Sydney Metro West- Phase J NST Electrical Kiosk Works

Construction Noise and Vibration Management Plan

SYSCON-SMW-EWNS-CNVMP-01
Revision 04

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Tables

Figures

Appendices

Glossary / Abbreviations

Term	Definition
AR	SMW Concept and Stage 1 Amendment Report (2020)
CEMP	Construction Environmental Management Plan
CNVS	Sydney Metros Construction Noise and Vibration Standard
Contractor	Syscon
dB	Decibels - A measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm (to base 10) of the ratio of a given sound power to a reference power. Typically uses the A-weighted scale (i.e. dBA) measured according to the frequency of the human ear.
DECC	Former Department of Environment and Climate Change (NSW) now NSW Department of Planning, Housing and Infrastructure
DPHI	NSW Department of Planning, Housing and Infrastructure
EIS	SMW Project Environmental Impact Statement (Jacobs/Arcadis 2020)
EPA	NSW Environment Protection Authority
EP&A Act	*NSW Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act, 1999*
EPL	NSW Environment Protection Licence under the *Protection of the Environment Operations Act 1997*.
EWMS	Environmental Work Method Statements
Feasible and reasonable	Feasible relates to engineering considerations and what is practical to build. Reasonable considers mitigation benefits versus social, economic and environmental costs
Highly noise affected	As defined in the ICNG
Highly noise intensive works	Works which are defined as annoying under the ICNG, including: (a) use of power saws, such as used for cutting timber, rail lines, masonry, road pavement or steel work; (b) grinding metal, concrete or masonry; (c) rock drilling; (d) line drilling; (e) vibratory rolling; (f) bitumen milling or profiling; (g) jackhammering, rock hammering or rock breaking; (h) rail tamping and regulating; and (i) impact piling.
ICNG	Interim Construction Noise Guideline (DECC 2009)
Incident	An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause non-compliance with the conditions of this approval *Note: "material harm" is defined in this approval*
Minister, the	NSW Minister for Planning, Housing and Infrastructure
CoA	NSW Minister for Planning, Houseing and Infrastructure Condition of Approval
L_{A90}	The noise level exceeded 90% of the measurement period, typically considered the average minimum noise level and used to establish background noise levels
$L_{Aeq\ (15min)}$	The A-weighted equivalent continuous (energy average) A-weighted sound pressure level over a 15-minute period.

$L_{A\ (max)}$	The A-weighted maximum noise level, measured using the fast time weighting on a sound level meter.
NCA	Noise Catchment Area
NML	The Noise Management Level ($L_{Aeq\ (15min)}$) providing a target noise level, where, if exceeded, all reasonable and feasible noise mitigation and management measures would be considered for implementation.
CNVMP	Construction Noise and Vibration Management Plan
OOHW	Out of Hours Work
RBL	The Rating Background Level for each period is the median value of the LA90 values for the period over all of the days measured. There is an RBL value for each period (day, evening and night).
RNP	Road Noise Policy (EPA 2011)
RMS	NSW Roads and Maritime Services now TfNSW
Secretary	Secretary of the Department of Planning and Environment
SMW	Sydney Metro West
SR	SMW Concept and Stage 1 Submissions Report (2020)
SWL	Sound Power Level the acoustic power output of a source expressed in decibels. Sound power level is calculated from measured sound pressure levels.
Sound Pressure Level	This is the level of noise, usually expressed in dB(A), as measured by a standard sound level meter with a pressure microphone.
the Project	Phase J – North Strathfield Electrical Kiosk Works
TfNSW	Transport for NSW
VDV	Vibration Dose Value

1 Introduction

1.1 Context

This Construction Noise and Vibration Management Plan (CNVMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the North Strathfield Electrical Kiosk Works (the Project), which is part of the Sydney Metro West Project (SMW Project).

This CNVMP has been prepared to outline how Syscon will comply with the applicable NSW Minister for Planning's Conditions of Approval (CoA), , and the Sydney Metro (SM) Construction Environmental Management Framework (CEMF) during construction of the Project.

It also outlines how Syscon will minimise environmental risks and achieve environmental outcomes on the project by creating a well-defined approach to the implementation of EIS Revised Environmental Management Measures (REMM).

The CNVMP has been prepared in accordance with the following, collectively referred to as the 'Project requirements' herein:

- The EIS approval including the CoA and REMMs
- The obligations allocated under the CEMF as per the Phasing Report

1.2 Project Background

The **North Strathfield Electrical Kiosk Works (Phase J)** form a critical enabling package within the SMW project, designed to establish a permanent and reliable high-voltage (HV) power supply to support future tunnelling and station works at the North Strathfield precinct. The works involve the delivery, installation, and commissioning of an electrical kiosk and associated infrastructure, interfacing directly with Ausgrid's distribution network.

The SMW Project EIS included (Chapter 11) an assessment of the impacts of Noise and Vibration from construction and operation of the Project at North Strathfield. The EIS concluded that sensitive receivers in the vicinity of the project would be impacted by noise and vibration from the construction works, however these impacts would be managed through the implementation of mitigation and management measures described in this CNVMP and in line with the Sydney Metro Construction Noise and Vibration Standard (CNVS) which provides standard mitigation measures and additional mitigation measures for certain noise and vibration impact levels.

The potential impacts from noise and vibration during construction are discussed in Section 7. These management measures are described in this CNVMP in Section 9.

Please refer to Chapter 1 of the CEMP for Project background and statutory context and Chapter 4 for a detailed Project description.

1.3 Scope of the Sub-plan

The scope of this Plan is to describe how Syscon proposes to manage potential noise and vibration impacts during construction of the Project.

Operational management measures do not fall within the scope of this Plan and as such are not included in management processes.

1.4 Implementation of the Sub-plan

In accordance with CoA C4, and with the exception of any CEMP Sub-plans expressly nominated by the Planning Secretary to be endorsed by the ER (CoA C7), the CEMP Sub-plans must be endorsed by the Environmental Representative (ER) and then submitted to the Secretary for approval no later than one month prior to the commencement of the construction activities to which they apply. In addition, the CNVMP must also be endorsed by the AA before submission to the Secretary.

In accordance with CoA C8 the CEMP Sub-plans not requiring the Planning Secretary's approval must obtain the endorsement of the ER as being in accordance with the conditions of approval and all relevant undertakings made in the documents listed in CoA A1. Construction of the relevant phase must not commence until the CEMP and all CEMP Sub-plans have been approved by the ER or Secretary. The CEMP and CEMP Sub-plans, as approved by the Secretary, including any minor amendments approved by the ER, must be implemented for the duration of construction.

2 Purpose and Objectives

2.1 Purpose

The purpose of this CNVMP is to describe how construction related noise and vibration impacts will be minimised and managed.

2.2 Objectives

This CNVMP has been prepared to meet the requirements of Condition C6 of the Infrastructure Approval by demonstrating how the Project will achieve the environmental performance outcomes identified in the documents listed under Condition A1. These outcomes relate to protecting acoustic amenity for surrounding receivers, avoiding cosmetic or structural building damage, preventing disturbance to sensitive and highly sensitive land uses, and managing ground-borne noise and vibration so far as reasonably practicable. The objectives, management measures and monitoring requirements contained in this Plan have been developed to ensure these outcomes are achieved through a structured and proactive management approach.

In accordance with Condition C6(d), this Plan incorporates a framework for ongoing identification and management of noise and vibration issues during construction, including cumulative impacts. Environmental risks will be reviewed regularly throughout the works, with mitigation measures updated or enhanced using SMART principles, ensuring they remain specific, measurable, achievable, relevant and time-bound. This adaptive approach enables responsive management of emerging risks, changes in construction methodology, or stakeholder feedback, and ensures the CNVMP remains effective and aligned with the Project's environmental performance outcomes.

The key objective of this Plan is to ensure all Project requirements relevant to noise and vibration management and allocated under the Stage 1 SMW Phasing Report are described, scheduled and assigned responsibility, as well as relevant legislation and other requirements described in Section 3 of this Plan.

2.3 Targets

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

- Minimise unreasonable noise and vibration impacts on residents and businesses;
- Avoid structural damage to buildings or heritage items as a result of construction vibration;
- Undertake active community consultation; and
- Maintain positive, cooperative relationships with schools, childcare centres, local residents and building owners.

To achieve these targets, Syscon will:

- Ensure construction noise levels comply with the predicted noise management levels identified in the DNVIS and, where exceedances are predicted, implement all feasible and reasonable mitigation measures prior to commencing the relevant activity;
- Undertake attended noise monitoring at the frequencies specified in this Plan to confirm the effectiveness of implemented mitigation measures and make adjustments where monitoring identifies non-compliance or elevated risk;
- Manage vibration levels to remain below the cosmetic damage criteria established in this Plan, verified through monitoring when works occur within the specified buffer distances;
- Prior to commencing works in any new area, review the localised noise and vibration risks and update the Environmental Risk Register to ensure controls remain specific and proportionate to the activity;
- Respond to all justified noise and vibration complaints within 24 hours, investigate the cause, and implement corrective actions within five working days, with records maintained in the complaints register.

3 Environmental requirements

3.1 Relevant legislation and guidelines

3.1.1 Legislation

Appendix A1 of the CEMP contains details of the legislation relevant to this management plan.

3.1.2 Guidelines and standards

Non-statutory guidelines and standards that provide for noise and vibration management are listed in Table 1.

Table 1 Non-statutory guidelines and standards

Guidelines and standards
Airborne Noise
NSW Interim Construction Noise Guideline (ICNG)
Sydney Metro Construction Noise and Vibration Standard (CNVS)
Sleep disturbance
Construction noise – NSW EPA Noise Policy for Industry
Road traffic noise – RNP and the Roads and Maritime Environmental Noise Management Manual (ENMM) Practice Note 3
Ground-borne noise
NSW Interim Construction Noise Guideline (ICNG)
Australian Standard AS/NZS 2107:2000 Acoustics – Recommended design sound levels and reverberation times for building interiors
Construction related road traffic noise
No specific guidelines, but guidance taken from the NSW Interim Construction Noise Guideline (ICNG) and the NSW Road Noise Policy (RNP).
Vibration (disturbance to building occupants)
NSW DECC's Assessing vibration; a technical guideline, published in February 2006.
British Standard BS 6472-2008, Evaluation of human exposure to vibration in buildings (1–80Hz).
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 4150:2016 – 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

3.2 CNVMP requirements

The CoAs relevant to this CNVMP are listed Table 2, the REMMs are listed in Table 3 , all CEMF requirements relevant to this CNVMP are listed in Table 4. Refer to Section 8 for all mitigation measures relevant to the development of this Plan and management of noise and vibration impacts for the Project. A cross reference is also included in these tables to indicate where the condition is addressed in this CNVMP or other Project management documents.

Table 2 Minister's Conditions of approval relevant to the CNVMP

CoA	Condition requirements	Document Reference
C1	Construction Environmental Management Plans (CEMPs) and CEMP Sub-plans must be prepared in accordance with the Construction Environmental Management Framework (CEMF) included in the documents listed in Condition A1 of this schedule to detail how the performance outcomes, commitments and mitigation measures specified in the documents listed in Condition A1 of this schedule will be implemented and achieved during construction.	Table 4 This Plan
C4	Any CEMP to be approved by the Planning Secretary must be endorsed by the ER and then submitted to the Planning Secretary for approval no later than one (1)	This Plan

<table>
<tr><td></td><td>month before the commencement of construction or where construction is phased no later than one (1) month before the commencement of that phase</td><td></td></tr>
<tr><td>C5</td><td>Of the CEMP Sub-plans required under Condition C1 of this schedule, the following CEMP Sub-plans must be prepared in consultation with the relevant government agencies identified for each CEMP Sub-plan. Details of issues raised by a government agency during consultation must be included in the relevant CEMP Sub-plan, including copies of all correspondence from those government agencies as required by Condition A6 of this schedule. Where a government agency (ies) request(s) is not included, the Proponent must provide the Planning Secretary / ER (whichever is applicable) justification as to why:
<table>
<tr><th></th><th>Required CEMP Sub-plan</th><th>Relevant government agencies to be consulted for each CEMP Sub-plan</th></tr>
<tr><td>(a)</td><td>Noise and vibration</td><td>SOPA (in respect of Sydney Olympic Park), Place Management NSW (in respect of The Bays) and Relevant Council(s)</td></tr>
</table></td><td>This Plan</td></tr>
<tr><td>C6</td><td>The CEMP Sub-plans must state how:
(a) the environmental performance outcomes identified in the documents listed in Condition A1 of this schedule will be achieved;
(b) the mitigation measures identified in the documents listed in Condition A1 of this schedule will be implemented;
(c) the relevant conditions of this approval will be complied with; and
(d) issues requiring management during construction (including cumulative impacts), as identified through ongoing environmental risk analysis, will be managed through SMART principles.</td><td>Section 2</td></tr>
<tr><td>C7</td><td>With the exception of any CEMP Sub-plans expressly nominated by the Planning Secretary to be endorsed by the ER, all CEMP Sub-plans must be submitted to the Planning Secretary for approval.</td><td>Section 1.4</td></tr>
<tr><td>C8</td><td>The CEMP Sub-plans not requiring the Planning Secretary's approval must obtain the endorsement of the ER as being in accordance with the conditions of approval and all relevant undertakings made in the documents listed in Condition A1 of this schedule. Any of these CEMP Sub-plans must be submitted to the ER with, or subsequent to, the submission of the CEMP but in any event, no later than one (1) month before construction or where construction is phased no later than one (1) month before the commencement of that phase.</td><td>Section 1.4</td></tr>
<tr><td>C9</td><td>Any of the CEMP Sub-plans to be approved by the Planning Secretary must be submitted to the Planning Secretary with, or subsequent to, the submission of the CEMP but in any event, no later than one (1) month before construction or where construction is phased no later than one (1) month before the commencement of that phase.</td><td>Section 1.4</td></tr>
<tr><td>C10</td><td>Construction must not commence until the CEMP and all CEMP Sub-plans have been approved by the Planning Secretary or endorsed by the ER (whichever is applicable), unless otherwise agreed by the Planning Secretary. The CEMP and CEMP Sub-plans, as approved by the Planning Secretary or endorsed by the ER (whichever is applicable), including any minor amendments approved by the ER, must be implemented for the duration of construction. Where construction of Stage 1 of the CSSI is phased, construction of a phase must not commence until the CEMP and CEMP Sub-plans for that phase have been approved by the Planning Secretary or certified by the ER upon nomination by the Planning Secretary (whichever is applicable).</td><td>This Plan</td></tr>
<tr><td>D34</td><td>A detailed land use survey must be undertaken to confirm sensitive receivers (including critical working areas such as operating theatres and precision laboratories) potentially exposed to construction noise and vibration and construction ground-borne noise. The survey may be undertaken on a progressive basis but must be undertaken in any one area before the commencement of work which generate construction noise, vibration or ground-borne noise in that area. The results of the survey must be included in the Noise and Vibration CEMP Sub-plan required under Condition C5 of this schedule.</td><td>Appendix A</td></tr>
</table>

D35	Work must only be undertaken during the following hours: (a) 7:00am to 6:00pm Mondays to Fridays, inclusive; (b) 8:00am to 6:00pm Saturdays; and (c) at no time on Sundays or public holidays.	Section 5
D36	Except as permitted by an EPL, highly noise intensive work that result in an exceedance of the applicable NML at the same receiver must only be undertaken: (a) between the hours of 8:00 am to 6:00 pm Monday to Friday; (b) between the hours of 8:00 am to 1:00 pm Saturday; and (c) if continuously, then not exceeding three (3) hours, with a minimum cessation of work of not less than one (1) hour. For the purposes of this condition, 'continuously' includes any period during which there is less than one (1) hour between ceasing and recommencing any of the work.	Section 5

D37	Notwithstanding Conditions D35 and D36 of this schedule work may be undertaken outside the hours specified in the following circumstances: (a) Safety and Emergencies, including: (i) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or (ii) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm. On becoming aware of the need for emergency work in accordance with (a)(ii) above, the AA, the ER, the Planning Secretary and the EPA must be notified of the reasons for such work. The Proponent must use best endeavours to notify as soon as practicable all noise and/or vibration affected sensitive land user(s) of the likely impact and duration of those work. (b) Low impact, including: (i) construction that causes LAeq(15 minute) noise levels: • no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and • no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s); and (ii) construction that causes LAFmax(15 minute) noise levels no more than 15 dB(A) above the rating background level at any residence; or (iii) construction that causes: • continuous or impulsive vibration values, measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), or • intermittent vibration values measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006). (c) By Approval, including: (i) where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or (ii) works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition D38 of this schedule; or (iii) negotiated agreements with directly affected residents and sensitive land user(s). (d) By Prescribed Activity, including: (i) tunnelling (excluding cut and cover tunnelling and surface works) are permitted 24 hours a day, seven days a week; or (ii) concrete batching at the Clyde construction site is permitted 24 hours a day, seven days a week; or (iii) delivery of material that is required to be delivered outside of standard construction hours in Condition D35 of this schedule to directly support tunnelling activities, except between the hours 10:00 pm and 7:00 am to / from	Section 5.1
D38	An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of work which are outside the hours defined in Conditions D35 and D36 of this schedule. The Protocol must be approved by the Planning Secretary before commencement of the out-of-hours work. The Protocol must be prepared in consultation with the ER, AA and EPA. The Protocol must provide:	OOHW Protocol

	(a) identification of low and high-risk activities and an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where: (i) the ER and AA review all proposed out-of-hours activities and confirm their risk levels; (ii) low risk activities can be approved by the ER in consultation with the AA; and (iii) high risk activities that are approved by the Planning Secretary; (b) a process for the consideration of out-of-hours work against the relevant NML and vibration criteria; (c) a process for selecting and implementing mitigation measures for residual impacts in consultation with the community at each affected location, including respite periods consistent with the requirements of Condition D50 of this schedule. The measures must take into account the predicted noise levels and the likely frequency and duration of the out-of-hours works that sensitive land user(s) would be exposed to, including the number of noise awakening events; (d) procedures to facilitate the coordination of out-of-hours work including those approved by an EPL or undertaken by a third party, to ensure appropriate respite is provided; and (e) notification arrangements for affected receivers for all approved out-of-hours works and notification to the Planning Secretary of approved low risk out-of-hours works. This condition does not apply if the requirements of Condition D37(b) of this schedule are met. Note: Out-of-hours work is any work that occurs outside the construction hours identified in Condition D35 and D36 of this schedule.	
D39	All reasonable and feasible mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration criteria: (a) construction 'Noise affected' noise management levels established using the Interim Construction Noise Guideline (DECC, 2009); (b) vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure); (c) Australian Standard AS 2187.2 - 2006 "Explosives - Storage and Use - Use of Explosives" (for human exposure); (d) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and (e) the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage for structurally unsound heritage items). Any work identified as exceeding the noise management levels and / or vibration criteria must be managed in accordance with the Noise and Vibration CEMP Sub-plan. Note: The ICNG identifies 'particularly annoying' activities that require the addition of 5 dB(A) to the predicted level before comparing to the construction Noise Management Level.	Section 9 Section 6.2
D40	All reasonable and feasible mitigation measures must be applied when the following residential ground-borne noise levels are exceeded: (a) evening (6:00 pm to 10:00 pm) — internal LAeq(15 minute): 40 dB(A); and (b) night (10:00 pm to 7:00 am) — internal LAeq(15 minute): 35 dB(A).	OOHW Protocol

	The mitigation measures must be outlined in the Noise and Vibration CEMP Sub-plan, including in any Out-of-Hours Work Protocol, required by Condition D38 of this schedule.	
D41	Noise generating work in the vicinity of potentially-affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise levels above the NMLs must not be timetabled within sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	Section 9
D42	Industry best practice construction methods must be implemented where reasonably practicable to ensure that noise levels are minimised around sensitive land user(s). Practices must include, but are not limited to: (a) use of regularly serviced low sound power equipment; (b) temporary noise barriers (including the arrangement of plant and equipment) around noisy equipment and activities such as rock hammering and concrete cutting; and (c) use of alternative construction and demolition techniques.	Section 9
D43	Detailed Noise and Vibration Impact Statements (DNVIS) must be prepared for any work that may exceed the NMLs, vibration criteria and / or ground-borne noise levels specified in Conditions D39 and D40 of this schedule at any residence outside construction hours identified in Condition D35 of this schedule, or where receivers will be highly noise affected. The DNVIS must include specific mitigation measures identified through consultation with affected sensitive land user(s) and the mitigation measures must be implemented for the duration of the works. A copy of the DNVIS must be provided to the AA and ER before the commencement of the associated works. The Planning Secretary and the EPA may request a copy (ies) of the DNVIS.	Section 8.1
D44	DNVIS must be prepared for each construction site before construction noise and vibration impacts commence and include specific mitigation measures identified through consultation with affected sensitive land users.	Section 8.1
D45	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before works that generate vibration commences in the vicinity of those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owners and occupiers are to be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier. These properties must be identified and considered in the Noise and Vibration CEMP Sub-plan	Section 9 Community Consultation Strategy (CCS)
D46	Vibration testing must be conducted during vibration generating activities that have the potential to impact on Heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures. Such measures must include, but not be limited to, review or modification of excavation techniques.	Section 9
D50	All work undertaken for the delivery of Stage 1 of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. The Proponent must: (a) reschedule any work to provide respite to impacted noise sensitive receivers so that the respite is achieved in accordance with Condition D51 of this schedule; or (b) consider the provision of alternative respite or mitigation to impacted noise sensitive receivers; and (c) provide documentary evidence to the AA in support of any decision made by the Proponent in relation to respite or mitigation.	Section 9

	The consideration of respite must also include all other approved Critical SSI, SSI and SSD projects which may cause cumulative and / or consecutive impacts at receivers affected by the delivery of Stage 1 of the CSSI.	
D51	In order to undertake out-of-hours work outside the work hours specified under Condition D35 of this schedule, appropriate respite periods for the out-of-hours work must be identified in consultation with the community at each affected location on a regular basis. This consultation must include (but not be limited to) providing the community with: (a) a progressive schedule for periods no less than three (3) months, of likely out-of-hours work; (b) a description of the potential work, location and duration of the out-of-hours work; (c) the noise characteristics and likely noise levels of the work; and (d) likely mitigation and management measures which aim to achieve the relevant NMLs under Condition D39 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers). The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour work must be provided to the AA, EPA and the Planning Secretary. Note: Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the RBL at any residence.	Section 9
D58	Stage 1 of the CSSI must be designed and constructed with the objective of minimising impacts to, and interference with, third party property and infrastructure, and that such infrastructure and property is protected during construction.	Section 9
D59	The utilities and services (hereafter "services") potentially affected by construction must be identified to determine requirements for diversion, protection and / or support. Alterations to services must be determined by negotiation between the Proponent and the service providers. Disruption to services resulting from construction must be avoided, wherever possible, and advised to customers where it is not possible.	Section 9 Section 4.4 Section 6.3.7
D60	A suitably qualified and experienced person must undertake condition surveys of all buildings, structures, utilities and the like identified in the documents listed in Condition A1 of this schedule as being at risk of damage before commencement of any work that could impact on the subject surface / subsurface structure. The results of the surveys must be documented in a Pre-construction Condition Survey Report for each item surveyed. Copies of Pre-construction Condition Survey Reports must be provided to the relevant owners of the items surveyed in the vicinity of the proposed work, and no later than one (1) month before the commencement of the work that could impact on the subject surface / subsurface structure.	Section 9 Section 10.5.1
D61	Condition surveys of all items for which condition surveys were undertaken in accordance with Condition D60 of this schedule must be undertaken by a suitably qualified and experienced person after completion of the work identified in Condition D60 of this schedule. The results of the surveys must be documented in a Post-construction Condition Survey Report for each item surveyed. Copies of Post-construction Condition Survey Reports must be provided to the landowners of the items surveyed, and no later than three (3) months following the completion of the work that could impact on the subject surface / subsurface structure unless otherwise agreed by the Planning Secretary.	Section 10.5.1
D62	The Proponent, where liable, must rectify any property damage caused directly or indirectly (for example from vibration or from groundwater change) by thework at no cost to the owner. Alternatively, the Proponent may pay compensation for the property damage as agreed with the property owner. Rectification or compensation must be undertaken within 12 months of completion of the work identified in Condition D60 of this schedule unless another timeframe is agreed with	Section 10.5.1

	the owner of the affected surface or sub-surface structure or recommended by the IPIAP.	

Table 3 REMMs relevant to the CNVMP

REMMS	Condition requirements	Document Reference
NV01	Further engagement and consultation would be carried out with: • The affected communities to understand their preferences for mitigation and management measures. • 'Other sensitive' receivers such as schools, medical facilities or places of worship to understand periods in which they are more sensitive to impacts. Based on this consultation, appropriate mitigation and management options would be considered and implemented where feasible and reasonable to minimise the impacts.	Table 18- NV25
NV02	Alternative construction methodologies and measures that minimise noise and vibration levels during noise intensive works would be investigated and implemented where feasible and reasonable. This would include consideration of: • The use of hydraulic concrete shears in lieu of hammers/rock breakers • Sequencing works to shield noise sensitive receivers by retaining building wall elements • Locating demolition load out areas away from the nearby noise sensitive receivers • Providing respite periods for noise intensive works • Minimising structural-borne noise to adjacent buildings including separating the structural connection prior to demolition through saw-cutting and propping, using hand held splitters and pulverisers or hand demolition • Installing sound barrier screening to scaffolding facing noise sensitive neighbours • Using portable noise barriers around particularly noisy equipment, such as concrete saws • Modifying demolition works sequencing / hours to minimise impacts during peak pedestrian times and / or adjoining neighbour outdoor activity periods.	Table 18- NV11, NV13, NV14, NV21
NV03	Appropriate respite would be provided to affected receivers in accordance with the Sydney Metro Construction Noise and Vibration Standard. This would include consideration of impacts from Stage 1 utility and power supply works when determining appropriate respite periods for affected receivers. When determining appropriate respite, the need to efficiently undertake construction would be balanced against the communities' preferred noise and vibration management approach.	Table 18- NV33
NV04	The use of noise intensive equipment at construction sites with 'moderate' and 'high' out-of-hours noise management level exceedances would be scheduled for standard construction hours, where feasible and reasonable. Where this is not feasible and reasonable, the works would be undertaken as early as possible in each work shift.	Table 18- NV26
NV05	Air brake silencers would be used on heavy vehicles that access construction sites multiple times per night or over multiple nights.	Table 18- NV05
NV06	Perimeter site hoarding would be designed with consideration of on-site heavy vehicle movements with the aim of minimising sleep disturbance impacts.	Table 18- NV20
NV09	Feasible and reasonable measures would be implemented to minimise ground-borne noise where exceedances are predicted. This may require implementation of less ground-borne noise and less vibration intensive alternative construction methodologies.	Table 18- NV34

NV14	Further assessment of construction traffic would be completed during detailed design, including consideration of the potential for exceedances of the NSW Road Noise Policy base criteria (where greater than 2 dB increases are predicted). The potential impacts would be managed using the following approaches, where feasible and reasonable: • On-site spoil storage capacity would be maximised to reduce the need for truck movements during sensitive times • Vehicle movements would be redirected away from sensitive receiver areas and scheduled during less sensitive times • The speed of vehicles would be limited and the use of engine compression brakes would be avoided • Heavy vehicles would not be permitted to idle near sensitive receivers.	Table 18- NV3, NV22, NV40
NV16	Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure (in consultation with a structural engineer) and vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure. For heritage items, the more detailed assessment would specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.	Table 18- NV38
NV17	Condition surveys of buildings and structures near to the tunnel and excavations would be undertaken prior to the commencement of excavation at each site, where appropriate. For heritage buildings and structures the surveys would consider the heritage values of the structure in consultation with a heritage specialist	Table 18- NV29
NV18	The likelihood of cumulative construction noise impacts would be reviewed during detailed design when detailed construction schedules are available. Co-ordination would occur between potentially interacting projects to minimise concurrent or consecutive works in the same areas, where possible. Specific mitigation strategies would be developed to manage impacts. Depending on the nature of the impact, this could involve adjustments to construction program or activities of Sydney Metro West or of other construction projects.	Table 18- NV31

Table 4 Relevant requirements of the CEMF

CEMF Ref.	Requirement	Document Reference
8.2 a)	Principal Contractors will develop and implement a Construction Noise and Vibration Management Plan for their scope of works consistent with the Interim Construction Noise Guidelines (Department of Environment and Climate Change, 2009). The Construction Noise and Vibration Management Plan will include as a minimum:	-
i.	Identification of work areas, site compounds and access points;	Section 9.1
ii.	Identification of sensitive receivers and relevant construction noise and vibration goals;	Section 4.1 CEMP Environmental Control Maps
iii.	Be consistent with, and include the requirements of the noise and vibration mitigation measures as detailed in, the environmental approval documentation and the Sydney Metro Construction Noise and Vibration Standard (CNVS);	Section 9
iv.	Details of construction activities and an indicative schedule for construction works, including the identification of key noise and/or vibration generating construction activities (based on representative construction scenarios) that	Section 9.1

	have the potential to generate noise or vibration impacts on surrounding sensitive receivers, in particular residential areas;	
v.	Identification of feasible and reasonable procedures and mitigation measures to ensure relevant vibrations and blasting criteria are achieved, including a suitable blast program;	Section 9.1
vi.	Community consultation requirements and Community notification provisions specifically in relation to blasting;	Community Consultation Strategy (CCS) Section 9.2
vii.	The requirements of any applicable licence or approval (for example EPL);	Section 5.1
viii.	Additional requirements in relation to activities undertaken 24 hours of the day, 7 days per week;	Not applicable- no works will be undertaken 24/7 on the project
ix.	Pre-construction compliance requirements and hold points;	Section 10.1
x.	The responsibilities of key project personnel with respect to the implementation of the plan;	Section 10.1
xi.	Noise monitoring requirements;	Section 10.1
xii.	Compliance record generation and management; and	Section 10.5
xiii.	An Out of Hours Works Protocol applicable to all construction methods and sites	
b)	Detailed Construction Noise and Vibration Impact Statements will be prepared for noise-intensive construction sites and or activities, to ensure the adequacy of the noise and vibration mitigation measures. Specifically, Construction Noise and Vibration Impact Statements will be prepared for works proposed to be undertaken outside of standard construction hours and to support applications to undertake out of hours works (this includes variations of EPL's and applications to relevant agencies).	Section 8.1
c)	Noise and vibration monitoring would be undertaken for construction as specified in the CNVS.	Section 8.1
d)	The following compliance records would be kept by Principal Contractors:	Section 10.5
i.	Records of noise and vibration monitoring results against appropriate NMLs and vibration criteria; and	
ii.	Records of community enquiries and complaints, and the Contractor's response.	

3.3 Acoustic Advisor

A suitably qualified and experienced Acoustics Advisor (AA) in noise and vibration management, who is independent of the design and construction personnel, must be nominated by the Proponent and engaged for the duration of work.
As required by CoA A33, work must not commence until an AA has been nominated by the Proponent and approved by the Planning Secretary. A description of the requirements and responsibilities of the AA is provided in CoA A36 listed below.

In accordance with CoA A36 the approved AA must:
(a) receive and respond to communication from the Planning Secretary in relation to the performance of Stage 1 of the CSSI in relation to noise and vibration;
(b) consider and inform the Planning Secretary on matters specified in the conditions of this approval relating to noise and vibration;

(c) consider and recommend, to the Proponent, improvements that may be made to avoid or minimise adverse noise and vibration impacts;
(d) review all proposed night-time works (with the exception of low risk activities) to determine if sleep disturbance would occur and recommend measures to avoid sleep disturbance or appropriate additional alternative mitigation measures;
(e) review all noise and vibration documents required to be prepared under the conditions of this approval and, should they be consistent with the conditions of this approval, endorse them before submission to the Planning Secretary (if required to be submitted to the Planning Secretary) or before implementation (if not required to be submitted to the Planning Secretary);
(f) regularly monitor the implementation of all noise and vibration documents required to be prepared under the conditions of this approval to ensure implementation is in accordance with what is stated in the document and the conditions of this approval;
(g) review the Proponent's notification of incidents in accordance with Condition A43 of this schedule;
(h) in conjunction with the ER (where required), the AA must:
(i) as may be requested by the Planning Secretary or Community Complaints Mediator (required by Condition B8 of this schedule), help plan, attend or undertake audits of noise and vibration management of Stage 1 of the CSSI including briefings, and site visits,
(ii) in the event that conflict arises between the Proponent and the community in relation to the noise and vibration performance of Stage 1 of the CSSI, follow the procedure in the Overarching Community Communication Strategy referenced in Condition C-B1 of this schedule to attempt to resolve the conflict, and if it cannot be resolved, notify the Planning Secretary,
(iii) if requested by the ER, consider relevant minor amendments made to the Site Establishment Management Plan, CEMP, relevant sub-plans and noise and vibration monitoring programs that require updating or are of an administrative nature, and are consistent with the conditions of this approval and the management plans and monitoring programs approved by the Planning Secretary and, if satisfied such amendment is necessary, endorse the amendment, (this does not include any modifications to the conditions of this approval),
(iv) if requested by the ER, review the noise impacts of minor ancillary facilities, and
(v) prepare and submit to the Planning Secretary and other relevant regulatory agencies, for information, a Monthly Noise and Vibration Report detailing the AA's actions and decisions on matters for which the AA was responsible in the preceding month. The Monthly Noise and Vibration Report must be submitted within seven (7) days following the end of each month for the duration of the AA's engagement for Stage 1 of the CSSI, or as otherwise agreed by the Planning Secretary.

In accordance with CoA A34 the Proponent must cooperate with the AA by:

(a) providing access to noise and vibration monitoring activities as they take place;
(b) providing access to the Complaints Register if requested;
(c) providing for review of noise and vibration documents required to be prepared under the conditions of this approval; and
(d) considering any recommendations to improve practices and demonstrating, to the satisfaction of the AA, why any recommendation is not adopted.

4 Existing Environment

The following sections summarise what is known about factors influencing Noise and Vibration impacts within and adjacent to the Project corridor as detailed in Chapter 11 of the SMW EIS.

4.1 Sensitive Receivers

4.1.1 North Strathfield

A noise assessment was conducted as part of the development of the SMW EIS and forms EIS Technical Paper 2: Noise and Vibration. The EIS noted that the noise environment in the study area is typically dominated by traffic on major roads adjacent to the study area.

Existing noise levels around the North Strathfield SMW construction site is influenced by the surrounding road network and existing rail line. The area surrounding the Construction Site is generally suburban with a mixture of residential, commercial and educational receivers. The nearest receivers are opposite the site, across Queen Street. The commercial receivers adjacent to the Site are typically of retail use.

In order to comply with CoA D34 required for the Project Area a Land Use Survey has been completed in areas where works could impact on sensitive receivers. Physical ground truthing of sensitive receivers was completed as part of the development of the land use survey and will continue to be undertaken throughout the delivery of Project. Where other sensitive receivers are identified throughout the delivery of the Project, the land use survey will be revised. Noise and vibration modelling will then account for these additional sensitive receivers, and appropriate mitigation measures will be implemented.

4.2 Noise Catchment Areas

To facilitate the assessment of noise impacts from the project, receivers along the route have been divided into Noise Catchment Areas (NCAs). NCAs group individual sensitive receivers by common traits such as existing noise environment and location in relation to the Project.

4.2.1 North Strathfield

The EIS assessment process identified a total of 22 NCAs for the full SMW Project alignment. Review of the EIS assessment process determined that NCAs 10-11 were applicable to The North Strathfield Project area. These are presented in Table 5 with a description of the noise characteristics of each area. NCAs are also presented in the Land Use Survey (refer to Appendix A) and Figure 1.

Table 5 NCAs relevant to North Strathfield site

NCA Reference	Description	Main sources of background noise
NCA10	The area surrounding the construction site is generally suburban with a mixture of residential, commercial and educational receivers including McDonald College and Our Lady of the Assumption Primary School.	Existing noise levels in this study area are controlled by transportation noise from the surrounding road network and existing rail line.
NCA11	Mainly residential, with areas of commercial receivers along Queen Street and Concord Road. Strathfield North Public School is in the north	Existing noise levels in this study area are controlled by transportation noise from the surrounding road network and existing rail line.

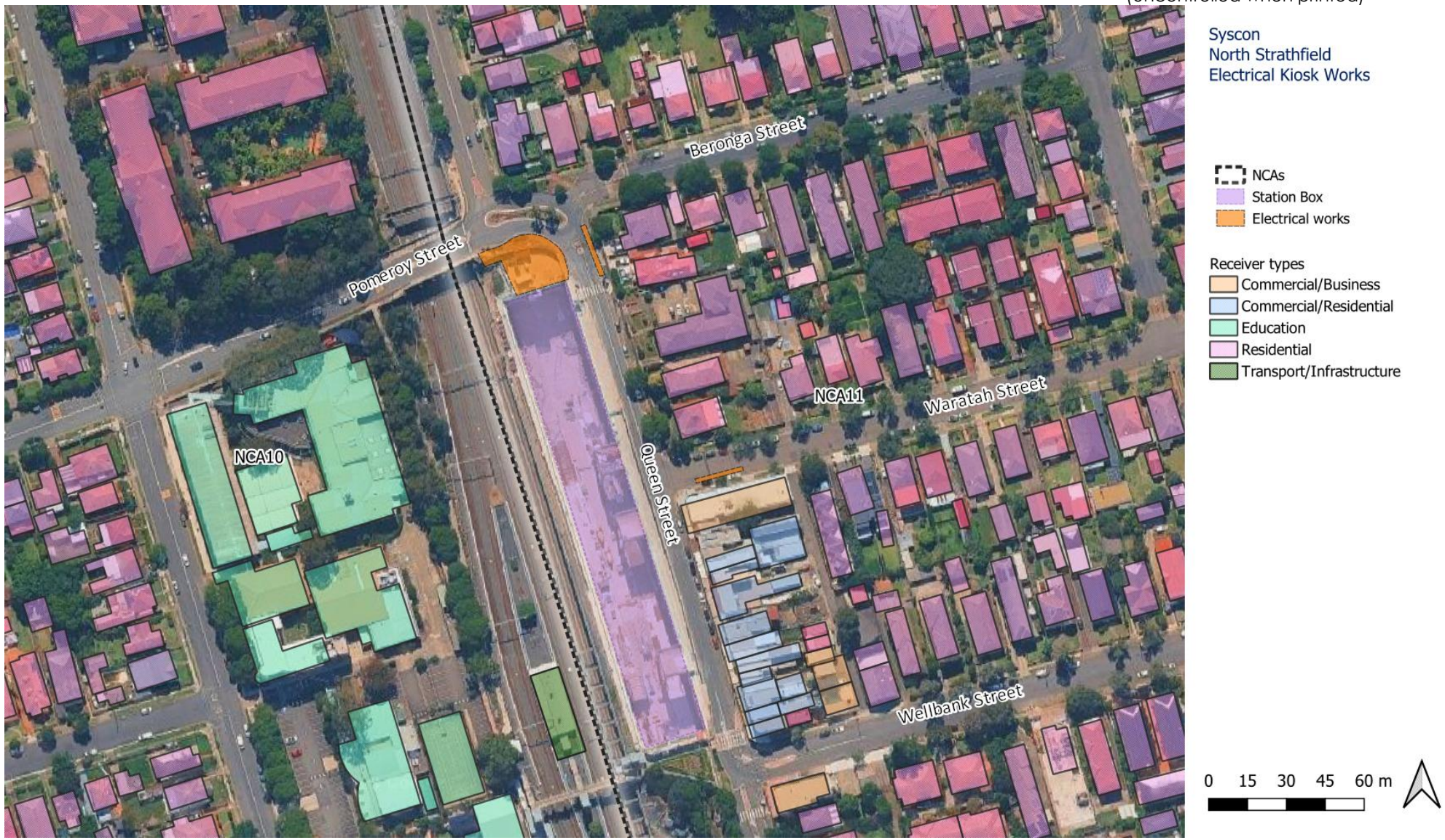

Figure 1 NCAs and land use types in proximity to the work areas

4.3 Ambient noise

Ambient noise levels were established as part of the EIS through background noise monitoring at representative locations undertaken in 2019, with results summarised for each NCA.

Noise levels in the project area generally display a typical diurnal trend with lower levels during the night-time than the daytime and evening periods (with some exceptions). This is characteristic of urban and suburban areas where the ambient noise environment is primarily influenced by road traffic.
The baseline information was used to establish the Rating Background Level (RBL), which represents the average minimum background sound level for each measurement period, averaged over the measurement days, this is provided in Table 6.

Table 6 RBLs for NCAs at North Strathfield and Eastern Creek Project areas

Noise Catchment Area (NCA)	Noise Monitoring Location	Noise level (dBA)		
		Day RBL	Evening RBL	Night RBL
North Strathfield				
NCA 10	**17 George Street, North Strathfield**	47	47	44
NCA 11	**131 Queen Street, North Strathfield**	51	47	39

1. The RBL values have been extracted from the EIS; refer to Table 4 in the EIS Technical Paper 2.

2. Daytime is 7:00am to 6:00pm, evening is 6:00pm to 10:00pm and night-time is 10:00pm to 7:00am.

4.4 Utilities and Services

Utilities and services located within or adjacent to the work areas may be sensitive to construction vibration or to construction methods that generate elevated noise levels. In accordance with Conditions D57 and D59, the Project will identify all known utilities prior to commencing works, confirm their location where required, and implement measures to avoid disruption wherever practicable.

Where works have the potential to affect utility assets, the Project will consult with the relevant service providers during planning and throughout the works to confirm asset sensitivities, agree on any required protection measures, and ensure construction methods remain compatible with service integrity requirements. This consultation may include review of utility maps, site inspections, agreement of vibration limits, and discussions regarding preferred construction methodologies.

From a noise and vibration perspective, works undertaken near critical utilities will be planned to ensure vibration levels remain below the appropriate cosmetic damage or service integrity criteria outlined in this Plan. Where utilities fall within buffer distances for vibration-generating plant, construction methods may be modified (e.g., reduced compaction effort, alternative excavation techniques, or different plant selection) to prevent adverse impacts.

Any additional protective measures or access constraints identified through consultation with utility providers will be incorporated into the relevant work methods and implemented in parallel with the noise and vibration controls in this CNVMP. Where disruption cannot be avoided, customers will be advised.

Although it is not envisaged that unplanned outages will be caused by noise or vibration directly, the following services may be present and sensitive to vibration:

- Electrical conduits and low-voltage power cables
- High-voltage underground feeders
- NBN and telecommunications fibre-optic cables
- Water supply mains (typically PVC, DICL or steel)
- Sewer mains and sewer junctions
- Stormwater pipes, pits and culverts
- Gas distribution pipelines

Asset identification (including BYD - Before You Dig) and protection measures will be implemented as identified in this plan (see table 17) and other management plans.

5 Construction hours

Working hours for North Strathfield are set by CoA D35 to D39. Construction hours as approved in CoA D35 are as follows:

- Monday to Friday: 7:00 am to 6:00 pm
- Saturday: 8:00 am to 6:00 pm
- At no times on Sundays and Public Holidays.

In accordance with CoA D36 highly noise intensive works that result in an exceedance of the applicable NML at the same receiver will only be undertaken:

(a) between the hours of 8:00 am to 6:00 pm Monday to Friday;

(b) between the hours of 8:00 am to 1:00 pm Saturday; and

(c) if continuously, then not exceeding three hours, with a minimum cessation of work of not less than one hour.

For the purposes of this condition, 'continuously' includes any period during which there is less than one hour between ceasing and recommencing any of the work.

Construction activities which are defined as annoying under the Interim Construction Noise Guideline (ICNG) are defined as 'highly noise intensive works'. These include:

- Using power saws (for cutting timber, masonry, road pavement or steel work)
- Grinding metal, concrete or masonry
- Rock drilling
- Line drilling
- Vibratory rolling
- Bitumen milling and profiling
- Jackhammering
- Rock-hammering or rock-breaking
- Impact piling.

Work may also be undertaken outside of approved construction hours would be permitted providing they meet the requirements of CoA D37 (refer to Section 5.1, or if they are undertaken as per the Out-of-Hours Work (OOHW) Protocol required under CoA D38 (refer to Section 5.1.2).

A Detailed Construction Noise and Vibration Impact Statement (DNVIS) will also be prepared for the Project to identify potential noise impacts and required mitigation measures both during construction and for OOHW to ensure compliance with relevant standards and criteria.

5.1 Out-of-Hours Works

5.1.1 North Strathfield

In accordance with CoA D37 work may be undertaken outside the hours specified in the following circumstances:

a) Safety and Emergencies, including:

   i. for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or

   ii. where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm.

   iii. On becoming aware of the need for emergency work in accordance with (a)(ii) above, the AA, the ER, the Planning Secretary and the EPA must be notified of the reasons for such work. The Proponent must use best endeavours to notify as soon as practicable all noise and/or vibration affected sensitive land user(s) of the likely impact and duration of those work.

b) Low impact, including:

   i. construction that causes LAeq(15 minute) noise levels:

      - no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and

- no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s); and

ii. construction that causes LAFmax(15 minute) noise levels no more than 15 dB(A) above the rating background level at any residence; or

iii. construction that causes:

- continuous or impulsive vibration values, measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), or
- intermittent vibration values measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).

c) By Approval, including:

i. where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or

ii. works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition D38 of this schedule; or

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

d) By Prescribed Activity, including:

i. tunnelling (excluding cut and cover tunnelling and surface works) are permitted 24 hours a day, seven days a week; or

ii. concrete batching at the Clyde construction site is permitted 24 hours a day, seven days a week; or

iii. delivery of material that is required to be delivered outside of standard construction hours in Condition D35 of this schedule to directly support tunnelling activities, except between the hours 10:00 pm and 7:00 am to / from the Five Dock and Westmead construction sites and to / from Burwood North construction site using any roads / streets other than directly from Parramatta Road; or

iv. haulage of spoil except between the hours of 10:00 pm and 7:00 am to / from the Five Dock and Westmead construction sites and to / from Burwood North construction site using any roads / streets other than directly from Parramatta Road; or

v. work within an acoustic shed where there is no exceedance of noise levels under Low impact circumstances identified in (b) above.

5.1.2 Out-of-Hours Work Protocol

An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of work which are outside approved construction hours, for works not subject to an EPL. The Protocol must be approved by the Planning Secretary before commencement of the out-of-hours work.

The requirements for the OOHW protocol outlined in CoA D38 are met through implementing the Sydney Metro Out of Hours Works Assessment Procedure provided as Appendix B to this Plan.

6 Noise and vibration criteria

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

- ICNG
- Sydney Metro Construction Noise and Vibration Standard
- Assessing Vibration: a technical guideline (for human exposure)
- German Standard DIN 4150-3: Structural Vibration - effects of vibration on structures (for structural damage).

Relevant elements of these documents are summaries and discussed in this Chapter.

6.1 Construction noise and assessment objectives

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

The main objectives of the ICNG are to:

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

6.2 Quantitative noise assessment criteria

6.2.1 Interim Construction Noise Guideline (DECC, 2009)

Table 2 of the ICNG (table 1 of the CNVS), reproduced in Table 7, shows how Noise Management Levels (NMLs) at residences are determined and how they are to be applied.

Table 7 Noise Management Levels at Residential Receivers

Time of Day	Noise Management Level $L_{Aeq\ (15min)}$[2]	How to Apply
Standard hours[1]: Monday to Friday 7 am to 6 pm Saturday 8.00 am to 6.00 pm (North Strathfield) Saturday 8.00 am to 1.00 pm (Eastern Creek)	RBL + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. 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 proponent would 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 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the proponent would consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level. If no quieter work method is feasible and reasonable, and the works proceed, the proponent would communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided.
Outside recommended standard hours	Noise affected RBL + 5 dB(A)	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 practices have been applied and noise is more than 5 dBA above the noise affected level, the proponent would negotiate with the community. For guidance on negotiating agreements see Section 7.2.2 of the ICNG.

Note 1: Standard hours are taken from the SSI Project Approval for The North Strathfield Project area; **Note 2**: Noise levels apply at the property boundary that is most exposed to construction noise. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise affected point within 30 m of the residence.

The RBL is used when determining the NML and is the overall single-figure background noise level measured in each relevant assessment period (as defined in the EPA's Noise Policy for Industry dated October 2017). NMLs apply only when the property is being used, for example, classrooms during school hours. Internal noise levels are to be assessed at the centre of the occupied room. External noise levels are to be assessed at the most-affected point within 50 m of the area boundary. The difference between the internal noise level and the external noise level is typically 10 dB with windows open for adequate ventilation, as detailed within the ICNG. This figure has been adopted by this plan. Non-mandatory NMLs for non-residential properties which are sensitive to noise impacts are presented in Table 8. These values are established on the principle that the typical activities for each use would not be unduly disturbed by the proposed allocated NML.

The NML for commercial and industrial premises are defined as per the land use in Table 8 and are assessed at the most affected point of the premises.

Other noise-sensitive businesses require separate specific noise goals and it is suggested in the ICNG that the internal construction noise levels at these premises are to be referenced to the 'maximum' internal levels presented in AS 2107. Recommended 'maximum' internal noise levels from AS 2107 are reproduced in Table 8 for other sensitive receiver types.

Table 8 Noise at sensitive land uses (non-residential) using quantitative assessment

Land Use	**Management Level (15minute) (Applies When Land Use is being Utilised)**
Classrooms at schools and other educational institutions Hospital wards and operating theatres Places of worship Childcare Centres (internal play/sleep areas)	45 dB(A) (internal) 55 dB(A) (external)
Active recreational areas and Outdoor Childcare playgrounds (such as parks and sports grounds or playgrounds)	65 dB(A) (external)
Passive recreational areas (such as outdoor grounds used for teaching, outdoor cafes or restaurants)	60 dB(A) (external)
Industrial premises	75 dB(A)
Office, retail outlets, small commercial premises	70 dB(A)
Hotel – Bars and lounges (day and evening)[1]	50 dB(A) (Internal)
Hotel – Sleeping areas: Hotels near major roads (night)[1]	40 dB(A) (Internal)
Café (Coffee Bar)	50dB(A) (Internal) 60dB(A) (External)
Bar/Restaurant (Bars and Lounges/Restaurant)	50dB(A) (Internal) 60dB(A) (External)

Land Use	Management Level (15minute) (Applies When Land Use is being Utilised)
Library (Reading Areas)	45 dB(A) (Internal)
Recording Studio (Music Recording Studios)	25dB(A) (Internal)
Theatre/ Auditorium (Drama Theatres)	30dB(A) (Internal)

6.2.2 Noise Management Levels

In accordance with Table 2 of the ICNG, Project-specific construction NML for each NCA have been determined using the measured ambient noise levels (RBLs) described in Section 4.3. These NMLs are presented in Table 9.

Table 9 Project Noise Management Levels

NCA	Noise Monitoring Location	Noise Management Level dB(A)			
		Approved Hours	OOHW		
		Day	Day[1]	Evening	Night
North Strathfield					
10	**17 George Street, North Strathfield**	57	52	52	49
11	**131 Queen Street, North Strathfield**	61	56	52	44

Note 1: Daytime out of hours is 7 am to 8 am and 8 am to 6 pm on Sunday and public holidays.

6.2.3 Sleep Disturbance

Maximum noise level events from construction activities during the night-time period can trigger both awakenings and disturbance to sleep stages. In line with the CNVS, the approach to managing events that cause sleep disturbance shall be consistent with the Noise Policy for Industry (EPA, 2017). A detailed maximum noise level even assessment is required where night-time noise levels at a residential location exceed the:

- LAeq,15min 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or the
- LAFmax 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater

The detailed assessment will cover the maximum noise level, the extent to which the maximum noise level exceeds the RBL, and the number of times this happens during the night-time period.

Maximum noise level event assessments should be based on the LAFmax descriptor on an event basis under 'fast' time response. The detailed assessment will consider all feasible and reasonable noise mitigation measures with a goal of achieving the above trigger levels for night-time activities.

As per CoA A36, the AA will review all proposed night-time works (with the exception of low risk activities) to determine if sleep disturbance would occur and recommend measures to avoid sleep disturbance or appropriate additional alternative mitigation measures.

6.2.4 Ground-Borne noise

Ground-borne (regenerated) noise is noise generated by vibration transmitted through the ground into a structure. Ground-borne noise caused, for example by underground works such as tunnelling, can be more noticeable than airborne noise. The following ground-borne noise levels for residences are nominated in the ICNG and indicate when management actions would be implemented. These levels recognise the temporary nature of construction and are only applicable when ground-borne noise levels are higher than airborne noise levels. Any levels exceeding objectives should be considered in the context of any existing exposure to ground-borne noise.

The ground-borne noise management levels are given below:

- Evening (6.00 pm to 10.00 pm) Internal Residential: 40 dB $LA_{eq(15minute)}$

- Night-time (10.00 pm to 7.00 am) Internal Residential: 35 dB $LA_{eq(15minute)}$

The evening and night-time criteria are only applicable to residential receivers. The internal noise levels are to be assessed at the centre of the most-affected habitable room.

For a limited number of discrete, ongoing ground-borne noise events, such as drilling or rock hammering, The LAmax noise descriptor using a slow response on the sound level meter may be better than the LAeq noise descriptor (15 min) in describing the noise impacts.

The level of mitigation of ground-borne noise would depend on the extent of impacts and also on the scale and duration of works. Any restriction on the days when construction work is allowed would take into account whether the community:

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

There is no guidance in the ICNG for acceptable ground-borne noise levels in commercial and other potentially sensitive receivers. However, the following has been applied as an initial screening approach for commercial and potentially sensitive other receivers in use outside daytime hours:

- Where an external ICNG NML applies, a level of 10 dB(A) below the NML has been adopted. This is based on the assumption that a 10 dB(A) noise reduction typically applies from external to internal for partially open windows as described in the NSW Road Noise Policy; or
- Where an internal ICNG NML applies, the objective for ground borne noise has also been set at this internal NML level.

These objectives are summarised in Table 10.

Table 10 Ground-borne noise objectives

Time	Ground-borne noise objectives
Residential Receiver	
Evening (6 pm to 10 pm)	40 dB(A) $L_{Aeq\ (15\ min)}$
Night-time (10 pm to 7 am)	35 dB(A) $L_{Aeq\ (15\ min)}$
Commercial and other receivers	
Evening and Night (when in use)	10 dB(A) below ICNG external target or ICNG/AS2107 internal target

6.3 Vibration

Approval condition CoA D39 requires that the project be constructed with the aim of achieving the following vibration goals:

- For structural damage, the vibration limits set out in the German Standard *DIN 4150-3: Structural Vibration – effects of vibration on structures*;
- The vibration limits set out in the British Standard BS 7385-2:1993 – Evaluation and measurement for vibration in buildings Part 2 – Guide for measurement of vibration and evaluation of their effects on buildings (as they are "applicable to Australian conditions");
- For human exposure, the acceptable vibration values set out in *Environmental Noise Management Assessing Vibration: A Technical Guideline* (Department of Environment and Conservation, 2006);

Further details of each of these references are provided below.

6.3.1 Vibration Criteria

Construction vibration is associated with three main types of impact:

- Disturbance to building occupants
- Potential damage to buildings

- Potential damage to sensitive equipment in a building.

Generally, if disturbance to building occupants is controlled, there is limited potential for structural damage to buildings.

6.3.2 Human exposure to vibration

Tactile vibration potentially disturbing human occupants of buildings is managed by reference to 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 11 provides a definition and examples of each type of vibration.

Table 11 Types of vibration

Types of vibration	Definition	Examples
Continuous	Continues uninterrupted for a defined period (usually throughout the day-time and/or night-time)	Machinery, steady road traffic, continuous construction activity (such as roadheader excavation).
Impulsive	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 the duration is short (typically less than 2 seconds)	Infrequent: Activities that create up to three distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.
Intermittent	Can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer, they would be assessed against impulsive vibration criteria.

Preferred and maximum values for continuous and impulsive vibration are defined in Table 2.2 of the guideline and are reproduced in Table 12.

Table 12 Preferred and maximum levels for human comfort (continuous and impulsive vibration)

Location	Assessment period[1]	Preferred values		Maximum values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration[3] (weighted rms Acceleration, m/s^2, 1-80Hz)					
Critical areas[2]	Day or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010

Location	Assessment period[1]	Preferred values		Maximum values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Offices, schools, educational institutions and places of worship	Day or night-time	0.020	0.014	0.040	0.028
Workshops	Day or night-time	0.04	0.029	0.080	0.058
Impulsive vibration[3] (Weighted rms Acceleration, m/s^2, 1-80Hz)					
Critical areas[2]	Day or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day or night-time	0.64	0.46	1.28	0.92
Workshops	Day or night-time	0.64	0.46	1.28	0.92

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. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of their policy and other guidance documents (eg. relevant standards) and should be referred to. Source: BS 6472-2008
3. Source: Table 2.2, Assessing Vibration; a technical guideline, Department of Environment and Climate Change 2006.

When assessing intermittent vibration, the vibration dose value (VDV) is used. VDV accumulates the vibration energy received over the daytime and night-time periods. As such, the vibration dose value is dependent upon the level and duration of the short term vibration event, as well as the number of events occurring during the daytime or night-time period.

The vibration dose values recommended in BS 6472-1992 for which various levels of adverse comment from occupants may be expected are presented in Table 14.

Table 13 Vibration Dose Value Ranges above which various degrees of Adverse Comment may be expected in Residential Buildings

Place and Time	Low Probability of Adverse Comment (m/s$^{1.75}$)	Adverse Comment Possible (m/s$^{1.75}$)	Adverse Comment Probable (m/s$^{1.75}$)
Residential buildings 16 hr day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 hr night	0.13	0.26	0.51

6.3.3 Structural damage to buildings

There is no current Australian Standard for assessing structural building damage caused by vibration. Potential damage of buildings and structures by vibration is typically managed by ensuring vibration at the structure does not exceed limits and standards described in British Standard 7385: Part 2. In addition, guidance values in German Standard DIN 4150-3, are generally used in reference to heritage structures and items.

British Standard BS 7385: Part 2 'Evaluation and measurement of vibration in buildings' can be used as a guide to assess the likelihood of building damage from ground vibration. The standard suggests levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur. Damage consists of 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.

BS 7385 is based on peak particle velocity and specifies damage criteria for frequencies within the range 4 Hz to 250 Hz, being the range usually encountered in buildings. At frequencies below 4 Hz, a maximum displacement value is recommended. The values set in the standard relate to transient vibrations and to low-rise buildings. Continuous vibration can give rise to dynamic magnifications due to resonances and may need to be reduced by up to 50 per cent. Table 14 sets out the BS 7385 safe limits for cosmetic damage.

Table 14 BS 7385 cosmetic damage safe limits

Line	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Un-reinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

For most construction activities involving intermittent vibration sources such as rock hammers, piling rigs, vibratory rollers, excavators and the like, the predominant vibration energy occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, the following vibration level (PPV) has been adopted as the assessment criteria for sound structures:

- Reinforced or framed structures – 25 mm/s
- Unreinforced or light framed structures – 7.5 mm/s.

For assessment purposes, a conservative vibration damage screening level of 7.5 mm/s has been adopted for sound structures to identify where further investigation is required.

For structures 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 done during detailed design to determine the applicable safe vibration level and approach to construction near the structure.

6.3.4 Heritage items

Heritage items are considered on a case-by-case basis, and care should be taken as these structures can be difficult to repair in the case of damage. It should be noted that British Standard BS 5228-2:2009 states that 'a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive' (p.39) when compared to other structures.

Heritage buildings and structures would be assessed under a more conservative cosmetic damage objective of 2.5 mm/s peak component particle velocity (from DIN 4150) unless the structure is confirmed as being structurally sound by a qualified person. In this case, the structure would be assessed against the screening criteria described above since it is therefore not assumed to be any more sensitive to vibration than the corresponding type of building in Table 25.

6.3.5 Damage to vibration-sensitive equipment

Some high technology manufacturing facilities, hospitals and laboratories use equipment that is highly sensitive and susceptible to vibration, for example scanning electron microscopes and micro-electronic manufacturing facilities. In addition, buildings housing sensitive computer or telecommunications equipment may require assessment against stricter criteria than those nominated for building damage.

There is no explicit guidance on acceptable vibration levels for sensitive equipment, so recommended vibration levels should be obtained from instrument manufacturers. In the absence of equipment-specific data provided by manufacturers, there are generic Vibration Criterion (VC curves can be used.

Table 15 summarises a range of suitable vibration limits that are applicable to buildings housing vibration-sensitive equipment which may potentially be affected by construction works associated with the project.

Table 15 Acceptable vibration limits on building structure housing sensitive equipment

Criterion Curve	Max level (um/sec, RMS)	Detail size (um)	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.
VC-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.

6.3.6 Existing rail tunnels

Any development that occurs within a distance of 25 metres horizontally from first reserve (dependent on tunnel dimensions), as defined in Asset Standards Authority (ASA) standard Development Near Rail Tunnels (ASA 2018), must consider vibration impacts on existing rail tunnels. The assessment requirement is a maximum peak particle velocity (PPV) of 15 mm/s at the tunnel lining for brick or mass concrete in good condition, or maximum PPV of 20 mm/s at the tunnel lining for cast iron, steel or concrete segment lining.

6.3.7 Damage to buried utilities

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. These values, which apply at the wall of the pipe, are reproduced and presented in

Table 16. As part of detailed design, these vibration limits would be considered to minimise the potential for damage to buried utilities from vibration impacts.

Table 16 Acceptable vibration limits for effects of short-term vibration on buried pipework

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

Notes: Consideration must also be given to pipe junctions within the building structure as potential substantial changes in mechanical loads on the pipe must be considered.
For long-term vibration, the vibration limits presented in Table 16 should be halved.

Recommended vibration goals for electrical cables and telecommunication utilities such as fibre optic cables range from 50 mm/s to 100 mm/s. Although cables may sustain these vibration levels, the utilities they are connected to, such as transformers and switch blocks, may not. If such equipment is encountered during the construction process, an individual vibration assessment would be carried out addressing impact on the utility, and consultation with the utility provider, to confirm specific vibration requirements.

6.3.8 Safe working distances for vibration intensive plant

The propagation of vibration emitted from a source is site-specific, with the level of vibration potentially experienced at a receiver dependent on the vibration energy generated by the source, the main frequencies of vibration, the localised geotechnical conditions and the interaction of structures and features which can dampen vibration.

As per the minimum requirements for all Sydney Metro Projects set out in section 4.2 of the CNVS, attended vibration measurements are required at the commencement of vibration generating activities to confirm that vibration levels satisfy the criteria for that vibration generating activity. Where there is potential for exceedances of the criteria further vibration site law investigations are required to be undertaken to determine the site-specific safe working distances for that vibration generating activity. Continuous vibration monitoring with audible and visible alarms is required to be conducted at the nearest sensitive receivers whenever vibration generating activities need to take place inside the applicable safe-working distances.

7 Environmental aspects and impacts

7.1 Construction activities

The Project is located in the suburb of North Strathfield in the Greater Sydney Region. The scope of work includes **site preparation** through survey, utility identification, and service protection activities to ensure safe excavation and construction. This is followed by **civil works**, including trenching and the installation of low-voltage conduits, footings, and reticulation necessary to house and connect the kiosk. The **electrical kiosk unit**, which has been procured in advance and is stored on site, will be positioned, secured, and fitted out with the required internal cabling, switchgear, and auxiliary systems to meet Ausgrid's standards.

In order to assess the level of potential impact on noise and vibration sensitive receivers, the broad categories of construction activity likely to interact with these receivers are identified in Table 17.

Table 17 Overview of construction activities at North Strathfield

Works category	Description of activities
Survey	• Site survey
Service locating, potholing, investigations, site preparation works	• NDD potholing to locate and identify existing services • Scanning of existing layout • Site preparation
Trench excavation, ,	• Trenching will consist of open excavation, conduit installation, backfilling and temporary restorations and will progressively move along the trench alignment. • Trench depths will range from a minimum depth cover over footpaths of 500mm and a minimum of 900mm cover over roadways. Where there is the need to excavate under services in the roadway digging will extend to depth of approximately 2000mm. • Trenching will be confined to foot path and hardstand areas within the SMW site.
Cable installation	• Following the trench excavation, LV cable will be installed using a truck or trailer mounted cable drum winch. • Additional cable pulling may be required from an excavator where necessary.
backfilling, temporary restorations –	• Stabilised sand will be placed into the trench using an excavator bucket allowing the trenches to be backfilled progressively with installation. • Stabilised sand material will be compacted with a plate compactor however, a trench roller may be required for long trenches.
Pre-outage/outage works	• Outage works will be completed with minimal site equipment other than those described above.
Permanent restorations and handover	• Return once all conduit installation works and cable pulling, testing works are completed. Restore any footpath materials to pre-existing materials -i.e. concrete or pavers where appropriate

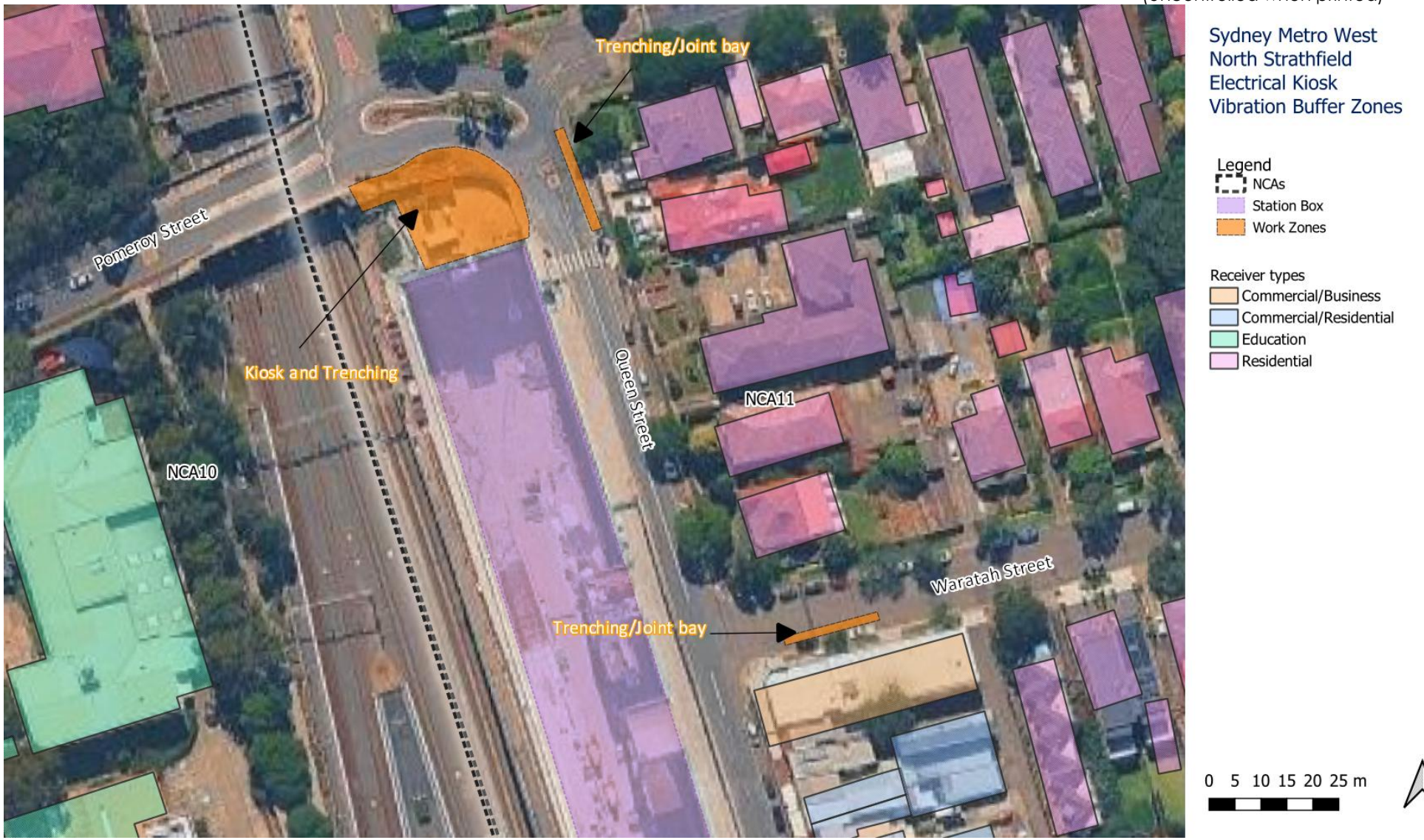

Figure 2 Overview of North Strathfield Power Supply Route

7.2 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
- The physical condition of the structure the receiver is in
- Presence of existing background noise (e.g. from heavy traffic areas).

Relevant aspects and the potential related impacts from noise and vibration identified in the Approval documents are presented below.

7.2.1 North Strathfield

The assessment undertaken as part of the EIS noted that noise impacts associated with utility works would be temporary and would move progressively along the utility service corridor resulting in impacts at particular receivers for only a limited period of time.

Relatively high noise impacts are likely where noise intensive plant items are required near adjacent receivers. On typical streets where the closest receivers are about 15 metres from the road, noise levels between 80 to 86 dBA are possible when noise intensive plant items are in use.

Where night-time works are required, worst-case exceedances of greater than 25 to 30 dB above NML are likely where noise intensive plant items are in use.

8 Construction noise and vibration assessment

8.1 Detailed Noise and Vibration Impact Statements

In accordance with CoA D43 and D44, Detailed Noise and Vibration Impact Statements (DNVIS) will be prepared to supplement the CNVMP and refine impact predictions presented in the EIS. The DNVIS will be prepared by an appropriately qualified and experienced acoustic consultant prior to construction noise and vibration impacts commencing. The DNVIS will be provided to the AA and ER.

In accordance with the CNVS, work described in a DNVIS cannot proceed until the DNVIS is approved by the AA or other delegate approved by Sydney Metro.

DNVIS will be prepared for any work that may exceed the NMLs, vibration criteria and / or ground-borne noise levels specified in this document at any residence outside the approved construction hours, or where receivers will be highly noise affected.

The DNVIS will be a key site management tool that will give Syscon clear instructions for managing noise and vibration by providing activity specific noise and vibration predictions and specific mitigation measures identified through consultation with affected sensitive land user(s) to be implemented for the duration of the works.

The DNVIS will address:

- Scope of work covered by the DNVIS
- Nearest noise and vibration sensitive receivers, based on land use survey
- Construction noise and vibration objectives
- Construction noise and vibration assessment
- Mitigation options and preferred management measures
- Activity specific noise and vibration monitoring requirements additional to those outlined in the monitoring program (Appendix B)

Monitored noise and vibration levels will be analysed against the predictions made in the DNVIS. This will allow for ongoing review, verification and, where required, amendment of the predictive model.

9 Environmental Control Measures

In accordance with CoA D39, reasonable and feasible noise mitigation measures (such as those listed within Chapter 6 of the ICNG and Section 4 and 5 of the CNVS) will be implemented with the aim of achieving the noise and vibration criteria specified in Section 5 of this plan. The proposed reasonable and feasible noise mitigations are included in the following sections.

9.1 Mitigation Measures

A range of environmental requirements and control measures are identified in the Approval documents as well as Sydney Metro documents. Specific measures and requirements to address the CEMF, CoA and REMMs in relation to impacts from noise and vibration are outlined in Table 18.

These mitigation measures would be implemented through the following means:

- All employees, contractors and subcontractors are to receive a Project induction which would detail specific noise and vibration mitigation measures
- Additionally, mitigation measures would be regularly communicated through toolbox talks
- Mitigation measures would be reviewed during site inspections to be implemented where reasonable and feasible

Table 18 Noise and Vibration Project requirements

ID	Measure / Requirement	Source of req.	Evidence	When to implement	Responsibility
NV1	Training will be provided to relevant Project personnel, including relevant sub-contractors on noise and vibration requirements from this plan through inductions, toolboxes and targeted training.	Best Practice	Training records	Prior to construction Construction	Environmental Manager
NV2	All employees, contractors and subcontractors are to receive a Project induction. The environmental component may be covered in toolboxes and will include: • Relevant approval conditions • Permissible hours of work • Any limitations on high noise generating activities • Location of nearest sensitive receivers • Construction employee parking areas • Relevant site-specific mitigation measures • Appropriate behavioural practices	Best Practice	Site induction records	Prior to construction Construction	Environmental Manager
NV3	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 and no extended periods of engine idling).	REMM NV14	Vehicle movement plans Training records	Construction	Site Supervisor Project Engineer Operator

ID	Measure / Requirement	Source of req.	Evidence	When to implement	Responsibility
NV5	Air brake silencers would be used on heavy vehicles that access construction sites multiple times per night or over multiple nights.	REMM NV05	Construction Traffic Management Plan (CTMF)	Construction	Operator Site supervisor
NV4	Out-of-hours deliveries will be minimised where possible.	Best Practice	CTMP	Construction	Site supervisor Project Engineer Operator
NV5	All construction plant and equipment used on site will be fitted with properly maintained noise suppression devices in accordance with the manufacturer's specifications.	CoA D42 CNVS	Plant inspection records	Construction	Site supervisor
NV6	All construction plant and equipment used on the site will be maintained in an efficient condition.	CoA D42 CNVS	Plant inspection records	Construction	Site supervisor
NV7	All construction plant and equipment used on the site will be operated in a proper and efficient manner.	CoA D42 CNVS	Site inspection records Safety observations	Construction	Site supervisor
NV8	Non-tonal movement alarms will be used in place of tonal movement alarms	CNVS	Plant inspection records	Construction	Project Engineer
NV9	Plant and machinery will be switched off when it is not in use for more than 15 minutes	Best Practice	Site inspection records	Construction	Operators Site supervisor
NV10	Where possible, maintenance work on plant and equipment will be undertaken off site. If maintenance is to be onsite the task will be carried out away from noise sensitive receivers where reasonable and feasible.	Best Practice	Plant inspection records	Construction	Operators Site supervisor

ID	Measure / Requirement	Source of req.	Evidence	When to implement	Responsibility
NV11	Consider noise when selecting construction methods and substitute for quieter methods where reasonable and feasible.	Best Practice REMM NV02	Plant inspection records	Construction	Operators Site supervisor
NV12	Use appropriately sized equipment, avoiding over-powered plant.	Best Practice	Site inspection records	Construction	Project Engineer Site supervisor
NV13	Additional temporary screening or enclosures will be considered for equipment where additional measures are required to meet relevant NMLs.	REMM NV02	Site inspection records	Construction	Site supervisor
NV14	Stationary noise sources would be enclosed or shielded where reasonable and feasible.	REMM NV02	Site inspection records	Construction	Site supervisor
NV15	Construction activities associated with the Project will be carried out in accordance with the hours in Section 5.	CoA D35	Site inspection records	Construction	Site supervisor
NV16	Except as permitted by an EPL, highly noise intensive works (as defined in Section 5.2 that result in an exceedance of the applicable NML at the same receiver will only be carried out: Between 8:00 am and 6:00 pm Monday to Friday Between 8:00 am and 1:00 pm Saturday 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.	CoA D36	Site inspection records	Construction	Project Manager Project Engineer Site Supervisor Environmental Manager

ID	Measure / Requirement	Source of req.	Evidence	When to implement	Responsibility
NV17	OOHW is to be carried out in accordance with the Project's Out-of-Hours-Works Protocol (Appendix B)	CoA D38	OOHW Permits Site inspection records	Construction	Project Manager Project Engineer Site Supervisor Environmental Manager
NV20	Perimeter site hoarding, where applicable, would be designed with consideration of on-site heavy vehicle movements with the aim of minimising sleep disturbance impacts.	REMM NV06	Site inspection records	Prior to construction Construction	Site supervisor Project Engineer
NV21	Portable noise barriers would be used around particularly noisy equipment, such as concrete saws	REMM NV02	Site inspection records	Prior to construction Construction	Site supervisor Project Engineer
NV22	Site access and egress points will be located as far as feasible and reasonable from noise sensitive receivers.	REMM NV14	Site inspection records	Prior to construction	Project Engineer Environmental Manager
NV24	Noise generating work in the vicinity of potentially-affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise levels above the NMLs must not be timetabled within sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	CoA D45	Consultation records	Prior to construction Construction	Community Liaison Environmental Manager

ID	Measure / Requirement	Source of req.	Evidence	When to implement	Responsibility
NV25	Further engagement and consultation would be carried out with: • The affected communities to understand their preferences for mitigation and management measures. • 'Other sensitive' receivers such as schools, medical facilities or places of worship to understand periods in which they are more sensitive to impacts. Based on this consultation, appropriate mitigation and management options would be considered and implemented where feasible and reasonable to minimise the impacts	REMM NV01	Consultation records	Prior to construction Construction	Community Liaison Environmental Manager
NV26	The use of noise intensive equipment at construction sites with 'moderate' and 'high' out-of-hours noise management level exceedances would be scheduled for approved construction hours, where feasible and reasonable. Where this is not feasible and reasonable, the works would be undertaken as early as possible in each work shift.	REMM NV04	OOHW Permits	Construction/Prior to any OOHW	Site supervisor Project Engineer
NV27	Detailed Noise and Vibration Impact Statements (DNVIS) must be prepared for any work that may exceed the NMLs, vibration criteria and / or ground-borne noise levels at any residence where work is occurring outside approved construction hours or where receivers will be highly noise affected.	CoA D43 CEMF 12.2b)	DNVIS	Prior to construction Construction	Environmental Manager Noise and Vibration Specialist
NV28	All complaints, including those related to property damage, will be managed in accordance with the CCS.	CCS	Complaints register	Construction	Community Liaison

ID	Measure / Requirement	Source of req.	Evidence	When to implement	Responsibility
NV29	Owners and occupiers at risk of exceeding the screening criteria for cosmetic damage (as outlined in the DNVIS) will be notified before works that generate vibration commences in the vicinity of those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owner and occupiers will be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier.	CoA D45	Consultation records	Prior to construction Construction	Community Liaison Project Engineer Project Manager Environmental Manager Noise and Vibration Specialist
NV30	Vibration testing must be conducted during vibration generating activities that have the potential to impact on Heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, Syscon must review the construction methodology and, if necessary, implement additional mitigation measures. Such measures must include, but not be limited to, review or modification of excavation techniques.	CoA D46	Monitoring records	Construction	Project Engineer Project Manager Environmental Manager Noise and Vibration Specialist

ID	Measure / Requirement	Source of req.	Evidence	When to implement	Responsibility
NV31	The likelihood of cumulative construction noise impacts would be reviewed during detailed design when detailed construction schedules are available. Co-ordination would occur between potentially interacting projects to minimise concurrent or consecutive works in the same areas, where possible. Specific mitigation strategies would be developed to manage impacts. Depending on the nature of the impact, this could involve adjustments to construction program or activities of Sydney Metro West or of other construction projects.	REMM NV18	Consultation records OOHW permits	Construction	Environmental Manager Noise and Vibration Specialist
NV33	Appropriate respite would be provided to affected receivers in accordance with the Sydney Metro Construction Noise and Vibration Standard. This would include consideration of impacts from Stage 1 utility and power supply works when determining appropriate respite periods for affected receivers. When determining appropriate respite, the need to efficiently undertake construction would be balanced against the communities' preferred noise and vibration management approach.	REMM NV03	Consultation records Monitoring records	Prior to construction Construction	Project Engineer
NV34	Feasible and reasonable measures would be implemented to minimise ground-borne noise where exceedances are predicted. This may require implementation of less ground-borne noise and less vibration intensive alternative construction methodologies.	REMM NV09	DNVIS	Construction	Environmental Manager

ID	Measure / Requirement	Source of req.	Evidence	When to implement	Responsibility
NV35	Select the smallest rock hammers capable of efficiently completing the work, where feasible and reasonable.	Best Practice	Site inspection records	Construction	Site supervisor Project Engineer
NV36	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.	Best Practice	Toolbox minutes Site inspection records	Construction	Site supervisor Project Engineer
NV37	The safe working distances for vibration intensive plant would be complied with where feasible and reasonable. This would include the consideration of smaller equipment when working in close proximity to existing structures. Where the safe working distance cannot be achieved vibration monitoring will be carried out.	Best Practice	Site inspection records	Construction	Site supervisor Project Engineer Environmental Manager Noise and Vibration Specialist
NV38	Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure (in consultation with a structural engineer) and vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure. For heritage items, the more detailed assessment would specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.	REMM NV16	Monitoring records	Construction	Project Engineer Project Manager Environmental Manager Noise and Vibration Specialist

ID	Measure / Requirement	Source of req.	Evidence	When to implement	Responsibility
NV39	Condition surveys of buildings and structures near to the tunnel and excavations would be undertaken prior to the commencement of excavation at each site, where appropriate. For heritage buildings and structures the surveys would consider the heritage values of the structure in consultation with a heritage specialist.	REMM NV17	Monitoring records	Construction	Project Engineer Project Manager Environmental Manager Noise and Vibration Specialist
NV40	Further assessment of construction traffic would be completed during detailed design, including consideration of the potential for exceedances of the NSW Road Noise Policy base criteria (where greater than 2 dB increases are predicted). The potential impacts would be managed using the following approaches, where feasible and reasonable: • On-site spoil storage capacity would be maximised to reduce the need for truck movements during sensitive times • Vehicle movements would be redirected away from sensitive receiver areas and scheduled during less sensitive times • The speed of vehicles would be limited and the use of engine compression brakes would be avoided • Heavy vehicles would not be permitted to idle near sensitive receivers.	REMM NV14	-	Construction	Sydney Metro

9.2 Additional noise and vibration mitigation measures

In instances where noise levels are still predicted to exceed the NML at receivers after the application of the measures described in Table 18, the CNVS directs that the Project should consider implementing additional mitigation measures where feasible and reasonable, which are included here as Table 19, Table 20 and Table 21.

In accordance with CoA A36, the selection and implementation of feasible and reasonable mitigation measures will be regularly monitored and reviewed by the AA.

Table 19 Triggers for Additional Mitigation Measures- Airborne Noise (Table 16 CNVS)

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

KEY: AA- Alternative Accommodation, **M**- Monitoring, **IB**- Individual Briefings, **LB**- Letter Box Drops, **RO**- Project specific respite offer, **PC**- Phone Calls and Emails, **SN**- Specific notification.

Table 20 Additional Mitigation Measures – Ground Borne Construction Noise (Table 17 CNVS)

Time Period		Mitigation Measures		
		Predicted LAeq (15minute) noise level Above NML		
		0 to 10 dB	>10 to 20 dB	> 20 dB
Standard	Mon-Fri (7.00 am - 6.00 pm)	No NML for GBN during standard hours		
	Sat (8.00 am - 6.00 pm)			
	Sun/Pub Hol (Nil)			
OOHW (Evening)	Mon-Fri (6.00 pm - 10.00 pm)	LB	LB, M, SN	LB, M, SN, IB, PC, RO
	Sat (61.00 pm - 10.00 pm)			
	Sun/Pub Hol (8.00 am - 6.00 pm)			
OOHW (Night)	Mon-Fri (10.00 pm - 7.00 am)	LB, M, SN	LB, M, SN, IB, PC, RO, AA	LB, M, SN, IB, PC, RO, AA
	Sat (10.00 pm - 8.00 am)			
	Sun/Pub Hol (6.00 pm - 7.00 am)			

KEY: AA- Alternative Accommodation, **M**- Monitoring, **IB**- Individual Briefings, **LB**- Letter Box Drops, **RO**- Project specific respite offer, **PC**- Phone Calls and Emails, **SN**- Specific notification.

Table 21 Additional Mitigation Measures - Ground-borne Vibration

Time Period		Mitigation Measures
		Predicted Vibration Levels Exceed Maximum Levels
Standard	Mon-Fri (7.00 am - 6.00 pm)	LB, M, RO
	Sat (8.00 am - 61.00 pm)	
	Sun/Pub Hol (Nil)	
OOHW (Evening)	Mon-Fri (6.00 pm - 10.00 pm)	LB, M, IB, PC, RO, SN
	Sat (61.00 pm - 10.00 pm)	
	Sun/Pub Hol (8.00 am - 6.00 pm)	
OOHW (Night)	Mon-Fri (10.00 pm - 7.00 am)	LB, M, IB, PC, RO, SN, AA
	Sat (10.00 pm - 8.00 am)	
	Sun/Pub Hol (6.00 pm - 7.00 am)	

KEY: AA- Alternative Accommodation, **M**- Monitoring, **IB**- Individual Briefings, **LB**- Letter Box Drops, **RO**- Project specific respite offer, **PC**- Phone Calls and Emails, **SN**- Specific notification.

10 Compliance Management

10.1 Roles and Responsibilities

The organisational structure and overall roles and responsibilities for the Project team are outlined in Section 6.2.1 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 6 of the CEMP.

10.2 Training

All employees, contractors and utility staff working on-site will undergo site induction relating to noise and vibration management issues. The induction will address elements related to noise and vibration management including:

- Existence and requirements of this Sub-plan
- Normal construction hours and exemptions
- Location of noise sensitive areas
- How to implement noise and vibration management measures

Targeted training in the form of toolbox talks or specific training will also be provided to personnel with a key role in noise and vibration management. Examples of training topics include:

- Relevant legislation and guidelines
- Complaints reporting and recording
- The process for seeking approval for out-of-hours works, including consultation
- 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 7 of the CEMP.

10.3 Monitoring and Inspection

Inspections of sensitive areas and activities with the potential 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 11 of the CEMP.

Noise and vibration monitoring will also occur routinely for the duration of the Project where recommended by the DNVIS.

Monitored noise and vibration levels will be analysed against the predictions made in the DNVIS. Where monitored noise levels are found to be above modelling predictions or vibration goals are exceeded, the following actions will be undertaken:

- Noise monitoring at the most affected receiver(s) would be undertaken at the start of construction works to check the levels are as predicted and to confirm that the standard mitigation measures are adequate
- Confirm the monitored levels are not being impacted by other noise or vibration sources
- 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, 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 receiver locations and potential impacts identified in the DNVIS following utilities location and updated trenching locations
- Review work practices to ensure compliance with the ICNG and DNVIS
- Review and revise mitigation measures as appropriate
- Ensure that the learnings from the above are fed back into the noise modelling assessment process for fine-tuning
- Communicate lessons learnt to relevant personnel.

Syscon 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 5 of the CEMP.

10.5 Reporting and Records

Reporting requirements and responsibilities are documented in Section 11 of the CEMP. Additional reporting will also be generated as required in DNVIS documents.

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

- The locations and descriptions of monitoring carried out including conditions and equipment used (personnel should also be listed in internal records)
- A tabulation of results (e.g. for noise including $L_{A\ (max)}$ and $L_{A90\ and\ LAeq}$ noise levels) together with notes identifying the principle sources and operations
- Records of noise and vibration monitoring results against appropriate NMLs and vibration criteria
- Records of community enquiries and complaints, and the Contractor's response (as part of CCS)
- Summary of any measurements exceeding the nominated criteria, and descriptions of the plant or operations causing these exceedances
- Detail of any corrective actions

10.5.1 Condition Surveys

In accordance with MCoA D60, a suitably qualified and experienced person must undertake condition surveys of all buildings, structures, utilities and the like identified in the documents listed in MCoA A1 at risk of damage before commencement of any work that could impact on the subject surface / subsurface structure.

Given the specific nature of the works and the limited assessment of impacts based on vibration during utilities work, the DNVIS will determine the properties 'at risk' of damage and therefore guide condition surveys, rather than those specified in the documents.

The results of the surveys must be documented in a Pre-construction Condition Survey Report for each item surveyed. Copies of Pre-construction Condition Survey Reports must be provided to the relevant owners within one month before the commencement of the work that could impact on the subject surface / subsurface structure.

This process of condition surveys will be repeated after completion of the work and results documented in a Post-construction Condition Survey Report as per MCoA D61. The Post-construction Condition Survey Reports will be provided to the landowners within three months following the completion of the work. Where liable, any property damage caused directly or indirectly (for example from vibration or from groundwater change) by the work will be rectified in accordance with MCoA D62.

11 Review and 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.

11.1 CNVMP update and amendment

The processes of document review and update are described in Section 12 of the CEMP.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 12 of the CEMP.

11.2 Document Consultation

In accordance with MCoA C5, this CNVMP was issued to the following government agency for review and comment on 10 October 2025:

- City of Canada Bay

A Council briefing was held on 23 October 2025. Attendees present were:

- Kai Zhu (Canada Bay Council)
- Adrian Washington (Syscon)
- Leon Coetzee (Syscon)
- Stuart Watkins (Syscon)
- Michael Kell (Retro Traffic)
- Andrew Kouros (Sydney Metro)
- Valerie Lebon (Sydney Metro)
- Richard Banzon (Sydney Metro)
- Robin Baird (Sydney Metro)

No comments were raised by City of Canada Bay Council in relation to this CNVMP. Consultation with City of Canada Bay Council will be ongoing as required during project delivery.

See Appendix C for consultation records.

Appendix A - Land Use Survey

Appendix B Out of Hours Works Protocol

Appendix C – Consultation Records