

Sydney Metro - WSA - SSTOM - OHE Station - Construction and OSOM Deliveries SMWSA Detailed Noise and Vibration Impact Statement

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Parklife Metro D&C

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Detailed Noise and Vibration Impact Statement
Sydney Metro Western Sydney Airport SSTOM Package
Orchard Hills Station
Standard Hours and Oversized Plant Delivery



Report Number 21239.1.6

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1 Introduction

The Sydney Metro Western Sydney Airport (SMWSA) Environmental Impact Assessment (EIS) was prepared in October 2020, which assessed the impacts of the construction (and operation) of the development. Approval for the development of the SMWSA project occurred on 23 July 2021 (Mod 1 approved 14 April 2022) with conditions as outlined in the SMWSA - Conditions of Approval - State Significant infrastructure (SSI) 10051. Chapter 10 of the EIS included a summary of the Noise and Vibration assessment, with the complete assessment provided in Technical Paper 2.

The SMWSA project is made up of three major contract packages. In December 2022 the third contract was awarded to Parklife Metro JV (JV) who will deliver approximately 23 kilometres of railway track including six new stations between St Marys and the new Aerotropolis, 12 new metro trains, core rail systems, and the stabling and maintenance facility (SMF) to be built at Orchard Hills.

After completion of these works, the JV will also operate and maintain the SMWSA line for 15 years after it becomes operational.

This contract is known as Stations, Systems, Trains, Operations and Maintenance (SSTOM).

VMS Australia Pty Ltd (VMS) has been engaged by the JV to prepare this Detailed Noise and Vibration Impact Statement (DNVIS) as required by Condition of Approval (CoA) E47 given the risk that noise management levels (NMLs) will be exceeded and to confirm the level of mitigation including for oversized plant deliveries that must occur out of hours. There is also a risk that ground-borne construction vibration levels will exceed maximum vibration levels associated with human comfort. This specific DNVIS focusses on the construction works to be undertaken at Orchard Hills Station which forms part of the SSTOM works.

Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in **Appendix A**.

2 Overall Project Description

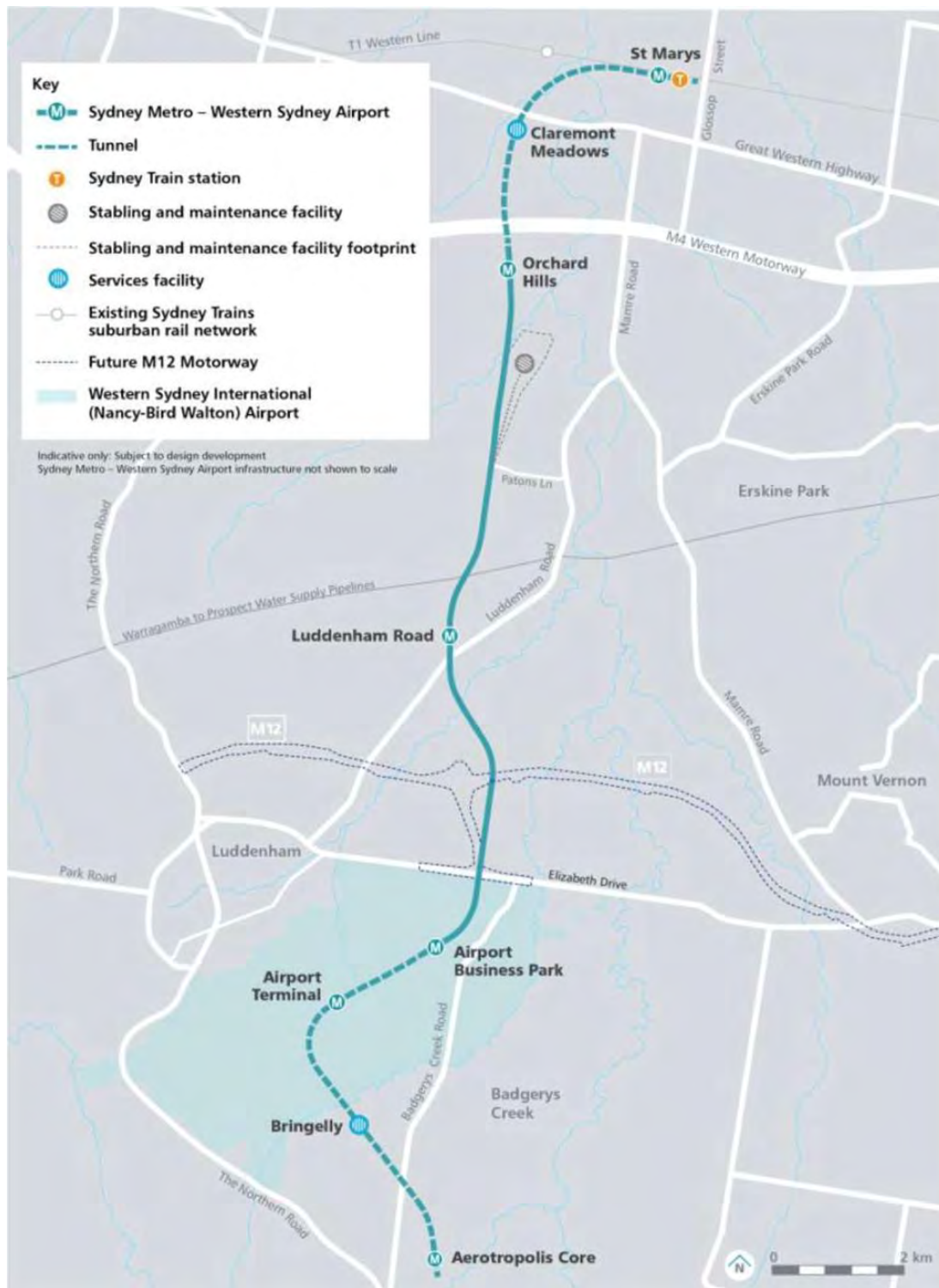
In terms of construction works, the SSTOM Works scope as part of the SMWSA Project includes:

- installation of tracks, signalling, mechanical and electrical systems,
- construction of a SMF at Orchard Hills,
- construction of the lower chamber of Bringelly shaft, along with capping and backfill,
- construction of the lower chamber of Claremont Meadows shaft, along with capping and backfill, and
- construction of six stations, including:
 - a new metro station connecting to, and providing an interchange with, the T1 Western Line (part of the existing Sydney Trains suburban rail network) at St Marys,
 - two new metro stations between the T1 Western Line and Western Sydney International; one at Orchard Hills and one at Luddenham within the Northern Gateway Precinct,
 - two new metro stations within the Western Sydney Airport site (WSA); one at the Airport Terminal and one at the Airport Business Park, both of which are located on Airport land, and
 - a new metro station within the Aerotropolis Core precinct, south of WSA.

Construction works relating to SSTOM are expected to be completed during the third quarter of 2026, with commissioning and testing completed by the end of 2026.

A site plan showing the extent of the entire project is shown in **Figure 1**.

Figure 1 Overall Project Site Plan



Source: Noise and Vibration Management Sub-plan

2.1 Scope of this DNVIS

This DNVIS focuses on the construction of Orchard Hills Station.

With reference to **Figure 1**, the project site extends approximately:

- South of the M4 Western Motorway.
- East of Kent Road.
- To the north and south of Lansdowne Road.

The main construction work scenarios addressed in this DNVIS are summarised in **Table 1** and include the work periods for each scenario. Ancillary operations referred to as ‘*Scenario 0.X*’ involving light and delivery vehicle movements, concrete batching plant operations, and the operation of existing plant, will take place concurrently with main construction work scenarios as described in **Table 1** and tabulated in **Table 2**.

The acoustic impact of ancillary operations are including into the total acoustic impact of main construction work scenarios.

All construction works assessed within this report are limited to surface works (including in the station box), no tunnelling is proposed as part of these works.

The majority of these works are proposed to be undertaken during standard construction hours only as per CoA E38 which is consistent with Condition L4.1 of the Environment Protection Licence (EPL) 21807, issued by the NSW Environment Protection Authority (EPA) on 20 July 2023. If applicable, CoA E39 and L4.2 are also considered.

Deliveries of oversized plant will occur outside standard hours and in this regard the JV will consider:

- L4.5 (a)(ii) of the EPL.
- E41a(i) and c(i) of the Approval.

Table 1 DNVIS Summary of Works

Scenario ID	Work Activity	Work as Scheduled
S0.1	Light Vehicles and Deliveries	Ongoing (Concurrent with S1-S6)
S0.2	Concrete Batching Plant	December 2023 to February 2026 (Concurrent with S2-S7)
S0.3	Existing Plant	Ongoing (Concurrent with S6-S7)
S1	Site Preparation Works	September 2023 to December 2023
S2.1	Enabling Works - Piling (bored)	September 2023 to February 2024
S2.2	Enabling Works - Concreting	September 2023 to February 2024
S3.1	Structural Works - Formworks and Concreting	January 2024 to August 2024
S3.2	Structural Works - Fixing	January 2024 to August 2024
S4	Mech Services/ Electrical/ Plumbing and Vertical Transport	December 2024 to May 2025
S5	Finishes and Above Ground Structures	May 2024 to September 2024
S6.1	Precinct Works including Landscaping and External Works - Roadworks	August 2024 to February 2026

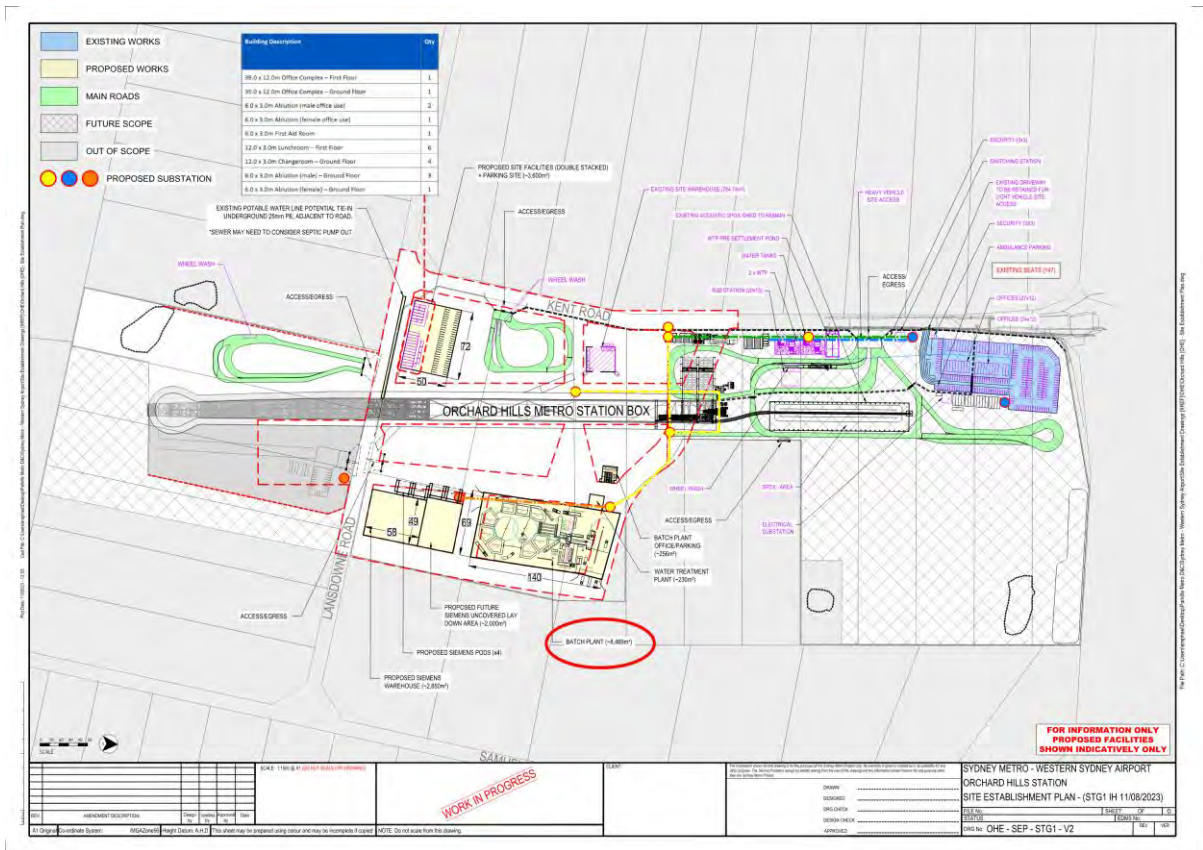
Scenario ID	Work Activity	Work as Scheduled
S6.2	Precinct Works including Landscaping and External Works - Landscaping	August 2024 to February 2026
S7	Peak Hour Traffic Movements	Ongoing
S8	OOH Over Size Over Mass Delivery	November 2023 to February 2024

Table 2 Concurrent Ancillary Scenarios

		Construction Scenarios											
		S1	S2.1	S2.2	S3.1	S3.2	S4	S5	S6.1	S6.2	S7	S8	
Ancillary Scenarios	S0.1	X	X	X	X	X	X	X	X	X	X		
	S0.2		X	X	X	X	X	X	X	X	X	X	
	S0.3								X	X	X		

Note 1: 'x' indicates ancillary a scenario as operational during a respective main construction scenario and contributing to its overall construction noise impact.

Figure 2 Orchard Hills Station Site Plan



Source: Parklife Metro JV.

2.2 Project Compliance Management

The two primary approval documents required for the construction of SSTOM are:

- SSI 10051.
- EPL 21807.

Considering the relevant aspects of the above documents, compliance is summarised in **Table 3** which also includes relevant Revised Environmental Mitigation Measures (REMMs).

In addition to the above, the following were referenced in the preparation of this DNVIS:

- JV - Construction Environmental Management Plan (CEMP).
- JV - Construction Traffic Management Plan - Orchard Hills Station (CEMP).
- JV - Noise and Vibration Management sub-Plan (NVMP).
- Sydney Metro - Construction Environmental Management Framework (CEMF).
- SMWSA - Construction Noise and Vibration Standard (CNVS).
- SMWSA - Submissions Report.
- Transport for NSW (TfNSW) - Construction Noise and Vibration Strategy (Strategy).
- WSA - Community Communications Strategy (CCS).

Table 3 Project Compliance Management Summary

ID	Work Activity	DNVIS Reference
SMWSA - Conditions of Approval - SSI 10051 - Noise and Vibration		
C15	The Noise and Vibration Construction Monitoring Program must include: (d) a process to undertake real time noise and vibration monitoring. The results of the monitoring must be readily available to the construction team, the Proponent and ER. The Planning Secretary and EPA must be provided with access to the results on request.	Section 8
E37	A detailed land use survey must be undertaken to confirm sensitive land use(s) (including critical working areas such as operating theatres and precision laboratories) potentially exposed to construction noise and vibration and construction ground-borne noise. The survey may be undertaken on a progressive basis but must be undertaken in any one area before the commencement of work which generates construction noise, vibration or ground-borne noise in that area. The results of the survey must be included in the Detailed Noise and Vibration Impact Statements required under Condition E47 .	Section 3.2 Appendix B
E38	Work must only be undertaken during the following hours: a) 7:00am to 6:00pm Mondays to Fridays, inclusive; b) 8:00am to 1:00pm Saturdays; and c) at no time on Sundays or public holidays.	Section 4
E39	Except as permitted by an EPL or approved in accordance with the Out-of-Hours Works Protocol required by Condition E42 , highly noise intensive work that result in an exceedance of the applicable NML at the same receiver must only be undertaken: a) between the hours of 8:00 am to 6:00 pm Monday to Friday; b) between the hours of 8:00 am to 1:00 pm Saturday; and c) if continuously, then not exceeding three (3) hours, with a minimum cessation of work of not less than one (1) hour. For the purposes of this condition, 'continuously' includes any period during which there is less than one (1) hour between ceasing and recommencing any of the work.	Section 4 Section 8

ID	Work Activity	DNVIS Reference
E40	This approval does not permit blasting.	NA to this DNVIS. Blasting not proposed.
E41	Variation to Work Hours: Notwithstanding Conditions E38 and E39 work may be undertaken outside the hours specified in the following circumstances: (a) Safety and Emergencies, including: (i) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; (c) By Approval, including: (i) where different construction hours are permitted or required under an EPL in force in respect of the CSSI;	Section 4
E42	Out-of-Hours Work Protocol - Work not subject to an EPL...	Refer to NVMP.
E43	Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration criteria: a) construction 'Noise affected' noise management levels established using the Interim Construction Noise Guideline (DECC, 2009); b) preferred vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure); c) Australian Standard AS 2187.2 – 2006 "Explosives – Storage and Use – Use of Explosives" (for human exposure); d) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and e) the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage for structurally unsound heritage items). Any work identified as exceeding the noise management levels and / or vibration criteria must be managed in accordance with the Noise and Vibration CEMP Sub-plan. Note: The ICNG identifies 'particularly annoying' activities that require the addition of 5 dB(A) to the predicted level before comparing to the construction Noise Management Level.	Section 5 Section 8
E44	All reasonable and feasible mitigation measures must be applied when the following residential ground-borne noise levels are exceeded: (a) evening (6:00 pm to 10:00 pm) — internal $L_{Aeq(15 \text{ minute})}$: 40 dB(A); and (b) night (10:00 pm to 7:00 am) — internal $L_{Aeq(15 \text{ minute})}$: 35 dB(A). The mitigation measures must be outlined in the Noise and Vibration CEMP Sub-plan, including in any Out-of-Hours Work Protocol, required by Condition E42.	Not triggered.
E45	Noise generating work in the vicinity of potentially-affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories, and operating theatres) resulting in noise levels above the NMLs must not be time tabled with sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	Not triggered. Additional consultation to be undertaken, if triggered. Section 8
E46	Industry best practice construction methods must be implemented where reasonably practicable to ensure that noise levels are minimised around sensitive land user(s). Practices must include, but are not limited to: a) use of regularly serviced low sound power equipment; b) at source control, temporary noise barriers (including the arrangement of plant and equipment) around noisy equipment and activities such as rock hammering and concrete cutting; c) use of non-tonal reversing alarms; and d) use of alternative construction and demolition techniques.	Section 8

ID	Work Activity	DNVIS Reference
E47	<p>Detailed Noise and Vibration Impact Statements (DNVIS) must be prepared for any work that may exceed the NMLs, vibration criteria and / or ground-borne noise levels specified in Conditions E43 and E44 at any residence outside construction hours identified in Condition E38, or where receivers will be highly noise affected or subject to vibration levels above those otherwise determined as appropriate by a suitably qualified structural engineer under Condition E87. The DNVIS must include specific mitigation measures identified through consultation with affected sensitive land user(s) and the mitigation measures must be implemented for the duration of the works. A copy of the DNVIS must be provided to the ER before the commencement of the associated works. The Planning Secretary and the EPA may request a copy(ies) of the DNVIS.</p>	This document.
E48	<p>Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before works that generate vibration commences in the vicinity of those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owners and occupiers are to be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier. These properties must be identified and considered in the Noise and Vibration CEMP Sub-plan.</p>	Not triggered. Section 7.3
E49	<p>Where sensitive land use(s) are identified in Appendix B as exceeding the highly noise affected criteria during typical case construction, mitigation measures must be implemented with the objective of reducing typical case construction noise below the highly noise affected criteria at each relevant sensitive landuse(s). Activities that would exceed highly noise affected criteria during typical case construction must not commence until the measures identified in this condition have been implemented, unless otherwise agreed with the Planning Secretary.</p> <p>Note: Mitigation measures may include path barrier controls such as acoustic sheds and/or noise walls, at-property treatment, or a combination of path and at-property treatment.</p>	Not triggered. Section 7.1
E50	<p>For all construction sites where acoustic sheds are installed, the sheds must be designed, constructed and operated to minimise noise emissions. This would include the following considerations:</p> <ul style="list-style-type: none"> (a) all significant noise producing equipment that would be used during the night-time would be inside the sheds, where feasible and reasonable; (b) noise generating ventilation systems such as compressors, scrubbers, etc, would be located inside the sheds and external air intake/discharge ports would be appropriately acoustically treated; and (c) the doors of acoustic sheds would be kept closed during the night-time period. Where night-time vehicle access is required at sites with nearby residences, the shed entrances would be designed and constructed to minimise noise breakout. 	NA to this DNVIS. Acoustic sheds not proposed.
E51	<p>Where Condition E49 determines that at-property treatment (temporary or permanent) is the appropriate measure to reduce noise impacts, this at-property treatment must be offered to landowners of residential properties for habitable living spaces, unless other mitigation or management measures are agreed to by the landowner.</p> <p>Landowners must be advised of the range of options that can be installed at or in their property and given a choice as to which of these they agree to have installed.</p> <p>A copy of all guidelines and procedures that will be used to determine at-property treatment at their residence must be provided to the landowner.</p>	Not triggered.
E52	<p>Any offer for at-property treatment or the application of other noise mitigation measures in accordance with Condition E51 does not expire until the noise impacts specified in Condition E49 affecting that property are completed, even if the landowner initially refuses the offer.</p> <p>Note: If an offer has been made but is not accepted, this does not preclude the commencement of construction under Condition E49.</p>	Not triggered.
E53	<p>The implementation of at-property treatment does not preclude the application of other noise and vibration mitigation and management measures including temporary and long term accommodation.</p>	Not triggered.
E54	<p>Vibration testing must be conducted during vibration generating activities that have the potential to impact on Heritage items to verify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures. Such measures must include, but not be limited to, review or modification of excavation techniques.</p>	Not triggered.

ID	Work Activity	DNVIS Reference
E55	The Proponent must seek the advice of a heritage specialist on methods and locations for installing equipment used for vibration, movement and noise monitoring at Heritage items.	NA to this DNVIS.
E56	All work undertaken for the delivery of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. The Proponent must: (a) reschedule any work to provide respite to impacted noise sensitive land use(s) so that the respite is achieved in accordance with Condition E57; or (b) consider the provision of alternative respite or mitigation to impacted noise sensitive land use(s); and (c) provide documentary evidence to the ER in support of any decision made by the Proponent in relation to respite or mitigation. The consideration of respite must also include all other approved Critical SSI, SSI and SSD projects which may cause cumulative and / or consecutive impacts at receivers affected by the delivery of the CSSI.	The JV is conducting ongoing coordination with other contractors to ensure that respite periods are maintained throughout the works.
E57	In order to undertake out-of-hours work outside the work hours specified under Condition E38, appropriate respite periods for the out-of-hours work must be identified in consultation with the community at each affected location on a regular basis. This consultation must include (but not be limited to) providing the community with: (a) a progressive schedule for periods no less than three (3) months, of likely out-of-hours work; (b) a description of the potential work, location and duration of the out-of-hours work; (c) the noise characteristics and likely noise levels of the work; and (d) likely mitigation and management measures which aim to achieve the relevant NMLs under Condition E43 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers). The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour work must be provided to the ER, EPA and the Planning Secretary prior to the out-of-hours work commencing. Note: Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the RBL at any residence.	The JV has conducted appropriate community consultation in accordance with the CCS, which has included discussions around appropriate respite periods. The JV has prepared a report detailing the outcomes of the community consultation to satisfy this Condition.
EPL - 21807		
L2.1	The licensee must minimise noise and vibration impacts at residences and other sensitive land uses. To meet the requirements of this condition the licensee must: a) implement the guidance in the Interim Construction Noise Guideline (DEC, 2009) and the Assessing Vibration: a technical guideline (DEC, 2006); b) implement all reasonable and feasible measures to minimise noise impacts in accordance with the Interim Construction Noise Guideline (DEC, 2009); and c) implement vibration mitigation in accordance with the Assessing Vibration: a Technical Guideline (DEC, 2006). In this condition, 'reasonable' and 'feasible', in relation to noise management, have the same meaning as defined in the Interim Construction Noise Guideline (DEC, 2009).	Section 5 Section 8
L2.2	When construction activities include 'High Noise Impact Activities and Works' as defined in the special dictionary in this licence, quantitative construction noise assessments must apply a +5dB correction to the measured or predicted level of construction noise at the nearest Noise Sensitive Receiver location before assessment against the Interim Construction Noise Guideline (DECC, 2009) noise management levels.	Table 9
L3.1	All blasting activities are prohibited on the licensed premises.	NA to this DNVIS. Blasting not proposed.
L4.1	Standard construction hours Unless permitted by another condition of this licence, works and activities must: a) only be undertaken between the hours of 7:00 am and 6:00 pm Monday to Friday; b) only be undertaken between the hours of 8:00 am and 1:00 pm Saturday; and c) not be undertaken on Sundays or Public Holidays.	Section 4

ID	Work Activity	DNVIS Reference
L4.2	<p>High Noise Impact Activities and Works</p> <p>Unless permitted by another condition of this licence, any High Noise Impact Activities and Works that exceed the applicable Noise Management Level (NML) at a Noise Sensitive Receiver must only be undertaken:</p> <ul style="list-style-type: none"> a) between 8:00 am and 6:00 pm Monday to Friday; b) between 8:00 am and 1:00 pm Saturday; and c) if high noise impact works are to be conducted continuously and the location of the works means that it is likely to impact the same receivers, then the works must be conducted in continuous blocks of no more than 3-hours, with at least a 1-hour respite between each block of continuous high noise impact work; except as expressly permitted by another condition of this licence. <p>Note: For the purposes of this condition 'continuous' includes any period where there is a less than 1-hour respite between ceasing and recommencing of any work that is subject to this condition.</p>	Section 4
L4.3	<p>Exemptions to standard construction hours for low noise impact works</p> <p>Works and activities may be carried on outside of standard construction hours specified in condition L4.1 if the works and activities do not cause, when assessed at the boundary of the most affected Noise Sensitive Receiver:</p> <ul style="list-style-type: none"> a) LAeq(15 minute) noise levels greater than 5dB above the day, evening and night Rating Background Level (RBL) as applicable; b) L_{Amax} noise levels greater than 15dB above the night RBL for night works; c) the preferred continuous or impulsive vibration values greater than those for human exposure to vibration, set out for residences in Table 2.2 in Assessing Vibration: a technical guideline (DEC, 2006); and d) the preferred intermittent vibration values greater than those for human exposure to vibration, set out for residences in Table 2.4 in Assessing Vibration: a technical guideline (DEC, 2006). <p>For the purposes of this condition, the RBLs are those contained in an environmental assessment for the activities subject to this licence prepared under the Environmental Planning and Assessment Act 1979.</p> <p>Alternatively, the licensee may use another RBL determined in accordance with the Noise Policy for Industry (EPA, 2017) and provided to the EPA prior to carrying out any works or activities under this condition.</p> <p>The notification requirements under condition L4.4 do not apply to this condition.</p>	Works undertaken under L4.3 will be assessed separately to this DNVIS.

ID	Work Activity	DNVIS Reference
L4.4	<p>Works outside of standard construction hours - Notification</p> <p>The licensee must notify potentially affected Noise Sensitive Receivers of works outside of standard construction hours unless notification under this condition is not required as specified in another condition of this licence.</p> <p>a) The notification must:</p> <ul style="list-style-type: none"> i. be given not less than 5 calendar days and not more than 14 calendar days before those works are to be undertaken, unless otherwise agreed with the affected community and notified to the EPA; ii. be undertaken by letterbox drop, email, text message or other targeted and equivalent method; and iii. be detailed on the project website or other relevant website notified to the EPA. <p>b) The notification required by this Condition must:</p> <ul style="list-style-type: none"> i. clearly outline the reason that the work is required to be undertaken outside the hours specified in condition L4.1; ii. include a diagram that clearly identifies the location of the proposed works in relation to nearby cross streets and local landmarks; iii. include details of the date, timing and relevant time restrictions that apply to the proposed works; iv. clearly outline in plain English, the location, nature, scope and duration of the proposed works; v. detail the expected noise impact of the works on Noise Sensitive Receivers; vi. clearly state how complaints may be made and additional information obtained; vii. include the number of the telephone complaints line required by condition M5.1, an afterhours contact phone number specific to the works undertaken outside the hours specified in condition L4.1, and the project website address; and viii. include consideration of culturally and linguistically diverse Noise Sensitive Receivers where required. 	Section 8
L4.5	<p>Exemptions to standard construction hours in exceptional circumstances</p> <p>a) The licensee may undertake works and activities outside of standard construction hours specified in condition L4.1 for:</p> <ul style="list-style-type: none"> i. emergency works required to avoid the loss of life or property, or to prevent material harm to the environment; and ii. the delivery of oversized plant, structures or materials determined by the police or other authorised authorities to require special arrangements to transport along public roads. <p>b) The licensee must, on becoming aware of the need to undertake emergency works under this condition notify the EPA's Environment Line as soon as practicable and submit a report to the EPA by 4:00 pm on the next business day after the emergency works commenced that describes:</p> <ul style="list-style-type: none"> i. the cause, time and duration of the emergency; ii. action taken by or on behalf of the licensee in relation to the emergency; and iii. details of any measures taken or proposed to be taken by the licensee to prevent or mitigate against a recurrence of the emergency. <p>For the purposes of this condition, 'material harm to the environment' has the same meaning as in section 147 of the POEO Act.</p> <p>Emergency works do not require a notification under condition L4.4.</p>	Section 4 JV to utilise (a)(ii)
L4.6	<p>The licensee must make all reasonable and feasible efforts to coordinate all works outside of standard construction hours with any neighbouring concurrent construction works that have the potential to impact the same Noise Sensitive Receivers. The licensee must ensure Respite Periods are being achieved as much as is reasonably practicable.</p>	Managed by PLM during cumulative impact meetings and coordination meetings with neighbouring construction projects.
L4.7	<p>Condition L4.6 does not apply to low impact noise work permitted by condition L4.3 or emergency works permitted by L4.5 of this licence.</p>	Noted. Refer to CNVMP.

ID	Work Activity	DNVIS Reference
L4.8	<p>Works outside of standard construction hours</p> <p>Under this condition, works and activities may be undertaken outside of standard construction hours specified in condition L4.1 and L4.2, but only if they are required in relation to one or more of the following:</p> <ul style="list-style-type: none"> a) carrying on those works and activities during standard construction hours would result in a high risk to construction personnel or public safety, based on a risk assessment carried out in accordance with AS/NZS ISO 31000:2018 "Risk Management"; b) the Relevant Road Network Operator has advised the licensee in writing that carrying out the works and activities during standard construction hours would result in a high risk to road network operational performance; c) a relevant utility service operator has advised the licensee in writing that carrying out the works and activities during standard construction hours would result in a high risk to the operation and integrity of the utility network; d) the TfNSW Transport Management Centre (or other road authority) have refused to issue a road occupancy licence during standard construction hours; or e) Sydney Trains (or other rail authority) requires a rail possession for the activities to be performed outside of standard construction hours. 	L4.8b) has been considered during the assessment of the delivery of oversized plant required outside of standard construction hours.

ID	Work Activity	DNVIS Reference
L4.9	<p>Works outside of standard construction hours - Regulatory Requirements</p> <p>In undertaking any works and activities outside of standard construction hours under condition L4.8, the licensee must comply with the following:</p> <p>a) Prepare a construction noise and vibration impact assessment in accordance with the Interim Construction Noise Guideline (DEC, 2009) that is to include:</p> <ul style="list-style-type: none"> i. a description of the proposed works and activities outside of standard construction hours; ii. predictions of LAeq (15 minute) dB noise levels at noise sensitive receivers from these works and activities, where noise levels are predicted to be greater than those permitted under condition L4.3; and iii. a monitoring plan to validate the noise predictions, based on monitoring at the boundary of representative sensitive receivers during noise generating activities that are representative of the works and activities, including during the period/s predicted to have the highest noise level impacts. <p>b) Undertake noise monitoring in accordance with the monitoring plan required by condition L4.9(a)(iii).</p> <p>c) Only undertake activities between the hours of 6:00pm on Mondays, Tuesdays, Wednesdays, Thursdays, Fridays and 7:00am the following day (unless permitted by another condition of this licence).</p> <p>d) Activities are not to be undertaken between the hours of 6:00pm on Saturdays, Sundays or Public Holidays and 7:00am the following day (unless permitted by another condition of this licence).</p> <p>e) Ensure that works and activities do not result in noise levels exceeding those specified in condition L4.3 at the same noise sensitive receivers (unless specified in another condition of this licence) on more than:</p> <ul style="list-style-type: none"> i. 2 consecutive evenings and/or nights at any time; and ii. 3 evenings and/or nights per week; and iii. 10 evenings and/or nights per month. <p>f) Undertake any high noise impact works before 12:00 am (midnight) where reasonable and feasible.</p> <p>g) Where high noise impact activities are undertaken, the respite provisions as per the requirements of condition L4.2(c) do not apply provided that all High Noise Impact Activities and Works are undertaken prior to 12:00 am (midnight).</p> <p>h) Where high noise impact activities are undertaken after 12:00 am (midnight), the respite provisions in condition L4.2(c) apply.</p> <p>i) Upon request of an authorised officer, the licensee must provide within 5 business day:</p> <ul style="list-style-type: none"> i. the construction noise and vibration impact assessment required by condition L4.9(a); ii. noise monitoring results required by condition L4.9(b); iii. written evidence demonstrating the works are necessary and permitted under condition L4.8; and/or iv. any other relevant information or records requested by the EPA. <p>j) the notification requirements under condition L4.4 apply to this condition.</p>	This DNVIS following the use of 4.5 (a)(ii).
M2.1	All noise and vibration monitoring for the purposes of determining compliance with the conditions of this licence must be undertaken by a suitably qualified and experienced person as defined in the special dictionary of this licence.	Section 8.2
M2.2	<p>All noise monitoring for the purposes of determining compliance with the conditions of this licence must consider and be generally undertaken in accordance with;</p> <p>(a) Australian Standard AS 1055: 2018 Acoustics - Description and measurement of environmental noise; and</p> <p>(b) the compliance monitoring guidance provided in the chapter 7 'Monitoring Performance' of the Noise Policy for Industry (EPA, 2017).</p>	Section 8.2

ID	Work Activity	DNVIS Reference
M2.3	All vibration monitoring must be: a) undertaken in accordance with the technical guidance provided in the Assessing Vibration: a technical guideline (DEC, 2006); and b) assessed and reported against the acceptable and maximum values of human exposure to vibration set out in Tables 2.2 and 2.4 of this guideline.	Section 8.2
M2.4	The licensee must undertake noise and vibration monitoring as directed by an authorised officer of the EPA. Where the monitoring is requested to take place on private land (for example a residential property) the licensee must request permission to access the premises in advance and keep a record of permission requests and responses. If a licensee is unable to obtain permission, the licensee must undertake the monitoring at an indicative location where possible and they must provide the response (including any nil response) to the EPA.	Noted
M2.5	Additional Monitoring Conditions The licensee must undertake monitoring, sampling, video recording and/or take photographs: a) if the EPA or licensee reasonably suspects that an event has occurred at the premises or in connection with the carrying out of the activities that has caused, is causing, is likely to cause or has the potential to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies); b) as soon as practicable; and c) as directed by an authorised officer.	Section 8.2
REMMs		
ONV1	An Operational Noise and Vibration Review would be prepared during design to confirm the mitigation measures required to manage: <ul style="list-style-type: none">• airborne and ground-borne noise impacts from rail operations• airborne noise impacts from the stabling and maintenance facility• airborne noise impacts from fixed industrial sources, including stations and services facilities The Operational Noise and Vibration Review would consider existing and potential future land use to establish Project Noise Trigger Levels. The EPA would be consulted during preparation of the Operational Noise and Vibration Review.	Section 8
NAH6	The following heritage items would be monitored for potential vibration impacts during construction: <ul style="list-style-type: none">• St Marys Railway Station Group• Queen Street Post-War Commercial Building• St Marys Munitions Workers Housing• McGarvie Smith Farm• McMaster Farm	Not triggered.

3 Existing Noise Environment and Receivers

3.1 Noise Catchment Areas

A total number of twelve Noise Catchment Areas (NCAs) were nominated along the alignment of SMWSA Project in the EIS. NCAs are utilised in determining the NMLs for residential receivers which are based on the measured existing background noise levels in each NCA.

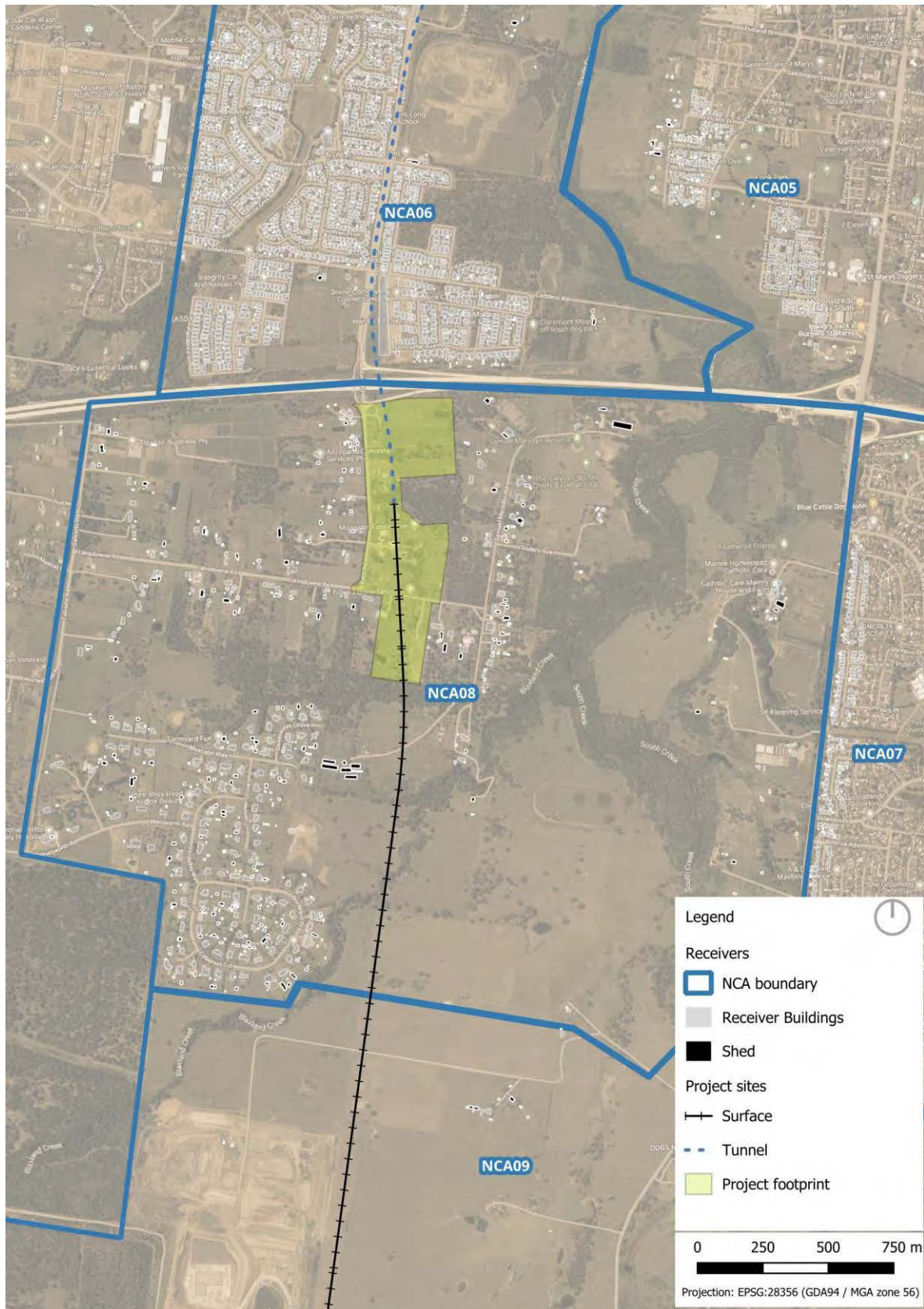
For Orchard Hills Station, the noise sensitive receivers within 5 catchments, NCA05 to NCA09 are considered most relevant for this assessment and as such, the overview of these NCAs are described in **Table 4** and presented in **Figure 3**. This information is consistent with the NVMP.

Table 4 Relevant Noise Catchment Areas

NCA	Description of the Area
NCA05	Predominantly medium density single and multi-storey residential dwellings. Ambient noise conditions are dominated by traffic along Mamre Road.
NCA06	Predominantly medium density residential dwellings to the east of Gipps Street and south of Caddens Road. Ambient noise conditions are dominated by traffic along M4 Western Motorway and Gipps Street.
NCA07	Predominantly medium density single-storey residential dwellings, located to the east of the project. Ambient noise conditions are dominated by traffic along Mamre Road.
NCA08	Predominantly low-density single storey residential dwellings. East of the project is mostly open land with scattered receivers along Samuel Marsden Road and Lansdowne Road. Ambient noise conditions are dominated by traffic along the M4 Western Motorway.
NCA09	Open farmland and a grouping of low-density single storey residential dwellings within 1,200m east of the project along Luddenham Road.

Source: Noise and Vibration Management Sub-plan.

Figure 3 Relevant Noise Catchment Areas



Source: VMS.

3.2 Nearest Sensitive Receivers

Consistent with the EIS, approval, and ICNG, receivers have been categorised based on their use as follows:

- Noise sensitive receivers including:
 - Residential.
 - Commercial.
 - Industrial.
 - Other noise sensitive receivers.
- Vibration sensitive receivers including:
 - Residential.
 - Commercial.
 - Industrial.
 - Heritage.
 - Critical working areas (such as operating theatres, labs).
 - Critical utilities.

Receivers potentially impacted by noise and vibration from construction activities have been identified following the completion of a detailed land use survey as per CoA E37. Sensitive receiver information within NCA05 to NCA09 for this assessment has been determined and is finalised as per the land use survey conducted July 2023.

On this basis and with reference to **Appendix B**, the nearest noise sensitive receivers to the Project site are residences in close proximity to the site:

- Directly west of the site along Lansdowne Road and across Kent Road.
- Directly south of the site.
- Directly east of the site along Lansdowne Road and Samuel Marsden Road.
- North of the Western Motorway.

There are no other sensitive noise receivers in close proximity to the works closer than residential receivers.

In terms of vibration, the use of a vibratory roller during Roadworks may impact sensitive receivers. With reference to **Appendix B**, the nearest sensitive receivers to these works are free standing residential to the west across Kent Road and to the south across Lansdowne Road.

There are no critical working areas (such as operating theatres, labs) or critical utilities or heritage structures in close proximity to where the vibratory roller is proposed to operate.

4 Construction Hours

At this stage, construction activities will be carried out during standard construction in accordance with the Project Approval and the NVMP. Deliveries of oversized plant will consider Condition L4.5 (a)(ii) of the EPL and E41a(i) and c(i) of the Approval.

CoA E38 and CoA E39 are most relevant to Standard Hours and reproduced below:

“Construction Hours

E38 Work must only be undertaken during the following hours:

(a) 7:00am to 6:00pm Mondays to Fridays, inclusive;

(b) 8:00am to 1:00pm Saturdays; and

(c) at no time on Sundays or public holidays.”

“Highly Noise Intensive Work

E39 Work Except as permitted by an EPL or approved in accordance with the Out-of-Hours Works Protocol required by Condition E42, highly noise intensive work that result in an exceedance of the applicable NML at the same receiver must only be undertaken:

(a) 8:00am to 6:00pm Mondays to Fridays, inclusive;

(b) 8:00am to 1:00pm Saturdays; and

(c) at if continuously, then not exceeding three (3) hours, with a minimum cessation of work of not less than one (1) hour.

For the purposes of this condition, 'continuously' includes any period during which there is less than one (1) hour between ceasing and recommencing any of the work.”

Condition L4.5 (a)(ii) of the EPL and CoA 41(a)(i) & (c)(i) is reproduced below and will be considered for oversized deliveries:

“Construction Hours

L4.5 (a)(ii) Exceptions to standard construction hours in exceptional circumstances:

(a) The licensee may undertake works and activities outside of standard construction hours specified in condition L4.1 for:

ii. the delivery of oversized plant, structures or materials determined by the police or other authorised authorities to require special arrangements to transport along public roads.”

“Variation to Work Hours

Notwithstanding Conditions E38 and E39 work may be undertaken outside the hours specified in the following circumstances:

E41 (a) Safety and Emergencies, including:

- (i) for the delivery of materials required by the NSW Police Force or other authority for safety reasons:
- E41 (c) By Approval, including:
- (i) where different construction hours are permitted or required under an EPL in force in respect of the CSSI”

5 Construction Noise and Vibration Management Levels

With reference to the works as proposed in the DNVIS, the following aspects of works will be assessed further in the following sections:

- Noise from construction on the site including the delivery of oversized plant.
- Noise from construction traffic generated by the site that will use the public road system.
- Vibration from construction on the site.

Based on the surrounding locality and proposed works, the airborne noise from the construction site will likely be the dominant source of noise from the Project site. On this basis an assessment of ground-borne noise is not necessary and not considered further in this DNVIS.

Given that oversized delivery activities are proposed to take place during the night, a sleep disturbance assessment is conducted for such operations.

Ground-borne vibration from the use of a vibratory roller will be assessed as this is the only activity considered to be vibration intensive for this DNVIS.

5.1 Construction Noise Management Levels (NMLs) - Airborne Noise from Site

The project specific Noise Management Levels (NMLs) for noise sensitive receivers are nominated in the NVMP and are summarised in **Table 5** for the construction hours relevant this DNVIS.

Table 5 Construction Noise Management Levels - Airborne Noise from Site

Receiver	Noise Management Level (NML) ¹	
	L _{Aeq(15min)} - dBA	
Residential Receivers	Standard Hours	Out of Hours - Night ²
NCA05	50 (75) ³	45
NCA06	47 (75) ³	37
NCA07	57 (75) ³	40
NCA08	54 (75) ³	45
NCA09	50 (75) ³	40
Other Sensitive Receivers	Based on ICNG	
Commercial	65	
Industrial	70	
Place of Worship	55	
Child Care Centre	55	
Education	55	

Note 1: Applied during Standard hours and Out of Hours (as approved) for residential receivers and when in use for other sensitive receivers.

Note 2: Oversized plant deliveries are expected to be permitted during the night period and after 10:00pm and before 7:00am.

Note 3: Highly Noise Affected (HNA) level of 75dBA.

5.2 Construction Traffic Noise Criteria

Currently there is no specific guideline to address the potential increase in the existing overall road traffic noise along the public road network from construction vehicles. In this regard, such noise is assessed with guidance from the EPAs Road Noise Policy (RNP) and from the SMWSA Construction Noise and Vibration Standard, Version 4.3 (CNVS).

In the first instance, however, it is noted that the CNVS states the following:

“An initial screening test should first be applied by evaluating whether noise levels will increase by more than 2 dBA due to construction traffic or a temporary reroute due to a road closure. Where increases are 2 dBA or less then no further assessment is required.”

This approach is consistent with the NVMP. If the initial screen test shows that exceedances are likely, further assessment will be required considering the base RNP criteria shown in **Table 6** which summarises the base road traffic noise criteria for the road types that will be utilised.

Both the daytime and night-time criteria are presented in **Table 6** and it should be noted that the daytime period, when considering road traffic noise, is defined as 7:00am to 10:00pm and not to 6:00pm as per on-site noise which considers the NPfI and not the RNP. The night criteria is shown given that night deliveries may take place where required, and the EIS has allowed for night movements to “support” the day works only.

Table 6 Construction Traffic Noise Criteria

Road Category	Land Use	Assessment Criteria ¹ - L _{Aeq} dBA	
		Daytime ²	Night-time ²
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments.	55 (1hr) ³	50 (1hr) ³
Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments.	60 (15hr) ⁴	55 (9hr) ⁴

Note 1: Applied externally to residential receivers only considering all road traffic noise sources.

Note 2: Daytime is defined as 7:00am to 10:00pm and night-time is defined as 10:00pm to 7:00am.

Note 3: Criteria assessed over an 1hr period during the daytime and night-time periods.

Note 4: Criteria assessed over 15hr period during the daytime and 9hr period night-time period.

5.3 Construction Vibration Management Levels (VMLs)

Two main aspects are considered regarding construction vibration:

- Potential annoyance to the occupants of buildings as a result of vibration impinging on the structure, this is typically referred to as “human comfort”.
- Potential damage to buildings and structures directly from vibration impinging on the structure.

The human comfort vibration management levels using the vibration dose value (VDV) as nominated in the NVMP are presented in **Table 7**. In order to allow for the same vibration parameter to be used across human comfort and damage, human comfort vibration management levels as a velocity are also presented. This is in line with the NVMP and in the first instance, continuous vibration has been conservatively assumed. In addition, the range between the preferred and maximum human comfort vibration levels is provided in **Table 7**.

Table 7 Human Comfort Vibration Management Levels

Place and Time	Preferred Value		Maximum Value	
	¹ m/s ^{1.75}	² mm/s	¹ m/s ^{1.75}	² mm/s
Residential buildings (day).	0.2	0.28	0.4	0.56
Offices, schools, educational institutions, & places of worship ³ (anytime).	0.4	0.56	0.8	1.1
Workshops ⁴ (anytime).	0.8	1.1	1.6	2.2

Note 1: VDV management level.

Note 2: Continuous vibration management level.

Note 3: In the absence of specific levels, assumed by VMS to be used for commercial spaces.

Note 4: In the absence of specific levels, assumed by VMS to be used for industrial spaces.

For the assessment of potential damage to buildings and structures, the NVMP considers the more conservative approach as presented in **Table 8** in the determination of cosmetic damage management levels independent of the frequency content of the vibration signal.

Table 8 Vibration Screening Criteria for Cosmetic Damage

Type of Building	Peak Component Particle Velocity ¹ (PPV)
Buildings used for commercial purposes, industrial buildings, and buildings of similar design. Reinforced or framed structures.	10 mm/s
Dwellings and buildings of similar design and/or occupancy. Unreinforced or light framed structures.	5 mm/s

Note 1: Applicable to vibration in horizontal plane of the highest floor of the building.

6 Identification of Construction Activities

6.1 Site Related Construction Activities

Considering the main construction work activities (**Table 1**), indicative worst-case scenarios have been developed in consultation with the JV and summarised in **Table 10**. While work activity schedules may overlap, it is assumed that no two worst case scenarios for two work activities will occur concurrently.

Refer to **Table 9** regarding the maximum L_{Aeq} sound power levels (SWL) from construction plant. Where a plant item SWL is not found within a relevant source document, an acoustically equivalent plant item is shown in brackets.

Table 11 identifies the highest potentially impactful vibration intensive source within each of the main construction work activities.

It should be noted that bored piling is not considered to be a vibration intensive activity.

Table 9 Sound Power Levels of Construction Plant

Plant	Source	SWL (maximum L_{Aeq})
Delivery Truck/ Truck and Dog/Flat Bed Truck/Hiab Truck (Body Truck/Semi Trailer/Water truck)	NVMP	108
Asphalt Paver	NVMP	114
Concrete Pump	NVMP	109
Concrete Agitator (Concrete Truck)	NVMP	109
Concrete Vibrator	NVMP	113
Dump Truck/Bogie Tipper (Dump Truck (40t))	NVMP	110
EWP/Knuckle Boom Lift/ Scissor Lift (Elevated Work Platform)	NVMP	97
5-13t Excavator/ 10t Wheeled Excavator (Excavator (approximately 10 tonne))	NVMP	100
40t Excavator	NVMP	115
20t Front End Loader	NVMP	112
Grader (16M)	NVMP	113

Plant	Source	SWL (maximum L _{Aeq})
200t Mobile Crane (Mobile/Crawler Crane >200 tonne)	NVMP	116
80-100t Mobile Crane (Mobile/Crawler Crane <200 tonne)	NVMP	113
80t Piling Rig (Pile Boring Rig)	NVMP	112
Site Light Vehicle	NVMP	99
Small Generator	NVMP	103
Telehandler/ Forklift (Telehandler/Forklift (assumed telehandler))	NVMP	106
Drum Roller (Vibratory roller (Typically 7-13 tonnes))	NVMP	114 ¹
Water Cart (Water Cart (Articulated truck))	NVMP	107
Hand Tools (Grinder)	Strategy	110 ¹
Hand Tools (Rattle Gun)	Strategy	109 ¹
Vibratory Plate (Vibratory Plate (Petrol) (62 kg))	DEFRA	108
Franna/ Manitou/ Crane Truck (Crane - Franna (20 tonne))	Strategy	98
Water Treatment Plant	SBT ² DNVIS	84
Electrical Substation	SBT ² DNVIS	85
Industrial Water Pump	JV ²	80
Concrete Screed Helicopter	VMS	100

Note 1: 5dB penalty applied.

Note 2: Existing plant from SBT (Station Boxes and Tunnelling) to remain.

Table 10 Summary of Site Related Construction Works - Noise

Scenario ID	Description	Equipment List
S0.1 (Concurrent with S1-S6)	Light Vehicles and Deliveries	2 x Delivery Truck (within 15 mins) 2 x Light Vehicle (per carpark within 15 mins)
S0.2 (Concurrent with S2-S6)	Concrete Batching Plant	1 x Aggregate/ Cement Delivery Truck 1 x Concrete Agitator 1 x 20t Front End Loader 1 x Small Generator 1 x Hopper & Belt & mixer 1 x Air Compressor
S0.3	Existing Plant	1 x Water Treatment Plant

Scenario ID	Description	Equipment List
(Concurrent with S6)		1 x Substation 2 x Industrial Water Pump
S1	Site Preparation Works	1 x Truck and Dog 1 x Bogie Tipper 2 x EWP 1 x 13t Excavator 1 x 40t Excavator 1 x Skidsteer 1 x Drum Roller 1 x Water Cart 15 x Hand Tool 1 x Franna 1 x Manitou
S2.1	Enabling Works – Piling (bored)	1 x Bogie Tipper 1 x 13t Excavator 2 x 80t Piling Rig
S2.2	Enabling Works – Concreting	2 x Concrete Pump 2 x Concrete Agitator 1 x Concrete Vibrator 1 x Scissor Lift 1 x Knuckle Boom Lift
S3.1	Structural Works – Formworks and Concerting	2 x Concrete Pump 2 x Concrete Agitator 1 x Concrete Vibrator 1 x Scissor Lift 1 x Vibratory Plate
S3.2	Structural Works – Fixing	1 x EWP 1 x 10t Wheeled Excavator 1 x Telehandler 15 x Hand Tools
S4	Mech Services/ Electrical/ Plumbing and Vertical Transport	1 x 80t Mobile Crane 1 x Forklift 30 x Hand Tools 1 x Crane Truck
S5	Finishes and Above Ground Structures	2 x Flat Bed Truck 2 x Hiab Truck 1 x Concrete Pump 1 x Concrete Agitator 1 x Concrete Vibrator 4 x Knuckle Boom Lift 1 x 100t Mobile Crane 1 x Telehandler

Scenario ID	Description	Equipment List
		40 x Hand Tools 1 x Franna 1 x Manitou 1 x Concrete Screed Helicopter
S6.1	Precinct Works including Landscaping and External Works – Roadworks	1 x Asphalt Paver 1 x Tipper Truck (10t) 1 x 5-12t Excavator 1 x Grader 1 x Drum Roller
S6.2	Precinct Works including Landscaping and External Works – Landscaping	1 x Dump Truck 1 x 5-12t Excavator
S7	Peak Hour On-Site Traffic (PM Peak)	5 x Delivery Truck (within 15 mins) 31 x Light Vehicle (per carpark within 15 mins)
S8	OOH Over Size Over Mass Delivery	2 x Delivery Truck 1 x 200t Mobile Crane 1 x Franna 1 x Hand tools

Table 11 Summary of Site Related Construction Works - Vibration Intensive

Scenario ID	Work Activity	Vibration Intensive Plant
S6.1	Precinct Works including Landscaping and External Works – Roadworks	12t vibratory roller

6.2 Construction Traffic along the Public Road Network

Works associated with the construction of the project will generate additional road traffic movements that will use the public road network. Vehicle access to site, refer to **Figure 4**, will be off either Kent Road or Lansdowne Road via the M4 when entering and via the M4 or continuing onto Kent Road/ Gipps Street when exiting.

Access to site will involve:

- Light vehicles will access site off Kent Road or off Lansdowne Road via Kent Road.
- Heavy vehicles will access site off Kent Road or off Lansdowne Road via Kent Road.

Figure 4 Modelled Construction Traffic Routes on the Public Road Network



Source: VMS

7 Construction Noise and Vibration Assessment

7.1 Airborne Noise from On-site Construction

The predictions have been undertaken using iNoise V2023 and include the following main inputs:

- Ground and air absorption.
- Natural shielding from topographical data obtained from SixMaps.
- Shielding from buildings.
- Site boundary Noise Wall 01 (5m in height), Noise Wall 02 (3m in height).
- Typical construction octave band sound power levels.

With consideration to the scenarios as per **Table 10** and the above factors, **Table 12** and **Table 13** provide a summary of highest predicted $L_{Aeq(15min)}$ noise levels for each noise sensitive receiver type within each identified NCA.

Table 12 Summary of Predicted Noise from on-site Construction - Standard Hours

Receiver Type	NML L _{Aeq(15min)} dBA	Predicted ¹ Airborne Noise for each Concurrent Scenario L _{Aeq(15min)} dBA									
		S1	S2.1	S2.2	S3.1	S3.2	S4	S5	S6.1	S6.2	S7
Noise Catchment Area 05											
RES	50 (75 HNA)	41	42	42	42	41	42	45	43	44	41
COM	65	39	40	40	40	39	40	43	42	42	40
IND	70	40	40	41	40	39	40	44	42	42	40
Noise Catchment Area 06											
RES	47 (75 HNA)	51	53	54	54	53	54	56	55	61	53
COM	65	37	39	39	39	37	38	42	40	39	38
IND	70	37	38	38	38	36	37	41	40	38	37
CCC	55	37	39	39	39	37	37	42	40	39	37
EDU	55	40	41	41	41	39	40	44	43	41	40
Noise Catchment Area 07											
RES	57 (75 HNA)	44	44	44	44	43	44	47	45	44	43
Noise Catchment Area 08											
RES	54 (75 HNA)	72	64	64	64	62	64	67	69	65	63
COM	65	45	49	49	49	48	49	53	50	51	49
IND	70	40	43	43	43	42	43	45	44	42	42
Noise Catchment Area 09											
RES	50 (75 HNA)	38	40	40	40	37	39	43	40	38	38

Note 1: Bolded number indicates exceedance of the NML.

The following can be concluded from **Table 12**:

- Exceedances have been predicted for residential receivers within NCA06 and NCA08, however no exceedances above 75dBA (HNA) have been predicted.
- No exceedances have been predicted for other sensitive receivers in all NCAs.

On the basis of the above, all reasonable and feasible mitigation measures that could reduce noise impacts are to be considered for residential receivers within NCA06 and NCA08, after which, if necessary, Additional Mitigation Measures (AMMs), as per the CNVS, shall be applied to further manage impacts.

Table 13 Summary of Predicted Noise from on-site Construction – OOH (S8)

Receiver Type	NML $L_{Aeq(15min)}$ dBA	Predicted ¹ Airborne Noise for each Concurrent Scenario $L_{Aeq(15min)}$ dBA
		S8
Noise Catchment Area 05		
RES	45 (75 HNA)	<30
Noise Catchment Area 06		
RES	37 (75 HNA)	39
Noise Catchment Area 07		
RES	40 (75 HNA)	<30
Noise Catchment Area 08		
RES	45 (75 HNA)	52
Noise Catchment Area 09		
RES	40 (75 HNA)	<30

Note 1: Bolded number indicates exceedance of the NML.

The following can be concluded from **Table 13**:

Exceedances have been predicted for residential receivers within NCA06 and NCA08, however no exceedances have been predicted for other sensitive receivers in all NCAs.

The exceedances predicted for residences within NCA06 are marginal.

On the basis of the above, all reasonable and feasible mitigation measures that could reduce noise impacts are to be considered for residential receivers within NCA06 and NCA08, after which, if necessary, AMMs shall be applied to further manage impacts. It should be noted that only a small number of these deliveries are proposed and only over a few nights during October 2023 and again in the first quarter of 2024.

7.2 Sleep Disturbance

Noting that the previously mentioned low number of events proposed over only a few nights, there is a risk of sleep disturbance to residential receivers during oversized deliveries that will occur during the night period. The nearest and potentially most impacted are residences within NCA08, directly west, across Kent Road.

It is difficult to precisely predict maximum noise levels from such activities, however the following has been assumed for this project based on our experience on other similar projects and other sleep disturbance assessments:

- Two maximum events (per delivery) are possible at the entry into the site via Kent Road.
- Two maximum events (per delivery) are possible at the entry into the site via Lansdowne Road.
- For the entry and exit, the typical maximum level is normally attributed to engine noise and is typically 3 to 5dBA above the L_{eq} sound power level. In consideration of the reduced truck velocity when entering and exiting site, and the typical maximum level in relation to the L_{eq} sound power level, an L_{max} level of 105dBA has been adopted.
- Typical unloading events are normally associated with crashes and bangs attributed to the use of chains, metal to metal clashing when plant comes off the truck, and the use of hammers and mallets. From observations, such events will likely bear a L_{max} sound power level of 105 to 112dBA.
- Furthermore, it is understood that once the truck is parked that the unloading will take place over a 10 to 15 minute period. It is estimated that approximately 10 maximum events in relation to unloading will occur, with 50% of these assumed to be at a sound power of 105dBA and the remainder 112dBA.

Based on the above, predictions as presented in **Table 14** have been undertaken to the highest potentially impacted receiver determined as 107-111 Kent Road (Building ID 2558).

Table 14 Summary of Predicted Sleep Disturbance from Deliveries During Night-time

Residential Receiver	NML (OOH Night) L_{Amax} dBA	Predicted ¹ Airborne Noise for Scenario S8 - L_{Amax} dBA	
		Truck Movement	Unloading
Noise Catchment Area 08			
107-111 Kent Road (Building ID 2558)	55 (65) ²	59 ³	54 ⁴ - 61 ⁴

Note 1: Bolded number indicates exceedance of the NML.

Note 2: Events below this external level are considered unlikely to cause awakening reactions as per the EPA's RNP.

Note 3: Two events per delivery.

Note 4: Five events at 54dBA and five events at 61dBA per delivery.

Table 14 shows an exceedance of the sleep disturbance NML of 55dBA, however as per the CVS and EPA, this is a screening approach in the first instance and further assessment is necessary to ascertain the risk of sleep disturbance. In this regard and with context of the area and nature of events, a detailed assessment encompassing the following factors is undertaken:

- Maximum noise levels from the events (refer **Table 14**).
- How often these events occur during the night.
- The distribution of these events across the night.
- The existing ambient maximum events in the absence of the deliveries/unloading.
- Current scientific literature available at the time of the assessment regarding the impact of maximum, noise levels events at night (such as the RNP).
- The implementation of feasible and reasonable noise mitigation measures where possible.

To quantify the impact of maximum noise levels, guidance is taken from the RNP which states following latest advice regarding maximum internal noise levels, typically from transportation events:

- Maximum internal noise levels below 50 to 55 dBA are unlikely to cause awakening reactions.

- One or two noise events per night, with maximum internal noise levels of 65 to 70 dBA, are not likely to affect health and wellbeing significantly.

If a window or door is partially opened for ventilation, it is commonly accepted that an outside to inside attenuation of 10 dB can be achieved and, on this basis, for comparison to the predicted levels that are outside a window of a potential bedroom, the above maximum levels can be increased by 10dB.

Considering the more detailed approach, and given the low impact and number of site related maximum events in any night, likely focused over a period of roughly 15 minutes for a single delivery, the risk of sleep disturbance to nearby residences in relation to truck manoeuvring is considered low by VMS given:

- Approximately up to 7 events (2 entry and 5 unloading) above the NML, but below the level considered unlikely to cause awakening reactions.
- A low number of oversized deliveries are proposed during a week in November 2023 and again Q1 of 2024.
- With reference to traffic movements provided in the EIS, 297 light vehicle and 52 heavy vehicle movements along Kent Road are expected to dominate the total maximum noise levels in the area.

As a result of the above, it is considered reasonable that the low number of night deliveries may be managed such that the risk of sleep disturbance is low.

7.3 Ground-borne Vibration from On-site Construction

The most intensive plant from **Table 11** will be the use of the 12t vibratory roller during roadworks. This activity is likely to occur in close proximity to the following vibration sensitive receivers:

- Within 25 to 30m of residential buildings across Kent Road and Lansdowne Road.

With regard to human comfort and with reference to the NVMP, the use of a 12t vibratory roller within a distance of 100m could result in exceedances of the criteria as per **Table 7**.

Similarly, in terms of damage, even cosmetic, the use of a 12t vibratory roller within a distance of 20m could result in exceedances of the criteria as per **Table 8**.

Given that the operation of a roller is within safe working distances as identified by the NVMP, a more detailed investigation is necessary. Therefore, predictions based on measured inground vibration data previously measured by VMS are summarised in **Table 15**. It is critical to note that these predictions must be verified as the final vibration level will be dependent on several factors including the ground type between the source and building, foundations and building response as well as the dominant frequencies of the vibration source.

Table 15 Summary of Predicted Ground-borne Vibration from 12t Roller

Receiver Type	Predicted Vibration Level ^{2,3} (mm/s)	Vibration Criteria (mm/s)	
		Cosmetic Damage	Human Comfort ⁴
Residential (across Kent and Lansdowne Roads)	1.4 ⁵	5	0.56

Note 1: Bolded number indicates exceedance of the NML.

Note 2: Predictions assumed to be in ground just in front of building/structure. Values on the structure would be lower.

Note 3: In the absence of detailed outside to inside transfer functions, predictions in ground just in front of building/structure are conservatively assumed to represent vibration values inside buildings potentially impacting occupants.

Note 5: Maximum value presented.

Note 6: Predicted to comply with human comfort criteria at a distance of 35m from residential buildings.

Table 15 shows that the predicted levels in regard to damage are below criteria and therefore the risk of damage, even cosmetic is considered to be low. It is likely however that human comfort vibration criteria will be exceeded (refer to predictions in bold) at receivers in close proximity to the operation of a 12t vibratory roller. All feasible and reasonable mitigation shall therefore be assessed in order to reduce impacts, after which, if necessary, AMM shall be applied to further manage impacts.

7.4 Construction Traffic along the Public Road Network

The EIS provides a summary of the existing traffic along all major road routes for the 2023/2024 base case. Of this data, and with reference to construction traffic related to OHE, existing traffic counts along Kent Road (south of the M4) classified as a sub-arterial road are considered relevant.

On the basis that there is no data provided in the EIS for Lansdowne Road, it has been assumed by VMS that traffic flows along Lansdowne Road to the east of Kent Road are 25% of the traffic flow provided for Kent Road based on the assumption that the majority of the traffic along Lansdowne Road off Kent Road will be directed west. Lansdowne Road has been conservatively classified by VMS as a local road. It is noted that potentially impacted residents along Lansdowne Road are 40-48 Lansdowne Road (Building IDs 2565 and 2547), 16-20 Lansdowne Road (Building ID 2392), and 8-14 Lansdowne Road (Building ID 2401). Being located at the end of Kent Road, 40-48 Lansdowne Road has been identified to experience comparable traffic noise to residents along Kent Road. Therefore, it is considered most appropriate to assess traffic noise to 40-48 Lansdowne Road with respect to existing and additional traffic movements along Kent Road. Both 16-20 and 8-14 Lansdowne Road are located to the east of the construction site and therefore will not experience pass-by construction traffic. On the other hand, these residents are located in close proximity to the concrete batching plant and therefore may experience associated HV noise.

In accordance with the existing traffic data provided in the EIS and with reference to the construction traffic movements provided in the CTMP, a construction traffic noise assessment is conducted.

For the purposes of this assessment, two cases are assessed for which all construction movements take place during the day, and construction movements take place during the night in accordance with the below assumptions to allow for works to begin at 7:00am (8:00am on Saturdays). With reference to the EIS and as advised by the JV, the following assumptions are considered:

- 50% of light vehicles to travel on the road network during the night (as per the EIS)
- 10% of heavy vehicles to travel on the road network during the night (as per the EIS)

The following additional assumptions have been made to determine traffic movement numbers:

- Existing traffic flows are assumed to be evenly distributed throughout a day or night period for the conduction of 1hr period noise impact assessments.

- For sub-arterial road assessments, construction traffic volumes have been derived as two times (in and out) the maximum peak hour construction traffic movements, in this case the PM peak.
- For local road assessments, construction traffic volumes have been derived as the maximum peak hour construction traffic movements, in this case the PM peak.
- In the absence of any detailed information, it is assumed by VMS that 50% HV traffic through Kent Road will continue onto Lansdowne Road to the concrete batching plant and SCAW.
- LV noise for receivers east of the site along Lansdowne Road is considered to have negligible impact based on the distance between receivers and the nearest site carpark.

Using the TfNSW Construction Road Traffic Noise Estimator, **Table 16** and **Table 17** provide a summary of the noise impacts associated with construction traffic along the public road network considering Kent Road and Lansdowne Road.

Table 16 Summary of Predicted Construction Traffic Noise along Kent Road

Vehicle Type	Existing Traffic Volumes (Glossop Street)		Construction Traffic Volumes		Increase in Noise Level (dBA)	
	Daytime ¹	Night-time ¹	Daytime ¹	Night-time ¹	Daytime ¹	Night-time ¹
	L _{Aeq(15hr)}	L _{Aeq(9hr)}	L _{Aeq(15hr)}	L _{Aeq(9hr)}	L _{Aeq(15hr)}	L _{Aeq(9hr)}
Light	7124	1258	244	122	0.6	0.6
Heavy	297	52	234	23		

Note 1: Daytime is defined as 7:00am to 10:00pm (15hr period) and night-time is defined as 10:00pm to 7:00am (9hr period).

Table 17 Summary of Predicted Construction Traffic Noise along Lansdowne Road

Vehicle Type	Existing Traffic Volumes (Phillip Street)		Construction Traffic Volumes		Increase in Noise Level (dBA)	
	Daytime ¹	Night-time ¹	Daytime ¹	Night-time ¹	Daytime ¹	Night-time ¹
	L _{Aeq(1hr)} ²	L _{Aeq(1hr)} ²	L _{Aeq(1hr)}	L _{Aeq(1hr)}	L _{Aeq(1hr)}	L _{Aeq(1hr)}
Light	119	35	0	0	1.9	0.9
Heavy	5	1	9	1		

Note 1: Daytime is defined as 7:00am to 10:00pm period and night-time is defined as 10:00pm to 7:00am period.

Note 2: Hourly traffic volumes assumed to be evenly distributed throughout the period.

It can be seen from **Table 16** and **Table 17** that additional construction traffic on Kent and Lansdowne Road has led to an increase of no more than 2 dBA and therefore complies with the initial screening test outlined in the CNVS, where if increases are 2 dBA or less than, no further assessment is required.

8 Mitigation Measures

In the first instance, all feasible and reasonable mitigation measures to reduce impacts will be assessed. These are considered Standard Mitigation Measures where mitigations will be applied at the source and/or the path to reduce noise levels.

Following this and in the event of residual exceedances, mitigation measures to manage the impacts will be implemented following the process within the CNVS.

8.1 Standard Mitigation Measures

The following standard mitigations have been assessed by the JV following consideration of whether reasonable and feasible and will be implemented:

1. Selection of quieter plant and processes to reduce noise.
2. Selection of quieter plant and processes to reduce noise at night during deliveries including:
 - Alternate use of chains such as harness to minimise metal to metal contact.
 - Use of rubber faced mallets instead of hammers to reduce metal to metal contact.
 - Non-tonal reversing alarms and limiting the use of reversion where reasonable.
 - Unless otherwise confirmed by consultation, it is recommended that deliveries are not to be scheduled to occur more than 2 consecutive nights.
3. Selection of plant and processes that result in lower vibration levels.
4. All noisy stationary plant to be located as far from noise sensitive receivers as possible and incorporate noise blankets/localised barriers.
5. Implementation of any operational controls (such as barriers/mounds) as early as practical. In this regard, it is noted that the Operational Noise and Vibration Review (REMM ONV1) is yet to be completed and the findings will be implemented where relevant once the Review is completed.
6. Non-tonal reversing alarms or equivalent are to be used on all plant that will regularly be used on site.
7. The JV will take all reasonable steps to communicate with the proponents of other nearby works sites to minimise cumulative acoustic impacts where there is a risk that other construction projects are impacting the same receivers.
8. Consultation with affected receivers as per CCS will be ongoing.

Furthermore, as required by CoA E39, the following measures are to be implemented:

- Highly noise intensive works (refer CoA E39) shall not be undertaken for more than 3 continuous hours after which a 1-hour respite shall be implemented.
- Such works can only occur from 8:00am and 6:00pm on weekdays and 8:00am and 1:00pm Saturdays.

For these works, highly noise intensive works include all vibration intensive works (refer **Table 11**).

Given that exceedance of NMLs have been predicted for the delivery of oversized plant, compliance with EPL L4.4 and L4.9 will be required with particular reference to:

- Notification.
- Complaints Management.
- Monitoring of noise impacts.

- Deliveries only to occur between 6:00pm (Monday to Friday) and 7:00am the next day and no more than:
 - 2 consecutive evenings and/or nights at any time; and
 - 3 evenings and/or nights per week; and
 - 10 evenings and/or nights per month.

8.2 Additional Mitigation Measures

In line with the CNVS, AMMs for airborne noise will be provided based on the exceedance above the NML whereas for ground-borne vibration, exceedance of the maximum vibration level is considered.

The description of each AMM in accordance with CNVS are reproduced in **Table 18**. The CNVS identifies the level of impact which triggers consideration of each measure. Refer to **Table 19** and **Table 20** regarding Airborne Noise and Ground-borne Vibration AMMs applicable for this Site.

During the planning of the works, the Community Liaison Team will liaise with the Project Team for the implementation of the selected measures following whether each measure is feasible and reasonable. The objective of these measures is to engage, inform and provide Project-specific messages to the community, recognising that advanced warning of potential disruptions can assist in reducing the impact.

Table 18 Additional Mitigation Measures

Measure	Description
Alternative Accommodation (AA) ¹	Alternative accommodation options may be provided for residents living in close proximity to construction works that are likely to incur unreasonably high impacts over an extended period of time. Alternative accommodation will be determined on a case-by-case basis.
Monitoring (M)	Where it has been identified that specific construction activities are likely to exceed the relevant noise or vibration goals, noise or vibration monitoring may be conducted at the affected receiver(s) or a nominated representative location (typically the nearest receiver where more than one receiver have been identified). Monitoring can be in the form of either unattended logging or operator attended surveys. The purpose of monitoring is to inform the relevant personnel when the noise or vibration goal has been exceeded so that additional management measures may be implemented.
Individual briefings (IB)	Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project.
Letter box drops (LB)	For each Sydney Metro project, a newsletter is produced and distributed to the local community via letterbox drop and the project mailing list. These newsletters provide an overview of current and upcoming works across the project and other topics of interest. The objective is to engage and inform and provide project-specific messages. Advanced warning of potential disruptions (e.g. traffic changes or noisy works) can assist in reducing the impact on the community. Content and newsletter length is determined on a project-by-project basis. Most projects distribute notifications on a monthly basis. Each newsletter is graphically designed within a branded template.
Project specific respite offer (RO) ¹	The purpose of a project specific respite offer is to provide residents subjected to lengthy periods of noise or vibration respite from an ongoing impact.
Phone calls and emails (PC)	Phone calls and/or emails detailing relevant information would be made to identified/affected stakeholders within 7 days of proposed work. Phone calls and/or emails provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs etc.
Specific notifications (SN)	Specific notifications would be letterbox dropped or hand distributed to identified stakeholders no later than 7 days ahead of construction activities that are likely to exceed the noise objectives. This form of communication is used to support periodic notifications, or to advertise unscheduled works.

Note 1: Measures typically reserved for residential properties.

Table 19 AMM Matrix - Airborne Construction Noise

Time Period		Mitigation Measures			
		Predicted $L_{Aeq(15\text{minute})}$ Noise Level Above NML			
		0 to 10 dB	10 to 20 dB	20 to 30 dB	>30 dB
Standard Hours	Mon-Fri (7.00 am - 6.00 pm)	-	LB	LB, M, SN	LB, M, SN
	Sat (8.00 am - 6.00 pm)				
	Sun/Pub Hol (Nil)				
OOH (Night)	Mon-Fri (7.00 am - 6.00 pm)	LB	LB, M, SN, RO	LB, M, SN, IB, PC, RO, AA	LB, M, SN, IB, PC, RO, AA
	Sat (8.00 am - 6.00 pm)				
	Sun/Pub Hol (Nil)				

Table 20 AMM Matrix - Ground-borne Construction Vibration

Time Period		Mitigation Measures
		Predicted Vibration Levels Exceed Maximum Levels
Standard Hours	Mon-Fri (7.00 am - 6.00 pm)	LB, M, RO
	Sat (8.00 am - 6.00 pm)	
	Sun/Pub Hol (Nil)	

The number of receivers where NMLs are exceeded are provided in **Table 21** and **Table 22**. Furthermore, to inform the Communications Team, both exceedance maps and associated predicted levels to receivers where NMLs are exceeded are provided in **Appendix C** and **Appendix E**.

Regarding the proposed night deliveries with impacts presented in **Table 22** and **Appendix C**, impacts will be managed as per mitigations, AMMs as triggered, and monitoring required as per EPL condition L4.9. Furthermore, respite offer will be offered following consultation with the community as per E57.

The number of receivers located within the buffer distance for vibration criteria (**Table 15**) with vibration level potentially exceeding the ground-borne vibration criteria (AMMs as triggered as per **Table 20**) are provided **Appendix E** (maps) and **Appendix F** (tabulated receiver identification).

Table 21 Number of Receivers Where NMLs are Exceeded - Daytime (Standard Hours)

Concurrent Scenario	Number of Receivers Where Construction NMLs Are Exceeded and AMM Category																			
	0 to 10 dB					10 to 20 dB					20 to 30 dB					> 30 dB				
	NCA05	NCA06	NCA07	NCA08	NCA09	NCA05	NCA06	NCA07	NCA08	NCA09	NCA05	NCA06	NCA07	NCA08	NCA09	NCA05	NCA06	NCA07	NCA08	NCA09
S1	-	15	-	17	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-
S2.1	-	41	-	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S2.2	-	42	-	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S3.1	-	42	-	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S3.2	-	32	-	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S4	-	39	-	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S5	-	126	-	47	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-
S6.1	-	61	-	39	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-
S6.2	-	74	-	39	-	-	11	-	1	-	-	-	-	-	-	-	-	-	-	-
S7	-	39	-	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 22 Number of Receivers Where NMLs are Exceeded - Night (OOH)

Concurrent Scenario	Number of Receivers Where Construction NMLs Are Exceeded and AMM Category																			
	0 to 10 dB					10 to 20 dB					20 to 30 dB					> 30 dB				
	NCA05	NCA06	NCA07	NCA08	NCA09	NCA05	NCA06	NCA07	NCA08	NCA09	NCA05	NCA06	NCA07	NCA08	NCA09	NCA05	NCA06	NCA07	NCA08	NCA09
S8	-	3	-	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

8.2.1 Monitoring of Noise and Vibration

Where required, noise and vibration monitoring shall be undertaken during construction by suitably qualified persons in accordance with Sydney Metro (and EPA) requirements in order to confirm that the noise or vibration levels in the adjacent community are consistent with the predictions in this DNVIS and that appropriate mitigation is in place or otherwise required.

Where monitoring is required, operator attended measurements are preferred and are to be undertaken at the nearest and/or highest impacted sensitive receivers at the time of the survey. Notes and photos to confirm events associated with the works or otherwise should be taken where permitted. The final monitoring location will depend on the works being undertaken and their location to nearby receivers (particularly residential) at the time of the survey.

Alternatively, unattended monitoring may be undertaken which shall include real-time monitoring data (with real-time alerts if required). Monitors are to be installed at locations representative of highest potential impacts. Such locations are likely to fall within private land, e.g. opposite Kent Road and Lansdowne Road, and therefore the final location(s) will be determined based on suitability and permission to access private land.

For standard hours construction, construction airborne noise impacts are expected to exceed NMLs by up to 10dB to 20dB which will trigger the requirement of letter box drops (refer **Table 18**) but will not require the conduction of noise monitoring.

In relation to night delivery operations, monitoring is required as per condition L4.9. The receiver locations listed below (refer **Appendix C** and **Appendix E**) have been identified as the potentially highest impacted receivers and are recommended as monitoring locations unless otherwise determined on site.

- 40-48 Lansdowne Road (Building IDs 2565 and 2547)
- 50-54 Lansdowne Road (Building ID 2567)

For receivers triggering monitoring for vibration intensive works associated with the use of a 12t vibratory roller during roadworks, vibration monitoring is to take place to confirm predicted levels against the management levels provided in **Table 7** and whether further mitigation is required. Monitoring is to take place at the receivers along Kent Road and Lansdowne Road as outlined in **Appendix D** and **Appendix F**.

8.2.2 Operator Attended Plant and Equipment Noise Audits

Internal compliance auditing of plant and equipment noise emissions would be undertaken via operator attended measurements of a representative selection of plant and equipment used on-site to confirm that the operating noise levels comply with the sound power levels in **Table 9**. Off-site plant noise auditing may be requested at any time by Sydney Metro, if inspections indicate that plant used on site is louder than expected. In line with recent Sydney Metro projects, it is sensible to firstly target plant and equipment that appear to be excessively noisy than expected and those assumed to have a noise level of 105dBA or greater.

9 Conclusion

A detailed construction noise and vibration impact assessment for the construction of Orchard Hills Station associated with the Sydney Metro Western Sydney Airport (Stations, Systems, Trains, Operations and Maintenance package) has been completed by VMS Australia Pty Ltd.

Considering worst case construction scenarios, the assessment concludes the following:

- Impacts associated with construction traffic along the public road network due to the potential increase of noise levels are considered compliant without the need for further mitigation.
- Impacts associated with construction vibration from site works are generally considered negligible with the exception of Roadworks that require mitigation and AMMs to impacted receivers within NCA08 as outlined in Section 8.
- Impacts associated with construction airborne noise from site works are predicted to exceed NMLs within NCA06 and NCA08 (refer **Table 12**, **Table 13** and **Table 14**). During standard hours, the exceedance will be, at worst within the 10dB to 20dB exceedance category and during the night where some oversized deliveries will occur the worst-case exceedances are in the 0dB to 10dB exceedance category with negligible sleep disturbance impacts. Exceedances can be effectively managed with the implementation of the mitigation measures outlined in Section 8.

Abbreviations and Terminology

Term/Acronym	Definition
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.
AMM	Additional Mitigation Measures
AS	Australian Standard
A-weighting	A frequency dependent filter applied to an instrument-measured noise. In its simplest form, the filter is designed to replicate the relative sensitivity to loudness perceived by the human ear.
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. 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 LA90 noise level.
Barrier	Solid walls or partitions, solid fences, earth mounds, earth berms, buildings, etc. used to reduce noise.
CEMP	Construction Environmental Management Plan
CNVS	Sydney Metro Construction Noise and Vibration Standard
CoA	Conditions of Approval
Condition	Planning Minister's Condition of Approval
Construction	Includes all physical work required to construct the Project, as defined in the CoA including commissioning trials of equipment and temporary use of any part of the Project
CR	Complaints Register
dB(A)	A-weighted decibels is an expression of the relative loudness of sounds in the air as perceived by the human ear.
DNVIS	Detailed Noise and Vibration Impact Statement
EIS	Environmental Impact Statement
EM	Environment Manager
EMS	Environmental Management System
Environment	Includes all aspects of the surroundings of humans, whether affecting any human as an individual or in his or her social groupings
EPA	NSW Environmental Protection Authority
EPL	Environmental Protection License
ER	The independent Environmental Representative appointed under the Project Planning Approval
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Engineering considerations and what is practical to build. Reasonable Feasible relates to relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
Frequency	Frequency is synonymous to pitch. Frequency or pitch can be measured on a scale in units of Hertz (Hz). Most noise sources typically comprise of a vast, and often complex, range of frequencies.
HNA	Highly Noise Affected
Heavy Vehicle	Has the same meaning as in the Heavy Vehicle National Law
ICNG	Interim Construction Noise Guideline (EPA, 2009)
LAeq	The equivalent continuous sound pressure level in dB(A). It is often accompanied by an additional suffix "T", which is indicative of the measurement time period. (e.g. LAeq,15min, symbolising the measurement is evaluated over 15-minutes).
Land	Has the same meaning as the definition of the term in section 1.4 of the EP&A Act
NCA	Noise Catchment Area
Negligible	Small and unimportant, such as to be not worth considering
NML	Project Specific Noise Management Level
NPfi	NSW Environment Protection Authority, Noise Policy for Industry. 2017
Operator	The principal construction contractor responsible for delivering the Project.

Appendix A

Glossary / Abbreviations

21239.1.6

Term/Acronym	Definition
Parklife Metro	Consortium comprising entities of Plenary, Siemens, RATP Dev and Webuild as the Applicant for the Sydney Metro Western Sydney Airport SSTOM Package.
Parklife Metro D&C	Parklife Metro Design and Construct. Consists of Webuild S.P.A, Siemens Mobility Pty Ltd and Richard Crookes Constructions Pty Ltd. Responsible for the construction of SSTOM Works.
Peak Particle Velocity	The peak particle velocity (PPV) is the most accepted and used indicator of vibration levels. Most regulations and standards prescribe vibrations thresholds in terms of the PPV. For each recorded waveform, the maximum particle velocity over the total recorded time is regarded as the peak particle velocity. This type of particle velocity must not be confused with the velocity with which the wave propagates through the medium. PPV is typically measured in the units of mm/s.
RBL	The Rating Background Level for each period is the medium value of the Assessment Background Level values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night).
REMM	Revised Environmental Management Measures as per the Submissions Report.
Residence	Existing or approved dwelling.
Reverberation	The persistence of a sound within a space, which will naturally decay over time. Most apparent once the source signal has ceased emitting. Reverberation may have effects on speech intelligibility if not adequately controlled. Reverberation time, represented in seconds, can vary depending on the volume and surface finishes of the space.
RMS	NSW Roads and Maritime Services.
RNP	NSW Road Noise Policy (DECCW 2011).
Rw	Weighted sound reduction index. A single number value which represents the airborne sound insulation performance of a partition or building element that has been determined under laboratory testing conditions.
Sensitive periods	Period of time determined in consultation with affected sensitive receiver.
Sensitive receiver	Includes residences, educational institutions (including preschools, schools, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), child care centres, passive recreation areas (including outdoor grounds used for teaching), active recreation areas (including parks and sports grounds). Receivers that may be considered to be sensitive include commercial premises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping grounds, restaurants, office premises, and retail spaces) and industrial premises, and others as identified by the Secretary.
Sound Power Level	The Sound Power Level is the sound power relative to a standard reference pressure of 1pW (20x10 ⁻¹² Watts) on a decibel scale. Unlike sound pressure, sound power is neither room-dependent nor distance-dependent. The SWL of a simple point source may be used to calculate the SPL at a given distance (r) using the following formula: $SPL = SWL - 10 \times \text{Log}_{10}(4 \times \pi \times r^2)$ Note that the above formula is only valid for sound propagation in the free-field (see below).
Spectrum	The spectrum is the result of transforming a time domain signal to the frequency domain. Spectrum analysis is the procedure of doing the transformation, and it is most commonly done with an FFT analyser.
SSTOM	Stations, Systems, Trains, Operations and Maintenance.
TfNSW	Transport for New South Wales.
the Project	Sydney Metro Western Sydney Airport.
VDV	Vibration Dose Value
VMS	VMS Australia Pty Ltd.
Works	All physical activities to construct the Project.

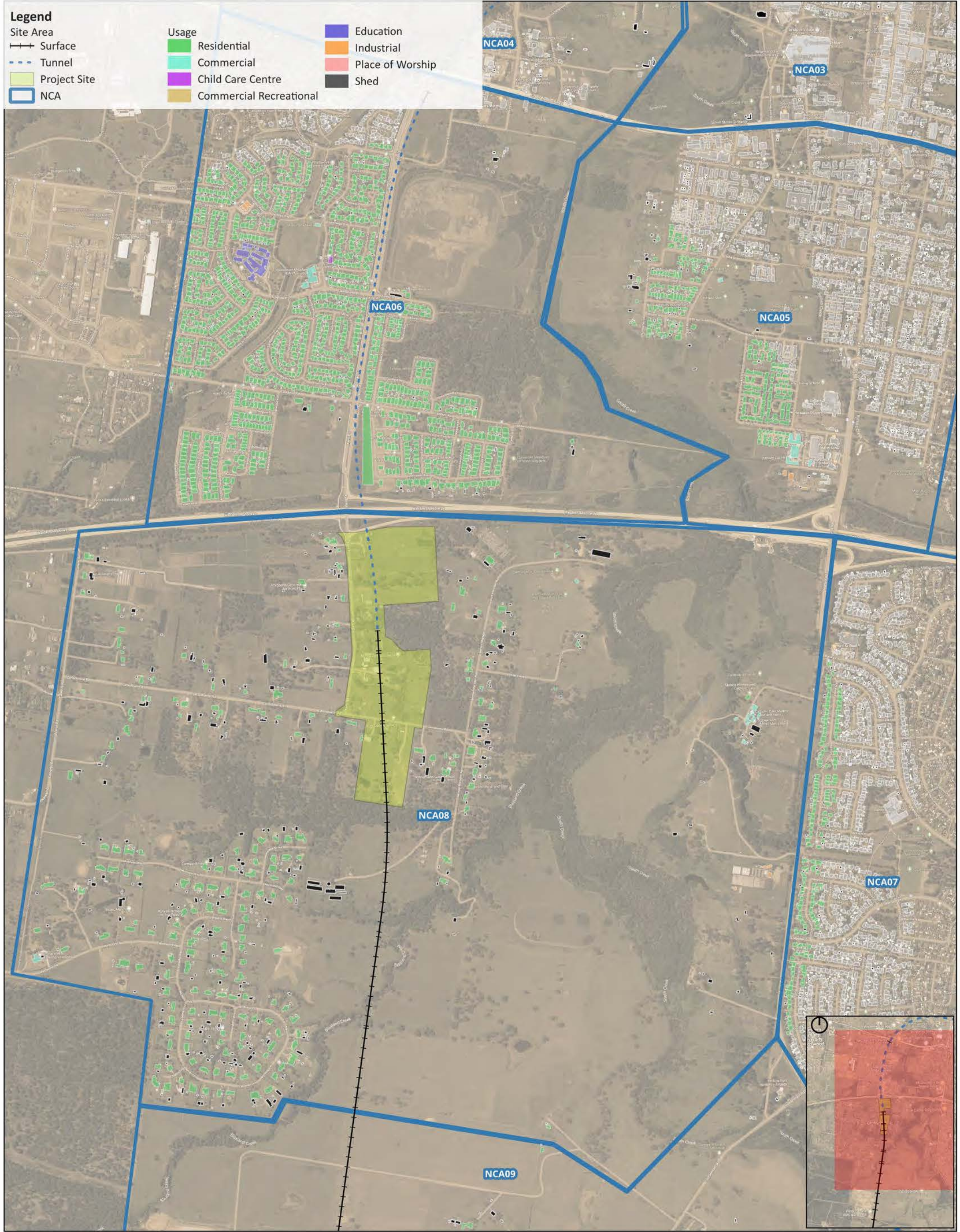
Legend

Site Area

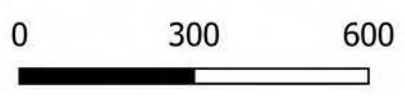
- Surface
- Tunnel
- Project Site
- NCA

Usage

- Residential
- Commercial
- Child Care Centre
- Commercial Recreational
- Education
- Industrial
- Place of Worship
- Shed



Project No.:	21239.1
Date:	29/11/2023
Drawn by:	M5
Scale:	1:13,000
Sheet Size:	@A3
Projection:	GDA94 / MGA zone 56



SSTOM: Orchard Hills Station

Land Usage



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This document may be based on data provided by third parties for which VMS Australia Pty Ltd cannot guarantee the accuracy.