

Sydney Metro WSA - SSTOM – STM – Detailed Noise and Vibration Impact Statement – Concrete Works


SMWSASSM-PLD-STM-SN100-NV-RPT-000003

Parklife Metro D&C

Version Control

| Revision | Author | Date | Comments | Approved by |
|----------|------------|------------|-----------------------------------|-------------|
| A | [REDACTED] | 6/11/2023 | Draft for submission | [REDACTED] |
| 00 | [REDACTED] | 28/11/2023 | Response to SM and ER Comments | [REDACTED] |

Signature



Detailed Noise and Vibration Impact Statement
Sydney Metro Western Sydney Airport SSTOM Package
St Marys Station - Concreting Works OOH - EPL
Variation



Report Number 21239.1.8

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| Reference | Status | Date | Prepared | Checked | Authorised |
|-----------|------------|------------------|------------|------------|------------|
| 21239.1.8 | Draft 1 | 2 November 2023 | ██████████ | ██████████ | ██████████ |
| 21239.1.8 | Revision 0 | 3 November 2023 | ██████████ | ██████████ | ██████████ |
| 21239.1.8 | Revision 1 | 23 November 2023 | ██████████ | █ | █ |

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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 the 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 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 in relation to the proposed Out of Hours (OOH) concreting works. This DNVIS is intended to support a variation of Environment Protection Licence (EPL) 21807 to account for the risk that concreting works will extend beyond Standard Construction hours as approved.

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

2 Overall Project Description

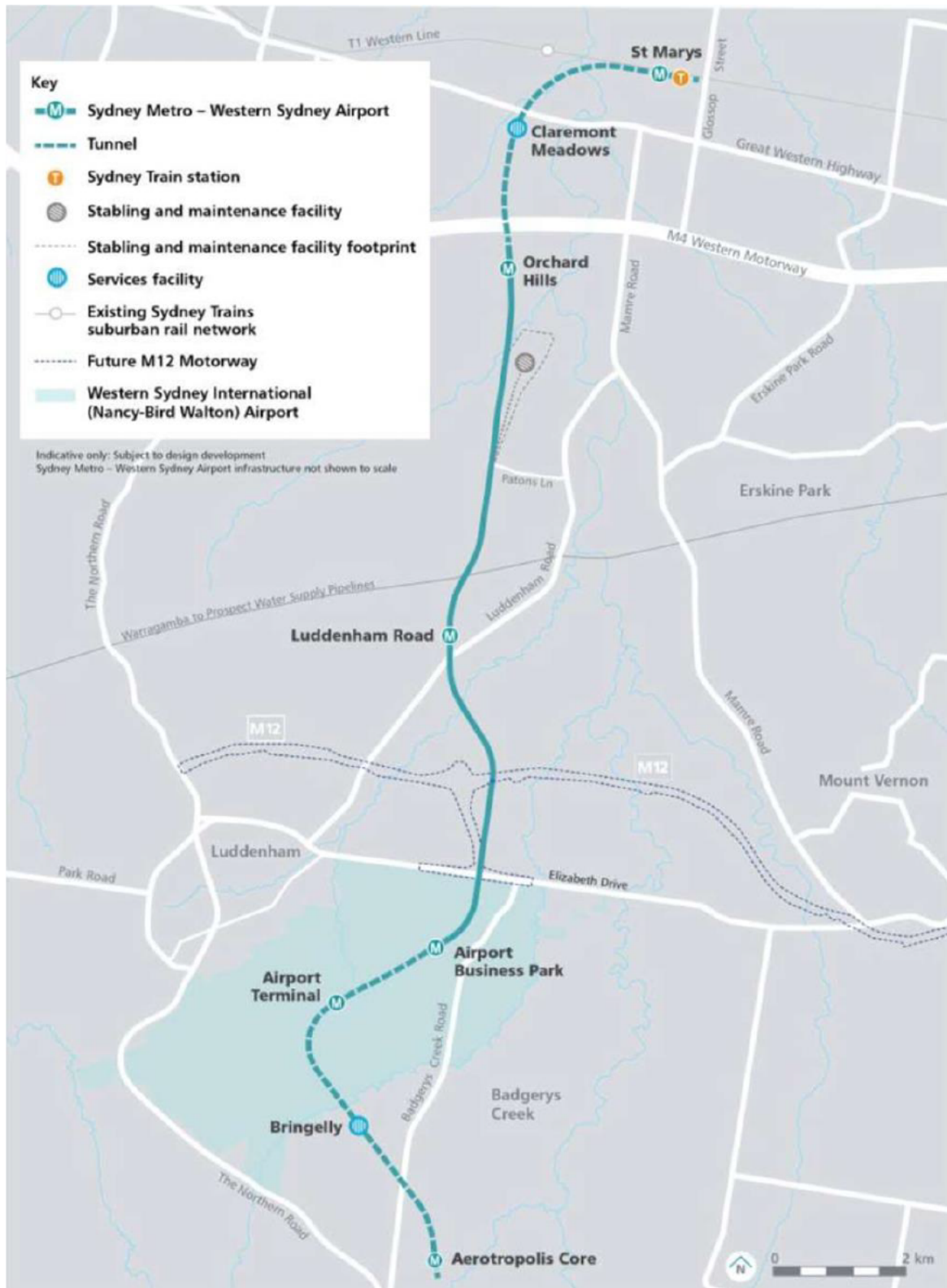
In terms of construction works, the SSTOM Works scope as part of the SMWSA Project includes:

- 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 St Marys Station and in particular a variation of Environment Protection Licence (EPL) 21807 to account for the risk that concreting works will extend beyond Standard Construction hours as approved.

Given the risk, the JV proposes to seek approval to extend concreting works into the evening to 10:00pm on weekdays and to 4:00pm (still considered day period as per EPA definitions) on Saturdays as required.

The variation to permit concreting works outside of standard construction hours as specified in L4.1 will be implemented via an additional Condition to be added to the EPL as suggested by the JV below:

“L4.10 Concrete works associated with stations, track slab and ancillary facilities, including concrete pouring, finishing and cleaning, are permitted to be undertaken outside of standard construction hours specified in L4.1 provided that:

- a) Works are required to achieve compliance with overarching project technical requirements,*
- b) Works had already begun within a reasonable time prior to end of standard construction hours,*
- c) OOH works are undertaken from 6pm to 10pm, Monday to Friday and 1pm to 4pm on Saturday,*
- d) Concreting activities (e.g. using concrete pump, vibrators, concrete trucks, etc) must be completed before 9pm on Monday to Friday,*
- e) Concrete finishing works (e.g. power floats, hand tools) must be completed before 10pm on Monday to Friday.*
- f) Works are permitted to occur until 31 March 2024.”*

Justification is provided separately by the JV, however in brief the following summary is relevant:

- Length and size of concrete pours may require lengthy pours that cannot be stopped once started.
- Temperature constraints may lead to concrete pours being scheduled during periods of the day when the ambient temperature is cooler, particularly during summer months.

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

- West of Gidley Street.
- South of the existing rail line.
- East of Glossop Street.
- North of Phillip Street, between Gidley Street and the access road to site parking, north of the access road and Chesham Street.

Concreting work will involve two scenarios consisting of concreting pouring and connecting finishing. Concrete pouring works are proposed to take place within three potential work areas, where at most two of these work areas will be operating concurrently. These work areas are referred to as Pump 1 located to the west of the site, Pump 2 located to the east of the site, and Pump 3 which spans across the northern end of the station box and includes six potential locations. Work areas are presented in to **Figure 2**. Concrete finishing works will take place within the station box.

Based on the above, the main construction work scenarios addressed in this DNVIS are summarised in **Table 1** and include the work periods for each scenario.

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.

Table 1 DNVIS Summary of Works

| Scenario ID | Work Activity | Work as Scheduled |
|-------------|-------------------------------------|-----------------------------|
| S1 | Concrete Works - Concrete Pour | November 2023 to March 2024 |
| S2 | Concrete Works - Concrete Finishing | November 2023 to March 2024 |

Figure 2 St Marys Station Site Plan - Concreting Works



Source: Parklife Metro JV

2.2 Project Compliance Management

In relation to the proposed OOH works, compliance is required with the EPL 21807 document.

In addition, this assessment is conducted in consideration and accordance with the Sydney Metro Western Sydney Airport (SMWSA) - SSI 10051.

Considering the relevant aspects of the above documents, compliance is summarised in **Table 2** which also includes relevant Revised Environmental Mitigation Measures (REMMs).

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

- Department of Environment & Climate Change NSW (DEC - now the EPA) - Interim Construction Noise Guideline (ICNG).
- JV - Construction Environmental Management Plan (CEMP).
- JV - Construction Traffic Management Plan - St Marys Station (CTMP).
- 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 2 Project Compliance Management Summary

| ID | Condition | DNVIS Reference |
|---|--|---|
| SMWSA - Conditions of Approval - SSI 10051 - Noise and Vibration | | |
| 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 2 |
| 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. | OOH works to take place as permitted by an EPL. |
| 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; | Condition E41(c)(i) applies as this DNVIS is intended to support approval of variation of work hours via EPL. |
| E42 | Out-of-Hours Work Protocol - Work not subject to an EPL... | Refer to NVMP. |

| ID | Condition | DNVIS Reference |
|-----|---|---|
| E43 | <p>Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration criteria:</p> <p>a) construction 'Noise affected' noise management levels established using the Interim Construction Noise Guideline (DECC, 2009);</p> <p>b) preferred vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure);</p> <p>c) Australian Standard AS 2187.2 – 2006 "Explosives – Storage and Use – Use of Explosives" (for human exposure);</p> <p>d) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and</p> <p>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).</p> <p>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.</p> <p>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.</p> | <p>Section 4</p> <p>Section 5</p> <p>Section 6</p> |
| E44 | <p>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.</p> | Section 6 |
| E45 | <p>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.</p> | Section 6 |
| E46 | <p>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:</p> <p>a) use of regularly serviced low sound power equipment;</p> <p>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;</p> <p>c) use of non-tonal reversing alarms; and</p> <p>d) use of alternative construction and demolition techniques.</p> | Section 6 |
| 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. No properties are at risk of exceeding the screening criteria for cosmetic damage. |
| 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> | Highly noise affected not triggered. |

| ID | Condition | DNVIS Reference |
|-----|--|--|
| 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> <p>(a) all significant noise producing equipment that would be used during the night-time would be inside the sheds, where feasible and reasonable;</p> <p>(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</p> <p>(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.</p> | 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> | NA to this DNVIS. No vibration intensive works. |
| E55 | <p>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.</p> | Not triggered. |
| E56 | <p>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:</p> <p>(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</p> <p>(b) consider the provision of alternative respite or mitigation to impacted noise sensitive land use(s); and</p> <p>(c) provide documentary evidence to the ER in support of any decision made by the Proponent in relation to respite or mitigation.</p> <p>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.</p> | The JV is conducting ongoing coordination with other contractors to ensure that respite periods are maintained throughout the works. |

| ID | Condition | DNVIS Reference |
|--------------------|--|---|
| E57 | <p>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:</p> <p>(a) a progressive schedule for periods no less than three (3) months, of likely out-of-hours work;</p> <p>(b) a description of the potential work, location and duration of the out-of-hours work;</p> <p>(c) the noise characteristics and likely noise levels of the work; and</p> <p>(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).</p> <p>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.</p> <p>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.</p> | As notified by the JV, consultation will be undertaken in accordance with this Condition, and in accordance with the EPL. |
| EPL - 21807 | | |
| L2.1 | <p>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:</p> <p>a) implement the guidance in the Interim Construction Noise Guideline (DEC, 2009) and the Assessing Vibration: a technical guideline (DEC, 2006);</p> <p>b) implement all reasonable and feasible measures to minimise noise impacts in accordance with the Interim Construction Noise Guideline (DEC, 2009); and</p> <p>c) implement vibration mitigation in accordance with the Assessing Vibration: a Technical Guideline (DEC, 2006).</p> <p>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).</p> | Section 4 Section 6 |
| L2.2 | <p>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.</p> | Not triggered. No High Noise Impact Activities and Works are planned. |
| L3.1 | <p>All blasting activities are prohibited on the licensed premises.</p> | Not triggered. Blasting not proposed. |
| L4.1 | <p>Standard construction hours</p> <p>Unless permitted by another condition of this licence, works and activities must:</p> <p>a) only be undertaken between the hours of 7:00 am and 6:00 pm Monday to Friday;</p> <p>b) only be undertaken between the hours of 8:00 am and 1:00 pm Saturday; and</p> <p>c) not be undertaken on Sundays or Public Holidays.</p> | This DNVIS is intended to support variation to EPL regarding OOH concreting works. |
| 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> <p>a) between 8:00 am and 6:00 pm Monday to Friday;</p> <p>b) between 8:00 am and 1:00 pm Saturday; and</p> <p>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> <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> | This DNVIS is intended to support variation to EPL regarding OOH concreting works. |

| ID | Condition | DNVIS Reference |
|------|---|--|
| 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> <p>a) LAeq(15 minute) noise levels greater than 5dB above the day, evening and night Rating Background Level (RBL) as applicable;</p> <p>b) LAmax noise levels greater than 15dB above the night RBL for night works;</p> <p>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</p> <p>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> <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> | This DNVIS is intended to support variation to EPL regarding OOH concreting works. |
| 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> <p>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;</p> <p>ii. be undertaken by letterbox drop, email, text message or other targeted and equivalent method; and</p> <p>iii. be detailed on the project website or other relevant website notified to the EPA.</p> <p>b) The notification required by this Condition must:</p> <p>i. clearly outline the reason that the work is required to be undertaken outside the hours specified in condition L4.1;</p> <p>ii. include a diagram that clearly identifies the location of the proposed works in relation to nearby cross streets and local landmarks;</p> <p>iii. include details of the date, timing and relevant time restrictions that apply to the proposed works;</p> <p>iv. clearly outline in plain English, the location, nature, scope and duration of the proposed works;</p> <p>v. detail the expected noise impact of the works on Noise Sensitive Receivers;</p> <p>vi. clearly state how complaints may be made and additional information obtained;</p> <p>vii. include the number of the telephone complaints line required by condition M5.1, an after hours contact phone number specific to the works undertaken outside the hours specified in condition L4.1, and the project website address; and</p> <p>viii. include consideration of culturally and linguistically diverse Noise Sensitive Receivers where required.</p> | Section 6 |

| ID | Condition | DNVIS Reference |
|------|--|--|
| 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> | NA to this DNVIS. |
| L4.7 | 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. | Noted. Refer to CNVMP. |
| 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. | This DNVIS is intended to support variation to EPL regarding OOH concreting works. |

| ID | Condition | 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 is intended to support variation to EPL regarding OOH concreting works. |
| 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 6 |
| 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 6 |
| M2.3 | <p>All vibration monitoring must be:</p> <p>a) undertaken in accordance with the technical guidance provided in the Assessing Vibration: a technical guideline (DEC, 2006); and</p> <p>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.</p> | NA to this DNVIS. No vibration intensive works. |

| ID | Condition | DNVIS Reference |
|--------------|---|---|
| M2.4 | <p>The licensee must undertake noise and vibration monitoring as directed by an authorised officer of the EPA.</p> <p>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.</p> | Noted. |
| M2.5 | <p>Additional Monitoring Conditions</p> <p>The licensee must undertake monitoring, sampling, video recording and/or take photographs:</p> <p>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);</p> <p>b) as soon as practicable; and</p> <p>c) as directed by an authorised officer.</p> | Section 6 |
| REMMs | | |
| ONV1 | <p>An Operational Noise and Vibration Review would be prepared during design to confirm the mitigation measures required to manage:</p> <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 <p>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.</p> | Section 6 |
| NAH6 | <p>The following heritage items would be monitored for potential vibration impacts during construction:</p> <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 | NA to this DNVIS. No vibration intensive works. |

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 most useful in determining the NMLs for residential receivers as these are based on the measured existing background noise levels in the area.

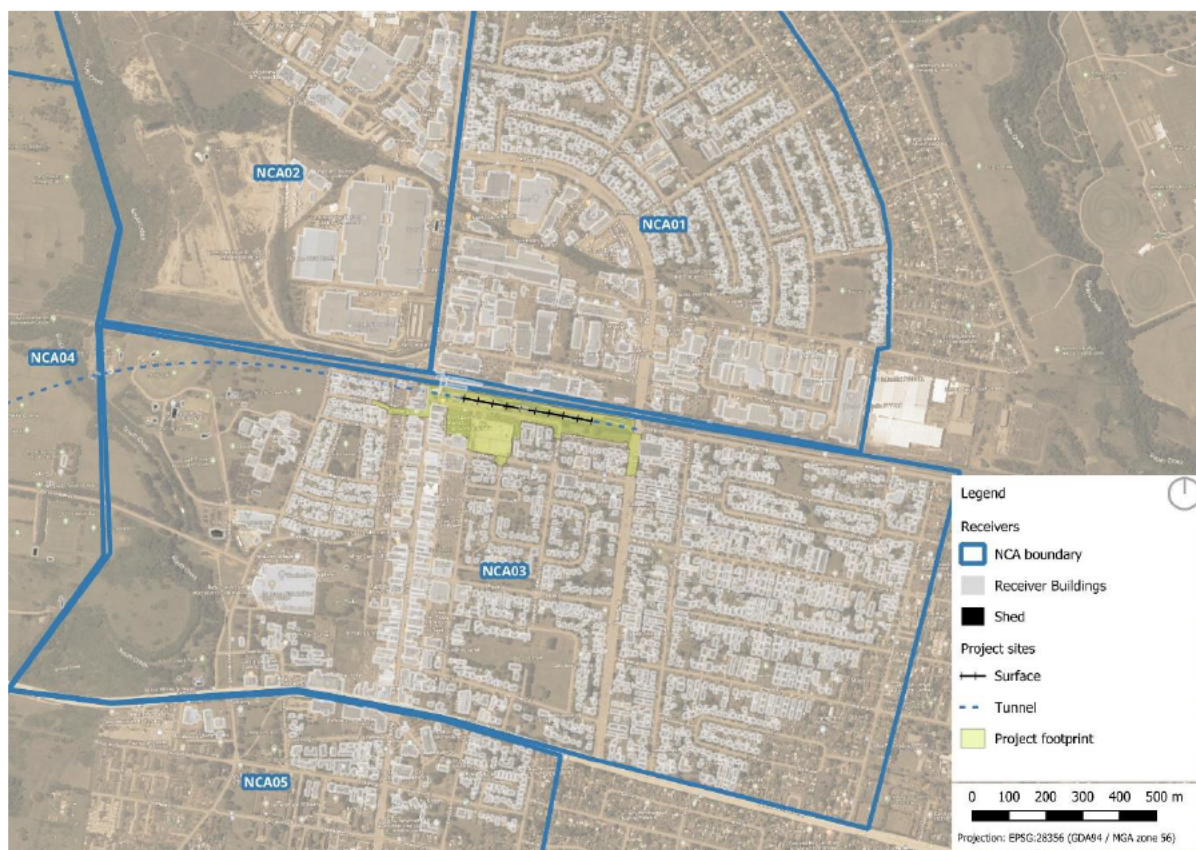
For St Marys Station, the noise sensitive receivers within 5 catchments, NCA01 to NCA05 are likely considered most relevant, as such the overview of these NCAs are described in **Table 3** and presented in **Figure 3**. This information is consistent with the NVMP.

Table 3 Relevant Noise Catchment Areas

| NCA | Description of the Area |
|-------|---|
| NCA01 | Medium density single and multistorey residential dwellings north of the project at St Marys. Ambient noise conditions are dominated by road and rail traffic noise from Glossop Street and Forrester Road, and the existing Sydney Trains suburban rail network. Includes commercial and industrial receivers along Kurrajong Road and Glossop Street. |
| NCA02 | Predominantly industrial and commercial receivers located to the north St Marys Station and the project. |
| NCA03 | Predominantly medium density single and multi-storey residential dwellings, with commercial receivers located along Queen Street. Ambient noise conditions are dominated by traffic along the existing heavy rail line through St Marys Station, and traffic along Queen Street. |
| NCA04 | Medium density residential dwellings are grouped around Werrington Station to the north of the project, with Wollemi College and Cobham Detention to the west. |
| NCA05 | Predominantly medium density single and multi-storey residential dwellings. Ambient noise conditions are dominated by traffic along Mamre 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. Base information within NCA01 to NCA05 was locked in for this assessment after July 2023 to account for any changes to surrounding receivers of to current and existing development.

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:

- East of Glossop Street (directly across site entry gate).
- South of Phillip Street, between Gidley Street and the access road to site parking and also south of the access road and Chesham Street (south of site Noise Barrier).

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

Furthermore, the concreting works do not include any vibration intensive works and the EPL does not consider off-site construction traffic noise.

Notwithstanding the above, the previous DVNIS for this site assessed impacts from works during Standard Hours and Oversized Plant Delivery (Ref: 21239.1.5 DVNIS St Marys R3R2 20231012). That assessment considered a worst case scenario from off-site construction traffic and confirmed compliance with construction traffic noise criteria during the day period (up to 10:00pm) provided that no more than 24 trucks leave the site in any hour when travelling along Philip Street.

On this basis, only airborne construction noise impacts for on-site activities are considered in this assessment.

3.3 Existing Typical Noise Environment

Unattended noise monitoring was conducted as part of the EIS within NCA01 to NCA05 in February 2020.

The Rating Background Levels (RBLs) are summarised in **Table 4** and are consistent with the NVMP.

Table 4 Summary of Unattended Rating Background Noise Levels

| NCA | Day ¹ | Evening ¹ | Night ¹ |
|-------|------------------|----------------------|--------------------|
| NCA01 | 38 | 38 ² | 38 ² |
| NCA02 | 37 | 37 ² | 36 |
| NCA03 | 37 | 37 ² | 36 |
| NCA04 | 35 | 32 | 31 |
| NCA05 | 40 | 40 ² | 40 ² |

Note 1: The EPA defines the following time periods (as per the Noise Policy for Industry (NPfI)) when considering noise from a site such as construction noise:

- Day: Monday to Saturday 7:00am to 6:00pm and Sundays and Public Holidays from 8:00am to 6:00pm.
- Evening: 6:00pm to 10:00pm on any day.
- Night: Monday to Saturday 10:00pm to 7:00am and Sundays and Public Holidays from 10:00pm to 8:00am.

Note 2: Where evening or night background noise levels exceed that of the previous period, they have been set at the background noise level of the previous period, in line with the NPfI, to reflect community's expectation for greater noise control during more sensitive periods.

4 Construction Noise Management Levels

4.1 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** and consider the construction hours relevant only to this DNVIS.

Table 5 Construction Noise Management Levels - Airborne Noise from Site

| Receiver | Noise Management Level (NML) ¹ - L _{Aeq(15min)} - dBA | |
|-------------------------------|---|-------------------------------------|
| Residential Receivers | Out of Hours - Day ² | Out of Hours - Evening ³ |
| NCA01 | 43 | 43 |
| NCA02 | 42 | 42 |
| NCA03 | 42 | 42 |
| NCA04 | 40 | 37 |
| NCA05 | 45 | 45 |
| Other Sensitive Receivers | Based on ICNG L _{Aeq(15min)} - dBA | |
| Commercial | 65 | |
| Industrial | 70 | |
| Place of Worship | 55 | |
| Child Care Centre | 55 | |
| Education | 55 | |
| Medical | 65 | |
| Community Active Recreational | 65 | |

Note 1: Applied externally for residential receivers and when in use for other sensitive receivers.

Note 2: Saturday 1:00pm to 4:00pm.

Note 3: Monday to Friday 6:00pm to 10:00pm.

5 Identification of Construction Activities

5.1 Site Related Construction Activities

Considering the main construction work activities (**Table 1**), worst-case scenarios have been developed in consultation with the JV and summarised in **Table 7**.

Refer to **Table 6** regarding the maximum L_{Aeq} sound power levels (SWL) from construction plant. Although reference to the NVMP has been considered, it is well known that these SWLs are generally overly conservative. Therefore, updated SWLs, more inline with modern construction plant have been used. These levels have been used by VMS on other TfNSW projects including the Transport Access Program and Metro Station works successfully and are based on previous measurements. Furthermore, they are broadly similar with SWLs currently used by other acoustic consultants on TfNSW jobs including WSA.

Table 6 Sound Power Levels of Construction Plant

| Plant | Source | SWL (maximum L _{Aeq}) |
|--|--------------|---------------------------------|
| Concrete Pump | VMS database | 105 |
| Concrete Agitator | VMS database | 105 |
| Concrete Screed Helicopter/Concrete Vibrator/Poker | VMS database | 100 |

Table 7 Summary of Site Related Construction Works - Noise

| Scenario ID | Work Activity | Work Area | Time of Works | Concurrently Operating Plant |
|-------------|-----------------|---|-----------------------------|--|
| S1 | Pouring Works | At worst case locations with reference to Figure 2 | November 2023 to March 2024 | 2 x Concrete Pump 2 x Concrete Agitator |
| S2 | Finishing Works | Within the station box. | November 2023 to March 2024 | 1 x Concrete Vibrator |

5.2 Airborne Noise from On-site Construction

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 (3m in height), Noise Wall 02 (2m in height).
- Typical construction octave band spectrum adjusted to consider the scenarios as per **Table 7**.

With consideration of the scenarios as per **Table 7** and the above variables, **Table 8** provides a summary of highest predicted L_{Aeq(15min)} noise levels for each noise sensitive receiver type within each identified NCA.

Table 8 Summary of Predicted Noise from on-site Construction - OOH Evening

| Receiver Type | NML $L_{Aeq(15min)}$ dBA | Predicted ¹ Airborne Noise for each Scenario | |
|----------------------------------|--------------------------|---|-----------|
| | | $L_{Aeq(15min)}$ dBA | |
| | | S1 | S2 |
| Noise Catchment Area 01 | | | |
| Residential | 43 (75 HNA) | 43 | 32 |
| Commercial | 65 | 45 | 34 |
| Industrial | 70 | 71 | 62 |
| Child Care Centre | 55 | 35 | <30 |
| Education | 55 | 38 | <30 |
| Noise Catchment Area 02 | | | |
| Industrial | 60 | 56 | 46 |
| Noise Catchment Area 03 | | | |
| Residential | 42 (75 HNA) | 65 | 55 |
| Commercial | 65 | 65 | 51 |
| Place of Worship | 55 | 40 | <30 |
| Child Care Centre | 55 | 41 | <30 |
| Education | 55 | 46 | 34 |
| Medical | 65 | 48 | 35 |
| Community Active Recreational | 65 | 34 | <30 |
| Noise Catchment Area 04 | | | |
| Commercial | 65 | 35 | <30 |
| Noise Catchment Area 05 | | | |
| Residential | 45 (75 HNA) | 41 | 30 |
| Commercial | 65 | 39 | <30 |
| Place of Worship | 55 | 35 | <30 |
| Child Care Centre | 55 | 37 | <30 |
| Education | 55 | 39 | <30 |
| Medical | 65 | 39 | <30 |

Note 1: Bolded number indicates exceedance of the NML.

The following can be concluded from **Table 8**:

- Exceedances have been predicted for residential receivers within NCA03, however no exceedances above 75dBA (HNA) have been predicted.
- Exceedances have been predicted for industrial receivers within NCA01. Note, such receivers are likely not operational during the evening period.

On the basis of the above, all reasonable and feasible mitigation measures that could reduce noise impacts are to be considered for these receivers, after which, if necessary, additional mitigation measures shall be applied to further manage impacts.

6 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.

6.1 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. Non-tonal reversing alarms or equivalent are to be used on all plant that will regularly be used on site.
3. 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.
4. Consultation with affected receivers as per CCS will be ongoing.
5. The implementation of a local temporary acoustic barrier to be established alongside concrete pumps and agitators during works. The construction of the barrier is to extend a least 2.1m high and 10m wide (extends as least 5m either side of the primary noise source in the direction of the barrier). The barrier is to be located to the east and south of Pump 1, south and west of Pump 2, and south of Pump 3 when under operation. The barriers have been modelled located approximately 2.5m from the source.
 - Predictions via iNoise V2023 indicate at the implementation of a barrier with the above construction will result in a reduction from 65 to 60 dBA to at the highest impacted residential receiver.

Following the implementation of Standard Mitigation Measures, remaining predicted exceedances above NMLs are managed through the implementation of Additional Mitigation Measures as per the CNVS.

6.2 Additional Mitigation Measures

In line with the CNVS, additional mitigation measures (AMM) for airborne noise will be provided based on the exceedance above the NML.

The description of each AMM in accordance with CNVS are reproduced in **Table 9**. The CNVS identifies the level of impact which triggers consideration of each measure. Refer to **Table 10** regarding Airborne Noise 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 9 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.

The number of receivers where NMLs are exceeded is provided in **Table 11**. Furthermore, to inform the Communications Team, both exceedance maps and associated predicted levels to those receivers where the NML was exceeded are provided as **Appendix C** and **Appendix D** to this report.

With reference to **Table 10** and **Table 11**, exceedances may be effectively managed with the implementation of letter box drops (LB) and monitoring (M).

Table 10 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 |
| OOH (Evening) | Mon-Fri (6.00 pm - 10.00 pm) | LB | LB, M | LB, M, SN, RO | LB, M, SN, IB, PC, RO |
| | Sat (1.00 pm - 10.00 pm) | | | | |
| | Sun/Pub Hol (8.00 am – 6.00 pm) | | | | |

Table 11 Number of Receivers Where NMLs are Exceeded - Evening (OOH)

| 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 |
| | NCA03 | NCA03 | NCA03 | NCA03 |
| S1 | 233 | 23 | 6 | - |
| S2 | 21 | 2 | - | - |
| S1-M ¹ | 100 | 16 | - | - |

Note 1: With barrier mitigation applied.

6.2.1 Monitoring of Noise

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 the proposed evening OOH works, 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 9**) and noise monitoring.

6.2.2 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 6**. 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.

Additionally, in light of the revised SWLs for the equipment utilised in this assessment, refer **Table 6**, the JV has committed to conducting SWL audits for the relevant equipment prior to the commencement of OOH concreting works to confirm SWL are at or below the levels outlined in **Table 6**.

7 Conclusion

A detailed construction noise and vibration impact assessment for the proposed OOH concreting works in relation to the construction of St Marys 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 airborne noise from site works are predicted to exceed NMLs (refer **Table 8**).
- Such impacts are to be managed with the implementation of Standard Mitigation Measures which include the implementation of 2.1m high temporary acoustic barriers surrounding concrete pumps and agitators. Standard Mitigation Measures and barrier construction are further detailed in **Section 6.1**.
- Remaining predicted exceedances following the implementation of Standard Mitigation Measures may be effectively managed through the implementation of Additional Mitigation Measures as per the CNVS. Mitigation Measures will include letterbox drops and monitoring as detailed in **Section 6.2**.

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). |
| L_{aeq} | 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. L _{aeq,15min,T} , 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 | Noise Management Level |
| NPfi | Noise Policy for Industry (EPA, 2017). |
| Operator | The principal construction contractor responsible for delivering the Project. |

Appendix A

Glossary / Abbreviations

21239.1.8

| 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 (EPA 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 | <p>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.</p> <p>The SWL of a simple point source may be used to calculate the SPL at a given distance (r) using the following formula:</p> $SPL = SWL - 10 \times \text{Log}_{10}(4 \pi r^2)$ <p>Note that the above formula is only valid for sound propagation in the free-field (see below).</p> |
| 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. |

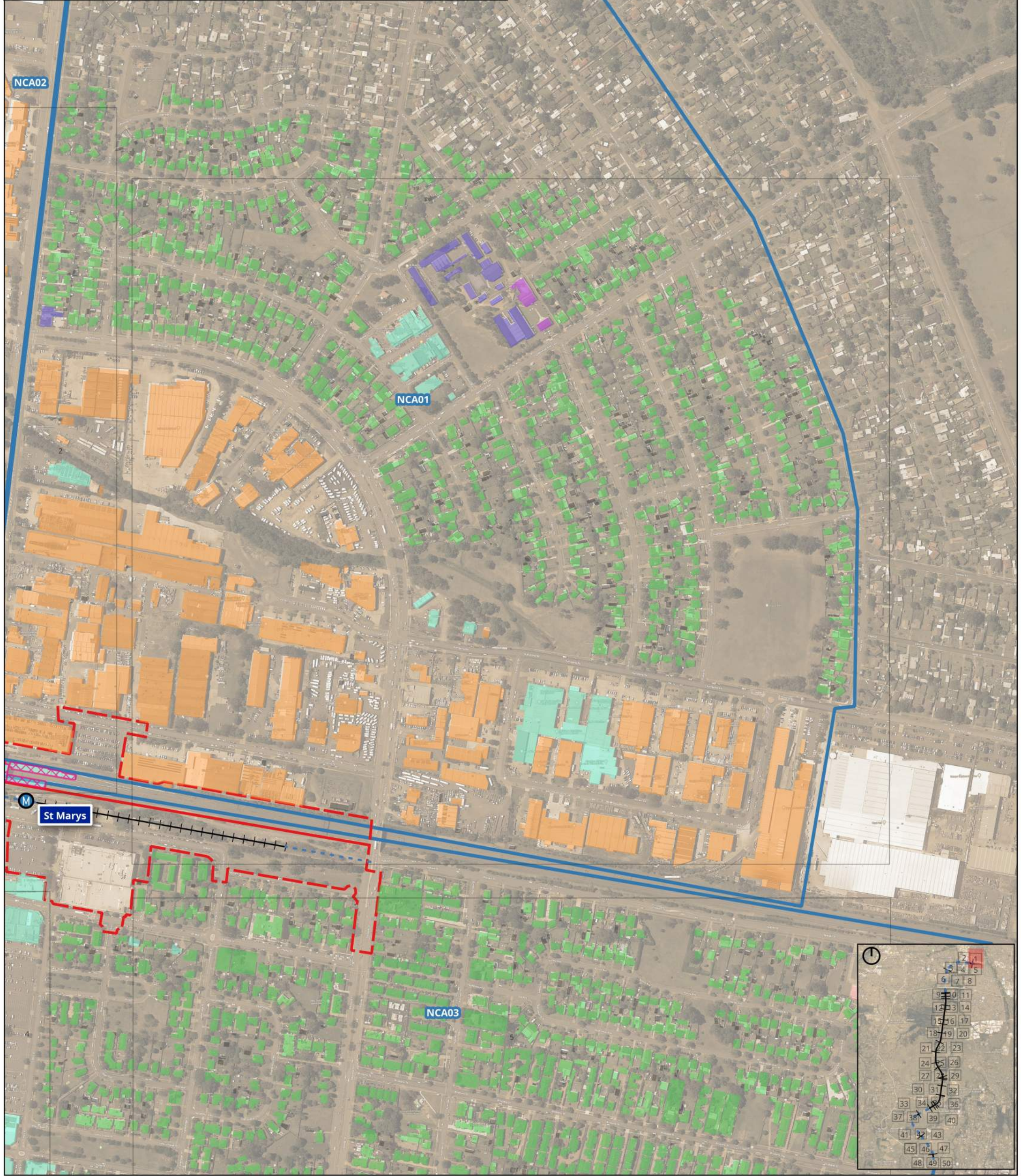
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Site Area

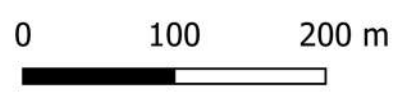
- Construction Footprint
- Stations
- Surface track
- Tunnel
- NCA

Building Usage

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



| | |
|--------------|---------------------|
| Project No.: | 21239.1 |
| Date: | 12/10/2023 |
| Drawn by: | MS |
| Scale: | 1:5,000 |
| Sheet Size: | @A3 |
| Projection: | GDA94 / MGA zone 56 |



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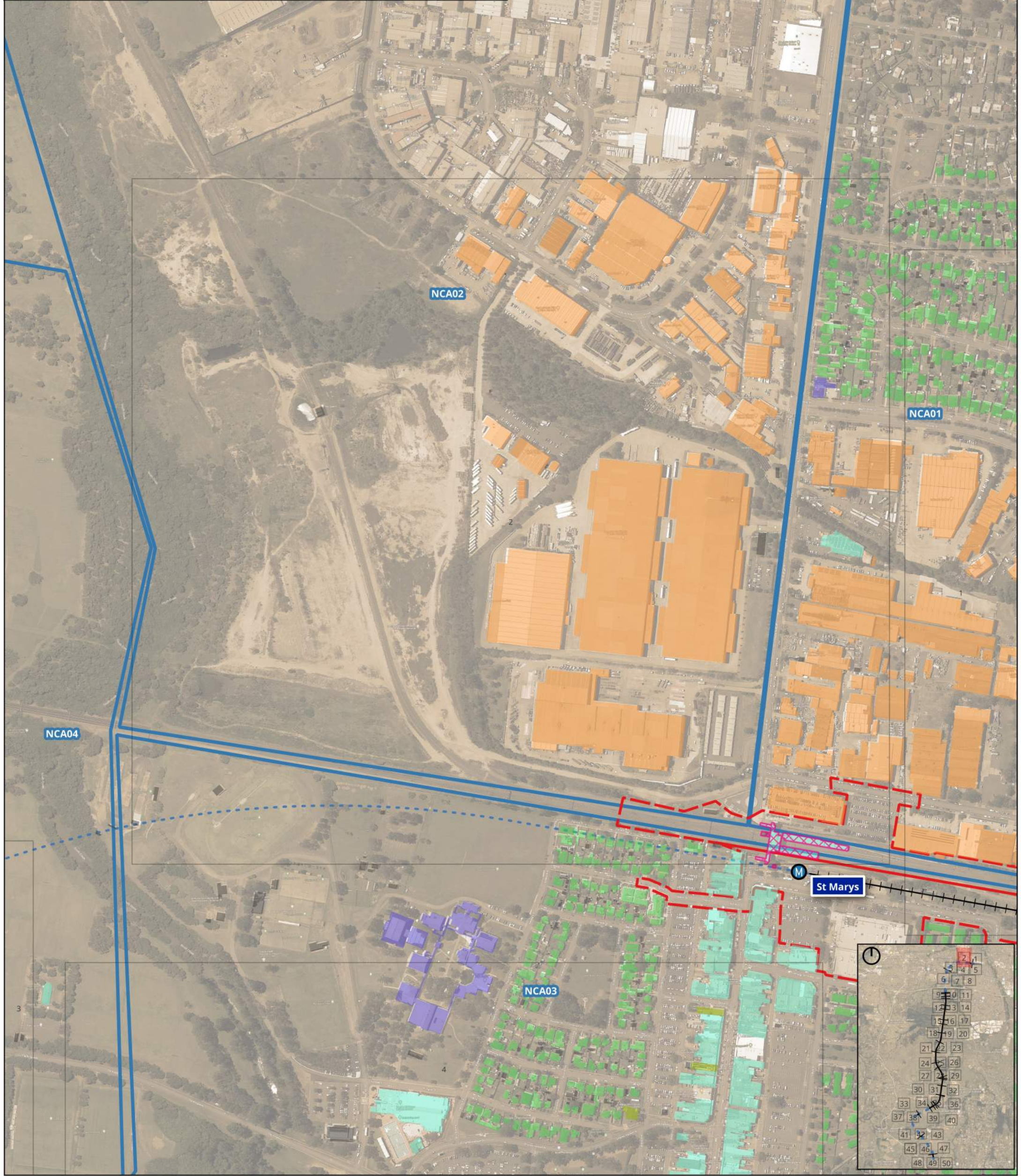
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Site Area

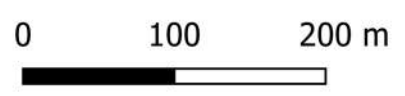
- Construction Footprint
- Stations
- Surface track
- Tunnel
- NCA

Building Usage

- Industrial
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- Commercial
- Child Care Centre
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| | |
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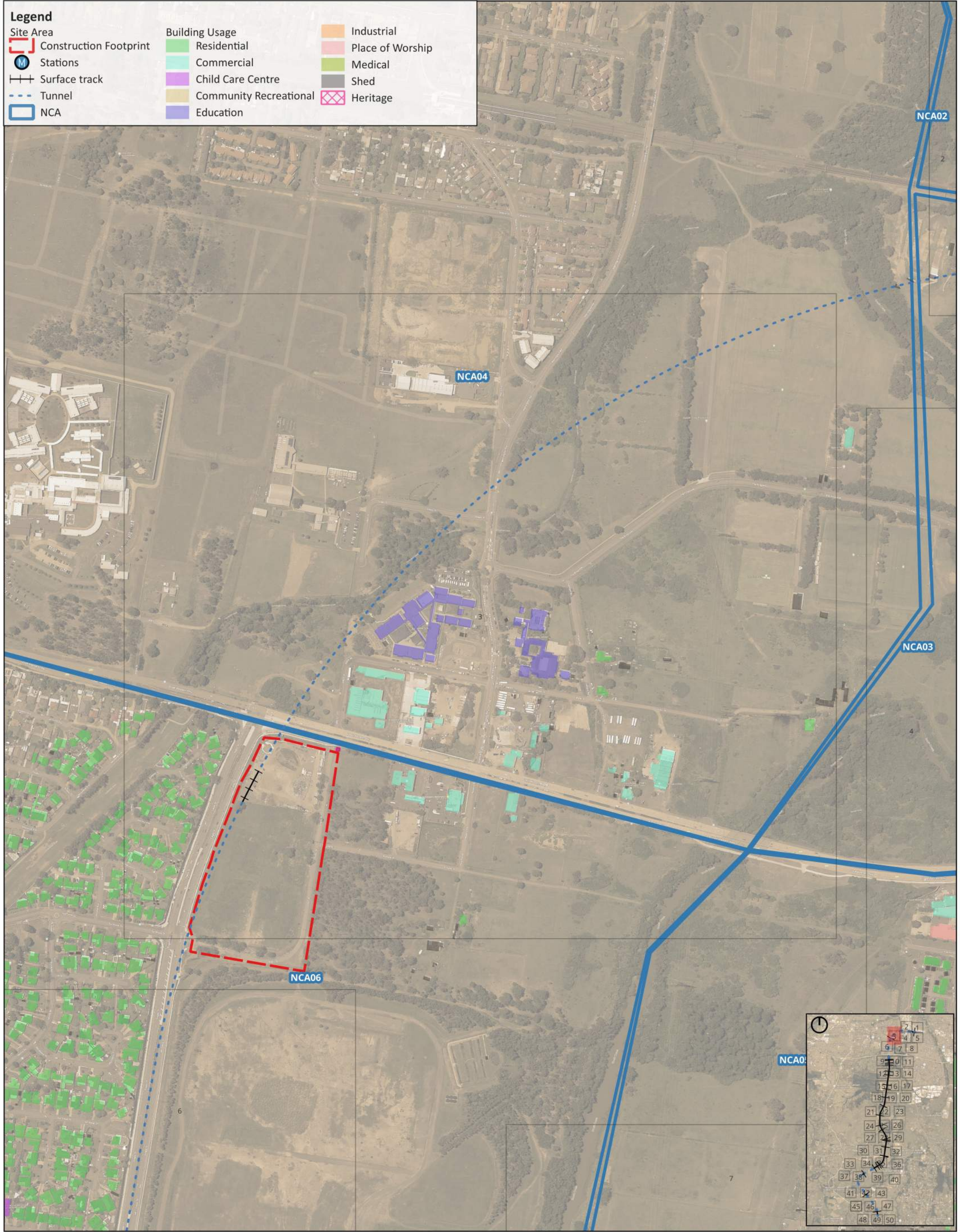
Legend

Site Area

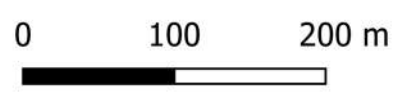
- Construction Footprint
- Stations
- Surface track
- Tunnel
- NCA

Building Usage

- Residential
- Commercial
- Child Care Centre
- Community Recreational
- Education
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| | |
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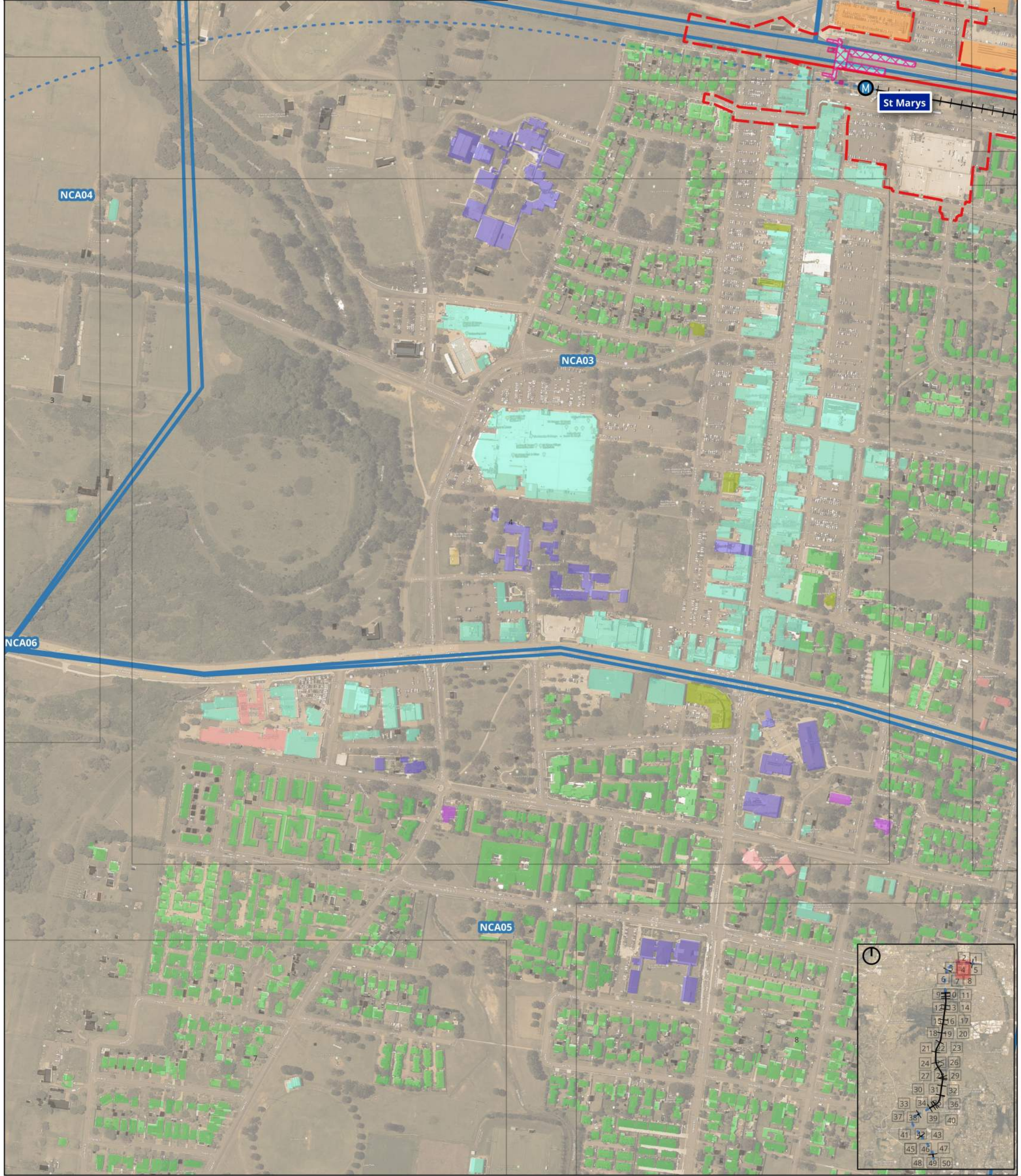
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Site Area

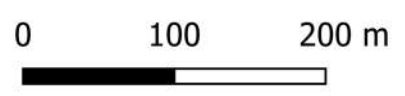
- Construction Footprint
- Stations
- Surface track
- Tunnel
- NCA

Building Usage

- Residential
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- Child Care Centre
- Community Recreational
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- Industrial
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- Medical
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- Heritage



| | |
|--------------|---------------------|
| Project No.: | 21239.1 |
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| Scale: | 1:5,000 |
| Sheet Size: | @A3 |
| Projection: | GDA94 / MGA zone 56 |



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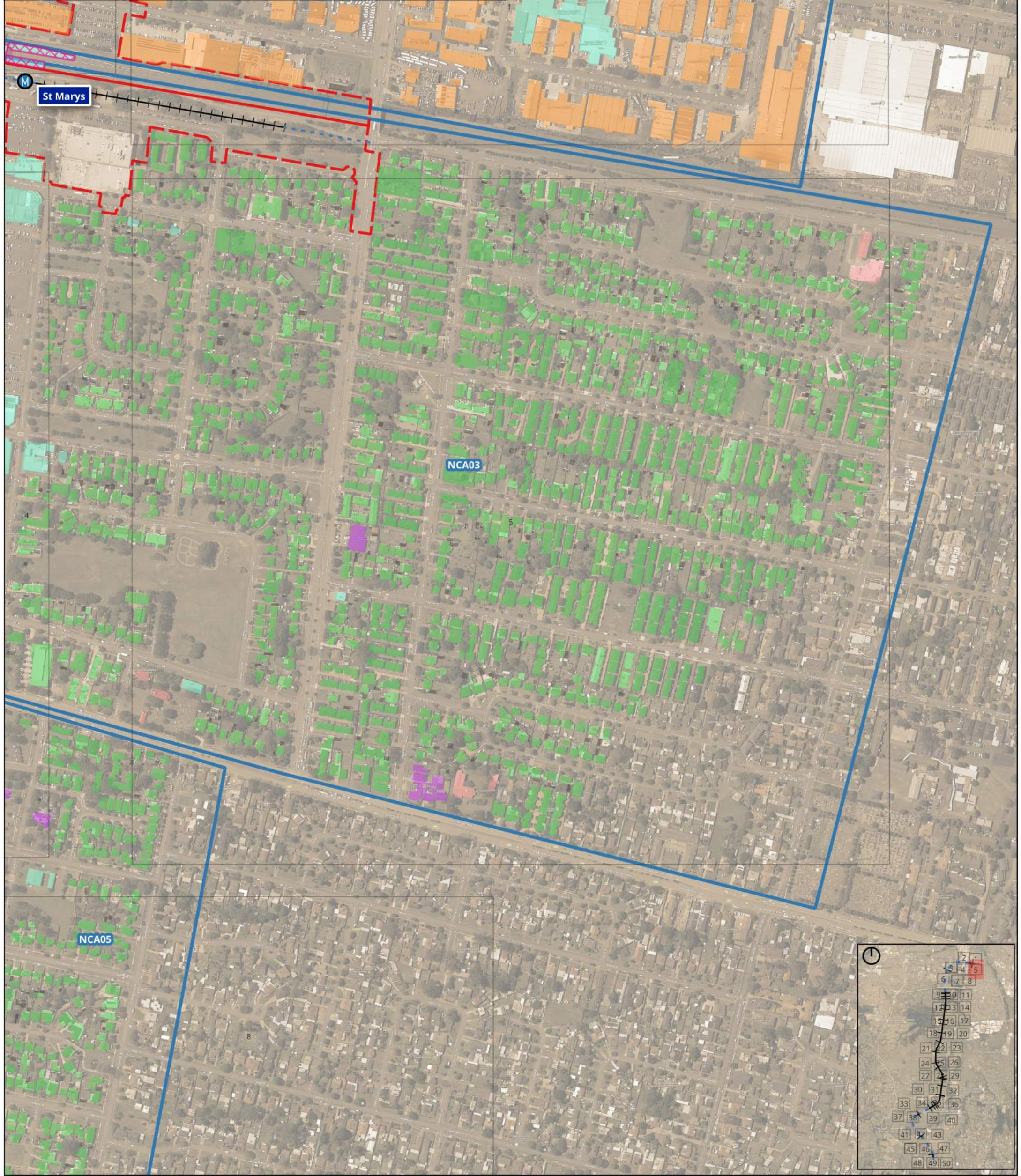
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Site Area

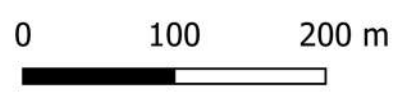
- Construction Footprint
- Stations
- Surface track
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- NCA

Building Usage

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| | |
|--------------|---------------------|
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| Date: | 12/10/2023 |
| Drawn by: | MS |
| Scale: | 1:5,000 |
| Sheet Size: | @A3 |
| Projection: | GDA94 / MGA zone 56 |



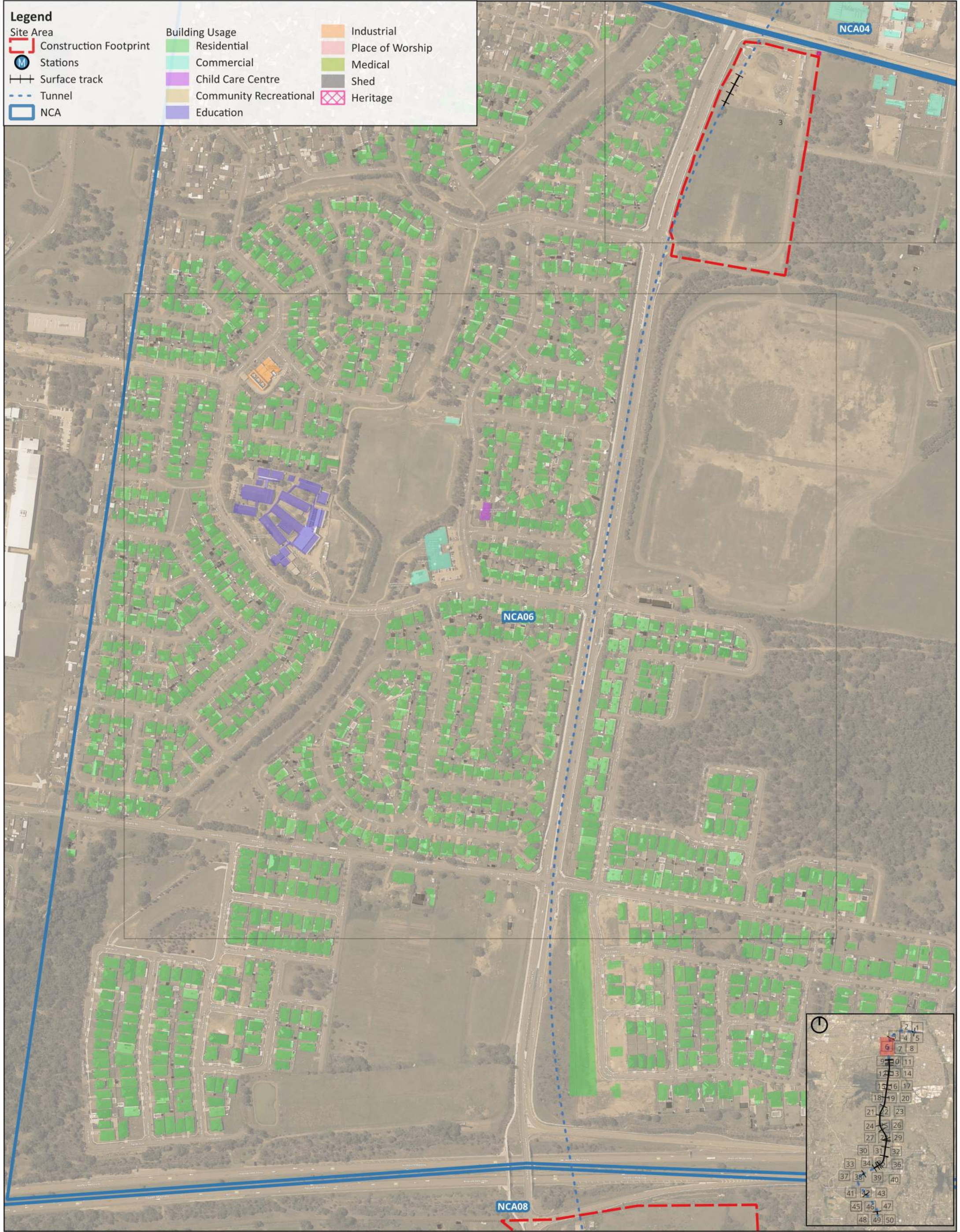
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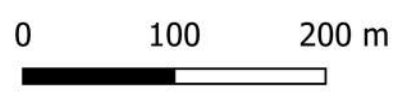
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Legend

- | | | |
|------------------------|------------------------|------------------|
| Site Area | Building Usage | Industrial |
| Construction Footprint | Residential | Place of Worship |
| Stations | Commercial | Medical |
| Surface track | Child Care Centre | Shed |
| Tunnel | Community Recreational | Heritage |
| NCA | Education | |

| | |
|--------------|---------------------|
| Project No.: | 21239.1 |
| Date: | 12/10/2023 |
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| Scale: | 1:5,000 |
| Sheet Size: | @A3 |
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Legend

Site Area

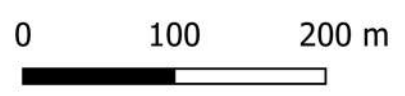
- Construction Footprint
- Stations
- Surface track
- Tunnel
- NCA

Building Usage

- Residential
- Commercial
- Child Care Centre
- Community Recreational
- Education
- Industrial
- Place of Worship
- Medical
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- Heritage



| | |
|--------------|---------------------|
| Project No.: | 21239.1 |
| Date: | 12/10/2023 |
| Drawn by: | MS |
| Scale: | 1:5,000 |
| Sheet Size: | @A3 |
| Projection: | GDA94 / MGA zone 56 |



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Legend

Site Area

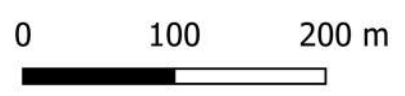
- Construction Footprint
- Stations
- Surface track
- Tunnel
- NCA

Building Usage

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



| | |
|--------------|---------------------|
| Project No.: | 21239.1 |
| Date: | 12/10/2023 |
| Drawn by: | MS |
| Scale: | 1:5,000 |
| Sheet Size: | @A3 |
| Projection: | GDA94 / MGA zone 56 |



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Appendix C
Airborne Noise Additional Mitigation
Measures Maps
21239.1.8



Legend

Other Elements

- Building - Shed
- NCA
- Modelled Source Location

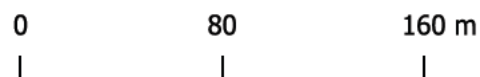
Alignment

- Tunnel
- Surface
- Project Site
- Noise Barrier
- Local Temporary Acoustic Barrier

AMM Categories

- Not Triggered
- 0 - 10 dB
- 10 - 20 dB
- 20 - 30 dB
- >30 dB
- Highly Noise Affected

Project No.: 21239.1
 Date: 03/11/2023
 Drawn by: MS
 Scale: 1:3,000
 Sheet Size: @A4
 Projection: GDA94 / MGA zone 56



STOM: St Marys Station - OOH Concrete works

Construction Airborne Noise Assessment
 Additional Mitigation Measures

Assessment Scenario: S1+ Barrier



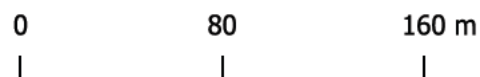
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| Legend | |
|------------------------------------|-------------------------|
| Other Elements | AMM Categories |
| ■ Building - Shed | ■ Not Triggered |
| □ NCA | □ 0 - 10 dB |
| — Modelled Source Location | □ 10 - 20 dB |
| Alignment | □ 20 - 30 dB |
| --- Tunnel | □ >30 dB |
| — Surface | ■ Highly Noise Affected |
| ■ Project Site | |
| — Noise Barrier | |
| — Local Temporary Acoustic Barrier | |

| | |
|--------------|---------------------|
| Project No.: | 21239.1 |
| Date: | 03/11/2023 |
| Drawn by: | MS |
| Scale: | 1:3,000 |
| Sheet Size: | @A4 |
| Projection: | GDA94 / MGA zone 56 |



STOM: St Marys Station - OOH Concrete works

Construction Airborne Noise Assessment
Additional Mitigation Measures

Assessment Scenario: S2



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Appendix D

Receivers with Predicted Levels above Noise Management Levels Requiring Additional Mitigation Measures

21239.1.8

| Building ID | Usage | NCA | Predicted Noise Levels Where Construction NMLs are Exceeded and AMM Category, dBA | | | |
|-------------|-------|-------|---|----|--------------------------|----|
| | | | AMM Category 0 to 10 dB | | AMM Category 10 to 20 dB | |
| | | | S1-Mitigated | S2 | S1-Mitigated | S2 |
| 29 | RES | NCA03 | 47 | - | - | - |
| 267 | RES | NCA03 | 44 | - | - | - |
| 271 | RES | NCA03 | - | 52 | 57 | - |
| 272 | RES | NCA03 | - | 52 | 57 | - |
| 311 | RES | NCA03 | 44 | - | - | - |
| 545 | RES | NCA03 | 43 | - | - | - |
| 546 | RES | NCA03 | 46 | - | - | - |
| 1026 | RES | NCA03 | - | 49 | 55 | - |
| 1030 | RES | NCA03 | - | 44 | 53 | - |
| 1031 | RES | NCA03 | 46 | - | - | - |
| 1032 | RES | NCA03 | - | 46 | 55 | - |
| 1033 | RES | NCA03 | 49 | - | - | - |
| 1034 | RES | NCA03 | - | 47 | 55 | - |
| 1035 | RES | NCA03 | - | 48 | 56 | - |
| 1037 | RES | NCA03 | 48 | - | - | - |
| 1038 | RES | NCA03 | 48 | - | - | - |
| 1040 | RES | NCA03 | 47 | - | - | - |
| 1041 | RES | NCA03 | 51 | - | - | - |
| 1042 | RES | NCA03 | 43 | - | - | - |
| 1048 | RES | NCA03 | 45 | - | - | - |
| 1049 | RES | NCA03 | 47 | - | - | - |
| 1050 | RES | NCA03 | 49 | - | - | - |
| 1053 | RES | NCA03 | 46 | - | - | - |
| 1054 | RES | NCA03 | 46 | - | - | - |
| 1055 | RES | NCA03 | 51 | 43 | - | - |
| 1057 | RES | NCA03 | 52 | 43 | - | - |
| 1058 | RES | NCA03 | - | 44 | 53 | - |
| 1060 | RES | NCA03 | - | 44 | 53 | - |
| 1061 | RES | NCA03 | 48 | - | - | - |
| 1063 | RES | NCA03 | 52 | 45 | - | - |
| 1064 | RES | NCA03 | 52 | 44 | - | - |
| 1067 | RES | NCA03 | 43 | - | - | - |
| 1068 | RES | NCA03 | - | 51 | 59 | - |
| 1069 | RES | NCA03 | 46 | - | - | - |
| 1072 | RES | NCA03 | 50 | 44 | - | - |
| 1073 | RES | NCA03 | 49 | 43 | - | - |
| 1074 | RES | NCA03 | - | - | 59 | 55 |

Appendix D

Receivers with Predicted Levels above Noise Management Levels Requiring Additional Mitigation Measures

21239.1.8

| Building ID | Usage | NCA | Predicted Noise Levels Where Construction NMLs are Exceeded and AMM Category, dBA | | | |
|-------------|-------|-------|---|----|--------------------------|----|
| | | | AMM Category 0 to 10 dB | | AMM Category 10 to 20 dB | |
| | | | S1-Mitigated | S2 | S1-Mitigated | S2 |
| 1075 | RES | NCA03 | - | - | 60 | 54 |
| 1084 | RES | NCA03 | 43 | - | - | - |
| 1085 | RES | NCA03 | 45 | - | - | - |
| 1086 | RES | NCA03 | 45 | - | - | - |
| 1091 | RES | NCA03 | 45 | - | - | - |
| 1092 | RES | NCA03 | 45 | - | - | - |
| 1095 | RES | NCA03 | - | 49 | 53 | - |
| 1096 | RES | NCA03 | - | 50 | 53 | - |
| 1097 | RES | NCA03 | - | 50 | 55 | - |
| 1098 | RES | NCA03 | 48 | - | - | - |
| 1099 | RES | NCA03 | 46 | - | - | - |
| 1105 | RES | NCA03 | 49 | 43 | - | - |
| 1107 | RES | NCA03 | 44 | - | - | - |
| 1108 | RES | NCA03 | 43 | - | - | - |
| 1110 | RES | NCA03 | 46 | - | - | - |
| 1111 | RES | NCA03 | 47 | - | - | - |
| 1113 | RES | NCA03 | 43 | - | - | - |
| 1116 | RES | NCA03 | 43 | - | - | - |
| 1117 | RES | NCA03 | 46 | - | - | - |
| 1119 | RES | NCA03 | 45 | - | - | - |
| 1122 | RES | NCA03 | 44 | - | - | - |
| 1124 | RES | NCA03 | 43 | - | - | - |
| 1125 | RES | NCA03 | 43 | - | - | - |
| 1126 | RES | NCA03 | 43 | - | - | - |
| 1127 | RES | NCA03 | 44 | - | - | - |
| 1128 | RES | NCA03 | 43 | - | - | - |
| 1130 | RES | NCA03 | 44 | - | - | - |
| 1139 | RES | NCA03 | 43 | - | - | - |
| 1192 | RES | NCA03 | 43 | - | - | - |
| 1195 | RES | NCA03 | 44 | - | - | - |
| 1197 | RES | NCA03 | 44 | - | - | - |
| 1200 | RES | NCA03 | 43 | - | - | - |
| 1201 | RES | NCA03 | 43 | - | - | - |
| 1202 | RES | NCA03 | 43 | - | - | - |
| 1217 | RES | NCA03 | 43 | - | - | - |
| 1220 | RES | NCA03 | 44 | - | - | - |
| 1221 | RES | NCA03 | 47 | - | - | - |

Appendix D

Receivers with Predicted Levels above Noise Management Levels Requiring Additional Mitigation Measures

21239.1.8

| Building ID | Usage | NCA | Predicted Noise Levels Where Construction NMLs are Exceeded and AMM Category, dBA | | | |
|-------------|-------|-------|---|----|--------------------------|----|
| | | | AMM Category 0 to 10 dB | | AMM Category 10 to 20 dB | |
| | | | S1-Mitigated | S2 | S1-Mitigated | S2 |
| 1222 | RES | NCA03 | 47 | - | - | - |
| 1223 | RES | NCA03 | 47 | - | - | - |
| 1226 | RES | NCA03 | 47 | - | - | - |
| 1227 | RES | NCA03 | 43 | - | - | - |
| 1228 | RES | NCA03 | 43 | - | - | - |
| 1231 | RES | NCA03 | 44 | - | - | - |
| 1441 | RES | NCA03 | 50 | - | - | - |
| 1443 | RES | NCA03 | 43 | - | - | - |
| 1454 | RES | NCA03 | 44 | - | - | - |
| 1478 | RES | NCA03 | 48 | - | - | - |
| 1487 | RES | NCA03 | 46 | - | - | - |
| 1488 | RES | NCA03 | - | 44 | 54 | - |
| 1490 | RES | NCA03 | 46 | - | - | - |
| 1507 | RES | NCA03 | 43 | - | - | - |
| 1509 | RES | NCA03 | 44 | - | - | - |
| 1510 | RES | NCA03 | 43 | - | - | - |
| 1512 | RES | NCA03 | 43 | - | - | - |
| 2028 | RES | NCA03 | 46 | - | - | - |
| 3021 | RES | NCA03 | 46 | - | - | - |
| 3196 | RES | NCA03 | 44 | - | - | - |
| 3267 | RES | NCA03 | 43 | - | - | - |
| 3276 | RES | NCA03 | 43 | - | - | - |
| 3278 | RES | NCA03 | 44 | - | - | - |
| 3282 | RES | NCA03 | 44 | - | - | - |
| 3294 | RES | NCA03 | 43 | - | - | - |
| 3425 | RES | NCA03 | 46 | - | - | - |
| 3426 | RES | NCA03 | 44 | - | - | - |
| 3427 | RES | NCA03 | 50 | - | - | - |
| 3434 | RES | NCA03 | 46 | - | - | - |
| 3435 | RES | NCA03 | 44 | - | - | - |
| 3436 | RES | NCA03 | 46 | - | - | - |
| 3444 | RES | NCA03 | 47 | - | - | - |
| 3445 | RES | NCA03 | 45 | - | - | - |
| 3446 | RES | NCA03 | 45 | - | - | - |
| 3448 | RES | NCA03 | 46 | - | - | - |
| 3450 | RES | NCA03 | 48 | - | - | - |
| 3451 | RES | NCA03 | 45 | - | - | - |

Appendix D

Receivers with Predicted Levels above Noise Management Levels Requiring Additional Mitigation Measures

21239.1.8

| Building ID | Usage | NCA | Predicted Noise Levels Where Construction NMLs are Exceeded and AMM Category, dBA | | | |
|-------------|-------|-------|---|----|--------------------------|----|
| | | | AMM Category 0 to 10 dB | | AMM Category 10 to 20 dB | |
| | | | S1-Mitigated | S2 | S1-Mitigated | S2 |
| 3491 | RES | NCA03 | 43 | - | - | - |
| 3492 | RES | NCA03 | 44 | - | - | - |
| 3493 | RES | NCA03 | 48 | - | - | - |
| 3496 | RES | NCA03 | 51 | - | - | - |
| 3499 | RES | NCA03 | 49 | - | - | - |