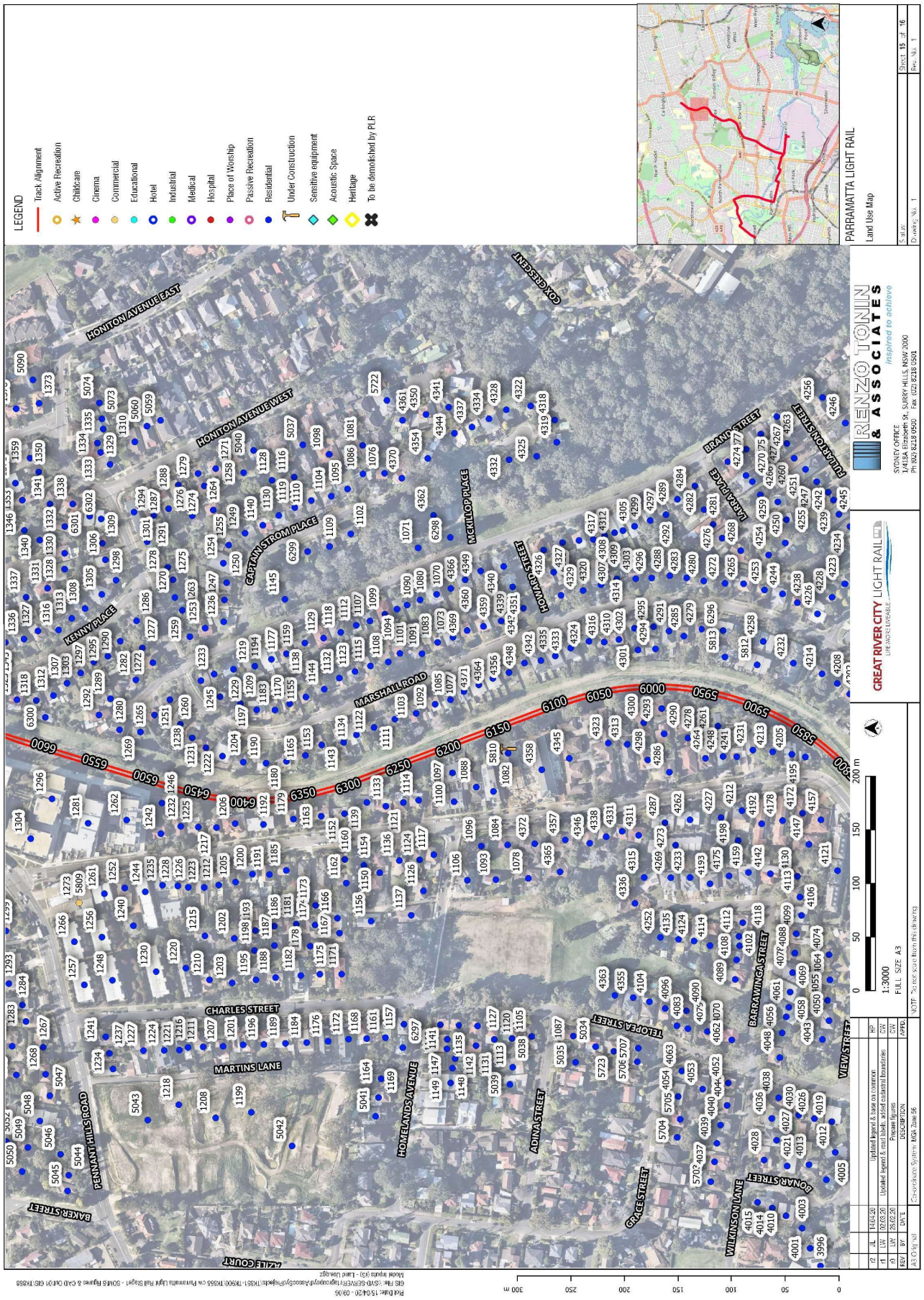
1/418A Elizabeth St, SURRY HILLS, NSW 2000
Ph (02) 8218 0500 Fax (02) 8218 0501
GREAT RIVER CITY LIGHT RAIL
LIFE MORE LIVEABLE
1:3000
FULL SIZE A3
Coordinate System: MGA Zone 56
DESCRIPTION
Updated legend & note on common
Updated legend & most labels added industrial boundaries
Preview figures
WILKINSON LANE
BARRAVINGA STREET
VIEW STREET
TELOPEA STREET
GARDEN STREET
WYLDE STREET
ROBERT STREET
VINEYARD CREEK RESERVE
TINTERN AVENUE
ORANA PLACE
THE PARADE
SOPHIE STREET
MARSHALL ROAD
FIG TREE AVENUE
SHORTLAND STREET
FIELD PLACE
EYLES STREET
WADE STREET
POLDING PLACE
BENAUD PLACE
EVANS
SIMPSON STREET
MORATIS DRIVE
STURT STREET
CHESTNUT AVENUE
MANSON STREET
BURKE STREET
WINTER STREET
LEARMONTH ROAD
ROCKCARMI AVENUE


LEGEND
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Ph (02) 8218 0500 Fax (02) 9218 0501
GREAT RIVER CITY LIGHT RAIL
LIFE MOVES LIVEABLE
HONITON AVENUE EAST
HONITON AVENUE WEST
CAPTAIN STROM PLACE
KENNY PLACE
MARSHALL ROAD
CHARLES STREET
MARTINS LANE
PENNANT HILLS ROAD
BAKER STREET
AZILE COURT
HOMELANDS AVENUE
ADINA STREET
GRACES STREET
WILKINSON LANE
BONAR STREET
BARRAWINGA STREET
TEOPEA STREET
VIEW STREET
MCKILLOP PLACE
HOWARD STREET
COX CRESCENT
BRAND STREET
HILLARTON STREET
LARKHAM PLACE
1:3000
FULL SIZE A3
0 50 100 150 200 m
Sheet 15 of 16

APPENDIX B Land use database

Refer to database in Document Number **PLR1SOM-GLR-ALL-NV-RPT-001002 [A]**

Appendix B-2 – Heritage items

Heritage items identified within the cosmetic damage screening criteria minimum working distances in the EIS: Technical Paper – Noise and Vibration Impact Assessment (Table 58) are presented in Table B-1.

Table B-1: Heritage Items Identified within Cosmetic Damage Minimum Safe Working Distance (from the EIS: Technical Paper – Noise and Vibration Impact Assessment, with additional items identified for NCA05 and NCA12A)

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

NCA	Item	Location
NCA09	Archaeological terrestrial	Church Street
NCA09	Former ANZ bank and potential archaeological site	Church Street
NCA09	Sandstone and brick wall	Church Street
NCA09	Telstra House (former post office) and potential archaeological site	Church Street
NCA09	HMV (former Commonwealth Bank) and potential archaeological site	Church Street
NCA09	Archaeological/terrestrial	Church Street
NCA09	Various Shops	Church Street
NCA09	Parramatta House and potential archaeological site	Church Street
NCA09	Archaeological/terrestrial	Church Street
NCA09	Shop and potential archaeological site	Church Street
NCA09	Shops and potential archaeological site	Church Street
NCA09	Former court house wall, sandstone cellblock and potential archaeological site	Church Street
NCA09	Horse parapet facade and potential archaeological site	Church Street
NCA09	Archaeological/terrestrial	Church Street
NCA09	Shop and potential archaeological site	Church Street
NCA09	Shop, office and potential archaeological site	Church Street
NCA09	Shop and potential archaeological site	Church Street
NCA09	Shop and potential archaeological site	Church Street
NCA09	Shop and potential archaeological site	Church Street
NCA09	Westpac Bank	Church Street
NCA09	Shop and potential archaeological site	Church Street
NCA09	Former David Jones Department Store	Church Street
NCA09	Shops and offices	Church Street
NCA10	Bicentennial Square and adjoining buildings	Macquarie Street
NCA10	Convict barracks wall	Macquarie Street

NCA	Item	Location
NCA10	Kia Ora and potential archaeological site	Macquarie Street
NCA10	Bicentennial Square and adjoining buildings	Macquarie Street
NCA10	Convict drain	Macquarie Street
NCA10	Centennial memorial clock	Macquarie Street
NCA10	Arthur Phillip High School and potential archaeological site	Macquarie Street
NCA10	Murrays' Building and potential archaeological site	Macquarie Street
NCA10	Leigh memorial Uniting Church	Macquarie Street
NCA10	Cottages and potential archaeological site	Barrack Lane
NCA10	Convict barracks wall	Barrack Lane
NCA10	Robin Thomas Reserve	Harris Street
NCA10	HMAS Parramatta shipwreck and memorials	George Street
NCA10	Tara (also known as Ellengowan)	George Street
NCA10	Queen's Wharf Reserve and stone wall and potential archaeological site	George Street
NCA11	Cottage	George Street
NCA11	Trees in median strip	George Street
NCA11	Bulimba	George Street
NCA11	Residential flats and houses	George Street
NCA12	Sewage Pumping Station 67	Grand Avenue
NCA12	Tram alignment	Grand Avenue
NCA12	Grave of Eliner Magee & child	Carlingford Line
NCA12	Clyde Carlingford Rail Bridge abutments	Carlingford Line
NCA12A	Granville Town Hall, 10 Carlton Street, Granville	Rosehill and Camellia
NCA12A	The Barn, 138 Parramatta Road, Granville	Rosehill and Camellia
NCA12A	Chateau Blanc, 51 South Street, Granville	Rosehill and Camellia
NCA12A	3-5 A'Beckett Street, Granville	Rosehill and Camellia

NCA	Item	Location
NCA12A	Latalda, 20 A'Beckett Street, Granville	Rosehill and Camellia
NCA12A	Conjoined residences, 22, 24 A'Beckett Street, Granville	Rosehill and Camellia
NCA12A	Conjoined residences, 42 Onslow Street, Granville	Rosehill and Camellia
NCA12A	Conjoined residences, 34, 36 Kemp Street, Granville	Rosehill and Camellia
NCA12A	Duck Creek Bridge, Great Western Highway, Granville	Rosehill and Camellia
NCA12A	Granville Boys High School, 10 Mary Street, Granville	Rosehill and Camellia
NCA12A	Granville Marsh Brothers Tannery Archaeological Site, Junction of main western line and Carlingford branch line, Duck Creek Near Memorial Drive	Rosehill and Camellia
NCA12A	Granville Railway Station Group, Bridge Street, Granville	Rosehill and Camellia
NCA12A	Granville RSL Club, 5 Memorial Drive, Granville	Rosehill and Camellia
NCA12A	Granville Swimming Pool, 1 Memorial Drive, Granville	Rosehill and Camellia
NCA12A	Granville War Memorial, 1 Memorial Drive, Granville	Rosehill and Camellia
NCA12A	Monuments, 5 Memorial Drive, Granville	Rosehill and Camellia
NCA12A	Mount Beulah Hall, 37 Cowper Street, Granville	Rosehill and Camellia
NCA12A	Parramatta Archaeological Management Unit 3047, Parramatta Road, Granville	Rosehill and Camellia
NCA12A	Rosehill Hotel, 91 Parramatta Road, Granville	Rosehill and Camellia
NCA12A	Shop (former), 6-8 Factory Street, Granville	Rosehill and Camellia
NCA12A	Terrace Housing, 5-23 Arthur Street, Granville	Rosehill and Camellia
NCA14	Wetlands	Carlingford Line
NCA14	UWS Parramatta Campus (former Rydalmere Hospital & Female Orphan School)	Carlingford Line
NCA14	Clyde Carlingford Rail Bridge abutments	Carlingford Line
NCA15	Dundas Railway Station Group	Carlingford Line
NCA16	Victorian house	Carlingford Line
NCA18	K13 Memorial	Carlingford Line

NCA	Item	Location
NCA19	Carlingford Stock Feeds	Carlingford Line

Appendix C – Noise management level and rating background level **by NCA**

Table C-1: Noise management level and rating background level by noise catchment area

Precinct	NCA	Rating Background Level (RBL) $L_{A90(15min)}$, dB(A)			Construction Noise Management Level $L_{Aeq(15min)}$, dB(A)				Sleep disturbance NML $L_{A1(1min)}$, dB(A)	
		Day	Eve	Night	Day	Day (OOH)	Eve	Night	Screening	Maximum
Westmead	NCA01	49	47	37	5	5	5	4	5	6
	NCA02	51	48	43	6	5	5	4	5	6
	NCA03	51	48	43	6	5	5	4	5	6
	NCA04	49	48	47	5	5	5	5	6	6
	NCA05	49	48	47	5	5	5	5	6	6

Precinct	NCA	Rating Background Level (RBL) $L_{A90(15min)}$, dB(A)			Construction Noise Management Level $L_{Aeq(15min)}$, dB(A)				Sleep disturbance NML $L_{A1(1min)}$, dB(A)	
		Day	Eve	Night	Day	Day (OOH)	Eve	Night	Screening	Maximum
Parramatta North	NCA06[1]	42	41	44	5	4	4	4[1]	5	6
	NCA07	51	50	39	6	5	5	4	5	6
Parramatta CBD	NCA08	59	57	46	6	6	6	5	6	6
	NCA09	58	53	43	6	6	5	4	5	6
	NCA10	43	40	34	5	4	4	3	4	6

Precinct	NCA	Rating Background Level (RBL) $L_{A90(15min)}$, dB(A)			Construction Noise Management Level $L_{Aeq(15min)}$, dB(A)				Sleep disturbance NML $L_{A1(1min)}$, dB(A)	
		Day	Eve	Night	Day	Day (OOH)	Eve	Night	Screening	Maximum
Rosehill and Camellia	NCA11	43	40	34	5	4	4	3	4	6
	NCA12	51	48	41	6	5	5	4	5	6
	NCA12A[1]	43	45	42	5	4	4	4	5	6
	NCA13	51	48	41	6	5	5	4	5	6
Carlingford	NCA14	45	43	38	5	5	4	4	5	6
	NCA15	45	43	37	5	5	4	4	5	6
	NCA16	46	42	34	5	5	4	3	4	6
	NCA17	43	40	31	5	4	4	3	4	6
	NCA18	42	40	32	5	4	4	3	4	6

Precinct	NCA	Rating Background Level (RBL) $L_{A90(15min)}$, dB(A)			Construction Noise Management Level $L_{Aeq(15min)}$, dB(A)				Sleep disturbance NML $L_{A1(1min)}$, dB(A)	
		Day	Eve	Night	Day	Day (OOH)	Eve	Night	Screening	Maximum
	NCA19	52	47	39	6	5	5	4	5	6

Notes:

1. Monitored evening or night-time level was found to be higher than the respective evening or daytime level. In line with the direction in Section 2.3 of the NPfI, as the community generally expects greater control of noise during the more sensitive evening and night-time periods than during the less sensitive daytime period, the project noise management levels for evening are set at no greater than daytime level, and the night-time is set to be no greater than the day or evening levels.

Appendix D – Construction predicted noise levels (worst case)

Figure D-1: EIS: Technical Paper – Noise and Vibration Impact Assessment, Table 15 - Construction Activities and Period of Construction

(Blue boxes indicate EIS scenarios equivalent to SOM works)

Scenario	Works ID	Indicative Duration (Weeks)[1]	Activity	Hours of Works[2]			
				Std. Day	Day OOH	Eve	Night
Demolition	W.0001	8	Demolition	✓			
	W.0002	12	Demolition (with Breaker)	✓			
Compounds – 24/7 Operation	W.0003	2	Site Establishment	✓	✓	✓	✓
	W.0004	6	Services & Utilities	✓	✓	✓	✓
	W.0005	2	Hoarding	✓	✓	✓	✓
	W.0006	6	Site Deliveries	✓	✓	✓	✓
Compounds – Daytime Only	W.0007	12	Site Establishment	✓			
	W.0008	12	Services & Utilities	✓			
	W.0009	12	Hoarding	✓			
	W.0010	190	Site Deliveries	✓			
Spoil & Ballast Recycling	W.0011	24	Screening & Crushing	✓	✓	✓	✓
Substations	W.0012	10	Site Establishment	✓			
	W.0013	20	Construction & Installation	✓			
Mainline – Embedded Track	W.0014	40	Earthworks	✓	✓	✓	✓
	W.0015	20	Earthworks (with Breaker/saw)	✓	✓	✓	✓
	W.0016	40	Concrete Works	✓	✓	✓	✓
	W.0017	40	Trackworks	✓	✓	✓	✓
	W.0018	12	Steel Erection & Wiring	✓	✓	✓	✓
Mainline – Ballast Track	W.0019	20	Earthworks	✓			
	W.0020	12	Concrete Works	✓			
	W.0021	12	Trackworks	✓			
	W.0022	8	Trackworks - Tamping	✓			
	W.0023	10	Steel Erection & Wiring	✓			
Stops	W.0024	20	Excavation	✓			
	W.0025	10	Excavation (with Breaker/saw)	✓			
	W.0026	30	Concrete Works	✓			
	W.0027	16	Finishing Works	✓			
Bridges	W.0028	12	Site Establishment	✓	✓	✓	✓
	W.0029	20	Pilling	✓	✓	✓	✓
	W.0030	50	Construction & Installation	✓	✓	✓	✓
	W.0031	50	Concrete Works	✓			
Stabling and Maintenance Facility	W.0032	10	Pilling	✓	✓	✓	✓
	W.0033	30	Concrete Works	✓	✓	✓	✓
	W.0034	10	Steel Erection	✓	✓	✓	✓
Off Corridor Roadworks	W.0035	20	Excavation	✓	✓	✓	✓
	W.0036	10	Excavation (with Breaker)	✓	✓	✓	✓
	W.0037	20	Pavement Works	✓	✓	✓	✓
	W.0038	8	Signage and Line Marking	✓	✓	✓	✓

Note 1: Durations should be regarded as indicative and represent typical works.

Note 2: OOH = Out of hours. During the daytime this refers to the period on Saturday between 7am – 8am and 1pm – 6pm, on Sunday and public holidays between 8am – 6pm.

Notes for the following prediction tables

The works scenarios developed for the EIS: Technical Paper – Noise and Vibration Impact Assessment that are applicable for the SOM works are indicated in blue boxes in Figure D-1. These works scenarios are used to provide indicative noise impacts from the SOM works at the worst impacted receivers based upon the scenarios developed for the EIS: Technical Paper – Noise and Vibration Impact Assessment.

Note 1:

Colouring indicates the predicted NML exceedances (see legend) based on the worst-case predicted noise level for the appropriate receiver type.

Note 2:

NCA12A was not presented in the EIS and so predictions are not available. See Section 5.1 and 5.2 for further information.

Table D-1: EIS: Technical Paper – Noise and Vibration Impact Assessment, Table 19: Predicted Worst-case Noise Levels from Project – All Works and All NCAs – Residential Standard Daytime (relevant to SOM works)

Precinct	NCA	NML	W.0006 - Site Deliveries	W.0010 - Site Deliveries	W.0012 - Site Establishment	W.0013 - Construction & Installation	W.0018 - Steel Erection & Wiring	W.0023 - Steel Erection & Wiring	W.0027 - Finishing Works	W.0032 - Pilling	W.0033 - Concrete Works	W.0034 - Steel Erection	W.0038 - Signage and Line Marking
Westmead	NCA01	59	49	<30	45	51	51	<30	55	<30	<30	<30	43
	NCA02	-	-	-	-	-	-	-	-	-	-	-	-
	NCA03	61	66	<30	65	71	75	<30	59	<30	<30	<30	70
	NCA04	59	51	74	34	40	76	<30	75	<30	<30	<30	74
	NCA05	59	61	38	30	36	69	<30	43	<30	<30	<30	70
Parr. N	NCA06	52	52	<30	51	57	75	<30	73	<30	<30	<30	72
	NCA07	61	67	<30	66	72	74	<30	75	<30	<30	<30	74
Parr. CBD	NCA08	69	59	<30	33	39	75	<30	67	<30	<30	<30	72
	NCA09	68	46	<30	45	51	77	<30	79	<30	<30	<30	75
	NCA10	53	42	33	35	41	53	44	51	<30	<30	<30	48
Rosehill & C	NCA11	53	64	<30	38	44	74	41	77	<30	<30	<30	43
	NCA12	61	39	<30	41	47	72	41	57	44	38	37	34
	NCA12A	-	-	-	-	-	-	-	-	-	-	-	-
	NCA13	-	-	-	-	-	-	-	-	-	-	-	-
Carlingford	NCA14	55	33	64	32	38	33	60	64	<30	<30	<30	<30
	NCA15	55	34	65	59	65	<30	76	77	<30	<30	<30	<30
	NCA16	56	<30	72	45	51	<30	76	56	<30	<30	<30	<30
	NCA17	53	<30	68	66	72	<30	74	71	<30	<30	<30	<30
	NCA18	52	<30	46	49	55	<30	76	50	<30	<30	<30	<30
	NCA19	62	<30	70	64	70	<30	68	72	<30	<30	<30	<30

Table D-2: EIS: Technical Paper – Noise and Vibration Impact Assessment, Table 20: Predicted Worst-case Noise Levels from Project – All Works and All NCAs – Residential Evening (relevant to SOM works)

Precinct	NCA	NML	W.0006 - Site Deliveries	W.0010 - Site Deliveries	W.0012 - Site Establishment	W.0013 - Construction & Installation	W.0018 - Steel Erection & Wiring	W.0023 - Steel Erection & Wiring	W.0027 - Finishing Works	W.0032 - Pilling	W.0033 - Concrete Works	W.0034 - Steel Erection	W.0038 - Signage and Line Marking
Westmead	NCA01	52	49	-	-	-	51	-	-	<30	<30	<30	43
	NCA02	-	-	-	-	-	-	-	-	-	-	-	-
	NCA03	53	66	-	-	-	75	-	-	<30	<30	<30	70
	NCA04	53	51	-	-	-	76	-	-	<30	<30	<30	74
	NCA05	53	61	-	-	-	69	-	-	<30	<30	<30	70
Parr. N	NCA06	46	52	-	-	-	75	-	-	<30	<30	<30	72
	NCA07	55	67	-	-	-	74	-	-	<30	<30	<30	74
Parr. CBD	NCA08	62	59	-	-	-	75	-	-	<30	<30	<30	72
	NCA09	58	46	-	-	-	77	-	-	<30	<30	<30	75
	NCA10	45	42	-	-	-	53	-	-	<30	<30	<30	48
Rosehill & C	NCA11	45	64	-	-	-	74	-	-	<30	<30	<30	43
	NCA12	53	39	-	-	-	72	-	-	44	38	37	34
	NCA12A	-	-	-	-	-	-	-	-	-	-	-	-
	NCA13	-	-	-	-	-	-	-	-	-	-	-	-
Carlingford	NCA14	48	33	-	-	-	33	-	-	<30	<30	<30	<30
	NCA15	48	34	-	-	-	<30	-	-	<30	<30	<30	<30
	NCA16	47	<30	-	-	-	<30	-	-	<30	<30	<30	<30
	NCA17	45	<30	-	-	-	<30	-	-	<30	<30	<30	<30
	NCA18	45	<30	-	-	-	<30	-	-	<30	<30	<30	<30
	NCA19	52	<30	-	-	-	<30	-	-	<30	<30	<30	<30

Table D-3: EIS: Technical Paper – Noise and Vibration Impact Assessment, Table 21: Predicted Worst-case Noise Levels from Project – All Works and All NCAs – Residential Night-time (relevant to SOM works)

Precinct	NCA	NML	W.0006 - Site Deliveries	W.0010 - Site Deliveries	W.0012 - Site Establishment	W.0013 - Construction & Installation	W.0018 - Steel Erection & Wiring	W.0023 - Steel Erection & Wiring	W.0027 - Finishing Works	W.0032 - Pilling	W.0033 - Concrete Works	W.0034 - Steel Erection	W.0038 - Signage and Line Marking
Westmead	NCA01	42	49	-	-	-	51	-	-	<30	<30	<30	43
	NCA02	-	-	-	-	-	-	-	-	-	-	-	-
	NCA03	48	66	-	-	-	75	-	-	<30	<30	<30	70
	NCA04	52	51	-	-	-	76	-	-	<30	<30	<30	74
	NCA05	52	61	-	-	-	69	-	-	<30	<30	<30	70
Parr. N	NCA06	46	52	-	-	-	75	-	-	<30	<30	<30	72
	NCA07	44	67	-	-	-	74	-	-	<30	<30	<30	74
Parr. CBD	NCA08	51	59	-	-	-	75	-	-	<30	<30	<30	72
	NCA09	48	46	-	-	-	77	-	-	<30	<30	<30	75
	NCA10	39	42	-	-	-	53	-	-	<30	<30	<30	48
Rosehill & C	NCA11	39	64	-	-	-	74	-	-	<30	<30	<30	43
	NCA12	46	39	-	-	-	72	-	-	44	38	37	34
	NCA12A	-	-	-	-	-	-	-	-	-	-	-	-
	NCA13	-	-	-	-	-	-	-	-	-	-	-	-
Carlingford	NCA14	43	33	-	-	-	33	-	-	<30	<30	<30	<30
	NCA15	42	34	-	-	-	<30	-	-	<30	<30	<30	<30
	NCA16	39	<30	-	-	-	<30	-	-	<30	<30	<30	<30
	NCA17	36	<30	-	-	-	<30	-	-	<30	<30	<30	<30
	NCA18	37	<30	-	-	-	<30	-	-	<30	<30	<30	<30
	NCA19	44	<30	-	-	-	<30	-	-	<30	<30	<30	<30

Table D-4: EIS: Technical Paper – Noise and Vibration Impact Assessment, Table 22: Predicted Worst-case Noise Levels from Project – All Works and All NCAs – Commercial (relevant to SOM works)

Precinct	NCA	NML	W.0006 - Site Deliveries	W.0010 - Site Deliveries	W.0012 - Site Establishment	W.0013 - Construction & Installation	W.0018 - Steel Erection & Wiring	W.0023 - Steel Erection & Wiring	W.0027 - Finishing Works	W.0032 - Pilling	W.0033 - Concrete Works	W.0034 - Steel Erection	W.0038 - Signage and Line Marking
Westmead	NCA01	70	38	<30	37	43	36	<30	40	<30	<30	<30	40
	NCA02	70	44	37	<30	30	67	<30	59	<30	<30	<30	50
	NCA03	70	71	31	67	73	77	<30	77	<30	<30	<30	43
	NCA04	70	-	-	-	-	-	-	-	-	-	-	-
	NCA05	70	-	-	-	-	-	-	-	-	-	-	-
Parr. N	NCA06	70	42	31	41	47	50	<30	52	<30	<30	<30	71
	NCA07	70	67	30	66	72	74	<30	77	<30	<30	<30	71
Parr. CBD	NCA08	70	72	30	<30	35	76	<30	77	<30	<30	<30	73
	NCA09	70	73	<30	72	78	78	<30	82	<30	<30	<30	75
	NCA10	70	-	-	-	-	-	-	-	-	-	-	-
Rosehill & C	NCA11	70	59	<30	36	42	73	41	76	<30	<30	<30	36
	NCA12	70	47	34	49	55	73	69	69	64	58	57	33
	NCA12A	70	-	-	-	-	-	-	-	-	-	-	-
	NCA13	70	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30
Carlingford	NCA14	70	45	71	35	41	41	65	68	44	38	37	<30
	NCA15	70	34	70	67	73	<30	70	59	<30	<30	<30	<30
	NCA16	70	<30	44	43	49	<30	50	54	<30	<30	<30	<30
	NCA17	70	<30	58	55	61	<30	67	71	<30	<30	<30	<30
	NCA18	70	<30	47	57	63	<30	67	60	<30	<30	<30	<30
	NCA19	70	<30	74	66	72	<30	76	80	<30	<30	<30	<30

Table D-5: EIS: Technical Paper – Noise and Vibration Impact Assessment, Table 23: Predicted Worst-case Noise Levels from Project – All Works and All NCAs – Other Sensitive (relevant to SOM works)

Precinct	NCA	NML[1]	W.0006 - Site Deliveries	W.0010 - Site Deliveries	W.0012 - Site Establishment	W.0013 - Construction & Installation	W.0018 - Steel Erection & Wiring	W.0023 - Steel Erection & Wiring	W.0027 - Finishing Works	W.0032 - Pilling	W.0033 - Concrete Works	W.0034 - Steel Erection	W.0038 - Signage and Line Marking
Westmead	NCA01	-	45	<30	37	43	47	<30	51	<30	<30	<30	30
	NCA02	-	60	49	55	61	74	<30	66	<30	<30	<30	51
	NCA03	-	73	<30	72	78	76	<30	70	<30	<30	<30	48
	NCA04	-	33	<30	30	36	74	<30	66	<30	<30	<30	62
	NCA05	-	66	61	34	40	76	<30	73	<30	<30	<30	59
Parr. N	NCA06	-	64	31	42	48	79	<30	81	<30	<30	<30	54
	NCA07	-	65	<30	<30	35	77	<30	74	<30	<30	<30	72
Parr. CBD	NCA08	-	68	<30	30	36	75	<30	60	<30	<30	<30	72
	NCA09	-	67	<30	61	67	79	35	82	<30	<30	<30	75
	NCA10	-	36	<30	<30	<30	47	<30	48	<30	<30	<30	46
Rosehill & C	NCA11	-	-	-	-	-	-	-	-	-	-	-	-
	NCA12	-	42	<30	39	45	57	41	53	43	37	36	33
	NCA12A	-	-	-	-	-	-	-	-	-	-	-	-
	NCA13	-	-	-	-	-	-	-	-	-	-	-	-
Carlingford	NCA14	-	59	57	38	44	42	71	60	40	34	33	<30
	NCA15	-	<30	48	37	43	<30	53	48	<30	<30	<30	<30
	NCA16	-	<30	44	43	49	<30	49	52	<30	<30	<30	<30
	NCA17	-	<30	45	36	42	<30	50	47	<30	<30	<30	<30
	NCA18	-	<30	36	37	43	<30	45	41	<30	<30	<30	<30
	NCA19	-	<30	58	54	60	<30	65	69	<30	<30	<30	<30

Note 1: 'Other sensitive' receiver NMLs are dependent on classification. The most affected 'other sensitive' receiver type may change between each activity resulting in

Appendix E – Acoustic Advisor and Environmental Representative endorsement

2 November 2020

Transport for NSW

Attention to: Senior Manager
Environment Parramatta Light Rail
[redacted]

Review of Construction Noise and Vibration Management Sub Plan.
Supply, Operate and Maintain (SOM) Contract - Parramatta Light Rail
(PLR1SOM-GLR-ALL-PM-PLN-000034 Rev F)

Pursuant to SSI8285 Condition of Approval A23 (d) i), as the approved Environmental Representative, I confirm that I have reviewed the Construction Noise and Vibration Management Sub Plan, Supply, Operate and Maintain (SOM) Contract - Parramatta Light Rail (PLR1SOM-GLR-ALL-PM-PLN-000034 Rev F), dated 29/10/2020, prepared by Great River City Light Rail, for consistency with the requirements of the Conditions of Approval.

In my opinion the aforementioned document is consistent with the requirements included in or required under the terms of the Conditions of Approval for the Parramatta Light Rail (Stage 1) development.

Yours sincerely,

[redacted]

Environmental Representative
[redacted]

Filename : *AQ1148.05 PLR GLR CNVMP endorsement 201102*

[redacted]

Ref: 5518_PLR-Construction Noise and Vibration Management Sub Plan_SOM_AA_Endorsement_06Nov2020
06 November 2020

RE: PLR1SOM–GLR-ALL-PM-PLN-000034 Construction Noise and Vibration Management Sub Plan (rF) October 2020 - Adequacy for Submission (AA Review)

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

Title:	Document Reference:	Version Status	Review Date
Construction Noise and Vibration Management Sub Plan: Supply, Operate and Maintain Contract Parramatta Light Rail – Stage 1, (ISD-17-6720)	PLR1SOM–GLR-ALL-PM-PLN-000034 (Rev F)	Revision F, 29 Oct 2020	06-11-2020

Pursuant to the requirements of the Conditions of Approval for the CSSI-8285, including A29(e), the CNVIS documents identified above have been reviewed by the AA for consistency with the CNVS and requirements of the CoA and EPL (Environmental Protection Licence – 21347, 3-Jan-2020).

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

Yours sincerely

[redacted]
BE(Mech), MAAS, RPEQ Senior
Environmental Engineer

[redacted]

Appendix F – Noise and Vibration Monitoring Program

Appendix F

Construction Noise and Vibration Monitoring Program

Supply, Operate and Maintain Contract

(ISD-17-6720)

Parramatta Light Rail – Stage 1

PLR1SOM-GLR-ALL-EN-PRG-000001

Revision 1 January 2020

NSW GOVERNMENT

Contents

About this release

Title	Supply, Operate, Maintain Construction Noise and Vibration Monitoring Plan

Version control

Revision	Date	Description	Approval
Revision A	18/03/2020	Draft for review	-
Revision A.2	27/03/2020	Internal review updates	-
Revision B	24/04/2020	Update for TfNSW comments	-
Revision B.2	----	Update for ER comments	-
Revision C	20/05/2020	Update for TfNSW follow up comments	-
Revision D	12/10/2020	Revised for Stakeholder Consultation and ER Endorsement	
Revision 0	23/10/2020	For DPIE Submission	
Revision 1	11/01/2021	Addressing DPIE Comments	

Glossary / Abbreviations

Abbreviations	Expanded Text
AA	Acoustics Advisor
CBD	Central Business District
CEMP	Construction Environmental Management Plan
CNVIS	Construction Noise and Vibration Impact Statement
CNVMP	Construction Noise and Vibration Management Plan
CoA	Conditions 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 Office of Environment and Heritage (OEH) are now administered by the Department of Planning, Industry and Environment)
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
ER	Environmental Representative
GRCLR	Greater River City Light Rail
ICNG	NSW Interim Construction Noise Guideline (Department of Environment, Climate Change and Water 2011)
LAeq	The A-weighted equivalent continuous (energy average) sound pressure level. For the purpose of assessing or measuring construction noise, this is related to the construction works under consideration over a defined period (such as 15-minutes, shown as LAeq(15 minute)). Note that during verification monitoring the LAeq should exclude other sources such as from industry, road, rail and the community.
LAmax	The “Maximum Noise Level” for an event, used in the assessment of potential sleep disturbance during night-time periods. The subscript “A” indicates that the noise levels are filtered to match normal human hearing characteristics (i.e. A-weighted).
OOHW	Out-of-hours Work

RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
CNVMonP	Construction Noise and Vibration Monitoring Plan (this Program)
PLR	Parramatta Light Rail
Project	Construction of the PLR light rail systems, high-voltage power supply and stops above slab level, and the stabling and maintenance facility
SaM Facility	Stabling and Maintenance Facility
SPIR	Parramatta Light Rail (Stage 1) Westmead to Carlingford via Parramatta CBD and Camellia Submissions Report (incorporating Preferred Infrastructure Report) (February 2018)

1 Introduction

1.1 Context

This Construction Noise and Vibration Monitoring Program (Program) describes how Great River City Light Rail (GRCLR) will monitor and compare actual performance for noise and vibration during all construction of the Parramatta Light Rail Supply, Operate and Maintain (SOM) Works (the Project).

1.2 Purpose of this report

This Program has been prepared to address the requirements of the Conditions of Approval (CoA) for the Project Infrastructure Approval. The requirements of the Program related CoA are listed in **Table 1-1**.

Table 1-1 Conditions applicable to the Noise and Vibration Monitoring Program

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 construction noise and vibration monitoring plan (this Program) will be submitted no later than one month prior to commencement of 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. *Note: the requirement to submit or have a CEMP or CEMP Sub-plan approved is specified in Condition C3*.	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.

CoA No.	Condition requirements	Document reference	How addressed
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 Conditions A1 or in the CEMP. (b) Noise and Vibration Monitoring Relevant government agencies to be consulted: Relevant Council(s), EPA, NSW Health (as relevant)	This document	The Program has been prepared in consultation with City of Parramatta Council, EPA and Health NSW, as noted in Section 2 by seeking feedback on this document from these relevant stakeholders.
C10	The Construction Monitoring Program must provide: (a) details of baseline data available	Section 3.2 and Section 4.2	Details of baseline noise and vibration monitoring provided in Section 3.2 and Section 4.2 respectively.
	(b) details of baseline data to be obtained and when	Section 3.2 and Section 4.2	Baseline noise monitoring presented in CNVMP as noted in Section 3.2. Baseline vibration monitoring identified in the CNVIS and completed prior to construction as noted in Section 4.2.
	(c) details of all monitoring of the project to be undertaken	Section 3 and Section 4	The construction noise and vibration monitoring to be undertaken is outlined in Section 3 and 4 of this Program.
	(d) the parameters of the project to be monitored	Section 3.3.1 and Section 4.3.3	The parameters to be measured during noise and vibration monitoring are noted in Sections 3.3.1 and Section 4.3.3 respectively.
	(e) the frequency of monitoring to be undertaken	Section 3.3 and Section 4.3	Section 3.3 and Section 4.3 outline timing and frequency of the noise and vibration monitoring (respectively).

CoA No.	Condition requirements	Document reference	How addressed
C10 (*contin.*)	(f) the location of monitoring	Section 3.3 and Section 4.3	Section 3.3 and Section 4.3 outline the location of the noise and vibration monitoring (respectively).
	(g) the reporting of monitoring results against relevant criteria	Section 6.1	Section 6.1 details the reporting requirements for noise and vibration monitoring.
	(h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and	Section 6.2	Section 6.2 details the process to implement when the monitored results are not in line with the expected noise levels.
	(i) any consultation to be undertaken in relation to the monitoring programs.	Section 2	The consultation requirements and process are presented in Section 2.
C11	The noise and vibration monitoring data collected during monitoring required by Condition C9 must be available to the Proponent, ER, AA, Relevant Council(s) and the community to inform construction scheduling, the level of impacts and whether additional mitigation is required. The Department must also be provided access to this data if specifically requested.	Section 6.1	A monthly Construction Monitoring Report containing the noise and vibration monitoring data collected during SOM Works will be available to the relevant stakeholders (including the community), as detailed in Section 6.1.

CoA No.	Condition requirements	Document reference	How addressed
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 2	This Program was provided to EPA, Health NSW and City of Parramatta Council for consultation and feedback, as documented in Section 2.
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 2.1	The Program would be endorsed by the ER and submitted to DPIE for information 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 2.1 Section 3.2 Section 4.2	Construction would not commence until the Program has been endorsed by the AA and ER and submitted to DPIE and baseline data relevant for the specific proposed construction activity 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 2.1	The Program would be implemented for the duration of construction, and for any longer period set out in this monitoring program or specified by the Secretary, whichever is the greater

CoA No.	Condition requirements	Document reference	How addressed
C16	The results of the Construction Monitoring Programs must be submitted to the Secretary, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	Section 6.1	A monthly Construction Monitoring Report containing the noise and vibration monitoring data collected during SOM Works will be available to the relevant stakeholders, as detailed in Section 6.1.
C17	Where a relevant CEMP Sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP Sub-plan.	CNVMP This Plan	This plan is included as an Appendix of the CNVMP.
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 4.2.2 Section 5	Baseline vibration monitoring for heritage items potentially impacts by the SOM construction works would be carried out at commencement of construction works. These specific items and the vibration monitoring requirements will be identified in the Construction Noise and Vibration Impact Statements (CNVIS) prepared for the SOM works.
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 4.2.2 Section 5	The installation of the monitoring equipment will be reviewed and approved by a heritage specialist.
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	Section 4.3.2	Building Condition Surveys are to be undertaken prior to construction as per the monitoring protocol for structural damage presented in Figure 4-2 and Section 9.6 of the CNVMP.

CoA No.	Condition requirements	Document reference	How addressed
	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.		
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 4.3.2	Building Condition Survey Reports will be undertaken after construction where required as detailed in Section 9.6 of the CNVMP. Structures at risk of damage requiring pre-construction inspections were identified as per Figure 4-2 and Section 9.6 of the CNVMP.
NV-2	The NVMP 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: … » Ongoing noise monitoring would be carried out during construction at sensitive receptors during critical periods to identify and	Section 3 and Section 4	Ongoing noise monitoring and verification would be undertaken during construction to manage high risk noise impacts at sensitive receivers as outlined in Section 3 and 4 of this Program.

CoA No.	Condition requirements	Document reference	How addressed
	assist in managing high risk noise events.		
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 NVMPs 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: … » 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.	Section 3 and Section 4	Noise verification monitoring would be undertaken by specifically trained personnel to verify the noise levels that have been predicted at specific potentially impact sensitive receivers as part of the CNVIS process (NV48) or in the response to a complaint as outlined in Section 3 and 4 of this Program.
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.	Section 4	Vibration monitoring would be used to verify vibration levels at sensitive buildings/structures as described in Section 4 of this Program.
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	Section 4.2	Measurements of existing ambient vibration levels have been carried out at receivers with vibration sensitive equipment during

CoA No.	Condition requirements	Document reference	How addressed
	inform the site-specific Construction Noise and Vibration Impact Statements for works near these locations.		the detailed design as in Section 4.2.
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: … » Unattended noise and vibration monitoring within the facilities to ensure noise and/or vibration levels are within acceptable levels	Section 4.2.1 and Section 4.3	Unattended noise and vibration monitoring would be used to establish site specific criteria where appropriate and verify noise and vibration impacts for sensitive receivers within the Westmead Research Zone facilities (NV57) as outlined in Section 4.2.1 and Section 4.3

2 Consultation

The following sections summarises the consultation undertaken as part of developing this Program.

2.1 Consultation Requirements under the Conditions of Approval

This monitoring program has been prepared in consultation with relevant Government Agencies and Councils in line with CoA C9(b). Consultation included the following stakeholders:

- NSW Environment Protection Authority
- City of Parramatta Council
- NSW Health.

This Program will be endorsed by the Environmental Representative (ER) as per CoA C13, and then submitted to the Secretary for information no later than one month prior to the commencement of construction. The Program, as submitted to Secretary, including any minor amendments approved by the ER, will be implemented for the duration of construction and for any longer period set out in this monitoring program or specified by the Secretary, whichever is the greater.

In line with CoA A5, evidence of consultation has been recorded in document [PLR1SOM-GLR-ALL-EN-RPT-001004] and includes:

a) Documentation of the engagement with the parties 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 parties and a summary of the issues raised by the identified parties

c) Documentation of any follow-up with the identified parties, where feedback has not been provided, to confirm that the identified parties have none or have failed to provide feedback after repeated requests

d) Outline of the issues raised by the identified parties and how they have been addressed, including evidence that the parties are satisfied the issues have been addressed

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).

3 Noise monitoring

3.1 Relevant standards and guidelines

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

- NSW Interim Construction Noise Guideline, Department of Environment and Climate Change 2009
- NSW Industrial Noise Policy, Environment Protection Authority 2000
- NSW Noise Policy for Industry, Environment Protection Authority 2017
- Transport for NSW's Construction Noise and Vibration Strategy (7TP-ST-157/4.0)
- Australian Standard 1055 Acoustics – Description and Measurement of Environmental Noise
- Australian Standard 2659.1 – 1998 Guide to the use of sound measuring equipment – portable sound level meters
- International Standard IEC 61672.1 Electroacoustic – Sound Level Meters – Specifications
- International Standard IEC 60942 'Electroacoustics - Sound calibrators
- ISO 3744 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane
- ISO 3746 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane
- ISO 6393 Earth-moving machinery - Determination of sound power level - Stationary test conditions
- ISO 6395 Earth-moving machinery - Determination of sound power level - Dynamic test conditions.
- NATA General Accreditation Guidance - General Equipment - Calibration and Checks, General Equipment Table 2018

3.2 Baseline noise monitoring data

As part of the EIS process, baseline noise monitoring was undertaken in October 2016 at a total of 16 locations. The baseline noise monitoring locations were selected to be representative of the appropriate Noise Catchment Areas (NCAs) within and around the Project, across a mix of existing land uses including residential, commercial, industrial and open space.

An additional monitoring location was adopted to represent NCA12A, which was developed to represent the area in the rail corridor at Clyde Junction and Clyde Station. Monitoring was undertaken in July 2016.

A summary of the locations and results from these long term noise monitoring are presented in **Table 3-1**. For further information regarding baseline noise monitoring refer to Section 5.2 of the CNVMP and Sections 2.3, 2.4 and 2.5 of the Technical Paper 13 – Noise and Vibration Impact Assessment *(SLR, document reference: 610.16769-R02, 16 August 2017, Version 1.0*).

No further additional baseline monitoring is anticipated. As construction works have now commenced (by other contractors) it is not possible to take further background monitoring, as the background noise environment has fundamentally changed.

Table 3-1: Summary of Rating Background Levels (RBLs) at residential receivers[1]

Precinct	NCAs	Logger ID	Noise monitoring location	RBL Day	RBL Eve	RBL Ngt
Westmead	NCA01	BG01	8-12 Alexandra Ave, Westmead	49	47	37
	NCA02	BG02	157 Hawkesbury Rd, Westmead	51	48	43
	NCA03	BG02	157 Hawkesbury Rd, Westmead	51	48	43
	NCA04	BG03	199 Hawkesbury Rd, Westmead	49	48	47
	NCA05	BG03	199 Hawkesbury Rd, Westmead	49	48	47
Parramatta North	NCA06	BG04	Cumberland Hospital East	42	41	44
	NCA07	BG06	St Patricks Cemetery, North Parramatta	51	50	39
Parramatta CBD	NCA08	BG07	20 Victoria Rd, Parramatta	59	57	46
	NCA09	BG08	Arthur Phillip Highschool, Parramatta	58	53	43
	NCA10	BG09	9 Noller Pde, Parramatta	43	40	34
Rosehill and Camellia	NCA11	BG09	9 Noller Pde, Parramatta	43	40	34
	NCA12	BG10	5 Hope St, Rosehill	51	48	41
	NCA12A	BG17[2]	10-42 East Street, Granville	43	45	42
	NCA13	BG10	5 Hope St, Rosehill	51	48	41
Carlingford	NCA14	BG11	14 Dudley St, Rydalmere	45	43	38
	NCA15	BG12	Dundas Station	45	43	37
	NCA16	BG13	22 Adderton Rd, Telopea	46	42	34
	NCA17	BG14	Telopea Station	43	40	31
	NCA18	BG15	89 Marshall Rd, Telopea	42	40	32
	NCA19	BG16	Carlingford Station	52	47	39

Notes: 1. Source: *EIS: Technical Paper – Noise and Vibration Impact Assessment*, with the exception of NCA12A

2. Source: *Resonate Acoustics - Acoustic Planning Report: East and Cowper Streets Granville Residential Development* (S15235) July 2016

3.3 Attended and unattended airborne noise monitoring

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

- Monitoring will be carried out at the commencement of activities for which a location and activity specific noise and vibration impact assessment has been prepared to confirm that actual noise and vibration levels are consistent with noise and vibration impact predictions and that the management measures that have been implemented are appropriate
- Prior to the applicable construction works, the noise levels of plant and equipment, including rental equipment, would be checked against the levels included in the CNVIS to ensure that equipment will operate at or below the assumed noise levels, noting that they may be below maximum operating Sound Power Levels in Appendix C of the TfNSW CNVS.
- Where a change in methodology, plant or equipment is anticipated to result in a significant increase in construction noise impact
- To verify high noise impact works (above 75 dB(A)) at the nearest sensitive receiver (including the Grey Headed Flying Fox camps noted in the Land Use Survey in the CNVMP to confirm if respite periods are required
- Where appropriate, in response to a noise related complaint(s) (determined on a case-by-case basis) and in accordance with the Out of Hours Works (OOHW) Protocol or Environment Protection Licence (EPL) (EPL only required for commencement of signalling works)
- As otherwise required by the Construction Noise and Vibration Impact Statement (CNVIS), Out of Hours Works (OOHW) Protocol or EPL
- Following the implementation of mitigation measures or noise attenuation as a result of an exceedance of predicted noise levels
- Ongoing spot checks for noise intensive plant and equipment will be undertaken throughout construction to ensure compliance with the maximum noise level goals for construction equipment listed in Appendix C of the Transport for NSW's Construction Noise and Vibration Strategy.

In addition to the above list, noise monitoring can 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.

Unattended airborne noise monitoring may also be undertaken, with a noise logger(s) deployed to obtain noise results over longer periods. In these instances, noise loggers will record audio to allow for the identification of construction noise contribution and the presence of any extraneous noise, if privacy concerns can be overcome. The use of unattended airborne noise monitoring will be determined on a case-by-case basis, as appropriate by the Environment and Sustainability Manager, and will be subject to any access approvals.

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

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

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

- The location of previous monitoring sites

- The proximity of the receiver to a Project worksite
- The sensitivity of the receiver to noise
- Background noise levels
- The expected duration of the impact.

3.3.1 Parameters to be monitored

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

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

Environmental noise monitoring (excluding spot checks of plant and equipment) will be recorded over 15 minute sample intervals, excluding periods of extraneous noise until a representative sample of the construction activity being monitored has been obtained. A representative sample will be determined by the operator, who will be competent, suitability trained and experienced in undertaking noise measurements and familiar with the relevant Australian Standards (as detailed in Section 6 of the CNVMP). The minimum range of noise metrics to be stored in the memory for later retrieval include the following A-weighted noise levels: L_{A90}, L_{Aeq}, $L_{A1(1min)}$ and L_{Amax}.

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

3.4 Attended and unattended ground-borne noise monitoring

The majority of vibration intensive activities would be undertaken by the Infrastructure Works contractor, with the exception of the SaM facility. As such, at all locations except for the SaM facility the potential source of ground-borne noise is not present. In the case of the SaM facility, even though there may be vibration intensive activities taking place as part of the SOM works, there are minimal sensitive receivers nearby, and where there is potential for noise impacts, as the construction works are at surface level, nearby sensitive receivers that could be impacted by ground borne noise are likely to be identified for additional mitigation measures due to high airborne noise impacts as well. As such, monitoring for ground-borne noise impacts will not typically be required at the commencement of all works, but will be identified in the CNVIS where required.

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

- Where appropriate in response to a noise related complaint(s) (determined on a case-by- case basis) and in accordance with the EPL, and
- As otherwise required by the CNVIS, OOHW Protocol or EPL.

Monitoring will be undertaken in the most affected habitable room of the residence or other sensitive building and will be conducted in conjunction with vibration measurements whenever practicable (refer to Section 4). The room selected for noise monitoring should be well shielded from airborne noise intrusions, such as road traffic noise to allow the ground-borne noise to dominate over non-construction generated airborne noise.

There may be instances where the resident does not allow access to monitor in the most suitable habitable room. In these instances, GRCLR will endeavour to monitor at the next most suitable available room or location, noting this in the monitoring form.

Given that ground-borne noise is mostly noticed during the evening or at night, noise loggers may also be left in place over night and picked up at a mutually agreed time with the resident. In these instances, noise loggers will record audio to allow for the identification construction noise contribution and the presence of any extraneous noise, if privacy concerns can be overcome. Where the resident or receiver will not allow the noise logger to record audio, attended noise monitoring will be offered instead.

Measurements will be carried out by an appropriately trained and competent person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.

3.4.1 Parameters to be monitored

Ground-borne noise monitoring will be taken with the following meter settings:

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

Ground-borne noise monitoring will be recorded over 15 minute sample intervals, where every 15 minutes the data is to be processed statistically and stored in memory. The minimum range of noise metrics to be stored in the memory for later retrieval include the following A-weighted noise levels: L_{A90}, L_{Aeq}, $L_{A1(1\ min)}$ and L_{Amax}.

3.5 Calibration, QA and competency

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

Noise monitoring equipment used will be at least Class 2 instruments and calibrated in accordance with manufacturer specifications or relevant Australian Standards.

All instrumentation should comply with IEC 61672 (parts 1-3) '*Electroacoustics - Sound Level Meters*' and IEC 60942 *'Electroacoustics - Sound calibrators'*.

All noise monitoring equipment used must be checked for accuracy (to manufacturer's specification) at least every two years [reference: NATA General Accreditation Guidance - General Equipment - Calibration and Checks, General Equipment Table (January 2018)] (or if less than 2 years old, manufacturers certification).

The calibration of the monitoring equipment will be checked in the field before and after the noise measurement period.

Records of monitoring equipment calibration will be maintained throughout the delivery of the Project.

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

- Date and time of measurement
- Name of person undertaking the measurement
- Class and model number of monitoring instrumentation
- Results of field calibration checks
- Time of day, length of measurement and any measurement time intervals
- Monitoring location (including a sketched map of area)
- Measurement location details and number of measurements at each location

- Weather conditions during measurements, including wind velocity, wind direction, temperature, relative humidity and cloud cover
- Details of the operation and activities of the noise sources under investigation, with specific details of what occurred during the monitored period
- Estimated contribution of the Project's activities, and
- Noise due to other extraneous and environmental sources (e.g. traffic, aircraft, trains, dogs barking, insects).
- Location of the nearest sensitive receiver to the construction works relative to the monitoring location.
- Details of any adjustments required or applied to the monitored noise data (ie. if noise events were excluded through pausing, adjustments are required due to the proximity of reflective surfaces).

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

All outdoor noise measurements will be undertaken with a windscreen over the microphone

Measurements should be undertaken when conditions are suitable, and not be undertaken when there is weather related influence, such when it is raining and/or the wind speed is greater than 5 m/s (18 km/h).

Where high background noise levels obscure construction noise contribution during attended noise measurements, operators will either:

- measure closer to the source and calculate back to the required position, or
- measure with the source noise off and then on (where possible) and calculate the difference or use the 'pause and/or cut' feature on the sound level meter to try to exclude as much of the extraneous noise as possible.

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

Where it is not possible to measure more than 3.5 m from any reflective structure or wall, adjustments may be required for presence or absence of nearby reflecting surfaces, with any adjustment recorded with justifications considering the site specific circumstances.

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

4 Vibration monitoring

4.1 Relevant standards and guidelines

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

- NSW Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- Australian Standard AS 2187.2 Explosives - Storage and use - Part 2 Use of explosives
- Australian Standard AS2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites Australian Standard 2659.1 – 1998 Guide to the use of sound measuring equipment – portable sound level meters
- Australian Standard 2775 Mechanical Mounting of Accelerometers
- British Standard BS 6472-2008, 'Evaluation of human exposure to vibration in buildings (1-80Hz)
- British Standard 7385: Part 2-1993 'Evaluation and measurement of vibration in buildings'
- German Standard DIN4150-3:2016 Vibration in buildings – Part 3: Effects on structures
- NATA General Accreditation Guidance - General Equipment - Calibration and Checks, General Equipment Table 2018

4.2 Baseline vibration monitoring

4.2.1 HAC community

TfNSW surveyed receivers along the alignment in 2017 to identify businesses and institutions that contain equipment that may be sensitive to noise and vibration. Baseline noise and vibration assessments were completed within these facilities as part of the Health Administration Corporation (HAC) Assessment System (see Section 5.1.3 of the CNVMP). Consultation with businesses and institutions was reviewed during the development of the Land Use Survey completed by the Infrastructure Contractor to satisfy Condition E20.

Data from the baseline vibration monitoring was used to form site specific vibration criteria for each of the identified facilities within the Westmead, Cumberland East and Cumberland West Health Precincts, outlined in the HAC Assessment System and develop the TfNSW Funded HAC Protection and Relocation. Data from the Baseline Study has been provided to the asset HAC and TfNSW by the Infrastructure Contractor.

4.2.2 Heritage-listed structures

As part of the EIS process the project is required to undertake vibration monitoring of heritage listed structures in response to Project Planning Condition of Approval (CoA) E43, which states the following:

"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."

The objective of the 'before' monitoring is to obtain a baseline vibration record for these structures prior to SOM construction works likely to impact on the heritage items. Vibration monitoring requirements will be identified in the Construction Noise and Vibration Impact Statements (CNVIS) prepared for the SOM works.

Vibration monitoring would be carried out at commencement of construction works likely to impact on the heritage item. At all locations, care will be taken to minimise any damage from the installation of the vibration monitoring equipment. The installation of the monitoring equipment will be reviewed and approved by a heritage specialist in accordance with CoA E44. The final installation method at each location will depend upon the measurement surface and connection between the equipment and that surface.

Monitoring will be carried out in accordance with Section 4.3 and 4.4.

4.3 Short term attended and unattended vibration monitoring

Attended vibration monitoring is to be undertaken as follows:

- At the commencement of operation for each plant or activity on site, which has the potential to generate significant vibration levels and where the vibration screening criteria is likely to be exceeded or as determined by a vibration assessment and reported a CNVIS
- At the commencement of vibration generating activities that have the potential to impact on heritage items to confirm/identify the site specific minimum working distances to prevent cosmetic damage
- Where vibration sensitive locations are determined to fall within the 'minimum working distances' established for each item of plant, so to refine the indicative minimum working distances
- Where vibration sensitive locations are determined to fall within the site specific 'minimum working distances' to ensure that levels are managed so as to be below the cosmetic damage criterion during the works
- Where appropriate in response to a vibration related complaint(s) (determined on a case-by- case basis) and in accordance with the OOHW Protocol or EPL (once approved for commencement of signalling works)
- As otherwise required by the CNVIS, OOHW Protocol or EPL.

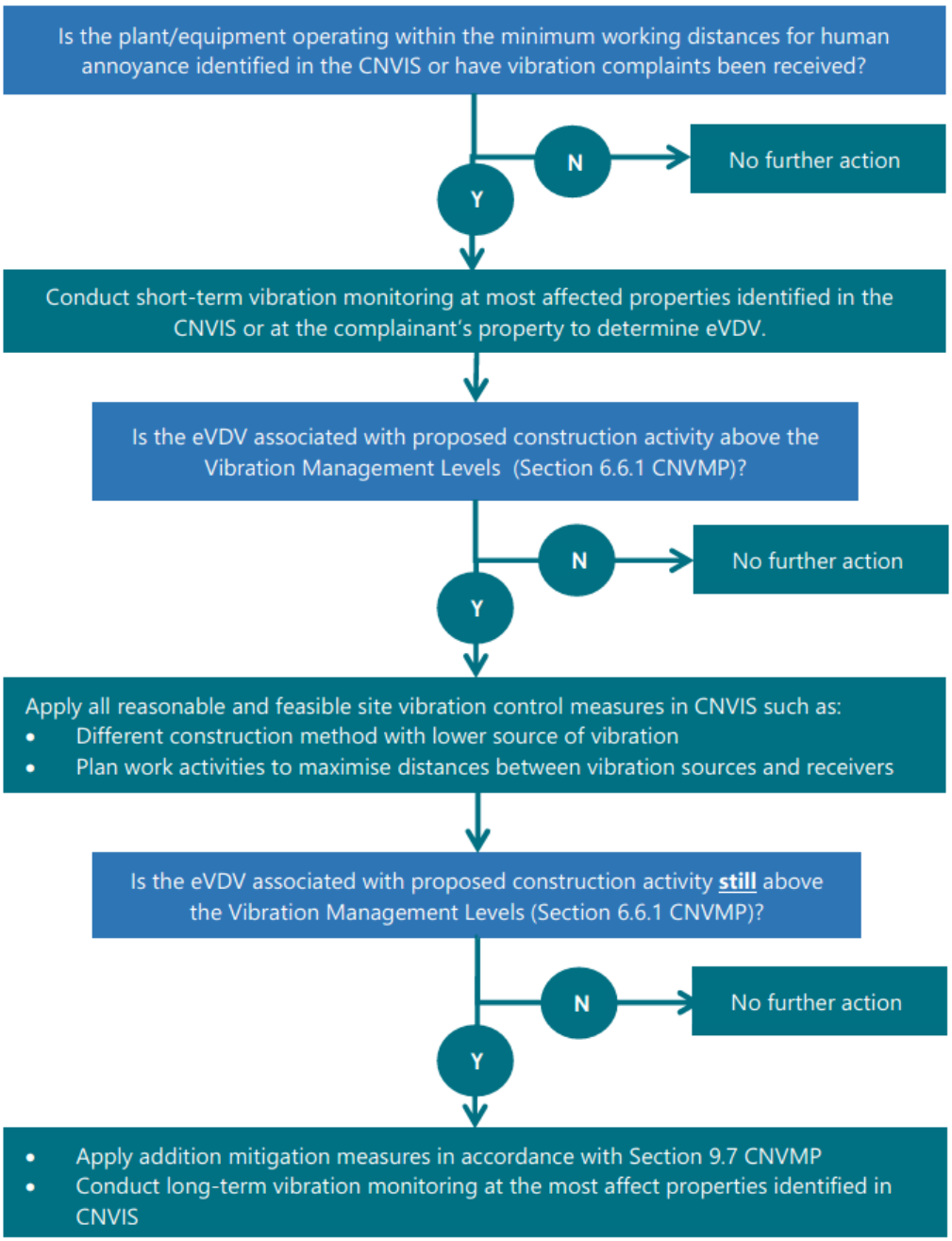
Vibration monitoring will be undertaken in accordance with the relevant vibration measurement requirements in the reference standards and documents in Section 4.1.

4.3.1 Vibration monitoring procedure for human annoyance

Where human comfort is a concern, vibration monitoring results will be assessed and reported against the values set out in Tables 2.2 and 2.4 of the EPA's Assessing Vibration – a technical guideline.

Figure 4-1 below shows the procedure to manage and minimise potential human annoyance vibration impacts through vibration monitoring.

Figure 4-1: Monitoring protocol for human annoyance impact

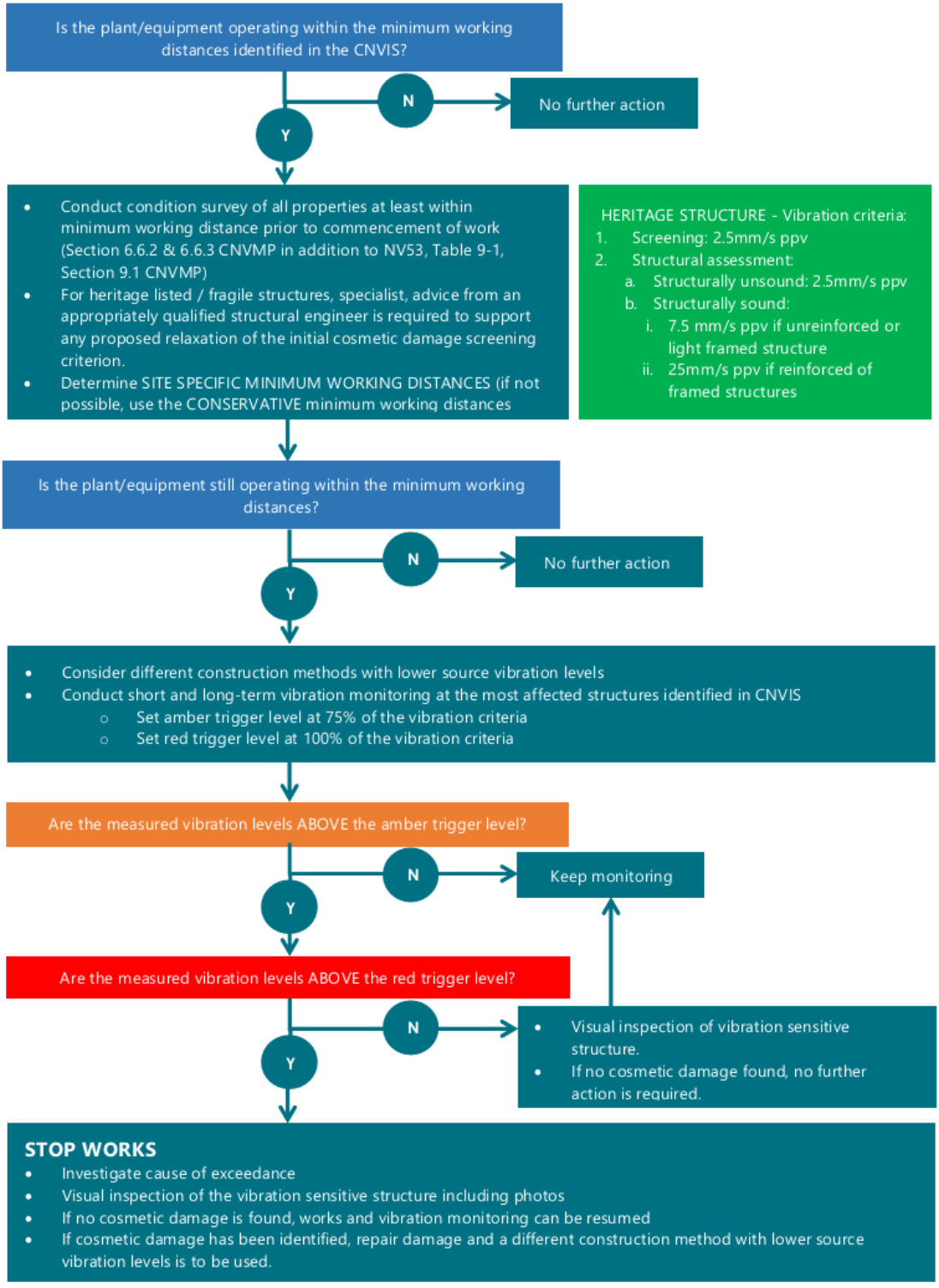


Where vibration monitoring is undertaken to measure tactile vibration levels, vibration monitoring results shall be assessed and reported against the acceptable values of human exposure to vibration set out in Tables 2.2 and 2.4 of the EPA's Assessing Vibration – a technical guideline.

4.3.2 Vibration monitoring procedure for structural damage

Where property damage is a concern, vibration monitoring results will be assessed and reported against the vibration levels from the British Standard 7385, as presented in Section 6.6.2 of the CNVMP. For heritage structures, BS7385-2:1993 does not provide numerical vibration levels to prevent structural damage. The approach that will be adopted for the Project to assess and manage potential vibration impact on heritage structures is outlined in Section 6.6.3 of the CNVMP. The procedure to manage and minimise potential structural damage impacts is presented in Figure 4-2.

Figure 4-2: Monitoring protocol for structural damage



Vibration monitoring shall be undertaken in accordance with the vibration measurement requirements stipulated in the reference standards and documents listed in Section 4.1. The following important notes in regard to vibration monitoring are:

- Vibration monitoring equipment shall be placed outside at the footings or foundations of the building of interest, on the side of the building that is closest to the vibrating plant
- The surface should be solid and rigid to best represent the vibration entering the structure of the building under investigation
- The vibration sensor or transducer shall not be mounted on loose tiles, loose gravel or other resilient surfaces
- The 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 mechanically 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.

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

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

4.3.3 Parameters to be monitored

The device will be set to continuously record vibration levels appropriate to assessing the vibration intensive activity under investigation. If required for human annoyance, the duration of vibration events will also be recorded, either as part of the measurement, or separately for later analysis.

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

- Root-Mean-Square acceleration (rms), or
- Vector-sum peak-particle velocity (ppv).

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

4.4 Calibration and QA

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

All vibration monitoring equipment used must be checked for accuracy (to manufacturer's specification) at least every two years against a reference vibration transducer that is calibrated at least every three years [reference: NATA General Accreditation Guidance - General Equipment - Calibration and Checks, General Equipment Table (January 2018)].

Records of monitoring equipment calibration and monitoring events will be maintained throughout the delivery of the Project.

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

- Date and time of measurements
- Name of person undertaking the measurements
- Calibration dates of monitoring equipment
- Type and model number of instrumentation
- Time of day, length of measurement and measurement time intervals
- Monitoring location (including a sketched map of area)
- Measurement location details and number of measurements at each location
- Type of measurement (unattended or attended)
- Location details of the vibrating plant under investigation relative to the measurement locations, and the building or facade of interest (if this is at a different location or a range of distances).
- 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.).

5 Heritage-listed structures

In accordance with CoA E43, the project will conduct vibration testing before (see Section 4.1) and during vibration generating activities that have the potential to impact on heritage items, to identify the site specific minimum working distances to prevent cosmetic damage. Should vibration testing and monitoring show that the preferred values for vibration are likely to be exceeded, the project will follow the process in Section 6.2.

CNVIS prepared for the SOM works under the CNVMP would identify the minimum working distances for heritage buildings/items, noting that these may be item or location specific, during vibration intensive activities and identify where monitoring should be conducted at heritage items.

The project will seek the advice of the heritage and noise and vibration specialists engaged, on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures.

6 Reporting

6.1 Reporting of monitoring results

Data from noise and vibration monitoring will be reported on monthly (during months where construction activities are occurring) assessed against the baseline conditions and performance criteria as required, within a Construction Monitoring Report. The Construction Monitoring Report will be supplied to the AA for review and submitted to the Secretary of the DPIE and relevant regulatory authorities (including relevant council(s)), Transport for NSW and the ER for information.

The monthly Construction Monitoring Report will be provided on the project website (http://www.parramattalightrail.nsw.gov.au/library/environment/compliance-reports) for availability by the community.

Separate from the Construction Monitoring Report, additional records relating to noise and vibration training, toolbox talks, monitoring results and audit results are described in Section 5 of the CEMP. The complaints management and reporting procedure is described in Section 6.4 of the CEMP.

6.2 Continual improvement and corrective action

Monitored noise and vibration levels will be analysed against the predictions made in the relevant CNVIS or using the Project's noise and vibration management tools. Where monitored construction noise levels are found to be above modelling predictions or vibration goals are exceeded, the following actions will be undertaken:

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

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

Where a complaint relating to human comfort is received, the project will review the noise and vibration model. If it is determined from the review that there is insufficient local monitoring to validate the noise and vibration model, the project will offer additional monitoring following the process defined in Section 3.3 and Section 4.3.

Attachment A – Recommended minimum working distances from vibration intensive equipment

Plant item	Approximate Size / Weight / Model	Minimum distance – Cosmetic damage (BS 7385)[2]	Minimum distance – Human response (AVTG)
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 12 tonne excavator)	2 m	7 m
Medium Hydraulic Hammer	900 kg (12 to 18 tonne excavator)	7 m	23 m
Large Hydraulic Hammer	1600 kg (18 to 34 tonne excavator)	22 m	73 m
Pile Driver – Vibratory	Sheet piles	2 to 20 m	20 m
Piling Rig – Bored	≤ 800 mm	2 m (nominally)	n/a
Piling Rig – Hammer	12 tonne down force	15 m	50 m
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

Notes:

1. Table adapted from the Transport for NSW's Construction Noise and Vibration Strategy
2. More stringent conditions may apply to heritage or other sensitive structures

Attachment B – ER and AA Endorsement Letters

[redacted]

Attention: Transport for NSW (PLR)

Ref: 5518_PLR-Construction Noise and Vibration Monitoring Program_SOM_AA_Endorsement_21Oct2020
21 October 2020

RE: PLR1SOM–GLR-ALL-EN-PRG-000001 Construction Noise and Vibration Monitoring Program (rD) October 2020 - Adequacy for Submission (AA Review)

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

Title:	Document Reference:	Version Status	Review Date
Construction Noise and Vibration Monitoring Program: Supply, Operate and Maintain Contract Parramatta Light Rail – Stage 1, (ISD-17-6720)	PLR1SOM–GLR-ALL-EN-PRG-000001 (Rev D)	Revision D, 12 Oct 2020	21-10-2020

Pursuant to the requirements of the Conditions of Approval for the CSSI-8285, including A29(e), the CNVIS documents identified above have been reviewed by the AA for consistency with the CNVS and requirements of the CoA and EPL (Environmental Protection Licence – 21347, 3-Jan-2020).

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

Yours sincerely

[redacted]

[redacted]

[redacted]

21 October 2020

Transport for NSW

Attention to: Senior Manager
Environment Parramatta Light Rail
[redacted]

Review of Appendix F Construction Noise and Vibration Monitoring Program.
Supply, Operate and Maintain Contract - Parramatta Light Rail
(PLR1SOM-GLR-ALL-EN-PRG-000001 Rev D)

Pursuant to SSI8285 Condition of Approval A23 (d) i), as the approved Environmental Representative, I confirm that I have reviewed the document Appendix F Construction Noise and Vibration Monitoring Program, Supply, Operate and Maintain Contract - Parramatta Light Rail (PLR1SOM-GLR-ALL-EN-PRG-000001 Rev D), dated 12/10/2020, prepared by Great River City Light Rail, for consistency with the requirements of the Conditions of Approval.

In my opinion the aforementioned document is consistent with the requirements included in or required under the terms of the Conditions of Approval for the Parramatta Light Rail (Stage 1) development.

Yours sincerely,

[redacted]

Environmental Representative
[redacted]

Filename : *AQ1148.05 PLR GLR CNVMonP endorsement 211020*

[redacted]

Attachment C – Consultation Report

CoA A5 Consultation Report – Noise and Vibration Management Plan and Monitoring Program

Transport for NSW
Stage 3 / Package 5

Parramatta Light Rail
October 2020
PLR1SOM-GLR-ALL-EN-RPT-001004 Rev B

NSW GOVERNMENT

Construction Noise and Vibration Management Plan and Monitoring Program

Parramatta Light Rail – Stage 1

October 2020

PLR1SOM-GLR-ALL-EN-RPT-001004 Revision #B

Version control

Revision	Date	Description	Approval
A	12 October 2020	CoA A5 Compliance	
B	21 October 2020	Updated to address ER and TfNSW Comments	

Contents

Glossary/Abbreviations

Abbreviation	Expanded text
CEMP	Construction Environmental Management Plan
CFFMP	Construction Flora and Fauna Management Plan
CFMP	Construction Flood Management Plan
CHMP	Construction Heritage Management Plan
CNVMP	Construction Noise and Vibration Management Plan
CNVMonP	Construction Noise and Vibration Monitoring Program
CTTAMP	Construction Traffic, Transport and Access Management Plan
CWQ(T)MonP	Water Quality (Turbidity) Monitoring Program
CoA	NSW Minister for Planning Conditions of Approval
CoPC	City of Parramatta Council
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
FMDR	Flood Management Design Report
Minister, the	Minister for Planning, Industry and Environment
OEH	Office of Environment and Heritage
ONVR	Operational Noise and Vibration Review
PIRMP	Pollution Incident Response Management Plan
Planning Approval	The Planning Approval includes the Conditions of Approval, the EIS and the Submissions and Preferred Infrastructure Report
Proponent, the	Transport for NSW
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
Project, the	Parramatta Light Rail – Westmead to Carlingford
REMMM	Revised Environmental Mitigation and Management Measure as outlined in the Project SPIR documentation.
ROL	Road occupancy licence
SEMP	Site Establishment Management Plan
SPIR	Submission and Preferred Infrastructure Report

Abbreviation	Expanded text
TfNSW RM	TfNSW Roads and Maritime
UDRR	Urban Design Requirements Report

1 Introduction

1.1 Background

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

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

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

In summary, the key features of the project include:

- A new dual track light rail network of 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 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 Route is shown in Figure 1-1.

Figure 1-1: Parramatta Light Rail Route

1.1.1 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).

Detailed environmental impact assessments have been carried out and approved by the Minister for Planning. The Planning Approval for the project is described in Section 1.1.2.

1.1.2 Parramatta Light Rail Planning Approval

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

The planning approval (Infrastructure approval SSI 8285) and related environmental assessment documents are located on Department of Planning and Environment's Major Project website:

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

1.2 Purpose of this Consultation Report

This Consultation Report has been prepared to meet the requirements of the CSSI approval, in particular Condition of Approval (CoA) A5. A5 outlines the requirements for undertaking and documenting consultation undertaken during the preparation of certain plans, programs and reports required under the CoA. Deliverables that GRCLR is responsible (in full or part) for as part of the SOM package, which required to comply with CoA A5 include the following:

- Construction Environmental Management Plan (CoA C1, C2);
- Traffic, Transport and Access Management Plan (CoA C3(a));
- Noise and Vibration Management Plan (CoA C3(b));
- Flood Management Plan (CoA C3(c));
- Heritage Management Plan (CoA C3(d));
- Flora and Fauna Management Plan (CoA C3(e));
- Water Quality (Turbidity) Monitoring Program (CoA C9(a));
- Noise and Vibration Monitoring Program (CoA C9(b));
- Site Establishment Management Plan (CoA C18);
- Pedestrian and Cyclist Network and Facilities Strategy (parts (f) – signage and wayfinding and (g) only – cycle facilities on LRVs) (CoA E14);
- Operational Noise and Vibration Review (CoA E48);
- Heritage Interpretation Strategy (CoA E64) – Implementation Component only;
- Electromagnetic Management Plan (CoA E117);
- Final Hazard Analysis and Construction Safety Study (CoA E132).

This particular Consultation Report has been prepared in support of the Construction Noise and Vibration Management Plan (CNVMP) which is required to be prepared under CoA C3(b) and the Construction Noise and Vibration Monitoring Program which is required to be prepared under CoA C9(b) and for which consultation is required to be undertaken with the following agencies and stakeholders under CoA C5:

- Relevant government agencies (including relevant Council(s)), which for this CNVMP includes:
    - NSW Environment Protection Authority (EPA);
    - NSW Health; and
    - City of Parramatta Council (CoPC).

1.3 Compliance with CoA

This section discusses the compliance of this Consultation Report with the relevant CoA as applicable to consultation required to be undertaken during the development of the Construction Noise and Vibration Management Plan (CNVMP) and Monitoring Program (CNVMonP).

Table 1 lists the applicable CoA, where and how they have been addressed in this Consultation Report.

Table 1: Compliance with Applicable CoA

CoA ID	CoA Detail	Where Addressed	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:	This Consultation Report.	This consultation report provides identifies of each of the stakeholders and agencies consulted in the preparation of this plan (Section 1.2). Full correspondence and documentation exchanged during consultation is found in Appendix A1 through A3 inclusive.
A5	(a) documentation of the engagement with the party(ies) identified in the relevant condition of approval before submitting the document for approval;	This Consultation Report.	Full correspondence and documentation exchanged during consultation is found in Appendix A1 and A3 inclusive. Each appendix relates to a different stakeholder/ agency, thereby ensuring all evidence for each is consolidated in a single appendix. All correspondence is provided in a chronological order.
A5	(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);	Section 2 of this Report.	Section 2 includes, by Stakeholder / agency, a log of all points of engagement completed or attempted. It also summarises the issues raised by each stakeholder.
A5	(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;	Section 2 of this Report.	Section 2 includes, by Stakeholder / agency, a log of all points of engagement completed or attempted.
A5	(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	Section 2 of this Report and Appendix A1 through A5.	Section 2 identifies all the issues raised during consultation. It provides in tabular format: • Issue raised; • Date raised; • How it was addressed or justification as to why it wasn't addressed; • Details of whether the Stakeholder was satisfied with the outcome.

CoA ID	CoA Detail	Where Addressed	How Addressed
			Section 2 then provides cross-referencing to the relevant Appendix identifying where evidence of the above is documented in full within this Report. *Note: Section 2 is broken down into each Stakeholder consulted with, and each has their own table addressing the above.*
A5	(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 2 of this Report.	Section 2 identifies all the issues raised during consultation. It provides in tabular format: • Issue raised; • Date raised; • How it was addressed or justification as to why it wasn't addressed; • Details of whether the Stakeholder was satisfied with the outcome. *Note: Section 2 is broken down into each Stakeholder consulted with, and each has their own table addressing the above.*
C5	The CEMP Sub-plans must be developed in consultation with relevant government agencies (including Relevant Council(s)).	This Report.	This Consultation Report has been prepared to address the consultation undertaken on the CNVMP and the CNVMonP for the SOM Works. A summary of the content of this Report is contained in Section 4 of the CNVMP, and Section 2 of the CNVMonP however all the consultation requirements of CoA A5 and C5 are addressed in detail in this Report.
C5	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.	Other Consultation Reports.	Each CEMP Sub-plan will include a summary of consultation undertaken for that plan. Additionally, each will also have a separate Consultation Report which addresses in detail CoA A5 and C5.

1.4 Consultation Process

Below Figure 2 presents the consultation process that was undertaken for the SOM Construction Noise and Vibration Management Plan and Monitoring Program. It should be noted that consultation was undertaken during COVID-19 lockdown, and as such, was undertaken using non-face to face means, including:

- Formal correspondence; (Team Binder);
- Formal correspondence (standard email);
- Phone Calls; and
- Teams Meetings (only when requested by the stakeholder).

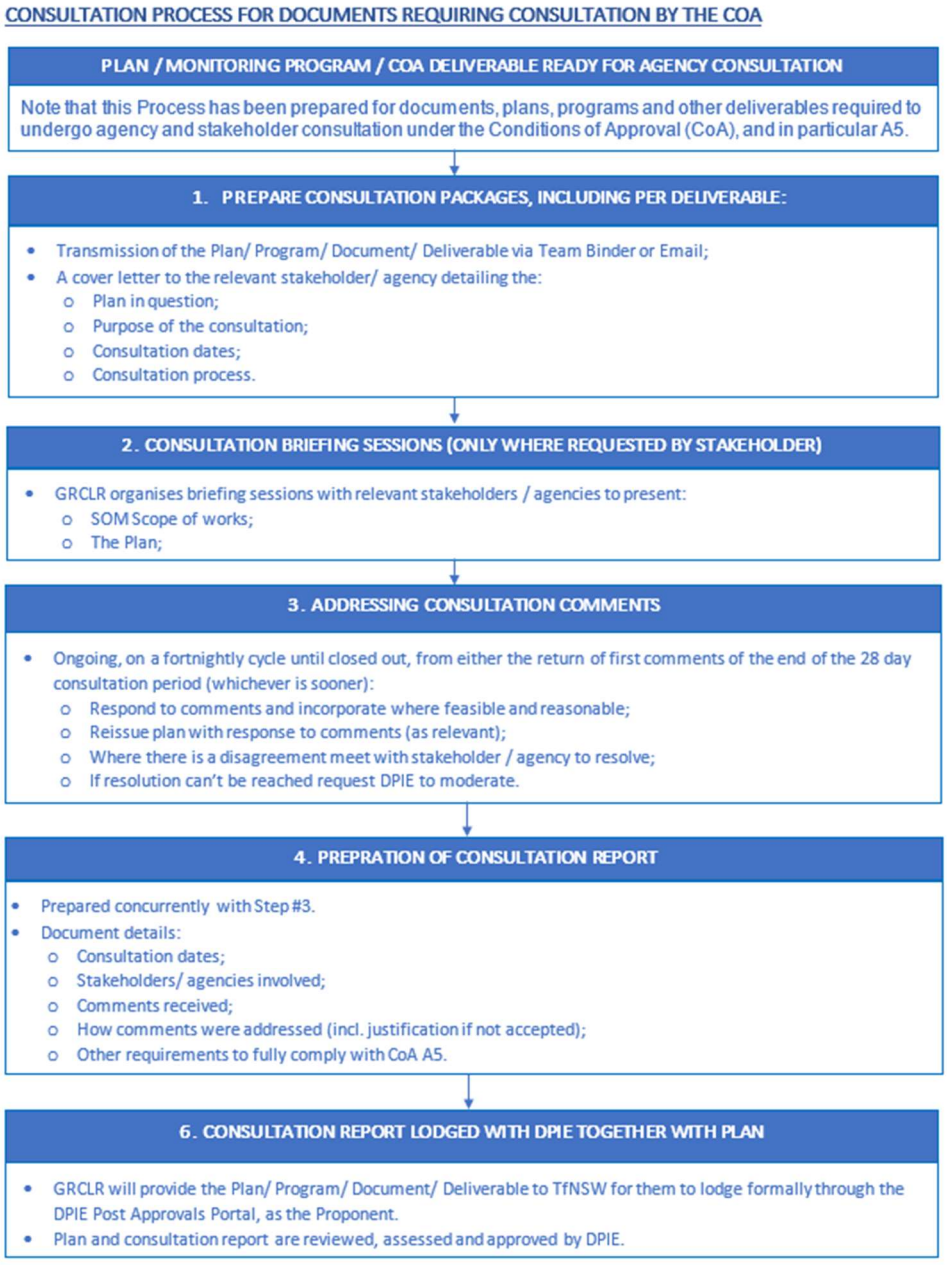


Figure 2: Consultation Process

2 Stakeholder / Agency Consultation

This Section of the Consultation Report provides detail of consultation undertaken with each stakeholder and agency in the preparation of the CNVMP and CNVMonP. In particular it contains:

A consultation log that identifies:

- Consultation dates (actual and attempted);
- Form of consultation;
- Whether responses and / or comments were received;
- Summary of the issues raised, including how they have been addressed;
- Justification for not addressing an issue raised.

Documentary evidence of all the correspondence received and sent through the consultation phase is contained in the Appendices at the end of this Report. The Appendices and this Section are broken down by Stakeholder / Agency not by issue.

2.1 NSW Environment Protection Authority (EPA)

Consultation with NSW EPA commenced on 23 June 2020 and concluded 24 July 2020.

Table 2 below includes the details of engagement between GRCLR and the EPA regarding the CNVMP and CNVMonP. Table 3, following, includes a summary of the issues raised, how those were addressed and closed out. Full evidence of correspondence is in Appendices A1 to this report.

Table 2: Engagement Log – EPA

#	Date	Correspondence		From	Recipient	Consultation Open / Closed
		Form / Type	Purpose			
1	23 June 2020	Email	Initial request for stakeholder review and comment.	GRCLR	EPA	Open.
2	24 July 2020	Email	Response to request for comments – no comments.	EPA	GRCLR	Closed.

Table 3: Summary of Issues – EPA

Aspect	Issue Raised	Date Raised	How Addressed / Justification Why Not Addressed	Stakeholder Satisfied / Issue Closed Out?
Not applicable to EPA as no comments were provided.				

2.2 NSW Health – HAC

Consultation with NSW Health – HAC commenced on 23 June 2020 and concluded 30 July 2020.

Table 4 below includes the details of engagement between GRCLR and NSW Health regarding the CNVMP and CNVMonP. Table 5, following, includes a summary of the issues raised, how those were addressed and closed out. Full evidence of correspondence is in Appendices A2 to this report.

Table 4: Engagement Log – NSW Health

#	Date	Correspondence		From	Recipient	Consultation Open / Closed
		Form / Type	Purpose			
1	23 June 2020	Formal – Team Binder	Initial request for stakeholder review and comment.	GRCLR	HAC – NSW Health	Open.
2	1 July 2020	Email	HAC Issued interim questions to SOM.	HAC – NSW Health	GRCLR	Open.
3	16 July 2020	Presentation – Teams	Explanation of the SOM Scope of Works and Q&A.	GRCLR	HAC – NSW Health	Open.
4	17 July 2020	Formal – Team Binder	Response to Questions Provided.	GRCLR	HAC – NSW Health	Open.
5	30 July 2020	Email	Response to request for comments – no comments.	HAC – NSW Health	GRCLR	Closed.

Table 5: Summary of Issues – NSW Health

Aspect	Issue Raised	Date Raised	How Addressed / Justification Why Not Addressed	Stakeholder Satisfied / Issue Closed Out?
Not applicable to NSW Health – HAC as no comments were provided.				

2.3 City of Parramatta Council

Consultation with the City of Parramatta Council (CoPC) commenced on 7 August 2020 and concluded 9 October 2020.

Table 6 below includes the details of engagement between GRCLR and the CoPC regarding the CNVMP and CNVMonP. Table 7 following includes a summary of the issues raised, how those were addressed and closed out. Full evidence of correspondence is in Appendix A3 to this report.

Table 6: CoPC Engagement Log

#	Date	Correspondence		From	Recipient	Consultation Open / Closed
		Form / Type	Purpose			
1	7 August 2020	Team Binder	Initial request for stakeholder review and comment.	GRCLR	CoPC	Open.
2	3 September 2020	Team Binder	Response to request for comments.	CoPC	GRCLR	Open.
3	8 September 2020	Team Binder	Response to CoPC – two comments made see Table 7 below.	GRCLR	CoPC	Open.
4	23 September 2020	Team Binder	Response to request for comments – no further comments but comments not closed.	CoPC	GRCLR	Open.
5	23 September 2020	Team Binder	Response to CoPC – requesting if comments have been closed.	GRCLR	CoPC	Open.
6	9 October 2020	Team Binder	Response to final request for comments – no comments.	CoPC	GRCLR	Closed.

Table 7: CoPC: Summary of Issues

Aspect	Issue Raised	Date Raised	How Addressed / Justification Why Not Addressed	Stakeholder Satisfied / Issue Closed Out?
CNVMP – Consultation, including with ER and AA	Requests that consultation process be included in the monitoring program. (Note: The exact same comment was raised on CNVMon).	7 July 2020	No change. GRCLR noted that this was the CNVMP, and referred to response in CNVMonP.	Yes. 9 October 2020.
CNVMonP – Consultation, including with ER and AA	Requests that consultation process be included in the monitoring program.	7 July 2020	No change. GRCLR pointed out that the ER and AA are independent of GRCLR, and that consultation and	Yes. 9 October 2020.

Aspect	Issue Raised	Date Raised	How Addressed / Justification Why Not Addressed	Stakeholder Satisfied / Issue Closed Out?
	Also request quarterly briefing of Council by ER and AA, on noise and vibration matters.		management of the cumulative impacts across the project (including all contractors) are coordinated by TfNSW, and the request would be better directed to TfNSW as this CNVMonP only related to SOM scope of works.	

Appendix A1 – NSW EPA

From: @epa.nsw.gov.au>
Sent: Friday, 24 July 2020 3:55 PM
To:
Subject: RE: Construction Noise and Vibration Management and Monitoring Plans - Consultation Request

Good Afternoon

Thank you for forwarding the Noise and Vibration Management Plan and Noise Vibration Monitoring Plan for our records. The EPA encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, it is not EPA policy to approve or endorse these documents. The EPA's role is to set environmental objectives/requirements for environmental management, rather than being directly involved in the development of strategies to achieve those objectives/requirements.

Apologies for the delay in my response. Thank you for your email and please do not hesitate to contact me should you wish to discuss.

Regards

From: @greatrivercity.com.au>
Sent: Thursday, 23 July 2020 3:55 PM
To: epa.nsw.gov.au>; @epa.nsw.gov.au>
Cc: @gmail.com>; @caf.net>;
@greatrivercity.com.au>
Subject: RE: Construction Noise and Vibration Management and Monitoring Plans - Consultation Request

Good Afternoon ,

Just following up on the below request for consultation on the GRCLR Noise and Vibration Management Plan (NVMP) and Noise and Vibration Monitoring Plan (NVMonP) sent to yourself on 23 June 2020 and whether you did intend to provide comments to GRCLR on these plans?

If you do not intend to provide any comments on these plans, could you please let us know by responding to this email, so we can progress submission of these.

Much appreciated,

Environment, Planning and Sustainability Manager

M +61
E @greatrivercity.com.au

Level 1, 31 Macquarie St, Parramatta NSW 2150

From:
Sent: Wednesday, 15 July 2020 11:22 AM
To: @epa.nsw.gov.au>;@epa.nsw.gov.au'
<@epa.nsw.gov.au>
Cc:@gmail.com>; '@caf.net>;
@greatrivercity.com.au>
Subject: RE: Construction Noise and Vibration Management and Monitoring Plans - Consultation Request

Good Morning ,

Just following up on the below request for consultation on the Noise and Vibration Management Plan (NVMP) and Noise and Vibration Monitoring Plan (NVMonP) sent to yourself on 23 June 2020.

Would EPA like to provide review comments on the GRCLR NVMP and NVMonPlan, and if EPA would like to provide comment, could you please ensure you return these to GRCLR by **Wednesday 22 July 2020.**

Please contact myself on the below details should additional information be required, or you have any further questions regarding the attached NVMP or NVMonP.

We look forward to your response. If you do not intend to make any comments on these plans, could you also please let us know.

Regards

Environment, Planning and Sustainability Manager

M +61
E @greatrivercity.com.au

Level 1, 31 Macquarie St, Parramatta NSW 2150

From:
Sent: Tuesday, 23 June 2020 3:08 PM
To:@epa.nsw.gov.au>;@epa.nsw.gov.au
Cc: @gmail.com>; @greatrivercity.com.au>; @greatrivercity.com.au>; @greatrivercity.com.au>;
@advisian.com>; @caf.net>; @greatrivercity.com.au>; @caf.net>;
@transport.nsw.gov.au>
Subject: Construction Noise and Vibration Management and Monitoring Plans - Consultation Request

Good Afternoon ,

Great River City Light Rail (GRCLR) has been engaged by TfNSW to design and construct a portion of the Parramatta Light Rail (PLR) Project, including the Stabling and Maintenance Facility (SaMF) at 6 Grand Avenue Camellia.

GRCLR has prepared the Noise and Vibration Management Plan (NVMP) and Noise and Vibration Monitoring Plan (NVMonP) as sub-plans to the Construction Environmental Management Plan (CEMP) required under the CSSI Approval (8285) the Conditions of Approval (CoA) C1 and C2, and under CoA C3 and C5 are required to undertake consultation with key Stakeholders.

GRCLR invites the Environment Protection Authority (EPA) to review and comment on the NVMP and NVMonPlan, attached to this email.

GRCLR requests that if EPA would like to review and provide comments on the GRCLR NVMP and NVMonPlan, would you please return these to GRCLR by **Wednesday 22 July 2020.**

Please contact myself on the below details should additional information be required, or you have any further questions regarding the attached NVMP or NVMonP.

We look forward to your response. If you do intend to make any comments on these plans, please also let us know.

Regards

Environment, Planning and Sustainability Manager

M +61
E @greatrivercity.com.au

Level 1, 31 Macquarie St, Parramatta NSW 2150

Appendix A2 – NSW Health – HAC

General Correspondence

Reference No.: **PLR-PLR1SOM-GLR-HAC-CORR-000009**

Project Title: Parramatta Light Rail - Main Works

Date: 23 July 2020, 12:31

To: Health Administration Corporation Health Administration Corporation

Cc: Transport for NSW
Great River City Light Rail Pty Ltd

From: Great River City Light Rail Pty Ltd

Subject: **RE: Construction Noise and Vibration Management and Monitoring Plans - Request for Consultation - Response**

Good Afternoon ,

Just following up with yourself whether you had any other comments on the GRCLR Noise and Vibration Management and Monitoring Plans for construction phase. I believe we have sent through all information requested.

Could you please let me know either way, so we can progress with the submission of these documents. Please give me a call on if you would like to discuss further.

Much appreciated,

Design Pkg:

Contract / Program: Stage 1 Supply Operate and Maintain Contract

Discipline: Environmental

Location:

----- Original Message -----

General Correspondence

Reference No.: **PLR-PLR1SOM-GLR-HAC-CORR-000008**

Project Title: Parramatta Light Rail - Main Works

Date: 17 July 2020, 13:23

To: Health Administration Corporation
Health Administration Corporation

Cc: Transport for NSW
Great River City Light Rail Pty Ltd
Great River City Light Rail Pty Ltd
Great River City Light Rail Pty Ltd
Great River City Light Rail Pty Ltd
Great River City Light Rail Pty Ltd
Transport for NSW
ransport for NSW

From: Great River City Light Rail Pty Ltd

Subject: **RE: Construction Noise and Vibration Management and Monitoring Plans - Request for Consultation - Response**

Good Afternoon ,

GRCLR have collated responses to your questions raised. Please find these attached along with the Landuse Survey which was not provided previously with the sub plan.

The files were to large to send through traditional email. I will also send through our minutes and presentation from our briefing yesterday.

As discussed, if you have any queries, please feel free to contact myself on .

Regards,

Design Pkg: **Contract / Program:** Stage 1 Supply Operate and Maintain Contract

Discipline: Environmental **Location:**

Attachments: HAC Questions and SOM (including RTA) Response 15072020.docx, PLR1SOM-GLR-ALL-NV-RPT-001001.B.C1.B.01.docx, PLR1SOM-GLR-ALL-NV-RPT-001001.B.C1.B.01.pdf, PLR1SOM-GLR-ALL-NV-RPT-001002.A.C1.A.01.pdf

----- Original Message -----

General Correspondence

Reference No.: **PLR-PLR1SOM-GLR-HAC-CORR-000007**

Project Title: Parramatta Light Rail - Main Works

Date: 30 June 2020, 16:23

To: Health Administration Corporation
Health Administration Corporation

Cc: Transport for NSW
Great River City Light Rail Pty Ltd
Great River City Light Rail Pty Ltd

From: Great River City Light Rail Pty Ltd

Subject: **FW: Construction Noise and Vibration Management and Monitoring Plans - Request for Consultation**

Good Afternoon

I understand has discussed our Noise and Vibration Management and Monitoring Plans being sent to you for review.

GRCLR is happy to discuss with you our project scope to aid the review of the documents which were sent through from .

Please respond with your available timing and I will arrange a suitable time to take you through the project scope. You can also contact myself on the below details to discuss further.

Regards,

Design Pkg:

Contract / Program: Stage 1 Supply Operate and Maintain Contract

Discipline: Environmental

Location:

Attachments: Construction Noise and Vibration Management Plan Rev D.pdf, Noise Vibration Monitoring Plan Rev C.pdf, NVMP and NMonP Consultation Comments Template.xlsx, PLR1SOM-GLR-HAC-LETTER-000001 - NSW Health Consultation Request - NVMP and NVMonP.pdf

----- Original Message -----

General Correspondence

Reference No.: **PLR-PLR1SOM-GLR-TFNSW-CORR-001110**

Project Title: Parramatta Light Rail - Main Works

Date: 23 June 2020, 15:00

To: Transport for NSW

Cc: Transport for NSW
Great River City Light Rail Pty Ltd

From: Great River City Light Rail Pty Ltd

Subject: **Construction Noise and Vibration Management and Monitoring Plans - Request for Consultation**

Good Afternoon,

Please find attached the Construction Noise and Vibration Management and Monitoring Plans (NVMP and NVMonP) for consultation with NSW Health.

Please provide review comments on the sheet attached and return these to GRCLR by **Wednesday 22 July 2020**.

Would you please direct any queries or requests for additional information to myself.

If NSW Health could let GRCLR know either way, on whether they will or will not provide comments, that would be much appreciated.

Regards,

Design Pkg:

Contract / Program: Stage 1 Supply Operate and Maintain Contract

Discipline: Environmental

Location:

Attachments: PLR1SOM-GLR-HAC-LETTER-000001 - NSW Health Consultation Request - NVMP and NVMonP.pdf, Construction Noise and Vibration Management Plan Rev D.pdf, NVMP and NMonP Consultation Comments Template.xlsx, Noise Vibration Monitoring Plan Rev C.pdf

From: @caf.net
Sent: Monday, 12 October 2020 10:08 AM
To: @gmail.com
Subject: Fw: Re: Notification of New Mail

See email chain below.

Environment and Sustainability Manager

E-mail: @caf.net
Phone:
Address: Level 1, 31-39 Macquarie Street, Parramatta, NSW 2150

----- Original message -----
From: @pwc.com>
To: @greatrivercity.com.au>
Cc: @transport.nsw.gov.au>, @greatrivercity.com.au>, @caf.net>
Subject: Re: Notification of New Mail
Date: Mon, Jul 6, 2020 4:50 PM

Hi ,
Can you please send through Zoom/Microsoft Team etc. meeting invite link?
The meeting will need to be hosted by GRCLR.

Regards,

Project Manager | Infrastructure & Urban Renewal | PwC
M: T: +61 (02)
@pwc.com

On Mon, 6 Jul 2020 at 16:46, @pwc.com> wrote:
Hi ,
16th July should be fine. I have issued an invite to HAC stakeholders.

Regards,

Project Manager | Infrastructure & Urban Renewal | PwC
M: T: +61 (02)
@pwc.com

On Fri, 3 Jul 2020 at 13:26, @greatrivercity.com.au> wrote:

Good Afternoon,

Thank you for your email, we are collating answers to your questions you have raised below and will respond before our scheduled briefing.

Would you be available the same time on Thursday 16 July?

Just to clarify this Noise and Vibration Management and Monitoring Plan is for the construction phase only, not operations, this will be dealt with separately at a later date.

Please let me know if the Thursday 16 July will be suitable for you and your team and we shall go from there.

Regards

\
Environment, Planning and Sustainability Manager

M +61
E @greatrivercity.com.au

Level 1, 31 Macquarie St, Parramatta NSW 2150

From: @pwc.com>
Sent: Wednesday, 1 July 2020 4:52 PM
To:@greatrivercity.com.au>
Cc: @transport.nsw.gov.au>
Subject: Re: Notification of New Mail

Hi,
Thanks for sending through the documents. I recommend a brief review session with HAC stakeholders, especially with Research Institutes (WIMR & CMRI).
Next Thursday 11:30 - 12 noon is ideal - this is after the HAC coordination meeting with PCPLR and most HAC attendees will be present. Can someone from GRCLR provide an overview and collate comments?
Prior to the meeting can you clarify some key items:

- Are Renzo Tonin preparing the CNVIS, carrying out all the assessments and monitoring? Are they following the same protocols set up with PCPLR? Will the same sensitive locations be transferred?
- Confirmation required on extent GRCLR are following the same processes/principles adopted by PCPLR. A lot of work has already been done to advise on HAC requirements for monitoring.
- Research Institutes (WIMR, CMRI and KR) are not mentioned as sensitive locations. Will this be added?
- Table 5-1 is general and does not identify any HAC locations, or apply NCA05 rating. Will this be added?
- This document appears to cover construction activities and monitoring. What about operational noise and vibration once the LR is live?
- Where is the Land Use Survey from Appendix B-1?

Regards,

Project Manager | Infrastructure & Urban Renewal | PwC
M: T: +61 (02)
@pwc.com

On Tue, 30 Jun 2020 at 16:24, @teambinder.com> wrote:

> You have received the following new mail in InEight Document
>
> | | |
> |---|---|
> | Project Number: | PLRM |
> | Project Title: | Parramatta Light Rail - Main Works |
>
> ---
>
> | | |
> |---|---|
> | Reference: | PLR-PLR1SOM-GLR-HAC-CORR-000007 |
> | Type: | CORR |

Date: 30 June 2020, 16:23
To: Health Administration Corporation

CC: Transport for NSW
Great River City Light Rail Pty Ltd

Subject: **FW: Construction Noise and Vibration Management and Monitoring Plans - Request for Consultation**
From: **Great River City Light Rail Pty Ltd**
Original Reference:
Good Afternoon,
I understand has discussed our Noise and Vibration Management and Monitoring Plans being sent to you for review. GRCLR is happy to discuss with you our project scope to aid the review of the documents which were sent through from . Please respond with your available timing and I will arrange a suitable time to take you through the project scope. You can also contact myself on the below
details to discuss further.
Regards, ...

From: @pwc.com> Thursday, 30 July 2020 4:47 PM
Sent:
To:
Cc: Re: Notification of New Mail
Subject:

Hi ,
Thanks for the consultation and presentation.
HAC has no further comments on SOM's Construction Noise and Vibration Management and Monitoring Plans.

Regards,

Project Manager | Infrastructure & Urban Renewal | PwC
M: T: +61 (02)
@pwc.com

On Thu, 23 Jul 2020 at 12:31, <system@teambinder.com> wrote:

You have received the following new mail in InEight Document

Project Number: PLRM
Project Title: Parramatta Light Rail - Main Works

Reference: PLR-PLR1SOM-GLR-HAC-CORR-000009
Type: CORR
Date: 23 July 2020, 12:31
To: Health Administration Corporation

CC: Transport for NSW
Great River City Light Rail Pty Ltd

RE: Construction Noise and Vibration Management and Monitoring Plans - Request for Consultation - Response
Great River City Light Rail Pty Ltd

Subject:

From:
Original Reference:
Good Afternoon, Just following up with yourself whether you had any other comments on the GRCLR Noise and Vibration Management and Monitoring Plans for construction phase. I believe we have sent through all information requested. Could you please let me know either way, so we can progress with the submission of these documents. Please give me a call on if you would like to discuss further. Much appreciated,
----- Original Message ----- Gen.....

Appendix A3 – City of Parramatta Council

03 September 2020, 14:43 Reference No.: **PLR-PLR1SOM-COP-GLR-LETTER-000012**

Great River City Light Rail Pty Ltd

Attention:

Project Name Parramatta Light Rail - Main Works
RE: Construction Environment Management Plan - Sub-Plan
Consultation Request with CoPC

Hi

City of Parramatta Council refers to GRCLR correspondence PDCS ref PLRM-GLR-COP-TX-000004, inviting CoPC to review and comment on the Sub-Plans, attached to this transmittal along with a review comment sheet.

Accordingly, please find attached CoPC Comment sheet for the the sub plans, with comments for each subplan entered on a separate worktab

Regards

Senior Engineering & Project Manager
(02)

City of Parramatta
Level 11, 126 Church Street, Parramatta NSW 2150
PO Box 32, Parramatta, NSW 2124
cityofparramatta.nsw.gov.au

Project Reference No: **PLR-PLR1SOM-COP-GLR-LETTER-000012**

To: (GLR) ,
Cc: (TFNSW) , (GLR) , PLR Document Controller (TFNSW) , (APP)

City of Parramatta

----- Original Message -----

Document Transmittal

Project Number:	PLRM	**Transmittal No:**	PLRM-GLR-COP-TX-000004
Project Title:	Parramatta Light Rail - Main Works		
Date:	07 August 2020 10:50 AM		

Subject: Construction Environment Management Plan - Sub-Plan Consultation Request with CoPC

Reason for Issue: Issued For Review

Message: ,

In follow up to our recent consultation on GRCLR's Construction Environment Management Plan (CEMP), GRCLR has now prepared Sub-Plans to the CEMP, required under the CSSI Approval (8285) the Conditions of Approval (CoA) C1 and C2, and under CoA C3 and C5. Under these conditions, GRCLR are required to undertake consultation with key Stakeholders.

The following Sub-Plans have been prepared by GRCLR:

Sub-Plans for the Stabilising and Maintenance Facility Only *(a revised version of these plans covering the entire SOM construction scope of works will be released at a later date for consultation prior to commencement of construction):*

- Traffic, Transport and Access Management Plan (TTAMP)
- Flood Management Plan (FMP)
- Flora and Fauna Management Plan (FFMP)

Sub-Plans for the Entire SOM Construction Scope of Works:

- Noise and Vibration Management Plan (NVMP) including Noise Vibration Monitoring Program (NVmonP)
- Heritage Management Plan (HMP)

Further to the above sub plans, GRCLR is required under the CSSI Approval (8285) the Conditions of Approval (CoA) C9 (a) to develop a Water Quality (turbidity) Monitoring Program. GRCLR is seeking an exemption from CoA C9 (a) Water Quality (turbidity) Monitoring Program for the SOM works, in consultation with our key stakeholders, due to the following reasons:

- The SaMF site would be limited to surface water run-off. Erosion and sediment controls would be in place. The potential release of sediment-laden surface flows would be low and would only occur if appropriate controls were not in place.
- Calculations of Erosion Risk at the site indicate that the rate of soil loss would be very low.
- The SaMF site has undergone subsurface remediation works, which involved removing all vegetation from site and installing a compacted capping layer. This will limit any exposed natural surfaces that would ordinarily contribute to the sediment-laden surface flows at the site.
- Any measured changes within the Parramatta River would be difficult to directly attribute to the works at the SaMF site in isolation from other contributors to the catchment flow.

GRCLR is providing the SWMP as an alternative to the water quality monitoring program, as was done for the early works packages for PLR. The scope of the SaMF would unlikely have measurable impacts on the Parramatta River. Therefore, monitoring of surface water is not proposed as part of delivery of the SaMF. As part of the review of this SWMP the Department of Primary Industries (Water) and the Environment Protection Authority is also being consulted on this approach. This is discussed in further detail in Section 4.2.1 of the SWMP.

Please note: the SWMP included with this transmittal, is for the construction of the SaMF site only. A revised SWMP covering all GRCLR construction works will be released at a later date for consultation prior to commencement of GRCLR works along the main alignment

GRCLR invites The City of Parramatta Council (CoPC) to review and comment on the Sub-Plans, attached to this transmittal along with a review comment sheet.

GRCLR requests that if CoPC would like to review and provide comments on the GRCLR Sub-Plans, would you please return these by **Thursday 3rd September 2020.**

Please contact on the below details should additional information be required, or you have any further questions regarding these Sub-Plans.

Environment, Planning and Sustainability Manager

M +61
E @greatrivercity.com.au

Please let us know if do not intend to make any comments

Please submit your comments by 03 September 2020

Transmitted to:

Company	Name
City of Parramatta	

Transmitted cc:

Company	Name
Transport for NSW	
Transport for NSW	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	

Click on Document Nos to download them individually.

Item	Document No	Rev	Sts	Title	Alt Doc Number	Design Package No
1	PLR1SOM-GLR-ALL-EN-PRG-000001	C	C3	Construction Noise and Vibration Monitoring Program		
2	PLR1SOM-GLR-ALL-PM-PLN-000032	D	S2	Construction Traffic, Transport and Access Management Sub Plan	PLR-SOM-GLR-PJT-PM-PLN-000032	
3	PLR1SOM-GLR-ALL-PM-PLN-000033	D	S2	Construction Flora and Fauna Management Sub Plan	PLR-SOM-GLR-PJT-PM-PLN-000033	
4	PLR1SOM-GLR-ALL-PM-PLN-000034	D	S2	Construction Noise and Vibration Management Sub Plan	PLR-SOM-GLR-PJT-PM-PLN-000034	
5	PLR1SOM-GLR-ALL-PM-PLN-000035	D	S2	Construction Soil and Water Quality Management Sub Plan	PLR-SOM-GLR-PJT-PM-PLN-000035	
6	PLR1SOM-GLR-ALL-PM-PLN-000037	G	S2	Construction Heritage Management Sub Plan	PLR-SOM-GLR-PJT-PM-PLN-000037	

7	PLR1SOM-GLR-ALL-PM-PLN-000047	C	S0	Flood Management Plan	PLR-SOM-GLR-PJT-PM-PLN-000040	

Transmitted by: Great River City Light Rail Pty Ltd

Attachments
CoPC Sub-Plan Consultation CoP Comments.xlsx (109 KB)

08 September 2020, 11:35 Reference No.: **PLR-PLR1SOM-COP-GLR-LETTER-000012**

City of Parramatta

Attention:

Project Name Parramatta Light Rail - Main Works
Construction Environment Management Plan - Sub-Plan Consultation Request with CoPC

City of Parramatta Council

Attention: I

Project Name: Parramatta Light Rail - Supply Operate and Maintain (SOM)
RE: Great River City Light Rail - Sub-plan Consultation Response

Dear ,

Thank you for taking the time to review GRCLR's Sub plans provided for the SOM scope of works.

GRCLR has provided response to each of these comments in the attached comments register under each tab.

GRCLR is happy to organise a meeting to discuss any outstanding concerns CoPC might have.

Please consider the attached responses, and contact, if you would like to discuss the content further.

If you consider that GRCLR's response has adequately closed your comments, please let us know these are now closed by responding to this email.

Regards,

----- Original Message -----

03 September 2020, 14:43 Reference No.: **PLR-PLR1SOM-COP-GLR-LETTER-000012**

Great River City Light Rail Pty Ltd

Attention:

Project Name Parramatta Light Rail - Main Works
RE: Construction Environment Management Plan - Sub-Plan Consultation Request with CoPC

Hi

City of Parramatta Council refers to GRCLR correspondence PDCS ref PLRM-GLR-COP-TX-000004, inviting CoPC to review and comment on the Sub-Plans, attached to this transmittal along with a review comment sheet.

Accordingly, please find attached CoPC Comment sheet for the the sub plans, with comments for each subplan entered on a separate worktab

Regards

Senior Engineering & Project Manager
(02)

City of Parramatta
Level 11, 126 Church Street, Parramatta NSW 2150
PO Box 32, Parramatta, NSW 2124
cityofparramatta.nsw.gov.au

Project Reference No: **PLR-PLR1SOM-COP-GLR-LETTER-000012**

To: (GLR) ,
Cc: (TFNSW) , (GLR) , PLR Document Controller (TFNSW) , (APP)

City of Parramatta

----- Original Message -----

Document Transmittal

Project Number:	PLRM	**Transmittal No:**	PLRM-GLR-COP-TX-000004
Project Title:	Parramatta Light Rail - Main Works		
Date:	07 August 2020 10:50 AM		
Subject:	Construction Environment Management Plan - Sub-Plan Consultation Request with CoPC		
Reason for Issue:	Issued For Review		
Message:			

In follow up to our recent consultation on GRCLR's Construction Environment Management Plan (CEMP), GRCLR has now prepared Sub-Plans to the CEMP, required under the CSSI Approval (8285) the Conditions of Approval (CoA) C1 and C2, and under CoA C3 and C5. Under these conditions, GRCLR are required to undertake consultation with key Stakeholders.

The following Sub-Plans have been prepared by GRCLR:

Sub-Plans for the Stabilising and Maintenance Facility Only *(a revised version of these plans covering the entire SOM construction scope of works will be released at a later date for consultation prior to commencement of construction):*

- Traffic, Transport and Access Management Plan (TTAMP)
- Flood Management Plan (FMP)
- Flora and Fauna Management Plan (FFMP)

Sub-Plans for the Entire SOM Construction Scope of Works:

- Noise and Vibration Management Plan (NVMP) including Noise Vibration Monitoring Program (NVmonP)
- Heritage Management Plan (HMP)

Further to the above sub plans, GRCLR is required under the CSSI Approval (8285) the Conditions of Approval (CoA) C9 (a) to develop a Water Quality (turbidity) Monitoring Program. GRCLR is seeking an exemption from CoA C9 (a) Water Quality (turbidity) Monitoring Program for the SOM works, in consultation with our key stakeholders, due to the following reasons:

- The SaMF site would be limited to surface water run-off. Erosion and sediment controls would be in place. The potential release of sediment-laden surface flows would be low and would only occur if appropriate controls were not in place.
- Calculations of Erosion Risk at the site indicate that the rate of soil loss would be very low.
- The SaMF site has undergone subsurface remediation works, which involved removing all vegetation from site and installing a compacted capping layer. This will limit any exposed natural surfaces that would ordinarily contribute to the sediment-laden surface flows at the site.
- Any measured changes within the Parramatta River would be difficult to directly attribute to the works at the SaMF site in isolation from other contributors to the catchment flow.

GRCLR is providing the SWMP as an alternative to the water quality monitoring program, as was done for the early works packages for PLR. The scope of the SaMF would unlikely have measurable impacts on the Parramatta River. Therefore, monitoring of surface water is not proposed as part of delivery of the SaMF. As part of the review of this SWMP the Department of Primary Industries (Water) and the Environment Protection Authority is also being consulted on this approach. This is discussed in further detail in Section 4.2.1 of the SWMP.

Please note: the SWMP included with this transmittal, is for the construction of the SaMF site only. A revised SWMP covering all GRCLR construction works will be released at a later date for consultation prior to commencement of GRCLR works along the main alignment

GRCLR invites The City of Parramatta Council (CoPC) to review and comment on the Sub-Plans, attached to this transmittal along with a review comment sheet.

GRCLR requests that if CoPC would like to review and provide comments on the GRCLR Sub-Plans, would you please return these by **Thursday 3rd September 2020.**

Please contact below details should additional information be required, or you have any further questions regarding these Sub-Plans.

Environment, Planning and Sustainability Manager
M +61
E @greatrivercity.com.au

Please let us know if do not intend to make any comments

Please submit your comments by 03 September 2020

Transmitted to:

Company	Name
City of Parramatta	

Transmitted cc:

Company	Name
Transport for NSW	
Transport for NSW	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	

Click on Document Nos to download them individually.

Item	Document No	Rev	Sts	Title	Alt Doc Number	Design Package No
1	PLR1SOM-GLR-ALL-EN-PRG-000001	C	C3	Construction Noise and Vibration Monitoring Program		
2	PLR1SOM-GLR-ALL-PM-PLN-000032	D	S2	Construction Traffic, Transport and Access Management Sub Plan	PLR-SOM-GLR-PJT-PM-PLN-000032	
3	PLR1SOM-GLR-ALL-PM-PLN-000033	D	S2	Construction Flora and Fauna Management Sub Plan	PLR-SOM-GLR-PJT-PM-PLN-000033	
4	PLR1SOM-GLR-ALL-PM-PLN-000034	D	S2	Construction Noise and Vibration Management Sub Plan	PLR-SOM-GLR-PJT-PM-PLN-000034	
5	PLR1SOM-GLR-ALL-PM-PLN-000035	D	S2	Construction Soil and Water Quality Management Sub Plan	PLR-SOM-GLR-PJT-PM-PLN-000035	
6	PLR1SOM-GLR-ALL-PM-PLN-000037	G	S2	Construction Heritage Management Sub Plan	PLR-SOM-GLR-PJT-PM-PLN-000037	
7	PLR1SOM-GLR-ALL-PM-PLN-000047	C	S0	Flood Management Plan	PLR-SOM-GLR-PJT-PM-PLN-000040	

Transmitted by: Great River City Light Rail Pty Ltd

Project Reference No: **PLR-PLR1SOM-GLR-COP-LETTER-000006**

To: (COP) ,
Cc: (APP) , (GLR) , (TFNSW) , PLR Document Controller (TFNSW) , (COP)

(GLR)

Great River City Light Rail Pty Ltd
ABN 622 239 605

Attachments
20200908 CoPC Comments -GRCLR Response.xlsx (109 KB)

From: @pwc.com> Thursday, 30 July 2020 4:47 PM
Sent:
To:
Cc: Re: Notification of New Mail
Subject:

Hi ,
Thanks for the consultation and presentation.
HAC has no further comments on SOM's Construction Noise and Vibration Management and Monitoring Plans.

Regards,

Project Manager | Infrastructure & Urban Renewal | PwC
M: T: +61 (02)
@pwc.com

On Thu, 23 Jul 2020 at 12:31, <system@teambinder.com> wrote:

You have received the following new mail in InEight Document

Project Number: PLRM
Project Title: Parramatta Light Rail - Main Works

Reference: PLR-PLR1SOM-GLR-HAC-CORR-000009
Type: CORR
Date: 23 July 2020, 12:31
To: Health Administration Corporation
Health Administration Corporation
CC: Transport for NSW
Great River City Light Rail Pty Ltd

RE: Construction Noise and Vibration Management and Monitoring Plans - Request for Consultation - Response
Great River City Light Rail Pty Ltd

Subject:

From:
Original Reference:

Good Afternoon, Just following up with yourself whether you had any other comments on the GRCLR Noise and Vibration Management and Monitoring Plans for construction phase. I believe we have sent through all information requested. Could you please let me know either way, so we can progress with the submission of these documents. Please give me a call on if you would like to discuss further. Much appreciated,

----- Original Message ----- Gen.....

09 October 2020, 15:29 Reference No.: **PLR-PLR1SOM-COP-GLR-LETTER-000007**

Great River City Light Rail Pty Ltd

Attention:

Project Name Parramatta Light Rail - Main Works
RE: Great River City Light Rail - Sub Plan Response

Hi

City of Parramatta Council refer to the GRCLR sub plans response on 23 September, and are satisfied that our comments/concerns have been closed.

Please find attached CoPC's further feedback accordingly in RED for clarity

Regards

Senior Engineering & Project Manager
(02)

City of Parramatta
Level 11, 126 Church Street, Parramatta NSW 2150
PO Box 32, Parramatta, NSW 2124
cityofparramatta.nsw.gov.au

Project Reference No: **PLR-PLR1SOM-COP-GLR-LETTER-000014**

To: (GLR)
Cc: (APP) , (COP) , (GLR) , (COP) , (TFNSW) , PLR Document Controller (TFNSW)

City of Parramatta

----- Original Message -----

23 September 2020, 15:46 Reference No.: **PLR-PLR1SOM-COP-GLR-LETTER-000007**

City of Parramatta

Attention:

Project Name Parramatta Light Rail - Main Works

RE: Great River City Light Rail - Sub Plan Response

Afternoon ,

Please find attached GRCLR's response to the outstanding queries on GRCLR sub plans.

Can you also confirm whether GRCLR have adequately closed the comments on the N&V Management Plan and N&V Monitoring Plan or if you require further clarification before considering these closed?

Is CoPC satisfied that their comments/concerns have been closed out adequately by GRCLR? If so, can you please respond indicating this.

If CoPC are not satisfied that GRCLR have adequately closed out these items on the spreadsheet attached, can I suggest we arrange a suitable time to discuss the outstanding items together?

We look forward to your response.

Environment, Planning and Sustainability Manager
Parramatta Light Rail Stage 1
Supply, Operate and Maintain

Project Reference No: **PLR-PLR1SOM-GLR-COP-LETTER-000007**

To: (COP)
Cc: (APP) , (COP) , (GLR) , PLR Document Controller (TFNSW)

Great River City Light Rail Pty Ltd
ABN 622 239 605

----- Original Message -----

23 September 2020, 11:41 Reference No.: **PLR-PLR1SOM-COP-GLR-LETTER-000007**

Great River City Light Rail Pty Ltd

Attention:

Project Name Parramatta Light Rail - Main Works
RE: Great River City Light Rail - Construction Environmental Management Plan Consultation Response

City of Parramatta Council refer to GRCLR responses to the Sub-Plan CEMP documents for the SOM scope of works (25 June 2020).

Please find attached spreadsheet with the CoPC feedback in Blue for clarity to GRCLR responses. Please note however we were unable to provide feedback comments for the N&V Management Plan, and N&V Monitoring Plan
Regards

Senior Engineering & Project Manager
(02) 9806 8484

City of Parramatta
Level 11, 126 Church Street, Parramatta NSW 2150
PO Box 32, Parramatta, NSW 2124
cityofparramatta.nsw.gov.au

Project Reference No: **PLR-PLR1SOM-COP-GLR-LETTER-000013**

To: (GLR) ,
Cc: (APP) , (GLR) , (TFNSW) , PLR Document Controller (TFNSW) , (COP)

City of Parramatta

----- Original Message -----

09 July 2020, 08:52 Reference No.: **PLR-PLR1SOM-COP-GLR-LETTER-000007**

City of Parramatta

Attention:

Project Name Parramatta Light Rail - Main Works
RE: Great River City Light Rail - Construction Environmental Management Plan Consultation Response

Dear ,

Thank you for taking the time to review the CEMP document for the SOM scope of works (25 June 2020).

GRCLR has provided response to each of these comments in the attached comments register. By way of summary of key items raised, GRCLR can confirm this CEMP:

- Has been prepared as an overarching management plan, under which there will be a series of sub-plans (currently under preparation) which will provide additional detail requested in some of CoPC comments. The sub-plans, as relevant, will be provided to CoPC for review and comment as a single package once they have been through internal, Proponent (TfNSW) and Environmental Representative (ER) review.
- Has been prepared to be compliant with the CSSI approval, CoA and deed requirements. It has been reviewed by the ER, to ensure that it meets the requirements as relevant to the SOM scope, within the CSSI planning approvals regime.
- Is not the governing document for management of:
    - Design process;
    - Asset management, and land access; or
    - Operational and maintenance processes and procedures.These are all managed separately to the CEMP through other existing processes, procedures and communications avenues. These will remain unchanged, and are unaffected by the CEMP which relates only to construction management.

GRCLR is happy to organise a meeting to discuss any outstanding concerns CoPC might have.

Please consider the above, and attached, and contact , if you would like to discuss any of the content.

Kind regards,

Project Reference No: **PLR-PLR1SOM-GLR-COP-LETTER-000003**

To: (COP) ,
Cc: (APP) , (GLR) , (TFNSW) , PLR Document Controller (TFNSW) ,

Great River City Light Rail Pty Ltd
ABN 622 239 605

----- Original Message -----

25 June 2020, 14:57 Reference No.: **PLR-PLR1SOM-COP-GLR-LETTER-000007**

Great River City Light Rail Pty Ltd

Attention:

Project Name Parramatta Light Rail - Main Works
RE: Great River City Light Rail - Construction Environmental Management Plan Consultation Request

Hi

City of Parramatta Council refer to the GRCLR Transmittal Ref PLRM-GLR-COP-TX-000003 dated 28 May below, and invitation to comment on Construction Environmental Management Plan (CEMP) for the construction of the SaMF site due by 25 June 2020.

Please find attached Comments Register in response to GRCLR CEMP, document PLR1SOM-GLR-ALL-PM-PLN-000014, Rev E.

Regards

Senior Engineering & Project Manager
(02)

City of Parramatta
Level 11, 126 Church Street, Parramatta NSW 2150
PO Box 32, Parramatta, NSW 2124
cityofparramatta.nsw.gov.au

Project Reference No: **PLR-PLR1SOM-COP-GLR-LETTER-000007**

To: (GLR) ,
Cc: (TFNSW) , (GLR) , PLR Document Controller (TFNSW) , (APP)

City of Parramatta

----- Original Message -----

Document Transmittal

Project Number:	PLRM	**Transmittal No:**	PLRM-GLR-COP-TX-000003
Project Title:	Parramatta Light Rail - Main Works		
Date:	28 May 2020 04:06 PM		
Subject:	Great River City Light Rail - Construction Environmental Management Plan Consultation Request		
Reason for Issue:	Issued For Review		

Message:

Good Afternoon,

Great River City Light Rail (GRCLR) has been engaged by TfNSW to design and construct a portion of the Parramatta Light Rail (PLR) Project, including the Stabling and Maintenance Facility (SaMF) at 6 Grand Avenue Camellia.

GRCLR has prepared the Construction Environmental Management Plan (CEMP) required under. the CSSI Approval (8285) the Conditions of Approval (CoA) C1 and C2, and under CoA C3 and C5 are required to undertake consultation with key Stakeholders.

GRCLR invites the City of Parramatta Council to comment on the CEMP, included together with this transmittal. The CEMP presented is for the construction of the SaMF site only.

Please note: a revised CEMP covering all GRCLR construction works will be released at a later date for consultation prior to commencement of GRCLR works along the main alignment, as these are dependent on completion of the Infrastructure Contractor (Parramatta Connect) works.

GRCLR requests that the City of Parramatta Council provide comments on the GRCLR CEMP **by Thursday 25 June 2020**.

Please contact on the below details should additional information be required, or you have any further questions regarding this CEMP.

It is of utmost importance that we receive your comments within the above timeframe, or at least confirmation that you will or will not be providing comments on this plan.

Environment, Planning and Sustainability Manager
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Commercial Manager/Temporary Contractors Representative
Great River City Light Rail
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Level 1, 31 Macquarie Street, Parramatta NSW 2150 Australia

Please submit your comments by 25 June 2020

Transmitted to:

Company	Name

City of Parramatta	

Transmitted cc:

Company	Name
Transport for NSW	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	
Great River City Light Rail Pty Ltd	

Click on Document Nos to download them individually.

Item	Document No	Rev	Sts	Title	Alt Doc Number	Design Package No
1	PLR1SOM-GLR-ALL-PM-PLN-000014	E	S2	Construction Environmental Management Plan	PLR-SOM-GLR-PJT-PM-PLN-00014	

Transmitted by: Great River City Light Rail Pty Ltd

Attachments
LETTER-PLR-PLR1SOM-GLR-COP-LETTER-000007-CoPC Comments -GRCLR Response 23092020.xlsx (115 KB)

Project	Parramatta Light Rail Stage 1
Contract:	Supply, Operate & Maintain (SOM)
Contractor	Great River City Light Rail (GRCLR)
Noise and Vibration Management Plan (NVmonP) Rev C	

RESPONSE STATUS LEGEND

O Open

No.	Stage	PACKAGE	Rev	Reviewer Name	Initial Comment Date	Discipline	Organisation	Document Reference	Reviewer Initial Comment	Contractor Response	Initial Response Date	Response Status
		Noise and Vibration Monitoring			01-Sep-2020		CoP	PLR1SOM-GLR-ALL-EN-PRG-000001 Rev C	The report is satisfacgtory in terms of the measures proposed to identify potential noise issues and the monitoring program designed to ensure that the required noise levels are maintained appropriately. This suggestion has been raised previously - that stakeholder engagement briefing program be incorporated into the Monitoring Program consultation piece. This would ideally involve minimum quarterly briefing of key stakeholders (Council included) by the Project Environmental Representative and Acoustic Advisor that speaks to: - The previous three month's worth of monitoring reports, discusses any complaints received and actions taken in response to these complaints; - Presents an overview of the works that will be taking place in the following three month period with any highly intrusive noisy works or OOHW that may generate complaints identified and brought to stakeholder attention so that potential complaints can be anticipated; and - Allows for detailed discussion of any other issues that may have arisen 6/10/20 SP - closed out	GRCLR notes Council response. TINSW (not GRCLR) coordinates the Consultation Process, which includes particpants from all the contractors involved in the construction of the PLR Project. Part of this process includes the OOHs Working Group which is coordinated by TINSW, which considers cumulative impacts across the packages. The ER and AA are also engaged directly by TINSW, and are independent of GRCLR. GRCLR participates in the above as required by internal TINSW processes and as requested by TINSW. All consultation, including scope of ER and AA are outside of the scope of this CNVMonP which is limited to N&V monitoring for the GRCLR construction scope of works. Therefore, this comment would be better directed to TINSW who manage this process, and GRCLR considers it closed for the purpose of the CNVMonP review. The process of consulation with the Stakeholders is defined in the Community Engagement and Stakeholder Plan. This plan is only focus on the monitoring program as required under the Condition of Approval. For work outside hours Community Notification will be sent out and there are ER and AA monthly Reports which are posted on TINSW website that are available for CoP to look at and be updated on the PLR envirnmental	07-Sep-2020	**Closed.**

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