



Noise and Vibration Management Plan

M1 Metro Northwest and Bankstown Line

Information

Issue Date:

06/10/2026

Next Review Date:

26/05/2027

Network:

Overall

Version:

08

Document Number:

SMCSWTS2-MTS-CSW-EM-PLN-002106

Alternative Number

n/a

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1. Introduction

1.1. Purpose

Renzo Tonin & Associates was engaged by Metro Trains Sydney (MTS) to prepare an Operational Noise and Vibration Management Plan (ONVMP) for the Sydney Metro Northwest and a separate Plan for the City & Southwest (SMCSW) project. This ONVMP merges these two Plans into a single Plan for the whole of the M1 Metro Northwest and Bankstown Line.

This Operational Noise and Vibration Management Plan has been prepared in accordance with the requirements of the OTS2 Project Deed's and the Consolidated Conditions of Approval for SSI-5414 CoA F4 and SSI-5931 CoA F7, SSI 15 7400 CoA D13 .

This ONVMP reviews the design process followed for the M1 project and confirms the implemented mitigation measures addresses the relevant CoAs. The purpose of this ONVMP is to summarise the noise and vibration criteria for the project, outline the complaint and response process for the project, detail the monitoring and reporting processes that will take place for the project, and how ongoing compliance with the operational noise and vibration criteria will be monitored and assessed.

1.1.2 Background

The Project involves the operation of a metro rail line and associated stations between the SMTF (N), Tallawong Station and Bankstown Station.

The Project passes through the local government areas (LGAs) of Blacktown, The Hills, Hornsby, Ryde, Willoughby, North Sydney, City of Sydney Inner West and Canterbury - Bankstown.

Key operational components of the Project include:

- The first two stages of the line, running from Tallawong to Sydenham via the Sydney CBD, are now open and carrying passengers. The final stage of the line, a conversion of the former T3 Bankstown Line to rapid transit standards, is currently under construction.
- When complete, the full line from Tallawong to Bankstown will have a long-term target capacity of about 40,000 customers per hour in each direction, similar to other metro systems worldwide.

Sydney Metro Northwest (stage 1)

- Sydney Metro Northwest between Tallawong and Chatswood was completed and commenced passenger services in May 2019.
- This stage of the project involved the construction of a brand-new line from Tallawong to Epping along a mixture of viaducts and tunnels and also absorbed the former Epping to Chatswood railway line which was converted to run the single-deck driverless trains.

Sydney Metro City and Southwest (stage 2)

- Sydney Metro City and Southwest extend the new line from Chatswood through to the CBD and Sydenham, and then onward to Bankstown. This includes a new crossing beneath Sydney Harbour, new underground stations in the lower North Shore and CBD, and the upgrade and conversion of previous Sydney Trains stations from Sydenham to Bankstown.
- Chatswood to Sydenham: Construction is complete, and passenger services commenced in August 2024.

Sydney Metro Southwest (stage 3)

- Sydenham to Bankstown: The final stage of converting the former Bankstown Line is underway and required the full closure of this line in September 2024. It is scheduled to open in late 2026.
- The Sydenham to Bankstown project involves upgrading 10 existing stations west of Sydenham (Marrickville to Bankstown inclusive) and upgrading a 13-kilometre-long section of the T3 Bankstown Line between Sydenham and Bankstown to run the new driverless trains.

1.2. Scope

This ONVMP applies to all facilities and infrastructure encompassed within the M1 Line's operations and maintenance. The ONVMP is required to address the requirements in the Conditions of Approval (CoA), and OTS2 Project Deed, and other operational noise and vibration design criteria established by Sydney Metro and contained within various Scope of Works and Technical Criteria (SWTC) documents.

The M1 project includes a large number of contracts. Some of the key contracts and responsibilities are summarised below:

- **TSE (Tunnel and Station Excavation)** – This contract was responsible for building the twin railway tunnels from Chatswood to Sydenham and excavating six new stations, the tunnel dives, etc.
- **Sydenham Upgrade & Southwest Metro Corridor** – This contract was responsible for upgrading Sydenham Station and the existing railway infrastructure between Sydenham and Bankstown to metro rail standards.
- **Northern Corridor Works** – This contract was responsible for delivering work on the T1 North Shore Line to prepare for the start of Sydney Metro services, including the realignment of the existing tracks near the northern dive and the construction of additional noise barriers.
- **Central Station Main Works** – This contract was responsible for delivering the new Sydney Metro platforms under Central Station as well as the new Central Walk underground pedestrian concourse.
- **Linewise Works (LWW)** – This contract was responsible for converting the empty rail tunnels into a working railway, including the railway track, overhead wiring, and other infrastructure works. The contract was responsible for building the new Sydney Metro Trains Facility South at Marrickville and the new electrical substations along the SSC corridor.
- **Station Contracts** – A range of station contracts were awarded to various contractors. These contracts were responsible for the construction and fit out of each station and related facilities. Some of these contracts included the construction of new commercial buildings above the stations.
- **Operations Trains and Systems 2 (OTS2)** – This contract is responsible for delivering the core rail systems for SMCSW, integrating the new line with the Sydney Metro Northwest line, and providing the operations and maintenance for the 66 km Sydney Metro network from Tallawong to Bankstown.
- **Southwest-** The key packages associated with Southwest section of the M1 line include the following:
 - Southwest Metro Early Works (SMEW);
 - Line-Wide (LW); • Southwest Metro Corridor (SMC), including Bankstown Station early works (BEW); S2B station works (PC+ Scope); Southwest Metro Conversion and Station Work Package 1 & 2 (SWM1 & 2) and SMC additional Works;
 - Southwest Metro Station Upgrades;
 - Marrickville, Canterbury and Lakemba Station Upgrades (MCL);
 - Dulwich Hill, Campsie and Punchbowl Station Upgrades (DCP); and
 - Hurlstone Park, Belmore and Wiley Park Station Upgrades (HBW).
 - Trains, Systems, Operations and Maintenance (TSOM);
 - Southwest Metro Final Conversion and Station Work Package 3 (SWM3); and
 - Errant and Hostile Vehicle Mitigation Treatments (EHVMT);
 - Metro Way

1.3. Role of Acoustic Integrator during design stage

To assist Sydney Metro in achieving the operational noise and vibration criteria for the project, an Acoustic Integrator was appointed. The role of the Acoustic Integrator was to prepare a strategy to ensure the successful coordination and integration of acoustic design between all contracts. An Acoustic Design Integration Strategy (ADIS) was developed which outlined the roles and responsibilities of each contract. The ADIS established noise and vibration budgets for each contractor, related to their design scope. The noise and vibration budgets for each contract were set below the overall project noise and vibration requirements to ensure that the overall levels from each contract combined achieves the overall project requirements.

Within this ONVMP, the operational noise and vibration criteria are based on the overall levels for the project. These have been derived from the applicable noise and vibration guidelines, the overall noise and vibration criteria summarised in the ADIS, and relevant detailed design documents for fixed facilities and stations.

1.4. The OTS PPP & OTS2

Sydney Metro (the Principal) engaged NRT Pty Ltd (OpCo) and NRT CSW Pty Ltd (OpCo2) to deliver the Sydney Metro Northwest (SMNW) and Sydney Metro City and Southwest (SMCSW) Public Private Partnership (PPP) contracts, respectively.

These two PPP contracts were awarded by government effectively as ‘packages’, each comprising three separate main entities, OpCo or OpCo2 plus two Core Contractors, each including three distinct roles:

- SMNW PPP (OTS), comprising OpCo (finance), the D&C Contractor (delivery) and the O&M Contractor (‘MTS’) (operations & maintenance).
- SMCSW PPP (OTS2): OpCo2 (finance), the Integrator (delivery) and MTS (operations & maintenance).

The delivery and the operations & maintenance obligations are ‘passed down’ virtually in their entirety to the relevant Core Contractor (e.g. to MTS, under the OTS and OTS2 O&M Contracts). SPR obligations of OpCo / OpCo2 are Core Contractor obligations. Accordingly, operation and maintenance obligations of OpCo and OpCo2 for OTS and OTS2 are obligations of MTS.

OTS and OTS2 were two separate and distinct PPP contracts. They have ‘merged’ together at the Incorporation Date in November 2024 (completion of OTS2 Phase 1, City section), from an operations and maintenance perspective, becoming a single operating railway under a single PPP contract (i.e. OTS2), with MTS responsible for all operations and maintenance obligations.

1.5. Consultation

In accordance with CoA D3 (d) and (a) of the Project’s Development Consent (SSI-5414 CoA F4 and SSI-5931 CoA F7 & SSI 15_7400) the ONVMP must be prepared in consultation with relevant government agencies. Note: For SSI 8256, there is no requirement for the ONVMP to be prepared in consultation with government agencies.

The status of consultation with these parties and a summary of key issues raised is presented in the table below.

Table 1 Consultation Stakeholders

Agency/ stakeholder	Key issues raised	MTS update	Status
DPHI	Further clarification is required in relation to complaints management. The document refers to conditions B6 and following by that framework for complaints management only applies for the duration of works and for a minimum for 12 months following completion of construction of the CSSI. Please clarify if this framework will be extended for the life of the infrastructure or if the complaints management approach will change after the 12-month period lapses.	The conditions B6 – B14 (in relation to SSI 15_7400) refers to construction phase complaints management and not operations. Therefore, any information related to B6 – B14 has been removed, and the MTS complaints management process has remained as this is the true operational complaints management process MTS will use moving forward.	Closed

1.6. Background ONVMP requirements

1.6.1. Consolidated Conditions of Approval

CSSI 7400 CoA D13 and D14 relate to operational noise and vibration, and state that an Operational Noise and Vibration Monitoring Program must be prepared to confirm that operational noise and vibration levels meet applicable requirements, and the procedure required when those requirements are not met.

Noise and vibration monitoring and verification of noise and vibration levels in accordance with the conditions of approval for the Northwest corridor was completed in 2020.

The noise and vibration monitoring and verification program for Chatswood to Sydenham was undertaken by MTS and was completed in April 2025. In summary, the report concluded that the M1 is operating in accordance with operational noise and vibration predicted and approved levels. The report was submitted to Sydney Metro and has been approved by Sydney Metro's Independent Acoustics Advisor (see Appendix F).

If the monitoring program identifies that any additional mitigation or management measures are necessary to achieve or demonstrate ongoing compliance with the operational noise and vibration objectives, then these will be included in an update to this ONVMP.

1.6.2. Conditions of Approval North West

Please refer to Appendix G, extracted from the now superseded OTS version of NVMP. Noting the COAs are not superseded by the incorporation of the OTS and OTS2 project deeds.

1.6.3. OTS2 Deed SPR Requirements

The OTS2 Project Deed, Schedule 1 Appendix 54 Section 3.20 requires the development of an Operations Phase Environmental and Sustainability Plan, part of which is a Noise and Vibration Management Plan. OTS2 deed Schedule 1 Appendix 54 Section 3.20 (d) states the requirements of the Noise and Vibration Management Plan. Table 2 below addresses each of the points in Section 3.20 (d) as well as SPR Appendix 44.

Table 2 Deed Compliance Table

	SPR 54 Section 3.20 (d)	Fulfilment of requirement
(i)	Include an outline of the Operational Noise and Vibration Review required by the Environmental Documents.	The Operational Noise and Vibration Review has been completed to address the operational noise and vibration conditions outlined in CSSI 5414 North West and CSSI 8256 City and Southwest Inline with CSSI 5414 CoA C20 and CSSI 8256 CoA E31 an Operational Noise and Vibration Review has been prepared. This requirement is confirmed in the following two documents: 1. SW Metro Dynamic Train Testing Validation Assessment (SMCSWTS2-MTS-WEC-NA-REP-006668). 2. SW Metro Noise and Vibration Impact Statement (SMCSWTS2-MTS-WEC-NA-REP-006669). An outline of the Operational Noise and Vibration Review is detailed below: North West- The Northwest ONVR Rev B dated April 2017 addresses operational noise and vibration from train operations between Epping and Tallawong, as well as noise from stations and other fixed facilities. It was prepared in accordance with the Minister's Conditions of Approval for SSI-5414 and the Project's Scope and Performance Requirements, and outlines the mitigation and management measures for operational noise and vibration. City and Southwest- The Southwest ONVR Rev C dated July 2022 addresses operational noise and vibration from train operations between Sydenham and Bankstown and associated fixed facilities, including the 10 existing stations being modified for metro operations. It was prepared to meet Condition E31 of the Project approval and demonstrates compliance with the Project's environmental noise and vibration obligations.
(ii)	Include the strategy for complying with the noise and vibration specifications relating to Train operations on surface and tunnel track, including the track design, Rolling Stock design, the	Sydney Metro's Acoustic Integrator was responsible for preparing an Acoustic Design Integration Strategy (ADIS) for the project and assuring compliance with the overall noise and vibration design objectives. Individual contractors prepared their own Acoustic Design Integration Plans (ADIPs) that demonstrated how compliance with the ADIS-assigned noise and vibration budgets would be achieved.

	SPR 54 Section 3.20 (d)	Fulfilment of requirement
	proposed maintenance strategies and other mitigation measures such as acoustic panels, rail dampers and noise barriers.	
(iii)	Describe where the proposed Rolling Stock has been used on other rapid transit systems, noise measurement reports must be provided which quantify the wayside noise levels and in-car noise levels (for tunnel and surface track). The measurement reports must fully describe the measurement locations, Train speeds, tunnel / track design, rail condition and other factors influencing the measurement results.	The rolling stock for the southwest corridor of the M1 line has been used on the NW and C2S sections of the network, since May 2019 and August 2024 respectively. Noise measurement reports were prepared as part of MTS's operations which quantify the noise levels from train operations on surface track and within the tunnels. Further monitoring is conducted as per Noise & Vibration Monitoring Procedure (SMCSWTS2-MTS-1NL-EM-PRO-005432).
(iv)	Describe the strategy for complying with the noise specifications relating to industrial noise emissions from the stabling and maintenance facility, stations, services facilities and other fixed facilities.	The ADIS details the strategy for complying with the noise specifications relating to industrial noise emissions from the stabling and maintenance facility, stations, services facilities and other fixed facilities. Individual contractors prepared their own Acoustic Design Integration Plans (ADIPs) that demonstrated how compliance with the ADIS-assigned noise and vibration requirements have been achieved. Train door chimes and Platform Edge Barriers (PEB) chimes on the Southwest are currently generating a notable volume of community complaints and is an escalating matter. At the time of writing of this plan, this matter is currently being investigated by Sydney Metro and MTS will require resolution of this matter to achieve compliance with noise emission standards and noise impacts on sensitive receivers.
(v)	Describe the proposed Rolling Stock measures, physical mitigation measures and operational measures that are likely to be required to reduce the potential impacts for the Sydney Metro Trains Facility and Sydney Metro Trains Facility (South).	The proposed rolling stock that will utilise the SMTF-N and SMTF-S is consistent with the rolling stock currently utilised on the Sydney Metro Northwest network. No additional noise mitigation measures are required for the SMTF-N. For SMTF-S, fixed facilities have been designed with appropriate noise controls to comply with the operational noise limits at all nearby sensitive receivers. Operational procedures to minimise noise impacts from train stabling and, maintenance activities include: 1. Heavy cleaning of trains on Road 7 or 8 will be limited to one train at a time. 2. No more than 10 trains will be started up simultaneously during the 10pm to 5am night-time period. 3. No more than 8 trains will be started up simultaneously during the 5am to 7 am shoulder period. 4. Whilst stabled in the yard, pantographs will be lowered and trains powered down, except during presentation services or for cleaning or light maintenance works. 5. The maintenance workshop will accept deliveries only between 7am and 10pm. 6. The maintenance workshop will be used only between 7am and 6pm. Ref: Railway Operating Manual for SMTF(S) (SMCSWTS2-MTS-SFC-OM-MAN-002477) & Railway Operating Manual for SMTF (N) Operations (SMCSWTS2-MTS-RFT-OM-MAN-005243)
(vi)	Describe how the proposed public announcement emergency warning intercommunication system design will comply with the environmental noise specifications (NSW Industrial Noise Policy and	The ADIS states that the public address (PA) system in the stations is not set, and consequently requires integration of the PA system design, the station acoustic performance (in terms of reverberation time) and noise levels within areas where the PA system is required to operate.

	SPR 54 Section 3.20 (d)	Fulfilment of requirement
	NSW EPA Sleep Disturbance Screening Criterion) for stations and rail facilities.	Renzo Tonin & Associates prepared an ONVR for CSSI-5414 Sydney Metro Northwest, which detailed recommendations for PA system noise. This is directly extracted in Appendix D. Renzo Tonin CSW Noise and Vibration Compliance Monitoring Report, SMCSWTS2-MTS-CSW-NA-REP-005227, April 2025, prepared to address the City section operational noise and vibration monitoring requirements under CSSI 7400 CoA D13, with reference to the design objectives determined under CSSI 7400 CoA D9. For the Southwest corridor from Sydenham to Bankstown, at this point in time performance testing on the PAS is still being completed, modifications to sound levels made need to be monitored and adjusted to avoid unacceptable noise intrusions at sensitive receivers. This is subject to compliance with rail safety requirements.
(vii)	Describe how the internal noise level criteria, reverberation times and public announcement emergency warning intercommunication system criteria are likely to be achieved. Details of the proposed noise modelling algorithms must be provided for Stations and Station Precincts.	The ADIS details the strategy for complying with the internal noise criteria, reverberation times and public announcement system requirements. Individual contractors prepared their own Acoustic Design Integration Plans (ADIPs) that demonstrated how compliance with the ADIS-assigned noise and vibration budgets and requirements would be achieved.
	SPR Appendix 44	
2.3 (f)	During Operations Activities, OpCo2 must ensure that there are no audible rattles, buzzes, hums, whines, whistles or squeals. These must be subjectively determined with the human ear and if detected, the source of the objectionable noise must be located and rectified.	These Noise and Vibration elements are included in the Weekly Environmental Checklist located in the Intellex Mobile App for station staff to complete. If any audible rattles, buzzes, hums, whines, whistles or squeals are heard/found, they will notify their supervisor and report it into Intellex, and the associated actions will be followed up.

1.6.4. Revised Environmental Mitigation Measures

CSSI-5414 CoA B1, CSSI-5931 CoA B1, CSSI 7400 CoA A2 and CSSI 8256 CoA A2 states, in part, that the project must be carried out in accordance with the Submissions and Preferred Infrastructure Report⁴ (SPIR), part of which details the Revised Environmental Mitigation Measures (REMMs) and Revised Environmental Performance Outcomes (REPOs). These are extracted from the Environmental Impact Statement (EIS) for the project. The REMMs and REPOs as per the SPIR are outlined below in the table below.

Table 3 Summary of REMMs as per the SPIR

Reference	Condition	Applicable SSI Approval	Applicable sites	Notes
REMM OPNV1	The height and extent of noise barriers adjacent to the northern surface track works would be confirmed during detailed design with the aim of not exceeding trigger levels from the Rail Infrastructure Noise Guidelines (Environment Protection Authority, 2013). At property treatments would be offered where there are residual exceedances of the trigger levels.	SSI 8256	Surface track works	Noise barriers have been designed and constructed adjacent to the northern surface track works as part of the detailed design. The responsible organisation will implement the at property treatments where there are residual exceedances of the trigger levels. If required, MTS will work with the responsible organisation to ensure completion of the implementation to the affected parties.
REMM OPNV2	Track form would be confirmed during the detailed design process in order to meet the relevant ground-borne noise and vibration criteria from the Rail Infrastructure Noise Guidelines (EPA, 2013) and the Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects (now known as Department of Climate Change, Energy, the Environment and Water (NSW) (DCCEEW) , 2007a).	SSI 7400	Metro rail tunnels	The track form for the tunnels has been designed to achieve the requirements in REMM OPNV2.
REMM OPNV3	Stations and ancillary facilities including train breakout noise from draught relief shafts would be designed to meet the applicable noise criteria derived from the Industrial Noise Policy (EPA, 2000).	SSI 7400	All except metro rail tunnels	The ADIS details the strategy for complying with the applicable noise criteria for stations, ancillary facilities and draught relief shafts. Individual contractors prepared their own Acoustic Design Integration Plans (ADIPs) that demonstrated how compliance with the ADIS-assigned noise and vibration budgets and requirements would be achieved.
REMM OPNV4	Procedural mitigation measures would be implemented to minimise noise emissions from the Sydney Metro Trains Facility South with the aim of meeting the relevant criteria derived from the Industrial Noise Policy (Environment	SSI 7400	SMTF-S	For SMTF-S, fixed facilities have been designed with appropriate noise controls to comply with the operational noise limits at all nearby sensitive receivers. Operational procedures to minimise noise impacts from train stabling and

Reference	Condition	Applicable SSI Approval	Applicable sites	Notes
	Protection Authority, 2000). This would consider measures such as: Minimising the number of trains being cleaned simultaneously Cleaning trains without air conditioning systems in use Limit cleaning and start-up operations during the night-time and early morning periods to the trains stabled furthest from the most affected residences. In the event that procedural measures are not sufficient to achieve compliance with the criteria derived from the Industrial Noise Policy, at-property treatments would be offered to affected receivers.			maintenance activities include: 1. Heavy cleaning of trains on Road 7 or 8 will be limited to one train at a time. 2. No more than 10 trains will be started up simultaneously during the 10pm to 5am night-time period. 3. No more than 8 trains will be started up simultaneously during the 5am to 7 am shoulder period. 4. Whilst stabled in the yard, pantographs will be lowered and trains powered down, except during presentation services or for cleaning or light maintenance works. 5. The maintenance workshop will accept deliveries only between 7am and 10pm. 6. The maintenance workshop will be used only between 7am and 6pm.
REMM OPNV5	Further detailed investigations would be undertaken of the phased operations once the detail of these changes is determined. This investigation would include determination of the likely change in noise levels at receivers and consideration of the need for any feasible and reasonable mitigation measures taking into consideration the likely duration of the phased operations.	SSI 8256	Surface Trackwork (Southwest)	This REMM concerns the SSC stage of the project. Additional assessment will be undertaken once the detail of the SSC operations is confirmed. The testing undertaken for Dynamic Testing and Minor Works Approval satisfy this requirement.
REPO OPERATIONAL NOISE AND VIBRATION	Noise and vibration – amenity Increases in noise emissions and vibration affecting nearby properties and other sensitive receivers during operation of the project are effectively managed to protect the amenity and well-being of the community. – Noise levels would comply with the Rail Infrastructure Noise Guidelines (Environment Protection Authority, 2013). Noise and vibration – structural Increases in noise emissions and vibration affecting environmental heritage as defined in the Heritage Act 1977	SSI 7400	Sensitive Receivers	The ADIS details the strategy for complying with the applicable noise and vibration criteria. Individual contractors prepared their own Acoustic Design Integration Plans (ADIPs) that demonstrated how compliance with the ADIS-assigned noise and vibration budgets and requirements would be achieved.



Reference	Condition	Applicable SSI Approval	Applicable sites	Notes
	during operation of the project are effectively managed. – The project would avoid any damage to buildings from vibration.			

1.6.5. Track attenuation and operational ground-borne noise review

CSSI 7400 CoA D9 concerns operational ground-borne noise, and it is copied verbatim below:

The Proponent must nominate, for the Secretary's approval, a ground-borne noise specialist who is independent of the design and construction personnel, to review:

- a. *the appropriateness of the proposed design (noise) objectives for ground-borne noise sensitive receivers; and*
- b. *predictions for operational ground-borne noise impacts, before the installation of track, to confirm the appropriate track attenuation required to meet the design (noise) objectives identified in a).*

The ground borne noise specialist must be submitted for the Secretary's approval before the review commences, and the review must be submitted to the Secretary at least one month before the installation of track.

Pursuant to CSSI 7400 CoA D9, a ground-borne noise specialist independent of the design and construction personnel has reviewed the project design with respect to ground-borne noise at sensitive receivers and track attenuation. This review was submitted for the Planning Secretary's approval in two parts, on 24 December 2020 and 22 June 2021.

These reviews considered if the criteria in the Secretary's Environmental Assessment Requirements (SEARs) have been adopted correctly, verifying that the criteria are appropriate by comparing them against overseas guidelines where applicable, and ensuring that the specific requirements of particularly sensitive receivers have been addressed.

The reviews concluded that the proposed design objectives were appropriate for the majority of receivers. More stringent criteria were recommended at three locations. The recommended criteria are summarised in Sections 2.3.2 and 2.3.3.

1.6.6. Sydney Metro Environment Protection License

The existing M1 operations between Tallawong and Bankstown are regulated by the NSW Environment Protection Authority (EPA), in accordance with EPA License 21247.

When operations commenced on SMCSW, EPA License 21247 was updated to incorporate the section of new track between Chatswood and Sydenham. EPA License 21247 included noise and vibration requirements relating to following:

- Noise and vibration associated with railway operations, including airborne noise, ground-borne noise and tactile vibration levels.
- Requirements relating to track maintenance to minimise noise impacts on sensitive receivers.
- Minimise noise impacts on sensitive receivers from horn usage.
- Minimise noise impacts from railway maintenance and construction activities.
- Maintain a register of noise and vibration complaints.
- Prepare a Compliance Assessment Monitoring Plan (CAMP) that demonstrates practical compliance with the applicable operational noise and vibration objectives.

In addition, on the 9 November 2024 MTS obtained approval from the NSW EPA for an amendment to the EPL to allow for Dynamic Testing to commence for the Sydenham to Bankstown section of the network. The EPA have advised that an amendment to the EPL is not required for Trial Running as the license amendment for Dynamic Testing is the same i.e. conditions of the EPL will not change.

The EPA has advised the current EPL conditions will remain the same for the whole of the M1 network. MTS does not anticipate any changes to the conditions of the EPL for the extension of the M1 line from Sydenham to Bankstown*.

**Note: MTS is currently working with the NSW EPA on incorporation of the Barangaroo Water Treatment Plant into EPL 21247, MTS anticipates this will be the only change in the foreseeable future.*

Link to EPL

<https://apps.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=323695&SYSUID=1&LICID=21247>

1.7. Noise sensitive receivers

The M1 line interacts with a large number of sensitive receivers along the route. The ONVMP is only concerned with receivers external to the project. Acceptable levels of noise and vibration for each receiver come from a range of sources, including the Rail Infrastructure Noise Guideline (RING), the Industrial Noise Policy (INP) and Assessing Vibration – a technical guideline. The noise sensitive receiver types relevant to this ONVMP are summarised in the table below.

Table 4 Summary of noise sensitive receiver types (external to the project)

Receiver Category	Definition	Sensitivity	Location
External	Any sensitive space within a building affected by SMCSW.	ABN GBNV SBNV	System wide
ISD/OSD	Developments within or directly over the top of stations. May be residential or commercial. Still considered external to the project.	ABN GBNV SBNV	Sydney Metro Stations
Public	Any public area outside the bounds of M1 line.	ABN	Public areas outside the bounds of M1 line

Key: ABN = Airborne Noise; GBNV = Ground-borne noise and vibration; SBNV = Structure-borne noise and vibration

1.8. Operational noise and vibration criteria

The project is required to meet several operational noise and vibration criteria. These are outlined in the following subsections.

1.8.1. Airborne noise from train operations

Airborne noise from rail operations has the potential to affect noise sensitive receivers when the rail line is outside a tunnel. For electric passenger trains, most noise is generated by the interaction of the train wheels with the track and this noise travels through the air into the surrounding area, creating the potential for airborne noise impacts on the community.

The Rail Infrastructure Noise Guideline (RING) (NSW EPA 2013) contains the applicable noise trigger levels for heavy rail projects, including the M1. All above-ground sections of the SMCSW section of the network are located within existing railway corridors (Chatswood, Marrickville, and SSC). Therefore, the above-ground sections of rail constitute redevelopment of existing railway lines. As such, the applicable airborne noise trigger levels for residential and non-residential land uses are shown in The below two tables.

Table 5 Airborne heavy rail noise trigger levels for residential land uses

Type of development	Noise trigger Levels dB(A) (External)	
	Day (7am-10pm)	Night (10pm-7am)
Redevelopment of existing rail line	Development increases existing $L_{Aeq(15h)}$ rail noise levels by 2 dB or more, or existing L_{Amax} rail noise levels by 3 dB or more and predicted rail noise levels exceed:	
	65 $L_{Aeq(15h)}$ or 85 L_{AFmax}	60 $L_{Aeq(9h)}$ or 85 L_{AFmax}
Note: L_{AFmax} refers to the maximum noise level not exceeded for 95% of rail pass by events and is measured on the 'fast' response setting on a sound level meter.		

Table 6 Airborne heavy rail noise trigger levels for sensitive land uses other than residential

Other sensitive land uses	Noise trigger Levels dB(A) (when in use)
	Redevelopment of existing rail line.
	Development increases existing rail noise levels by 2 dB(A) or more in L_{Aeq} for that period and resulting noise levels exceed:
Schools, educational institutions and childcare centres	45 $L_{Aeq(1h)}$ internal
Places of worship	45 $L_{Aeq(1h)}$ internal
Hospital wards	40 $L_{Aeq(1h)}$ internal
Hospitals other uses	65 $L_{Aeq(1h)}$ internal
Open space – passive use	65 $L_{Aeq(15h)}$ external
Open space – active use	65 $L_{Aeq(15h)}$ external

1.8.2. Ground-borne noise from train operations

Ground-borne noise commences as vibration energy due to the wheel and rail interaction. The vibration energy travels through the ground, which transfers into the building walls and floors and re-radiates as low frequency noise which can be heard by occupants. Ground-borne noise has the potential to be evident where railway tracks are underground or in deep cuttings, where the air-borne noise path is not present or negligible. The table below shows the applicable ground-borne noise trigger levels applicable to heavy rail projects.

Table 7 Ground-borne noise trigger levels for heavy rail project

Sensitive land use	Time of day	Internal noise trigger Levels dB(A)
		Development increases existing rail noise levels by 3 dB(A) or more, and resulting rail noise levels exceed:
Residential	Day (7am – 10pm)	40 L_{ASmax}
	Night (10pm – 7am)	35 L_{ASmax}
Schools, educational institutions, places of worship	When in use	40-45 L_{ASmax}

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

In addition, Sydney Metro established additional design requirements in the SWTC for other sensitive receiver areas, which are shown in the table below.

Table 8 Sydney Metro ground-borne noise trigger levels

Location	Requirement
General office areas	L _{Amax} (slow) 45dB(A) (when in use)
Private offices and conference rooms	L _{Amax} (slow) 40dB(A) (when in use)
Retail areas	L _{Amax} (slow) 50dB(A) (when in use)
Cinemas	L _{Amax} (slow) 35dB(A) (when in use)
Public halls	L _{Amax} (slow) 35dB(A) (when in use)
Lecture theatres	L _{Amax} (slow) 35dB(A) (when in use)
Film/TV/sound recording studios	NR15 (refer AS/NZS2107:2000)
Medical institutions	L _{Amax} (slow) 40dB(A) (when in use)
Drama theatres	NR 25 (refer AS/NZS2107:2000)
Other critical spaces	Satisfactory levels in AS/NZS2107:2000
The Great Synagogue, 166 Castlereagh Street, Sydney	L _{Amax} (slow) 35dB(A) (when in use) ¹
City Recital Hall at Angel Place, near Martin Place, Sydney	NR 15 (refer AS/NZS2107:2000) ¹
Note 1: For these locations, the recommended criteria are based on the recommendations in the track attenuation and operational ground-borne noise review.	

1.8.3. Ground-borne vibration from train operations

Ground-borne vibration commences as vibration energy due to the wheel and rail interaction. The vibration energy travels through the ground, which transfers into the building walls and floors and may be felt as tactile vibration by building occupants. The C2S section of the project includes 15 km of underground tunnels between Chatswood and Marrickville.

Assessing Vibration: a technical guideline (AVTG) (DEC 2006) presents preferred and maximum vibration values for different receiver types. For railway operations, the preferred intermittent vibration dose values (VDVs) are applicable. These are shown in the table below.

Table 9 Acceptable vibration dose values for intermittent vibration

Location	Vibration dose value (m/s ^{1.75})	
	Preferred value	
	Daytime (7am-10pm)	Night-time (10pm-7am)
Critical areas¹	0.1	0.1
Residences	0.2	0.13
Offices, schools, educational institutions and places of worship	0.4	0.4
Workshops	0.8	0.8

Note 1: Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring.

For railway operations, Sydney Metro has specified more stringent requirements in the SWTC than the VDV criteria in the above table. The Sydney Metro ground-borne vibration goals are shown in the table below and are consistent with the preferred continuous vibration criteria in AVTG.

Table 10 Sydney Metro ground-borne vibration goals

Location	Requirement
Residential (Day)	106 dBV (0.2 mm/s)
Residential (Night)	103 dBV (0.14 mm/s)
Commercial	112 dBV (0.4 mm/s)
Educational	112 dBV (0.4 mm/s)
Place of worship	112 dBV (0.4 mm/s)
Industrial	118 dBV (0.8 mm/s)
Theatres	106 dBV (0.2 mm/s)
Other critical spaces	Generic Vibration Criterion curves in Institute of Environmental Sciences and Technology industry Standard IEST-RP-CC012.1. Considerations in Clean Room Design (2007)
Crow's Nest Day Surgery, Clarke Street, Crow's Nest	100 dBV (0.1 mm/s) ¹

Note 1: For this location, the recommended criterion is based on the recommendations in the track attenuation and operational ground-borne noise review.

1.8.4. Airborne noise from fixed facilities

Airborne noise is often generated by items of plant and equipment at fixed facilities such as stations, buildings or electrical substations. Noise levels travel between the source and receiver via an airborne noise path and may be heard at nearby sensitive receivers.

The standard governing the assessment of airborne noise emissions from fixed facilities is the NSW Industrial Noise Policy 2000 (INP). Additional requirements are introduced through REMMs, REPOs and the SWTC.

The assessment procedure in the INP has two components:

- Controlling intrusive noise impacts in the short-term for residences; and
- maintaining noise level amenity for particular land uses for residences and other land uses.

1.8.4.1. Intrusive noise criteria

According to the INP, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor) does not exceed the background noise level measured in the absence of the source by more than 5 dB(A).

The intrusiveness criterion is summarised as follows:

- $L_{Aeq,15minute} = \text{Rating Background Level (RBL) plus 5 dB.}$

1.8.4.2. Amenity noise criteria

The INP amenity criteria are designed to maintain noise level amenity for particular land uses, including residential and other land uses. The INP recommends base acceptable noise levels for various receivers, including residential, commercial, industrial receivers and other sensitive receivers in Table 2.1 of the INP. Noise from new sources need to be designed such that the cumulative effect does not produce levels that would significantly exceed the criterion.

1.8.4.3. Noise criteria

The table below summarises the project-specific noise levels for each fixed facility as per the INP.

Table 11 Applicable L_{Aeq} noise criteria

Fixed facility/station	Receiver type/description	Project-specific noise level $L_{Aeq}(15 \text{ min})$, dB(A)			
		Shoulder	Day	Evening	Night
Northern Dive ⁵	Residential ¹ West of Service Building	N/A	61	61	57
	Residential ² North of Service Building		46	45	40
	Residential ³ East of Service Building		55	50	44
	Residential ² South of Service Building		47	45	39
	Commercial		65 (external) when in use		
	Industrial		75 (external) when in use		

Artarmon Substation ⁶	Residential North of Artarmon Substation	N/A	60	50	45
	Commercial		65 (external) when in use		
	Industrial		75 (external) when in use		
Crow's Nest Station ⁷	Residential (Pacific Highway)	N/A	59	57	53
	Residential (Clarke Lane)		58	53	52
	Commercial		65 (external) when in use		
Victoria Cross Station ¹³	Residential Towers to the south of the northern end station	N/A	-	-	56
	Commercial West of the southern end station		65 (external) when in use		
	Commercial South of the southern end station		65 (external) when in use		
	Commercial South-west of the southern end station		65 (external) when in use		
	Educational facility North-west of the southern end station		-	-	55
	Mixed-use East of the southern end station		-	-	55
Barangaroo Station ⁸	Residential	N/A	51	54	45
	Commercial		65 (external) when in use		
	Educational		45 (external) when in use		
Martin Place Station ¹³	Residential West of the southern end of the station	N/A	-	-	52
	Residential East of the southern end of the station		-	-	52
	Residential West of the northern end of the station		-	-	52
	Commercial		65 (external) when in use		

	Educational facility South of the southern end of the station		-	-	55
Gadigal Station – North ⁹	Residential	N/A	59	59	55
	Hotel		64	64	60
	Commercial		65 (external) when in use		
	Place of worship		40 (internal) when in use		
Gadigal Station – South ⁹	Residential (including OSD)		61	57	55
	Hotel		66	62	60
	Commercial		65 (external) when in use		
	Place of worship		40 (internal) when in use		
Central Station ¹³	Residential	N/A	-	-	50
	Commercial		65 (external) when in use		
	Hospital		-	-	50
Waterloo Station ¹⁰	NCA01 ¹² Residential	N/A	60	58	51
	NCA02 ¹² Residential		55	48	43
	NCA03 ¹² Residential		55	48	43
	OSD NCA01 ¹²		60	58	51
	OSD NCA02/3 ¹²		55	48	43
	Place of worship		40 (internal) when in use		
	Commercial		65 (external) when in use		
	Active recreation		55 (external) when in use		
Sydenham Station ¹³	Residential South of the tunnel portal openings	N/A	-	-	43
	Residential North-east of the tunnel portal openings		-	-	40
SMTF-S and Southern Dive ¹¹	NCA-A ¹² Residential ^{1,3} North-West of SMTF-S	50	56	48	43

	NCA-B ¹² Residential ^{1,3} North-East of SMTF-S	53	59	56	43
	NCA-C ¹² Residential ^{1,3} South-East of SMTF-S	55	61	58	46
	NCA-D ¹² Residential ^{1,3} South-West of SMTF-S	48	52	52	44
	School	N/A	35 (internal) ⁴ when in use		
	Place of Worship		40 (internal) ⁴ when in use		
	Commercial		65 (external) when in use		
	Active Recreation		55 (external) when in use		

Summary of Project RBLs in each NCA for Sydenham to Bankstown (S2B)

Fixed facility/station	Receiver type/description	Project-specific noise level $L_{Aeq}(15 \text{ min})$, dB(A)			
		Shoulder	Day	Evening	Night
NCA01	Marrickville	N/A	38	38	33
NCA02	Marrickville	N/A	38	38	33
NCA03	Hurlstone Park	N/A	38	38	34
NCA04	Hurlstone Park	N/A	40	40	35
NCA05	Canterbury	N/A	36	36	32
NCA06	Campsie	N/A	45	42	35
NCA07	Belmore	N/A	41	41	35
NCA08	Lakemba	N/A	47	47	41
NCA09	Lakemba	N/A	44	44	36
NCA10	Punchbowl	N/A	47	47	41
NCA11	Bankstown	N/A	47	47	39
NCA12	Bankstown	N/A	54	51	42
NCA13 ¹⁴	Bankstown	N/A	42	42	39
NCA14	Tempe	N/A	41	41	40
NCA15 ¹⁵	Sydenham	N/A	51	51	43

NCA16 ¹⁵	St Peters	N/A	58	52	38
NCA17 ¹⁴	Yagoona	N/A	48	48	44

Notes

- 1 Assessment in areas of high traffic noise as per Section 2.2.3 of the INP.
- 2 Noise amenity area - Suburban (Residence) as per Table 2.1 of the INP.
- 3 Noise amenity area - Urban (Residence) as per Table 2.1 of the INP.
- 4 An outside-to-inside façade loss (windows open scenario) has been conservatively assumed for receivers with an internal noise criterion.
- 5 Criteria for Northern Dive taken from TK685-01F17 Chatswood Northern Dive NV Design Report Stage 3 (r1) by Renzo Tonin & Associates, dated 16/9/20.
- 6 Criteria for Artarmon Substation taken from TK685-01F07 Artarmon Substation NV Design Report Stage 3 (r2) by Renzo Tonin & Associates, dated 9/11/20.
- 7 Criteria for Crow's Nest Station taken from Stage 3 Design Report – Noise and Vibration Crows Nest Station Design Stage 2&3 (SMCSWSCN-SMC-SCN-NA-REP-000382), dated 6/5/2020.
- 8 Criteria for Barangaroo Station taken from Building Services Design Report - Barangaroo Station - Stage 3 Detail Design Underground Stations Design & Technical Services - Metron (SMCSWSBR-MET-SBR-BS-REP-000004) by Metron, dated 28/9/2022.
- 9 Criteria for Gadigal Station – North and Gadigal Station – South taken from Sydney Metro Pitt Street Integrated Station Development - Stage 3 Acoustic Design Report (SMCSWSPU-CPB-SPS-NA-REP-003497).
- 10 Criteria for Waterloo Station taken from Waterloo Acoustic Design Report (SMCSWSWL-JHG-SWL-NA-REP-000683) by Renzo Tonin & Associates, dated 2/9/21.
- 11 Criteria for SMTF-S and Southern Dive taken from TK685-05F02 SMTF South NV Design Report Stage 3 (r5) by Renzo Tonin & Associates, dated 29/9/21.
- 12 Receiver type name taken from original document.
- 13 Criteria for Victoria Cross Station, Martin Place Station, Central Station and Sydenham Station taken from TK685-01F09 Tunnel Ventilation Design Report Stage 3 (r6) by Renzo Tonin & Associates, dated 15/10/2020.
- 14 NCA13 and NCA17 are beyond the Sydney Metro Project area and are therefore not considered further in the CNVIS
- 15 The nearest receivers in NCA15 and NCA16 are not noise sensitive and are therefore not considered further in the CNVIS

Day: 7am to 6pm Monday to Saturday and 8am to 6pm Sundays & Public Holidays.

Evening: 6pm to 10pm Monday to Sunday & Public Holidays.

Night: 10pm to 7am Monday to Saturday and 10pm to 8am Sundays & Public Holidays.

Shoulder: a 'Shoulder' period has been established for 5am to 7am. The shoulder period rating background level is taken to be the mid-point between the rating background levels between the two assessment periods that are on either side of the shoulder period.

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

the residence, except where otherwise noted. Noise levels may be higher at upper floors of the noise affected residence.

Long-Terms Noise Monitoring Results

Table 12 Long-Term Noise Monitoring

(Extract: Table 2-3 of ONVR SSI-5391 (Renzo Tonin))

NCA	NOISE MONITORING LOCATION	RATING BACKGROUND LEVEL (RBL) LA90				LAEQ AMBIENT NOISE LEVELS		
		SHOULDER	DAY	EVE	NIGHT	DAY	EVE	NIGHT
RTF-01	M_RTFO1 88 Amarco Circuit, The Ponds	38	43	44	32	58	56	51
RTF-02	BG25 43 Schofields Road, Rouse Hill	37	43	44	30	53	54	58
RTF-03	M_RTFO3 67 Tallawong Road, Rouse Hill	33	33	33	33	52	47	45
RTF-04	M_RTFO3 67 Tallawong Road, Rouse Hill	33	33	33	33	52	47	45

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

Night: 22:00-07:00 Monday to Saturday and 22:00-08:00 Sundays & Public Holidays

Note 2: Shoulder: a 'Shoulder' period has been established for 05:00-07:00. The shoulder period rating background level is taken to be the mid-point between the rating background levels between the two assessment periods that are on either side of the shoulder period.

Note 3: As required by the INP, the external ambient noise levels presented are free-field noise levels. [i.e. no façade reflection]

Note 4: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

SMTF-N noise and Vibration Criteria

Table 13 SMTF Operational Noise Targets (dB(A))

(Extract: Table 3-2 of ONVR SSI-5391 (Renzo Tonin))

NCA	LOCATION	INTRUSIVE NOISE CRITERIA LAeq (15 min)			AMENITY NOISE CRITERIA LAeq (period)			SLEEP DISTURBANCE		
		SHDR	DAY	EVE	NIGHT	SHDR	DAY	EVE	NIGHT	LA1 (1 min)
RTF-01	South of Schofields Rd, between Cudgegong Rd and east of Boundary Rd.	43	48	48	37	45	55	45	40	47
RTF-02	West of SMTF, between Schofields Rd and Gordon Rd.	42	48	48	35	45	55	45	40	45
RTF-03	North of SMTF, west of Tallawong Rd and north of Gordon Rd.	38	38	38	38	45	55	45	40	48
RTF-04	North of SMTF, between Tallawong Rd and Cudgegong Rd.	38	38	38	38	45	55	45	40	48
RTFO-01	Lankarama Buddhist Temple	40 (internal) when in use.								

Note 1: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5m above ground level. If the property boundary is more than 30m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence, except where otherwise noted. Noise levels may be higher at upper floors of the noise affected residence.

Note 2: Shldr: a 'Shoulder' period has been established for 05:00-07:00 Monday to Saturday and 05:00- 08:00 Sundays & Public Holidays

- Day: 07:00-18:00 Monday to Saturday and 08:00-18:00 Sundays & Public Holidays Evening: 18:00-22:00 Monday to Sunday & Public Holidays
- Night: 22:00-05:00 Monday to Sundays & Public Holidays

Note 3: Where the Evening (or night) Rating Background level (RBL) is greater than Day RBL , Evening Noise Management Level (NML) is based on Day time NML, in accordance with INP guidelines.

The noise criteria listed in Table(s) 10.1, 10.2, 10.3 (these table references are as they appear in the source material and are not numbered in line with table captions in this plan) apply under normal operating conditions for fixed facilities. Although noise emissions during an emergency are not controlled under the INP, noise impacts are

required to be managed during testing of fixed facilities in 'Emergency Mode', which is expected to be undertaken infrequently and for short periods of time.

Testing of equipment in Emergency Mode is required to be undertaken at the least sensitive time of day and for the shortest duration that is feasible considering the needs of an operating railway and may need to be accompanied by an appropriate community notification plan. Community notification will be dependent on the nature of the works being undertaken, the time of day and duration of the activities and compliance with the conditions of the EPL.

1.8.5. Structure-borne noise and vibration from fixed facilities

For fixed facilities, structure-borne noise and vibration is most likely to be caused by equipment with moving components, such as ventilation fans. Although these are generally mounted on anti-vibration mountings, there remains a possibility that vibration during operation is transmitted to nearby sensitive receivers.

Structure-borne noise is managed in accordance with AS/NZS2107:2016. This standard includes a large range of receiver types. Should any structure-borne noise complaints be received, noise levels will be compared with the relevant preferred and maximum noise levels in AS/NZS2107:2016 to determine if any additional mitigation measures are required.

Structure-borne vibration is managed in accordance with AVTG 2006. The continuous vibration levels in AVTG are applicable. This type of vibration can be assessed on the basis of the weighted rms acceleration values or as rms velocity levels. The rms velocity levels are consistent with the values provided in Table 9.

1.8.6. Noise via draught relief shafts

Noise levels from train movements in the tunnels which escapes to the atmosphere via draught relief shafts must not exceed the following SWTC noise limits at the nearest residential and commercial premises.

Table 14 Noise via draught relief shafts

Receiver type	Requirement
Residential	55 dB(A) L _{AFmax}
Commercial	65 dB(A) L _{AFmax}

Note: L_{AFmax} refers to the maximum noise level not exceeded for 95% of rail pass by events and is measured on the 'fast' response setting on a sound level meter.

1.9. Ground-borne noise and vibration operational monitoring program after the commencement of City operations

Note this section relates specifically to the operation of the Chatswood to Sydenham Section of the network CSSI 7400 CoA D13 states that:

*The Proponent must prepare an **Operational Noise and Vibration Monitoring Program** to confirm that the operational noise and vibration levels meet the CSSI proposed design objectives as determined in the **Track Attenuation and Operational Ground-borne Noise Review** in Condition D9 following the commencement of operations.*

After the commencement of operations, noise and vibration monitoring has been undertaken by Consultants Renzo Tonin. MTS worked collaboratively with Metro & Renzo Tonin to create and implement an Operational Noise and Vibration Monitoring Program to confirm that the operational noise and vibration levels meet the CSSI proposed design objectives as determined in the Track Attenuation and Operational Ground-borne Noise Review. The Operational Noise and Vibration Monitoring Program Report was completed in April 2025 (SMCSWTS2-MTS-CSW-NA-REP-005227). This confirmed that operational noise and vibration levels comply with CSSI design objectives.

The Operational Noise and Vibration Monitoring Program Report has been completed and endorsed by Sydney Metro's Independent Acoustic Advisor.

Note: The Noise and Vibration Monitoring and Verification Program for the City package was submitted to DPHI, and DPHI acknowledged receipt of the documents on 26 June 2025.

1.10. Ongoing noise and vibration compliance monitoring

MTS conducts Noise and Vibration monitoring in accordance with the Noise & Vibration Monitoring Procedure (SMCSWTS2-MTS-1NL-EM-PRO-005432) and the Asset Engineering Notification - Rail Corrugation Assessment - AEN2023-07-10-PW-01S (SMCSWTS2-MTS-1NL-RD-REC-005525).

2. Complaints management system

MTS responds to community enquiries and complaints received during the operation and maintenance of the network relating to Noise and Vibration. Where community complaints are received about specific times or sections of the network, these are investigated through a review of the complaint via observation and noise monitoring as per the Noise & Vibration Monitoring Procedure. These complaints will also be sent to Sydney Metro for review on a needs basis.

This Community Response Process is integrated into the Stakeholder and Community Involvement Plan (SMCSWTS2-MTS-CSW-PM-PLN-002162).

Table 15 Community response process

An environmental enquiry or complaint is received via Transport for NSW's Customer Information service on 131 500 and online at www.transport.info .			
Step	Action	Timeframe	
		Operational hours	Engineering hours
1	Initial contact - TfNSW notifies MTS of enquiry or complaint (operational hours). - MTS receives complaints where 131 500 is diverted (engineering hours). - SM/TfNSW-related online enquiry or complaint is received by MTS via Salesforce.	- Immediately. 131 500 phone calls are entered into Salesforce and responsibility assigned to MTS. - Web-based enquiry or complaint is entered into Salesforce and responsibility assigned to MTS.	- Immediately. 131 500 passed off to MTS-designated number between 12am – 6am. - Web-based form entries are provided to MTS the next business day by TfNSW.
2	Investigation For complaints, MTS Customer Information Delivery Partner investigates and contacts complainant to seek any additional information.	Within 24 hours when only trains are operating.	- Within two hours or as agreed with complainant when maintenance and repair works are occurring in Environmental Protection Licence licenced premise. - Within 24 hours when only trains are operating or not within EPL licenced premise.
3	Escalation (Beyond a usual operational issue) Where this cannot be resolved by the MTS SMCIC, DCRC or GMOCE, for dissemination, coordination of Subject Matter Expert or SM/TfNSW involvement (as required) and response.	Within two business days.	
4	Review SME involvement, review of complaint, investigate work practices and mitigations. Develop response including proposed monitoring and any proposed additional mitigation measures.	Within five business days.	

5	Resolve MTS Customer Relations Officer communicates the resolution with complainant.	Target five business days. Where a complaint requires a detailed investigation, may require significant mitigation* and may take longer than 20 days, the complainant will be kept informed of progress on a regular basis until the matter is resolved.
* Significant mitigation is defined by MTS to be mitigation that: a. has a cost of more than \$10,000; or b. will require further noise modelling to determine the scope of reasonable and feasible mitigation measures (e.g., height and size of noise barriers, or specifications for at-property treatments).		

Table 16 PAS coverage areas and announcement types across the M1 line

		Announcement Type							
	Time period	1	2	3	4	5	6	7	8
Coverage Area		Only platform concerned	Platform concerned, concourse & entrance	Concourse, platform & station entrance					All areas
Announcement Frequency	AM peak 6:00am to 8:30am PM peak 4:30pm to 7:30pm	Per rail traffic movements	2 min (adjustable) or when required	15 min (adjustable)			3 min or when required	2 min or when required	
	Off peak train periods 8:30am to 4:30pm and 7:30pm to 10:00pm	Per rail traffic movements							
	10pm to 6am night-time	Only underground stations		Only underground stations					
Announcement Types	1: Automatic announcements of train arrival at platform concerned. 2: Train service delay announcements. 3: Educational announcements (e.g. escalator safety). 4: Reminder announcements (e.g. beware of slippery floor during wet weather). 5: Promotional announcements (e.g. advertising). 6: Directional announcements (e.g. giving information relating to which station exit should be used for events). 7: Crowd control announcements. 8: Emergency announcements (e.g. station evacuation during incident).								

3. Integration with Asset Management and Maintenance Systems

Noise and vibration monitoring results and mitigation measures are systematically integrated into MTS's Asset Management System and maintenance programs.

All significant noise and vibration issues identified through the Operational Noise & Vibration Monitoring Program or community complaints are recorded and tracked in MTS's asset management tools (e.g. via Asset Engineering Notifications and the MTS asset information system). This ensures that any required corrective actions, such as track maintenance (e.g. rail grinding to address corrugation), rolling stock maintenance (wheel re-profiling to mitigate wheel squeal), or additional noise-dampening measures, are incorporated into relevant maintenance procedures.

For example, where routine monitoring reveals exceedance of noise or vibration criteria due to asset condition (track or rollingstock issues), MTS initiates appropriate maintenance responses through its Asset Management System in line with the Asset Management Plan's (SMCSWTS2-MTS-CSW-PM-PLN-000069) processes for addressing asset deficiencies and continuous improvement.

Note: See Technical Maintenance Plan – Rollingstock, M1 Metro Northwest and Bankstown Line SMCSWTS2-MTS-1NL-RD-PLN-006005, that addresses wheel lubrication and wheel maintenance processes and schedules.

4. Conclusion

This Operational Noise and Vibration Management Plan has been prepared in accordance with the requirements of the OTS2 Project Deed's and the Consolidated Conditions of Approval for SSI-5414 CoA F4 and SSI-5931 CoA F7, SSI 15 7400 and SSI8256.

This ONVMP reviews the design process followed for the M1 project and confirms the implemented mitigation measures addresses the relevant CoAs.

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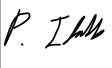
APPENDIX

Appendix A. Document control

Appendix A1. Document information

Document Number:	SMCSWTS2-MTS-CSW-EM-PLN-002106
Version:	08
Issue Date:	06/10/2026
Network:	City and Southwest

Appendix A2. Approval record

Function	Position	Name	Signature	Date
Prepared by:	Senior Technical Writer <i>Per procurationem</i> Environment and Sustainability Advisor	Peter Simcic <i>Per procurationem</i> Deepa Punnoose		15/10/2026
Reviewed and endorsed by:	Environment and Sustainability Lead	David Wilson		15/10/2026
Endorsed by:	Interim General Manager Safety, Quality, Risk & Environment	Helen Wilkinson	 H Wilkinson (16/10/2026 17:04:13 GMT+11)	16/10/2026
Approved by:	MTS Chief Executive Officer	Oliver Bratton	 Oliver Bratton (16/10/2026 20:38:22 GMT+11)	16/10/2026
Endorsed by:	Contract Associate Director - M1 Metro Northwest & Bankstown Line	Peter Ifandoudas		17/10/2026
Approved by:	NRT Group (OpCo2) Chief Executive Officer	Phil Dark		19/10/2026

Appendix A3. Amendment record

Date	Rev	Amendment description	By
07/04/2024	01	Updated to MTS branding standards.	Peter Simcic
03/05/2024	01	Review by MTR and OpCo2.	Ronnie Tong / Katrina Milburn
15/05/2024	01	Update based on review comments.	Peter Scioscia
28/06/2024	02	Updated for final submission to Sydney Metro and DPHI after external stakeholder consultation	Peter Scioscia
28/07/2024	03	Further update for final submission to DPHI	Peter Scioscia
12/09/2024	04	Updated as per DPHI's comments	Peter Scioscia
21/05/2025	04	Merged NW & CSW and incorporates verification testing results.	David Wilson
21/05/2025	04	Updated wording on OTS PPP and OTS2. Added reference to Renzo Tonin CSW Noise and Vibration Compliance Monitoring Report.	Peter Simcic
06/06/2025	04	Extracted the draft procedure in the appendices and made a live procedure from it. Updated some document references.	David Wilson / Peter Simcic
18/07/2025	04	Streamlined text relating COAs, added appendix G with COAs of North West and MTS approach to compliance. More consistent wording on whole of line.	Peter Simcic
26/08/2025	05	Updates from SM feedback. Updates on table numbering.	Peter Simcic
03/11/2025	05	Updates from SM feedback. - Wording improvements. - Added link to EPA website. - Table references fixed and updated. - Added reference to SSI 8256 in section 1.9. - Added document reference to Appendix D. - Reference documentation for noise verification for the C2S section and associated sign off from SMA's has been included in the revision.	David Wilson
10/11/2025	05	Updated manually typed table captions for Tables 10.2 and 10.3 to be automated caption fields so they properly show in the list of Tables. Formatting updates to comply MTS plan template standard.	Peter Simcic
24/11/2025	05	Addition for SW to Applicable LAeq noise criteria table.	David Wilson
08/12/2025	05	Removal of highlighted text and amendment of sign off sheet as General Manager SQRE on leave	David Wilson
27/05/2026	06	Updates based on feedback received from SM. Minor amendments throughout the document. Amendments to Compliance table. Added references to Railway Operating Manuals for SMTF sites. SSI-7400 D13 added. Text for SSI-7400 D14 updated.	David Wilson / Deepa Punnoose
23/06/2026	06	All feedback from page turn meeting with Sydney Metro applied.	David Wilson / Deepa Punnoose
14/08/2026	07	Feedback from SMA applied throughout the document, change of signatories, formatting updates to comply with MTS plan template standard. Updated Section 1.6.4 to correct the Conditions of Approval references for SSI 5414 and SSI 5931.	Deepa Punnoose

Date	Rev	Amendment description	By
		- Moved the NVMP purpose statement into Section 1.1 Purpose. - Updated Table 2(i) to include additional ONVR commentary and references/links. - Updated Table 2(vi) with information relating to CSSI 7400. - Updated Section 1.6.4 and added a new column to Table 3 identifying the applicable SSI approval. - Amended text relating to REMM OPNV5 (Surface Trackwork Southwest) in Table 3. - Corrected typos. - Updated Section 1.1 by removing SSI 8256 from the ONVMP discussion and adding SSI 7400 CoA D13. - Updated Section 1.2 to provide clearer coverage of the Southwest scope. - Updated Section 1.5 regarding consultation requirements. - Added a note regarding the DPHI submission for the City package in Section 1.9 and Appendix F. - Revised Section 1.9 title to clarify it applies to the City section and added a note regarding E34 (Southwest) in Appendix G, Table 20. - Added SSI 7400 CoA D3 to Appendix G, Table 21. - Updated Appendix G, Table 21 with information relating to CoAs E31-E33.	
06/10/2026	08	NVMP updated post receiving feedback from SM. This includes: - Minor wording changes throughout the document. - Amending the table in Appendix D to be placed in the body of the document.	Deepa Punnoose

B

APPENDIX

Appendix B. List of terms

Table 17 List of acronyms

Abbreviation	Definition
AAT	Acoustic Assurance Tool
ABN	Airborne Noise
ADIP	Acoustic Design Integration Plan
ADIS	Acoustic Design Integration Strategy
AVTG	Assessing Vibration: a technical guideline (NSW DEC 2006)
C2S	Chatswood to Sydenham
CAMP	Compliance Assessment Monitoring Plan
CBD	Central business district
CoA	Condition of Approval
CNVIS	Construction Noise and Vibration Impact Statement
CSSI	Critical State Significant Infrastructure
DCCEEW	Department of Climate Change, Energy, the Environment and Water (NSW)
DPHI	Department of Planning, Housing and Infrastructure
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EPL	Environmental Protection Licence
GBN	Ground-borne Noise
GBNV	Ground-borne Noise and Vibration
GBV	Ground-borne Vibration
GIS	Geographic Information System
INP	Industrial Noise Policy (NSW EPA 2000)
ISD	Integrated Station Development
LGA	Local Government Area
LW	Linewidth
LWW	Linewidth Works
MTS	Metro Trains Sydney
NCW	Northern Corridor Works
NML	Noise Management Level
O&M	Operations and Maintenance
ONVMP	Operational Noise and Vibration Management Plan
OpCo / OpCo2	Operating Company = NRT Pty Ltd
OSD	Over-site Development
OTS / OTS2	Operations, Trains, and Systems
PEB	Platform Edge Barrier
PPP	Public Private Partnership

Abbreviation	Definition
RBL	Rating Background Level
REMM	Revised Environmental Mitigation Measure
REPO	Revised Environmental Performance Outcome
RING	Rail Infrastructure Noise Guideline (NSW EPA 2013)
S2B	Sydenham to Bankstown
SBN	Structure-borne noise
SBNV	Structure-borne noise and vibration
SEAR	Secretary's Environmental Assessment Requirements
SM	Sydney Metro
SMCSW	Sydney Metro City and South-west
SMNW	Sydney Metro North West
SMTF -N	Sydney Metro Trains Facility (North)
SMTF-S	Sydney Metro Trains Facility (South)
SPIR	Submissions and Preferred Infrastructure Report
SPR	Scope and Performance Requirements
SSC	Southwest Stations and Corridor
SSI	State Significant Infrastructure
SSJ	Sydenham Station and Junction
SWTC	Scope of Works and Technical Requirements
TSE	Tunnel and Station Excavation
TSOM	Trains, Systems, Operations and Maintenance
VDV	Vibration Dose Values

C

APPENDIX

Appendix C. Related documents

Note: some documents will be closely interconnected and will need to be reviewed when this one is changed. Those will be marked yes in the review column below. Others are simply related content that supplement the material in this document.

Table 18 Related documents

Document Number	Document Title	Review
SMCSWSBR-MET-SBR-BS-REP-000004	Building Services Design Report - Barangaroo Station - Stage 3 Detail Design Underground Stations Design & Technical Services - Metron	No
SMCSWSCN-SMC-SCN-NA-REP-000382	Stage 3 Design Report – Noise and Vibration Crows Nest Station Design Stage 2&3	No
SMCSWSPU-CPB-SPS-NA-REP-003497	Sydney Metro Pitt Street Integrated Station Development - Stage 3 Acoustic Design Report	No
SMCSWTS2-MTS-1NL-EM-PLN-002711	Flooding and Hydrology Plan	Yes
SMCSWTS2-MTS-1NL-EM-PLN-002711	Flooding and Hydrology Plan	Yes
SMCSWTS2-MTS-1NL-EM-PLN-002712	Groundwater Management Plan	Yes
SMCSWTS2-MTS-1NL-EM-PLN-005496	Severe Weather Conditions Response Plan	No
SMCSWTS2-MTS-1NL-EM-PRO-005432	Noise & Vibration Monitoring Procedure	Yes
SMCSWTS2-MTS-1NL-NA-REP-005526	Rolling Stock Noise Test Report	No
SMCSWTS2-MTS-1NL-NA-SPC-005527	Design Doc NRT 0320 - PAS Noise Algorithms Extract	No
SMCSWTS2-MTS-1NL-PR-PLN-005495	Procurement Policy	No
SMCSWTS2-MTS-1NL-RD-REC-005525	Asset Engineering Notification - Rail Corrugation Assessment - AEN2023-07-10-PW-01S	Yes
SMCSWTS2-MTS-1NL-SA-REC-005478	SMS Element 17: Procurement and Contract Management	No
SMCSWTS2-MTS-CSW-EM-PLN-002105	Operations Phase Environment and Sustainability Plan	Yes
SMCSWTS2-MTS-CSW-EM-PLN-002107	Carbon and Energy Management Plan	Yes
SMCSWTS2-MTS-CSW-EM-PLN-002697	Operational Environmental Management Plan	Yes
SMCSWTS2-MTS-CSW-EM-PLN-002731	Pollution Incident Response Management Plan	Yes
SMCSWTS2-MTS-CSW-EM-PLN-005554	Flora & Fauna Management Plan	Yes
SMCSWTS2-MTS-CSW-EM-PRO-005542	Waste and Resource Management Procedure	Yes
SMCSWTS2-MTS-CSW-EM-PRO-005548	Spill Management Procedure	Yes
SMCSWTS2-MTS-CSW-EM-PRO-005553	Fauna Handling Procedure	Yes
SMCSWTS2-MTS-CSW-EM-PRO-005556	Unexpected Contaminated Finds Procedure	Yes
SMCSWTS2-MTS-CSW-EM-PRO-005558	Weed Management Procedure	Yes
SMCSWTS2-MTS-CSW-HE-PLN-002100	Heritage Management Plan	No
SMCSWTS2-MTS-CSW-HE-PRO-005555	Unexpected Heritage Finds Procedure	No
SMCSWTS2-MTS-CSW-NA-REP-005227	Renzo Tonin CSW Noise and Vibration Compliance Monitoring Report	No
SMCSWTS2-MTS-CSW-PM-PLN-000069	Asset Management Plan	No
SMCSWTS2-MTS-CSW-PM-PLN-002136	Training Management Plan	No
SMCSWTS2-MTS-CSW-PM-PLN-002143	Human Resources Plan	No
SMCSWTS2-MTS-CSW-PM-PLN-002145	Incident Management Plan	No

Document Number	Document Title	Review
SMCSWTS2-MTS-CSW-PM-PLN-002156	Quality Management Plan	No
SMCSWTS2-MTS-CSW-PM-PLN-002158	Risk Management Plan	No
SMCSWTS2-MTS-CSW-PM-PLN-002162	Stakeholder & Community Involvement Plan	No
SMCSWTS2-MTS-RFT-OM-MAN-005243	Railway Operating Manual For SMTF (N) Operations	No
SMCSWTS2-MTS-SBR-EM-PRG-004533	Water Quality Monitoring Program - Barangaroo	Yes
SMCSWTS2-MTS-SFC-OM-MAN-002477	Railway Operating Manual for SMTF (S)	No
SMCSWTS2-MTS-WEC-NA-REP-006668	SW Metro Dynamic Train Testing Validation Assessment	No
SMCSWTS2-MTS-WEC-NA-REP-006669	SW Metro Noise and Vibration Impact Statement	No
SMCSWTS2-MTS-WEC-NA-REP-006670	SW Metro Corridor Trial Running Noise Assessment	No
SMCSWTS2-MTS-1NL-RD-PLN-006005	Technical Maintenance Plan – Rollingstock M1 Metro Northwest and Bankstown Line	Yes
SMCSWSWL-JHG-SWL-NA-REP-000683	Waterloo Acoustic Design Report	No
SMCSWSWM-SMD-WEC-NA-REP-002650	Sydney Metro City & Southwest, Noise and Vibration Testing and Commissioning Assurance Report – Sydenham to Bankstown Rev C	No

D

APPENDIX

Appendix D Public address system noise

Extract from Renzo Tonin & Associates SSI-5414 Operational Noise & Vibration Review (ONVR) Report (NWRLOTS-NRT-SWD-AV-RPT-105008-B).

Each station will include public address system (PAS) for the purpose of making safety and other announcements at platform areas, station entry points, paid / unpaid concourse areas and back of house (staff) areas. The table below provides a guidance on the types of announcements, frequencies, times of day and locations within station areas where these announcements may occur.

The PAS includes speakers placed at strategic locations to assist with achieving the minimum speech intelligibility criteria in 95% of station coverage areas. Where possible, speakers are placed close to receiver positions so that announcements are intelligible, and the volume of announcements is minimised. This approach improves the intelligibility of the announcements within the public areas of stations and reduces the potential noise spill outside station areas at nearby sensitive receivers.

The proposed PAS includes ambient noise compensation technology. This allows the volume of announcements to be set on the basis of the current noise environment in different areas of the station. During peak periods when ambient noise levels are high, the volume of announcements is increased so that announcements remain clear. During off-peak periods, when ambient noise levels are low, the volume of announcements is automatically reduced.

In relation to the PAS strategy in the table below, it is noted that regular announcements will occur for each train arrival (Type 1) and to convey other educational, reminder or promotional information (Types 3 to 6).

For noise modelling purposes, the following assumptions have been adopted:

- The volume of announcements at receiver positions 1.5 m above platform and concourse areas is assumed to be 10 dB higher than the ambient noise levels. Ambient noise levels from mechanical ventilation systems are required to be less than 55 dB(A). In the presence of other noise sources, ambient noise levels are likely to be in the range of 55 dB(A) to 60 dB(A), with the volume of announcements being typically 65 dB(A) to 70 dB(A) at receiver positions in station areas. For environmental noise prediction purposes, the volume of announcements is assumed to be 65 dB(A) in concourse areas and 70 dB(A) in platform areas.
- In each 15-minute period when regular announcements are made (6:00am to 10:00pm), the total duration of announcements is assumed to be 3 minutes in platform areas and 1 minute in paid/unpaid concourse areas. A 5 dB(A) noise penalty has been included in the predicted noise levels at nearby sensitive receivers to account for the potential annoying characteristics of PAS voice announcements.

For elevated and open cut stations and the station entry points of underground stations, these announcements will not be made during the 10:00pm to 6:00am night-time period to avoid potential nuisance to nearby residential receivers. The noise associated with regular PAS announcements during the 6:00 am to 10:00 pm period is included as part of the assessment undertaken for each station in the following sections.

Announcements related to train service delays, crowd control or emergencies (Types 2, 7 and 8) will only be made when required and may occur at any time of the day or night. The frequency of such announcements is anticipated to be minimal and therefore does not warrant specific assessment.

E

APPENDIX

Appendix E Glossary of terminology

Table 19 Glossary

Acronym	Definition																																													
Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).																																													
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.																																													
Assessment period	The period in a day over which assessments are made.																																													
Assessment Point	A point at which noise measurements are taken or estimated.																																													
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).																																													
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment: <table><tr><td>threshold of hearing</td><td>0 dB</td><td>The faintest sound we can hear</td></tr><tr><td></td><td>10 dB</td><td>Human breathing</td></tr><tr><td></td><td>20 dB</td><td></td></tr><tr><td>almost silent</td><td>30 dB</td><td>Quiet bedroom or in a quiet national park location</td></tr><tr><td></td><td>40 dB</td><td>Library</td></tr><tr><td>generally quiet</td><td>50 dB</td><td>Typical office space or ambience in the city at night</td></tr><tr><td></td><td>60 dB</td><td>CBD mall at lunch time</td></tr><tr><td>moderately loud</td><td>70 dB</td><td>The sound of a car passing on the street</td></tr><tr><td></td><td>80 dB</td><td>Loud music played at home</td></tr><tr><td>loud</td><td>90 dB</td><td>The sound of a truck passing on the street</td></tr><tr><td></td><td>100 dB</td><td>Indoor rock band concert</td></tr><tr><td>very loud</td><td>110 dB</td><td>Operating a chainsaw or jackhammer</td></tr><tr><td>extremely loud</td><td>120 dB</td><td>Jet plane take-off at 100m away</td></tr><tr><td></td><td>130 dB</td><td></td></tr><tr><td>threshold of pain</td><td>140 dB</td><td>Military jet take-off at 25m away</td></tr></table>	threshold of hearing	0 dB	The faintest sound we can hear		10 dB	Human breathing		20 dB		almost silent	30 dB	Quiet bedroom or in a quiet national park location		40 dB	Library	generally quiet	50 dB	Typical office space or ambience in the city at night		60 dB	CBD mall at lunch time	moderately loud	70 dB	The sound of a car passing on the street		80 dB	Loud music played at home	loud	90 dB	The sound of a truck passing on the street		100 dB	Indoor rock band concert	very loud	110 dB	Operating a chainsaw or jackhammer	extremely loud	120 dB	Jet plane take-off at 100m away		130 dB		threshold of pain	140 dB	Military jet take-off at 25m away
threshold of hearing	0 dB	The faintest sound we can hear																																												
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	130 dB																																													
threshold of pain	140 dB	Military jet take-off at 25m away																																												
dB(A)	A-weighted decibels. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the “A” filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.																																													
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing																																													

Acronym	Definition
	from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch, and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
LMax	The maximum sound pressure level measured over a given period.
LMin	The minimum sound pressure level measured over a given period.
L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L90	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
Leq	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

F

APPENDIX

Appendix F. Sydney Metro CSW Acoustics Advisor Endorsement of ONVMP

Note: The Noise and Vibration Monitoring and Verification Program for the City package was submitted to DPHI, and DPHI acknowledged receipt of the documents on 26 June 2025.







APPROVAL

CITY & SOUTHWEST ACOUSTICS ADVISOR

Review of:	Metro Trains Sydney Operational Noise and Vibration Management Plan Sydney Metro City & Southwest	Document reference:	SMCSWTS2-MTS-CSW-EM-PLN-002106
Prepared by:	Daniel Weston Acoustics Advisor		Prepared by Metro Trains Sydney
Date of issue:	28 June 2024		28 June 2024
			Version 02

As approved Acoustics Advisor for the Sydney Metro City & Southwest project, I have reviewed the Operational Noise and Vibration Management Plan (ONVMP) prepared by Metro Trains Sydney, as required under A27 (d) of the project approval conditions.

I am satisfied that the document (Version 02) meets the requirements of relevant project approval conditions, approve the ONVMP, and consider that the document is suitable for submission to the Secretary for information.



Daniel Weston, City & Southwest Acoustics Advisor

EMM: 20240627 MTS ONVMP V02 AA approval

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APPROVAL

CITY & SOUTHWEST ACOUSTICS ADVISOR

Review of:	Sydney Metro City & Southwest Operational Noise and Vibration Monitoring Program as required by Condition D13 (with Corrigendum)	Document reference:	Program: TN498-01F03 GBNV Measurement Plan (r3) Prepared by Renzo Tonin & Associates for Metro Trains Sydney 29 October 2024 Revision 3
Prepared by:	Daniel Weston Acoustics Advisor		
Date of issue:	4 June 2025		Corrigendum: TN498-01F03 GBNV Measurement Plan Corrigendum (r0) Prepared by Renzo Tonin & Associates for Metro Trains Sydney 23 May 2025 Revision 0

The Operational Noise and Vibration Monitoring Program is a document required by Condition D13 of the CSSI 7400 Mod 9 planning approval. As approved Acoustics Advisor for the Sydney Metro City & Southwest project, I have reviewed this document together with Corrigendum dated 23 May 2025 as required by Condition A27 (d) of the CSSI 7400 Mod 9 planning approval. I am satisfied that the Operational Noise and Vibration Monitoring Program, when read with the Corrigendum, meets the relevant planning approval requirements.

I approve the Operational Noise and Vibration Monitoring Program with Corrigendum and consider the documents as suitable for submission to the Secretary for information.



Daniel Weston, City & Southwest Acoustics Advisor

EMM: 20250529 C2S CoA D13 ONVMP w Corr AA approval

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G

APPENDIX

Appendix G. Summary O&M Noise and Vibration CoA Assessment Requirements

The tables below are extracted from the OTS version of this plan (now superseded) and contain each of the relevant CoA together with the approach MTS proposes to implement to achieve compliance.

Notation

- i. Rolling Stock Noise Test Report (SMCSWTS2-MTS-1NL-NA-REP-005526) and Design Doc NRT 0320 - PAS Noise Algorithms Extract (SMCSWTS2-MTS-1NL-NA-SPC-005527) are to be read in conjunction with this Plan.
- ii. Noise and Vibration monitoring will be undertaken in accordance with the Noise & Vibration Monitoring Procedure (SMCSWTS2-MTS-1NL-EM-PRO-005432) and the Asset Engineering Notification - Rail Corrugation Assessment - AEN2023-07-10-PW-01S (SMCSWTS2-MTS-1NL-RD-REC-005525).

Table 20 O&M Noise and Vibration Monitoring and Assessment

SSI #	COA REF:	COA REQUIREMENT	TIMEFRAME	STATUS
5931 – SMTF	F2	Operational Noise Review of Stationary Components	Within 2 Years of commencement of O&M Phase.	Completed. This condition has been satisfied, and an Operational noise review was performed to assess compliance with F2 (refer Section 2.3 of Report TK920- 04F01 Compliance with EPL R4.4 (r2) (SMCSWTS2-MTS-1NL-NA-REP-005526).
5931 – SMTF	F5	Operation Noise and Vibration Compliance Assessment	Within 12 Months of commencement of O&M Phase	Completed. This Operational Noise and Vibration Review has been completed, (SMCSWTS2-MTS-1NL-NA-REP-005526).
5931 – SMTF	F6	Operational Performance Audit (may review Compliance Assessment).	Within 15 Months of commencement of O&M Phase.	Completed. This requirement has been satisfied, and an Operational Performance Audit was undertaken by an Independent Auditor in July 2020.
5414 – Whole of Project	C17	Operational Noise Review of Stationary Facilities	Within 2 Years of commencement of O&M Phase.	Completed. This condition is satisfied, and an Operational noise review was performed to assess compliance with C17 (SMCSWTS2-MTS-1NL-NA-REP-005526).
5414 – Whole of Project	C22	Noise and Vibration Compliance Assessment	Within 12 Months of commencement of O&M Phase.	Completed This Operational Noise and vibration Review has been completed (SMCSWTS2-MTS-1NL-NA-REP-005526).

5414 – Whole of Project	F2	Operational Performance Audit (may review Compliance Assessment).	Within 15 Months of completion of Construction.	Completed. This requirement has been satisfied, and an Operational Performance Audit was undertaken by an Independent Auditor in July 2020.
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The work undertaken to comply with SSI-5414 CoA C22 formed the basis for then meeting the requirements of SSI-5931 F6, which built upon for SSI-5414 C17 and SSI-5931 F2. This provided a uniform approach to operational noise and vibration assessment and reporting.

Table 21 Summary O&M Noise and Vibration CoA Assessment Requirements for the M1 line

COA	SUMMARY OF COA O&M ASSESSMENT REQUIREMENTS	MTS APPROACH
SSI-5414 C22	Undertake a noise and vibration compliance assessment to confirm the predictions of the noise assessment referred to in the ONVR. The noise and vibration compliance assessment shall: a) be developed in consultation with the EPA; and b) be undertaken within twelve months of the commencement of operation of the SSI. The assessment shall include, but not necessarily be limited to: a) noise and vibration monitoring and compliance assessment, to assess compliance with conditions C15 to C18 of the approval and the ONVR. b) methodology for assessment. c) details of any complaints received relating to operational noise and vibration impacts. d) any required recalibration of the noise and vibration model considering such aspects as land use change. e) an assessment of the performance and effectiveness of the applied noise and vibration mitigation measures; and f) identification, if required, of further noise and vibration mitigation measures to meet the requirements of C15 to C18 of this approval and the objectives identified in the ONVR. A Noise and Vibration Compliance Assessment Report providing the results of the assessment shall be submitted to the Secretary and the EPA within 60 days of its completion.	MTS undertook a noise and vibration compliance assessment report (TK920- 04F01 Compliance with C22 F5 and EPL R4.4 (r1). Compliance Assessment Report TK920- 04F01 Compliance with C22 F5 and EPL R4.4 (r1) by engaging a qualified noise consulting service. Reference is SMCSWTS2-MTS-1NL-NA-REP-005526. The report was provided to EPA as part of consultations to develop the approach of the assessment, as well as confirm the relevant criteria. The consultant undertook noise and vibration monitoring in accordance with all relevant guidelines and requirements for operational noise and vibration to inform the assessment. This report addresses multiple areas of compliance and is in accordance with SSI-5414 Condition C22, to provide a noise and vibration compliance assessment to confirm the predictions of the noise assessment referred to in the SSI-5414 ONVR, as relevant to the track alignment, SSI-5931 Condition F5, to provide a noise and vibration compliance assessment to confirm the predictions of the noise assessment referred to in the SSI-5931 ONVR, as relevant to the Sydney Metro Train Facility (SMTF) and noise and vibration compliance for noise and vibration from stationary facilities including stations, services facilities, electrical substations, and car parks. The Report was provided to DPIE and EPA within 60 days of its completion. The assessment indicated compliant levels of noise and vibration to predictions in ONVR during

COA	SUMMARY OF COA O&M ASSESSMENT REQUIREMENTS	MTS APPROACH
	If the assessment indicates an exceedance of the noise and vibration objectives identified in the ONVR, the Proponent shall implement further feasible and reasonable measures (where required) to mitigate these exceedances in consultation with affected property owners.	operations phase. Further assessment of additional feasible and reasonable mitigation measures is not required.
SSI-5414 C17	Operational noise levels shall be reviewed within 2 years of commencement of operations. The review: - shall have regard to the status of land use planning, - any land use changes and - the background noise environment within areas adjacent to the fixed facilities at the time of the relevant review. - Any proposed changes to the operational noise levels as a result of the review shall be included in a revised ONVR.	MTS undertook the review of operational noise levels of stationary facilities as part of the noise and vibration compliance assessment required to be completed (within 12 months of commencement of operation) by CoA C22. Since the assessment did not discover any changes to the operational noise levels of fixed facilities, hence ONVR revision is not required as stated in this CoA.
SSI-5414 F2	Within fifteen months of the completion of construction, the Proponent shall commission an independent qualified person or team to undertake an Operational Performance Audit of the SSI. The independent person or team shall be approved by the Director General prior to the commencement of the Audit. The Operational Performance Audit Report shall be submitted to the Director General within one month of the completion of the Audit, unless otherwise agreed by the Director General. The Audit shall: - assess compliance with the requirements of this approval, and other licences and approvals that apply to the SSI; - assess the environmental performance of the SSI against the predictions made and conclusions drawn in the documents referred to under condition 81 of this approval; and - review the effectiveness of the environmental management of the SSI, including any environmental impact mitigation works.	The Independent Qualified Person was engaged in July 2020 to undertake this performance audit, reviewed the Noise and Vibration Compliance Assessment Report required to be prepared under CoA C22, in order to be able to assess the environmental performance of the SSI against the predictions made in the ONVR. There are audit observations included in the audit report relevant to ONVR compliance report. MTS has taken notes of these observations and shall be considering the correction actions on this.
SSI-5391 F5	The Proponent shall undertake a noise and vibration compliance assessment to confirm the predictions of the noise assessment referred to in the ONVR. The noise and vibration compliance assessment shall be developed: - in consultation with the EPA; and - be undertaken within twelve months of the	MTS employed the same strategy as identified for SSI-5414 CoA C22 to address this condition.

COA	SUMMARY OF COA O&M ASSESSMENT REQUIREMENTS	MTS APPROACH
	commencement of operation of the SSI. The assessment shall include, but not necessarily be limited to: a) noise and vibration monitoring and compliance assessment, to assess compliance with conditions F1 to F3 of the approval and the ONVR. b) methodology for assessment. c) details of any complaints received relating to operational noise and vibration impacts. d) any required recalibration of the noise and vibration model considering such factors as land use change. e) an assessment of the performance and effectiveness of the applied noise and vibration mitigation measures; and f) identification, if required, of further noise and vibration mitigation measures to meet the requirements of F1 to F3 of this approval and the objectives identified in the ONVR. A Noise and Vibration Compliance Assessment Report shall be submitted to the Secretary and the EPA within 60 days of its completion. If the assessment indicates an exceedance of the noise and vibration objectives identified in the ONVR, the Proponent shall implement further feasible and reasonable measures (where required) to mitigate these exceedances in consultation with affected property owners.	
SSI-5391 F2	Operational noise levels shall be reviewed within two years. The review shall have regard to the status of land use planning, • any land use changes, and • the background noise environment within • areas adjacent to the fixed facilities at the time • of the relevant review. Any proposed changes to the operational noise levels as a result of the review shall be included in a revised ONVR.	MTS employed the same strategy as identified for SSI-5414 CoA C17 to address this condition.
SSI-5391 F6	Within fifteen months of the operation Proponent shall commission an independent qualified person or team to undertake an Operational Performance Audit of the SSI. The independent person or team shall be approved by the Director General prior to the commencement of the Audit.	MTS employed the same strategy as identified for SSI-5414 CoA F2 to address this condition.

COA	SUMMARY OF COA O&M ASSESSMENT REQUIREMENTS	MTS APPROACH															
	The Operational Performance Audit Report shall be submitted to the Director General within one month of the completion of the Audit, unless otherwise agreed by the Director General. The Audit shall: Assess compliance with the requirements of this approval, and other licences and approvals that apply to the SSI; Assess the environmental performance of the SSI against the predictions made and conclusions drawn in the documents referred to under condition 81 of this approval Review the effectiveness of the environmental management of the SSI, including any environmental impact mitigation works.																
SSI 7400 D3	Where an OEMP is required, the Proponent must include the following OEMP sub-plans in the OEMP: <table border="1"> <thead> <tr> <th></th><th>Required OEMP sub-plan</th><th>Relevant government agencies to be consulted for each OEMP sub-plan</th></tr> </thead> <tbody> <tr> <td>(a)</td><td>Noise and vibration</td><td>EPA</td></tr> <tr> <td>(b)</td><td>Groundwater Management</td><td>EPA and DPI Water</td></tr> <tr> <td>(c)</td><td>Traffic and Transport</td><td>Sydney Coordination Office, Relevant Road Authority and non-private transport operators</td></tr> <tr> <td>(d)</td><td>Flooding and hydrology (including emergency response)</td><td>Directly affected landowners, OEH, DPI Water, SES,</td></tr> </tbody> </table>		Required OEMP sub-plan	Relevant government agencies to be consulted for each OEMP sub-plan	(a)	Noise and vibration	EPA	(b)	Groundwater Management	EPA and DPI Water	(c)	Traffic and Transport	Sydney Coordination Office, Relevant Road Authority and non-private transport operators	(d)	Flooding and hydrology (including emergency response)	Directly affected landowners, OEH, DPI Water, SES,	MTS addressed this condition with the submission of the OEMP and the relevant sub-plans to DPHI.
	Required OEMP sub-plan	Relevant government agencies to be consulted for each OEMP sub-plan															
(a)	Noise and vibration	EPA															
(b)	Groundwater Management	EPA and DPI Water															
(c)	Traffic and Transport	Sydney Coordination Office, Relevant Road Authority and non-private transport operators															
(d)	Flooding and hydrology (including emergency response)	Directly affected landowners, OEH, DPI Water, SES,															

COA	SUMMARY OF COA O&M ASSESSMENT REQUIREMENTS			MTS APPROACH
		planning)	Sydney Water and Relevant Council(s)	
SSI-7400 D13	The Proponent must prepare an Operational Noise and Vibration Monitoring Program to confirm that the operational noise and vibration levels meet the CSSI proposed design objectives as determined in the Track Attenuation and Operational Ground-borne Noise Review in Condition D9 following the commencement of operations			MTS employed the same strategy as identified for SSI-5414 CoA C17 to address this condition. Reference: SMCSW Operational Noise & Vibration Monitoring Program as required by condition D13 (Renzo Tonin ,29 October 2024, Document Number TN498-01F03 GBNV Measurement Plan (r3).docx
SSI-7400 D14	Should the operational noise and vibration levels exceed the CSSI design objectives, the Proponent is to prepare a report, outlining actions that will be taken so that the CSSI meets the design objectives in the future. The report is to be prepared within three (3) months following the identification of the exceedance and be forwarded to the Secretary for information. All recommendations in the report must be implemented within three (3) months of the date of the report or as agreed with the Secretary.			No exceedances of CSSI design objectives identified MTS employed the same strategy as identified for SSI-5414 CoA C17 to address this condition. Reference: SMCSW Operational Noise & Vibration Monitoring Program as required by condition D13 (Renzo Tonin ,29 October 2024, Document Number TN498-01F03 GBNV Measurement Plan (r3).docx
SSI 8256 E31	The Proponent must prepare an Operational Noise and Vibration Review (ONVR) to confirm noise and vibration control measures that would be implemented for the Operation of the CSSI. The ONVR must be prepared as part of the iterative design development and in consultation with the Planning Secretary, relevant council(s), and other relevant stakeholders and must: (a) identify appropriate Operational noise and vibration objectives and levels for surrounding development, including existing sensitive receivers; (b) confirm the Operational noise predictions based on the expected final design. Confirmation must be based on an appropriately calibrated noise model (which has incorporated data obtained from noise monitoring); (c) examine all noise and vibration mitigation measures, with a focus on source control and design; (d) identify specific physical and other mitigation measures for controlling noise and vibration at the source and at the receiver (if relevant) including location, type and timing of mitigation measures; (e) where noise and vibration objectives cannot be achieved, the ONVR must present an analysis of all noise			This condition is the responsibility of the Sydney Metro Authority and has been satisfied. The relevant information is published on the Sydney Metro website: https://www.sydneymetro.info/sites/default/files/2022-10/Sydenham-Bankstown-Operational-Noise-Vibration-Review.pdf

COA	SUMMARY OF COA O&M ASSESSMENT REQUIREMENTS	MTS APPROACH
	and vibration mitigation measures and the 'best practice' achievable noise and vibration outcome for each activity; (f) fully describe the design, assumptions, calculation process, mitigation strategy, and other relevant factors; and (g) include a consultation strategy to seek feedback from directly affected landowners on the noise and vibration mitigation measures being offered. The ONVR must be verified by a suitably qualified and experienced noise and vibration expert. The ONVR must be undertaken at the Proponent's expense and submitted to the Planning Secretary for approval before the implementation of mitigation measures. The Proponent must implement the identified noise and vibration control measures and make the ONVR publicly available.	
SSI 8256 E32	Operational noise mitigation measures as identified in Condition E31 that will not be physically affected by Construction, must commence implementation within six (6) months of the commencement of Construction in the vicinity of the impacted receiver(s) to minimise Construction noise impacts, and detailed in an updated Noise and Vibration CEMP Sub-plan for the CSSI. <i>Note: For the purpose of Conditions E32 and E33, operational noise mitigation measures refer to at property or other identified non-source controls, the detail of which would broadly be included in the Noise and Vibration CEMP Sub-plan. When detail on the specific mitigation measures is known and before the implementation of the mitigation measures, the CEMP subplan must be updated.</i>	This condition is the responsibility of the Sydney Metro Authority and has been satisfied. The relevant information is published on the Sydney Metro website: https://www.sydneymetro.info/sites/default/files/2022-10/Sydenham-Bankstown-Operational-Noise-Vibration-Review.pdf
SSI 8256 E33	Where implementation of Operational noise mitigation measures will be physically affected by Construction such that they cannot commence implementation within six (6) months of the commencement of Construction in accordance with Condition E32, the Proponent must submit to the Secretary a report providing justification as to why, along with details of temporary measures that would be implemented to address construction noise impacts until such time that the Operational noise mitigation measures identified in Condition E31 are implemented. The report must be submitted to the ER for review. When the ER is satisfied that the justification and alternative measures are appropriate to address construction noise impacts, and within six (6) months of the commencement of Construction which would affect the identified sensitive receivers, the report must be submitted to the Planning Secretary for information.	This condition is the responsibility of the Sydney Metro Authority and has been satisfied. The relevant information is published on the Sydney Metro website: https://www.sydneymetro.info/sites/default/files/2022-10/Sydenham-Bankstown-Operational-Noise-Vibration-Review.pdf

COA	SUMMARY OF COA O&M ASSESSMENT REQUIREMENTS	MTS APPROACH
SSI 8256 E34	Within 12 months of the commencement of Operation of the CSSI, the Proponent must undertake monitoring of Operational noise to compare actual noise performance of the CSSI against the noise performance predicted in the review of noise mitigation measures required by Condition E31. The Proponent must prepare an Operational Noise Compliance Report to document this monitoring. The Report must include, but not necessarily be limited to: (a) noise monitoring to assess compliance with the Operational noise levels predicted in the review of Operational noise mitigation measures required under Condition E31; (b) a review of the Operational noise levels in terms of criteria and noise goals established in the <i>NSW Rail Infrastructure Noise Guideline 2013</i>; (c) methodology, location and frequency of noise monitoring undertaken, including monitoring sites at which CSSI noise levels are ascertained, with specific reference to locations indicative of impacts on receivers; (d) details of any complaints and enquiries received in relation to Operational noise generated by the CSSI between the date of commencement of Operation and the date the report was prepared; (e) any required recalibrations of the noise model taking into consideration factors such as noise monitoring; (f) an assessment of the performance and effectiveness of applied noise mitigation measures together with a review and if necessary, reassessment of mitigation measures; and (g) identification of additional measures to those identified in the review of noise mitigation measures required by Condition E31, that would be implemented with the objective of meeting the criteria outlined in the <i>NSW Rail Infrastructure Noise Guideline 2013</i> and <i>Noise Policy for Industry</i> (EPA, 2017), when these measures would be implemented and how their effectiveness would be measured and reported to the Planning Secretary and the EPA. The Operational Noise Compliance Report must be submitted to the Planning Secretary and the EPA within 60 days of completing the Operational noise monitoring and made publicly available.	An Operational Noise Compliance Report will be prepared within 12 months of FPS. At this point in time, FPS is scheduled for October 2026. The ONCR will be completed by September 2027 for submission to SMA and DPHI.

Table 22 Operational Noise Review of Stationary Components

SSI #	COA REF:	COA REQUIREMENT	TIMEFRAME	Status
ECRL REF	29(a)	Operational Noise Review of Stationary Components	Within 3 months of commissioning the mechanical & electrical plant & ventilation systems	The review was undertaken by the D&C contractor, and the requirement has been closed.