SYDNEY METRO WEST

Western Tunnelling Package (WTP)
Detailed Noise and Vibration Impact Statement (DNVIS)
Westmead to Sydney Olympic Park

Prepared for:

Gamuda Australia Laing O'Rourke Consortium (GLC)
Suite 26.01,100 Miller Street, North Sydney, NSW 2060, Australia

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PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
Tenancy 202 Submarine School, Sub Base Platypus, 120 High Street
North Sydney NSW 2060 Australia

T: +61 2 9427 8100
E: sydney@slrconsulting.com   www.slrconsulting.com

BASIS OF REPORT

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Glossary and Abbreviations

Item	Description / Definition
AA	Acoustic Advisor
AVTG	Assessing Vibration: a technical guideline (DEC, 2006)
dBA	Decibel, A-weighted
CEMP	Construction Environmental Management Plan
CNVMP	Construction Noise and Vibration Management Plan
DEC	Department of Environment and Conservation (now EPA)
DECC	Department of Environment and Climate Change (now EPA)
DECCW	Department of Environment, Climate Change and Water (now EPA)
DNVIS	Detailed Noise and Vibration Impact Statement
DPHI	Department of Planning, Housing and Infrastructure
EPA	Environment Protection Authority
EPL	Environmental Protection Licence
ER	Environmental Representative
GLC	Gamuda Australia Laing O'Rourke Consortium
HNA	Highly Noise Affected, as defined in the ICNG. Relates to construction noise levels of ≥75 dBA and is the point above which there may be strong community reaction to construction noise levels
Highly Noise Intensive Works	Works which are defined as annoying under the ICNG, including: (a) use of power saws, for cutting timber, rail lines, masonry, road pavement or steel work; (b) grinding metal, concrete or masonry; (c) rock drilling; (d) line drilling; (e) vibratory rolling; (f) bitumen milling or profiling; (g) jackhammering, rock hammering or rock breaking; (h) rail tamping and regulating; and (i) impact piling.
ICNG	*Interim Construction Noise Guideline* (DECC, 2009)
L_{Aeq}	The average noise level during a measurement period, such as the daytime or night-time
L_{AFmax}	The maximum noise level measured during a monitoring period, using 'fast' weighting (also known as the L1 level)
L_{90}	The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.
Clyde MSF	Clyde Maintenance and Stabling Facility
NCA	Noise Catchment Area
NML	Noise Management Level

Item	Description / Definition
Noise intensive equipment	Construction equipment that is particularly noisy and causes annoyance. Includes items such as rockbreakers and concrete saws
NPfI	Noise Policy for Industry
NSW	New South Wales
NVIA	Noise and Vibration Impact Assessment
OOH	Out of Hours
OOHW	Out-of-Hours Work
Other sensitive receivers	Non-residential sensitive receivers, including hospitals, educational facilities, place of worship, child care centres, outdoor recreation areas, etc
Project	Sydney Metro West – Western Tunnelling Package
RBL	Rating Background Level. This is the background noise level measured at a particular location. The method for calculating the RBL is defined in the NSW *Noise Policy for Industry*
Realistic worst-case scenarios	Realistic worst-case construction scenarios have been developed to assess the potential impacts from the project. These scenarios are based on the noisiest items of equipment which would likely be required to complete the works
RMS	Root Mean Square
RNP	Road Noise Policy
ROL	Road Occupancy Licence
Rosehill SF	Rosehill Services Facility
SLR	SLR Consulting Australia Pty Ltd
SWL / Lw	Sound Power Level
Sydney Metro CNVS	Sydney Metro Construction Noise and Vibration Standard (Sydney Metro, 2020)
TfNSW	Transport for New South Wales
TfNSW CNVS	TfNSW Construction Noise and Vibration Strategy (TfNSW, 2019)
The Bays	A proposed station located between Glebe Island and White Bay Power Station
VC	Vibration Criterion
VDV	Vibration Dose Value
Worst-case impacts and noise levels	The worst-case (ie highest) impacts or noise levels predicted in this report
Work	Any physical work to construct or facilitate the construction of the CSSI, including Low Impact Work, environmental management measures and utility work. However, does not include activities that informs or enables detailed design of the CSSI or generates noise that is not more than 5 dB(A) above the RBL at any sensitive land user(s)
WTP	Sydney Metro West – Western Tunnelling Package

Note 1: Additional definitions are provided in the consolidated Conditions of Approval for Sydney Metro West – Concept and Stage 1 Construction (SSI 10038).

1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Gamuda Australia Laing O'Rourke Consortium (GLC) to undertake a detailed noise and vibration impact statement (DNVIS) of the Sydney Metro West – Western Tunnelling Package (WTP, or the Project). The WTP forms part of the Sydney Metro West – Westmead to the Sydney CBD Project. This assessment has been prepared to accompany the Construction Noise and Vibration Management Plan (CNVMP) for the Project. The CNVMP was developed as a sub-plan to the Construction Environmental Management Plan (CEMP) of the Sydney Metro West – WTP.

This assessment has been prepared in accordance with the Construction Noise and Vibration Management Plan (CNVMP) for the Project, as per the Minister's Condition of approval (CoA) D43 and the requirements of the Sydney Metro Construction Noise and Vibration Standard (CNVS).

This report assesses the potential construction noise and vibration impacts associated with the Project. An explanation of the specialist acoustic terminology used in this report is provided in **Appendix A**.

Note: This revision of the DNVIS includes the following changes:

- *Revised noise assessment at the Clyde Dive project site with reference to CD.03, CD.04, CD.06, CD.14 and CD.18 outlined in **Section 4**.*
- *Revised noise assessment at the Parramatta project site with reference to PM.21 outlined in **Section 4**.*

1.1 Project Description

Sydney Metro West (SMW) is a new underground railway connecting Greater Parramatta and the Sydney CBD. It will provide fast connections between greater Sydney's two major business centres as well as providing better access to the growing business and entertainment precincts in Olympic Park and Pyrmont, the health and medical research hub at Westmead and the future business and tourism site at The Bays.

Sydney Metro West – Westmead to the Bays Concept and Stage 1 received planning approval on 11 March 2021 (SSI 10038). Modification 1 was approved on 28 July 2021. The WTP comprises the western portion of Stage 1 of SSI 10038, from Sydney Olympic Park to Westmead. A summary of the key components of the Project are outlined below:

1.1.1 Scope of Work

SMW is being delivered in a number of packages. The Western Tunnelling Package (WTP) is the initial construction package for the western portion of the SMW. It involves 9km of twin railway tunnels between Sydney Olympic Park and Westmead as well as:

- Westmead Station box excavation, including temporary support, stub tunnels, partially mined station cavern and crossover cavern including permanent lining and support.

- Parramatta Station, including excavation of station box and associated support.
- Clyde Maintenance and Stabling Facility (MSF), including permanent dive structure, portal, spur running tunnels, spur tunnel junction cavern, bulk earthworks, civil structures, utilities corridor, road crossing and creek diversion.
- Rosehill Services Facility, including shaft excavation, permanent lining and lateral support.
- Sydney Olympic Park Station, including tunnel boring machine retrieval, spoil removal and construction staff facilities.
- Demolition and site clearance work.
- Precast facility at Eastern Creek is excluded from this report and will be assessed separately.

Ancillary Work

Ancillary works include fencing, hoarding, maintenance access, drainage, temporary noise barriers, road and transport network work and temporary site offices, laydown and work sites to support construction.

Utility Work

It is noted that utility work in the local area surrounding constructions sites (ie off-premises) will be required. This work will involve adjustments to utility services and transport infrastructure, to service or respond to changed circumstances arising from the construction site. To maintain transport infrastructure and utility services, it may be necessary to complete utility work outside the approved project working hours (refer **Section 1.1.5**).

Noise and vibration impacts for utility work will be assessed separately and individually as the occasions arise and OOHW approval will be managed in accordance with the CNVMP and project-specific Environmental Protection Licences (EPLs).

1.1.2 Project Location

The entire Sydney Metro West Stage 1 is shown in **Figure 1** below. The WTP Project location is from Westmead to Sydney Olympic Park. Individual study areas with sensitive receivers and noise catchment areas are presented in **Figure 2** to **Figure 5**.

Figure 1 Project Location

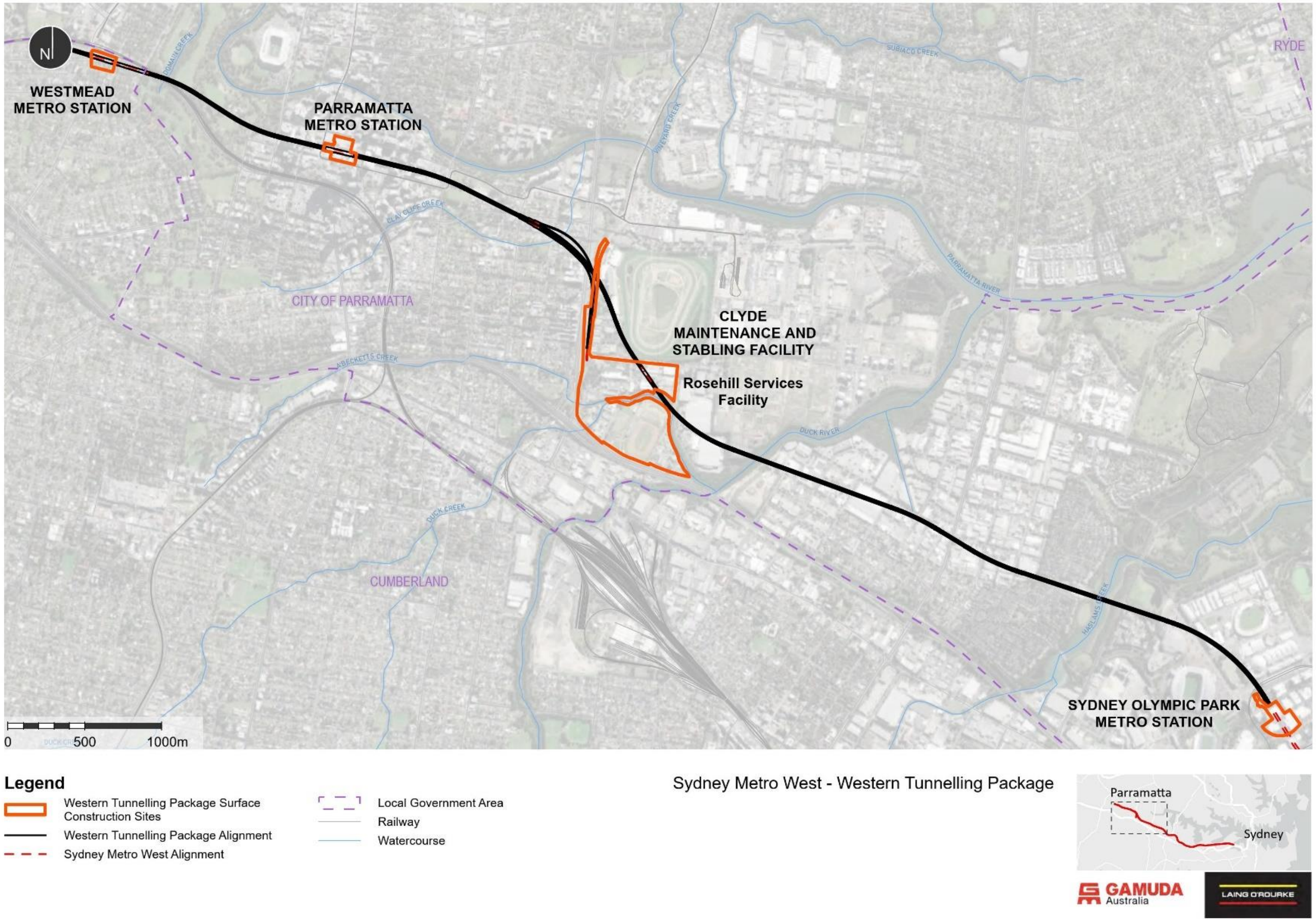


Figure 2 Westmead Study Area

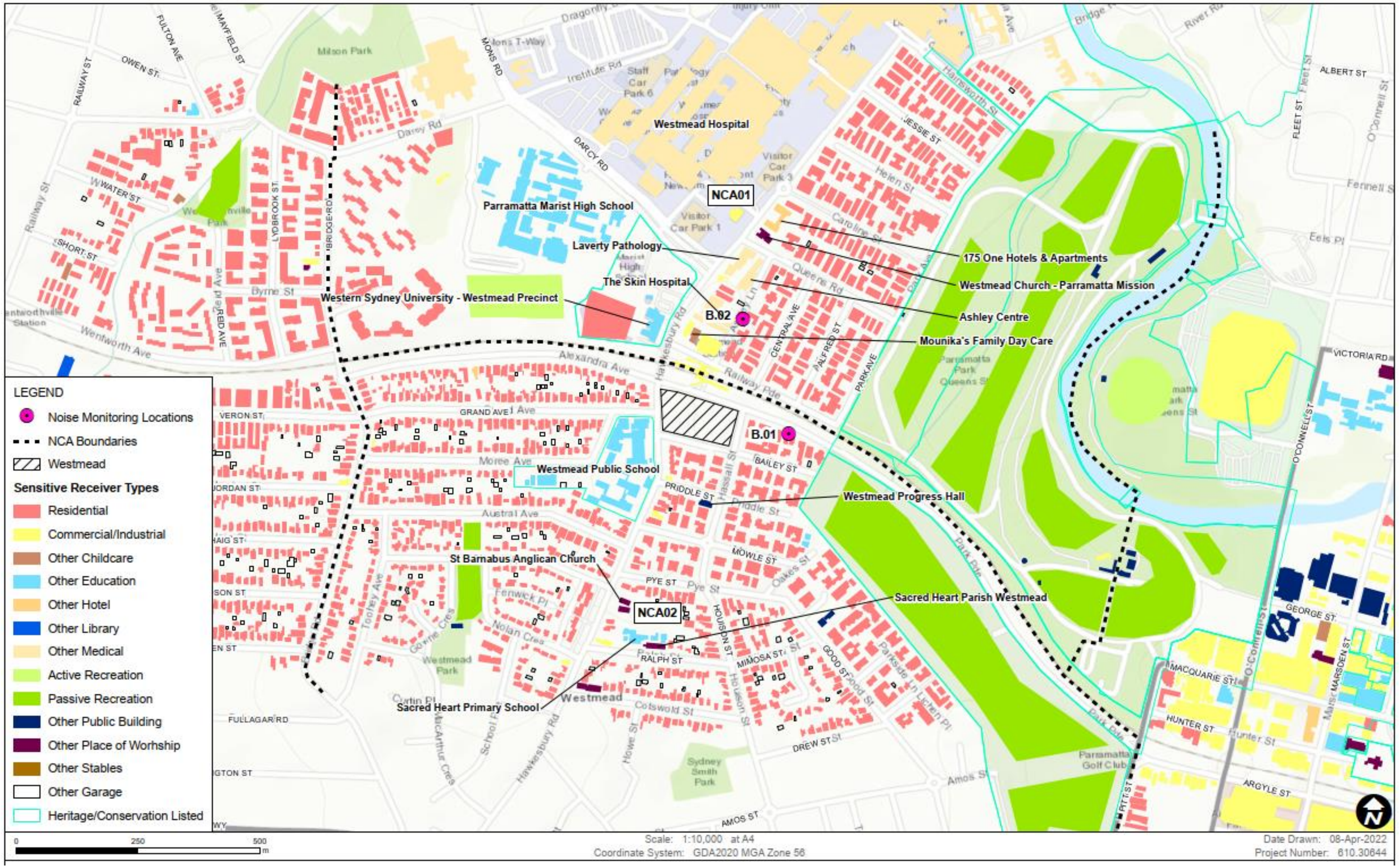


Figure 3 Parramatta Study Area

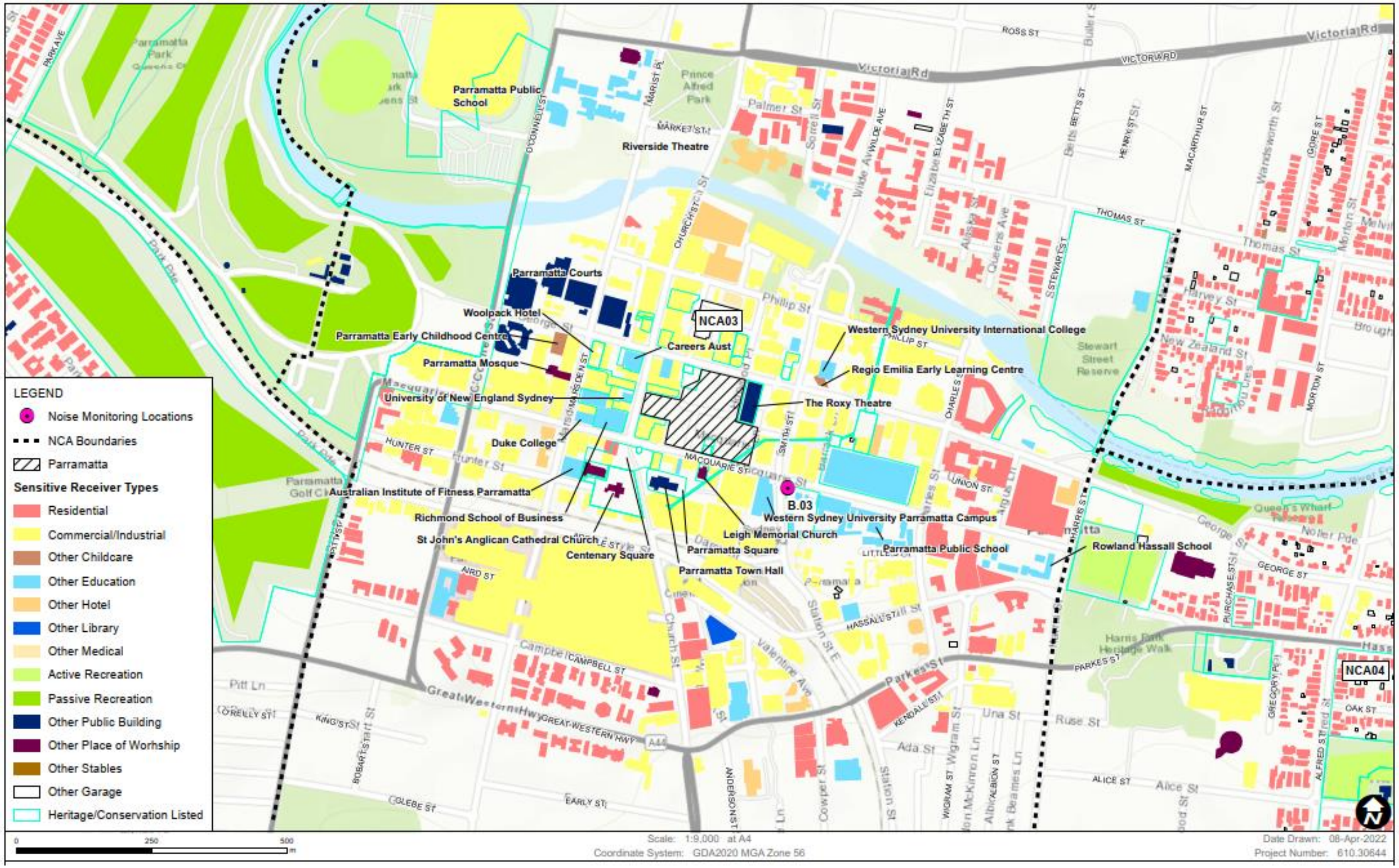


Figure 4 Clyde/Rosehill Study Area

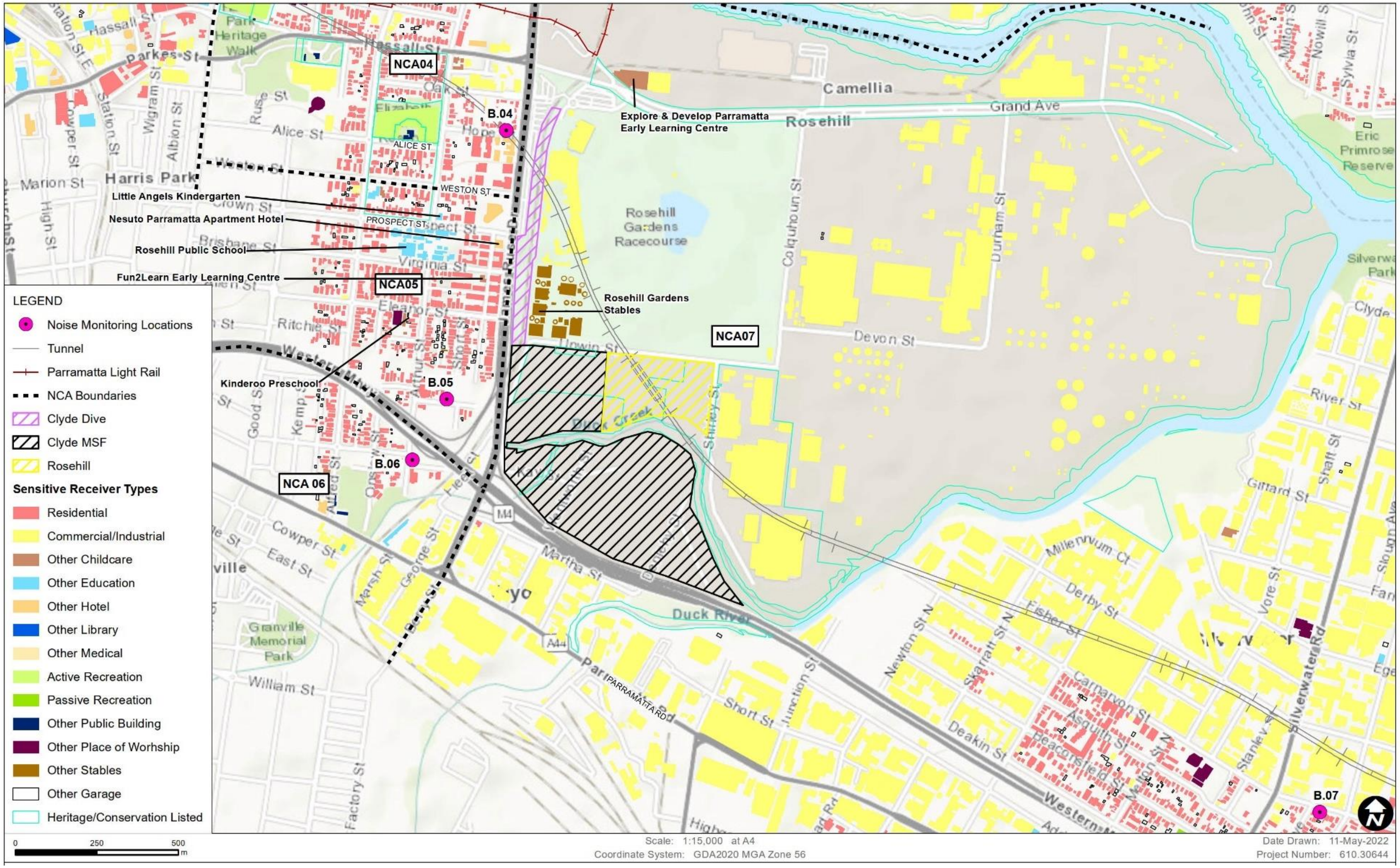
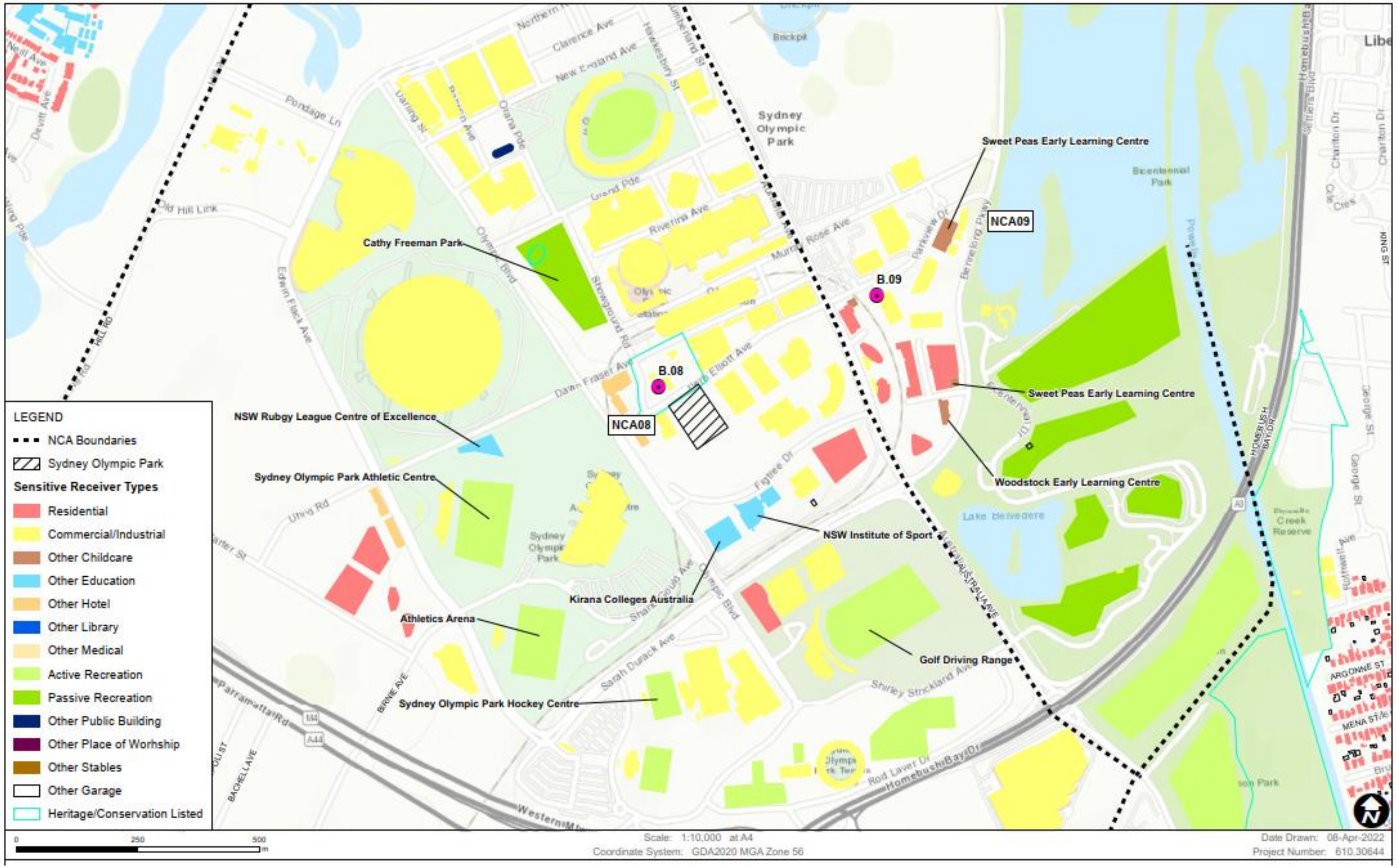


Figure 5 Sydney Olympic Park Study Area



1.1.3 Project Requirements

This DNVIS has been developed to satisfy the requirements of the CoA D43. A list of applicable requirements from the CoA, Sydney Metro - Construction Environment Management Framework (CEMF) and the Sydney Metro - Construction Noise and Vibration Standard (CNVS) is provided in **Table 1** below.

Other requirements relevant to Noise and Vibration are further detailed in the Construction Noise and Vibration Management Plan (CNVMP).

Table 1 Construction noise and vibration management compliance matrix

ID	Requirements	Document Reference
Condition of Approvals		
D35	Work must only be undertaken during the following hours: a) 7:00am to 6:00pm Mondays to Fridays, inclusive; b) 8:00am to 6:00pm Saturdays; and c) at no time on Sundays or public holidays.	**Section 1.1.5**
D39	All reasonable and feasible mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration criteria:	
	a) construction 'Noise affected' noise management levels established using the Interim Construction Noise Guideline (DECC, 2009);	**Section 3.2**
	b) vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure);	**Section 3.5**
	c) Australian Standard AS 2187.2 – 2006 "Explosives – Storage and Use – Use of Explosives" (for human exposure);	Not Applicable, Blasting not part of Project design.
	d) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and	**Section 3.5**
	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).	**Section 3.5**
	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.	**Section 8**
	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 4.1**
D41	Noise generating work in the vicinity of potentially-affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise levels above the NMLs must not be timetabled within sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	**Section 8**

ID	Requirements	Document Reference
D42	Industry best practice construction methods must be implemented where reasonably practicable to ensure that noise levels are minimised around sensitive land user(s). Practices must include, but are not limited to:	
	a) use of regularly serviced low sound power equipment;	**Section 8**
	b) temporary noise barriers (including the arrangement of plant and equipment) around noisy equipment and activities such as rock hammering and concrete cutting; and	**Section 8**
	c) use of alternative construction and demolition techniques.	**Section 8**
D43	**Detailed Noise and Vibration Impact Statements** (**DNVIS**) must be prepared for any work that may exceed the NMLs, vibration criteria and / or ground-borne noise levels specified in **Conditions D39** and **D40** of this schedule at any residence outside construction hours identified in **Condition D35** of this schedule, or where receivers will be highly noise affected. The **DNVIS** must include specific mitigation measures identified through consultation with affected sensitive land user(s) and the mitigation measures must be implemented for the duration of the works. A copy of the **DNVIS** must be provided to the **AA** and **ER** before the commencement of the associated works. The Planning Secretary and the EPA may request a copy(ies) of the **DNVIS**.	This DNVIS **Section 1** **Section 1.1.3** **Section 1.1.4** **Section 8**
D44	**DNVIS** must be prepared for each construction site before construction noise and vibration impacts commence and include specific mitigation measures identified through consultation with affected sensitive land users.	This DNVIS **Section 8**
D45	Owners and occupiers of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before works that generate vibration commences in the vicinity of those properties. If the potential exceedance is to occur more than once or extend over a period of 24 hours, owners and occupiers are to be provided a schedule of potential exceedances on a monthly basis for the duration of the potential exceedances, unless otherwise agreed by the owner and occupier. These properties must be identified and considered in the **Noise and Vibration CEMP Sub-plan**.	**Section 8**
D46	Vibration testing must be conducted during vibration generating activities that have the potential to impact on Heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures. Such measures must include, but not be limited to, review or modification of excavation techniques.	**Section 8**
D49	If a Heritage item is found to be structurally unsound (following inspection) a more conservative cosmetic damage criterion of 2.5 mm/s peak component particle velocity (from DIN 4150) must be applied.	**Section 3.5.1**

ID	Requirements	Document Reference
D63	Appropriate equipment to monitor areas in proximity of construction sites and the tunnel route during construction must be installed with particular reference to at risk buildings, structures and utilities identified in the condition surveys required by Condition D60 of this schedule and / or geotechnical analysis as required. If monitoring during construction indicate exceedance of the vibration criteria identified in the DNVIS prepared under Condition D43 of this schedule, then all construction affecting settlement must cease immediately and must not resume until fully rectified or a revised method of construction is established that will ensure protection of affected buildings.	**Section 6.4.2**
Sydney Metro - Construction Environment Management Framework (CEMF)		
8.2 (b)	Detailed Construction Noise and Vibration Impact Statements will be prepared for noise-intensive construction sites and or activities, to ensure the adequacy of the noise and vibration mitigation measures. Specifically, Construction Noise and Vibration Impact Statements will be prepared for works proposed to be undertaken outside of standard construction hours and to support applications to undertake out of hours works (this includes variations of EPL's and applications to relevant agencies).	This DNVIS **Section 8**
Sydney Metro Construction Noise and Vibration Standard (CNVS)		
3.1	**Detailed Noise and Vibration Impact Statements (DNVIS)** • Identify sensitive receivers	**Section 2.2**
	• Determine background noise levels	**Section 2.3**
	• Determine noise and vibration management Levels	**Section 3**
	• Determine source noise levels and construction scenarios	**Section 4.2** **Appendix B**
	• Identify mitigation and measures	**Section 8**
	• Classify impacts	**Section 4.3** **Section 5** **Section 6**
4	**Standard Noise and Vibration Mitigation Measures** • For all Sydney Metro construction projects, the standard mitigation measures in Table 11 (of the CNVS) shall be applied by default where feasible and reasonable in order to minimise the potential noise and vibration impacts at the surrounding noise sensitive receivers.	**Section 8**
9	**Documentation Requirements** • Acoustic Terminology / Glossary	**Appendix A**
	• Overview of the Project / Works	**Section 1.1**
	• Secretary's Environmental Assessment Requirements	**Section 1.1.3**
	• Site Plan and Sensitive Receivers	**Section 1.1.2**
	• Ambient Noise Monitoring	**Section 2.3**

ID	Requirements	Document Reference
	• Construction Noise and Vibration Assessment	Section 4 Section 5 Section 6
	• Summary of Noise and Vibration Impacts	Section 4 Section 5 Section 6
	• Summary of all Standard and Additional Mitigation Measures	Section 8
	• References	Section 10

1.1.4 Consultation

In accordance with CoA D43, a copy of the DNVIS will be provided to the Acoustic Advisor (AA) and Environmental Representative (ER) for review before the commencement of the associated works. Copies of the DNVIS will also be available for the Planning Secretary (DPHI) and the EPA on request.

Ongoing consultation with the community and potentially affected receivers (in accordance with CoA D43 and D44) will inform mitigation and management of noise and vibration impacts, refer **Section 8**. Refer to the CEMP and CNVMP for more information regarding consultation during delivery of the WTP.

1.1.5 Hours of Work

The Minister's Conditions of Approval (CoA) D35 and the Project EPL (21676) condition L5.1 state that work should only be undertaken during the following approved hours:

- 7:00 am to 6:00 pm Mondays to Fridays, inclusive.
- 8:00 am to 6:00 pm Saturdays, and
- at no time on Sundays or public holidays.

Out-of-Hours Work (OOHW)

Notwithstanding, the approved hours above, CoA D37 allows out of hours work to be undertaken in the following circumstances:

- Safety and Emergencies (CoA D37(a)), including:
  - for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or
  - where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm.
- 'Low Impact' construction (CoA D37(b)) that:
  - causes $L_{Aeq(15\ minute)}$ noise levels no more than Noise Management Levels (NMLs).
  - causes vibration levels no more than vibration criteria.

- As approved by an EPL, out-of-hours work protocol or negotiated agreement (CoA D37(c)).
- A prescribed activity within the CoA D37(d).

The Project EPL (21676) provides exemptions to standard construction hours for low noise impact work in condition L5.3, as reproduced below:

> Works and activities may be carried on outside of the hours specified in condition L5.1 if the works and activities do not cause, when measured at the boundary of the most affected noise sensitive receiver:
>
> a) LAeq(15 minute) noise levels greater than 5dB above the day, evening and night rating background level (RBL) at any residence in accordance with the ICNG; and
>
> b) no more than the "Noise affected" NMLs specified in Table 3 of the ICNG at other sensitive land user(s); and
>
> c) LA1(1 minute) or LAmax noise levels greater than 15dB above the night RBL for night works;
>
> d) 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
>
> e) 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).
>
> 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. 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.

Project work periods are outlined in **Table 2** below:

Table 2 Hours of Work

Work Period	Description[1]
Approved Hours	Monday -Friday (7am – 6pm)
	Saturday (8am – 6pm)
	Sunday / Public Holidays (Nil)
OOHW1 (Evening)[2]	Monday -Friday (6pm – 10pm)
	Saturday (6pm – 10pm)
	Sunday / Public Holidays (8am -6pm)
OOHW2 (Night)[2]	Monday -Friday (10pm – 7am)
	Saturday (10pm – 8am)
	Sunday / Public Holidays (6pm -7am)

Note 1: Adapted from the Sydney Metro Construction Noise and Vibration Standard, incorporating CoA D35 (approved work hours).

Note 2: All OOHW must be approved in accordance with the CNVMP and OOHW Protocol or fall under an EPL prior to commencing.

2 Existing Noise Environment

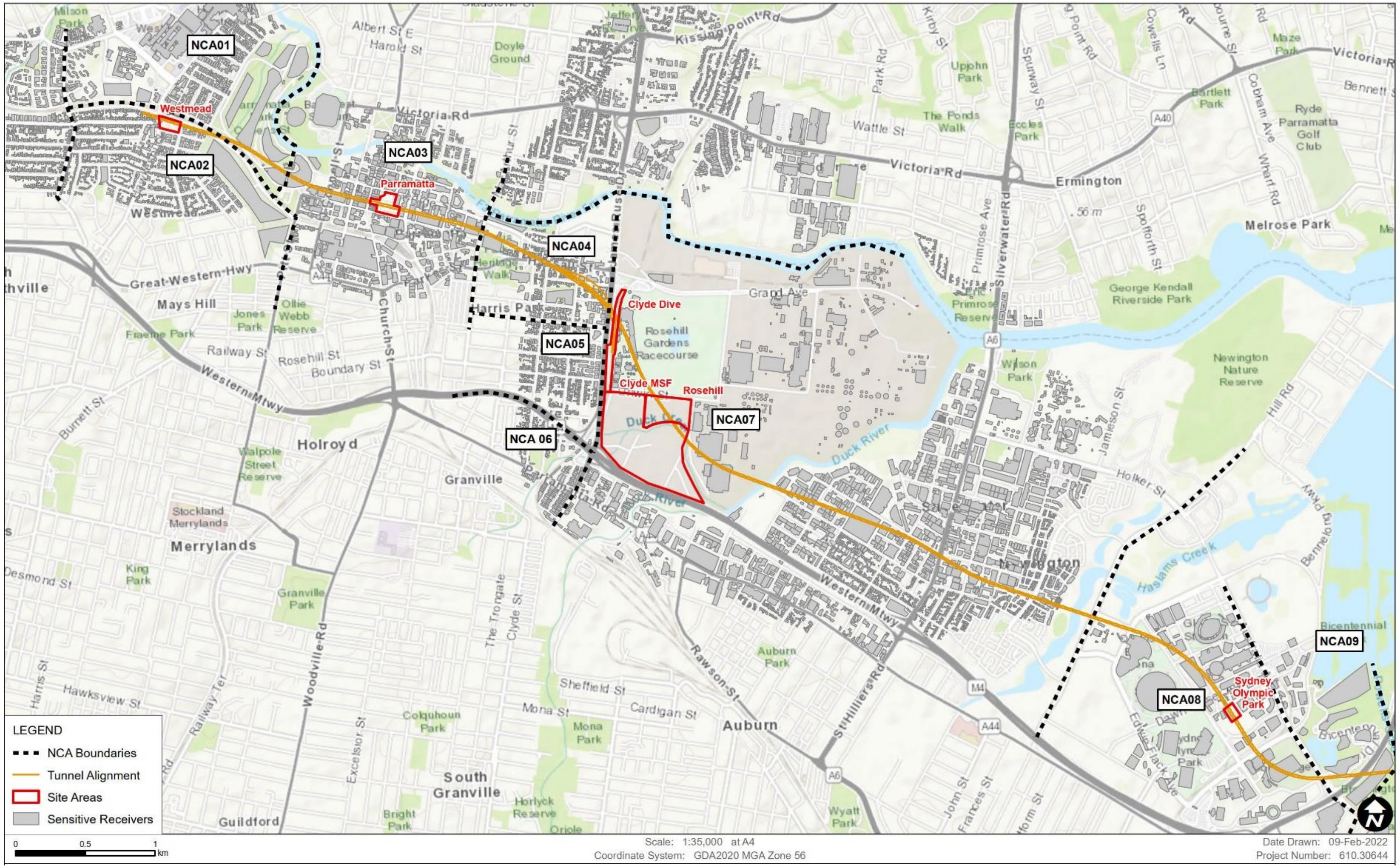
2.1 Noise Catchment Areas

The Project study area has been divided into nine Noise Catchment Areas (NCAs) as defined in the *Sydney Metro West – Westmead to the Bays Concept and Stage 1 - Environmental Impact Statement* (EIS). These NCAs reflect the ambient noise environment of that area, as well as the noise and vibration sensitivity of the surrounding land uses. These nine NCA are described in **Table 3** below and presented in **Figure 6**.

Table 3 Noise Catchment Areas

NCA	Description
NCA01	North of the existing rail corridor in Westmead and mainly residential. 'Other sensitive' receivers include Westmead Hospital, Western Sydney University – Westmead, and Parramatta Marist High School. A childcare centre and a number of medical facilities are to the north of the existing Westmead Station.
NCA02	South of the existing rail corridor and mainly residential. Westmead Primary School is in the north of the catchment on Hawksbury Road.
NCA03	Covers Parramatta CBD and is mainly commercial. Residential receivers are generally on the outskirts of the catchment. There are many 'other sensitive' receivers in this catchment, including Western Sydney University – Parramatta, Arthur Phillip High School, Parramatta Public School, and nearby hotels and places of worship.
NCA04	South of the Parramatta River and west of James Ruse Drive. The catchment is mainly residential with small areas of commercial receivers.
NCA05	North of the M4 Motorway and west of James Ruse Drive. The catchment is mainly residential. 'Other sensitive' receivers include Rosehill Public School and a number of hotels and child care centres.
NCA06	South of the M4 Motorway in Granville. The catchment is mostly residential adjacent to the motorway, with some commercial use in the south-east.
NCA07	East of James Ruse Drive, this catchment is mostly commercial and covers Rosehill Gardens racecourse, the Clyde commercial/industrial area, and Silverwater and Newington. Residential receivers and Newington Public School are in the south-east. This catchment is included in both the Clyde and Silverwater precincts.
NCA08	Covers the western portion of Olympic Park near the existing Olympic Park Station. This catchment is mainly of commercial and sporting related uses, with some 'other sensitive' receivers including hotels and educational facilities. Residential apartment blocks are in the south, east and west.
NCA09	Covers the eastern portion of Olympic Park and is a mixture of commercial and residential. There are several high-rise residential apartment buildings near Australia Avenue.

Figure 6 Noise Catchment Areas



2.2 Sensitive Receivers

A detailed Land Use Survey was prepared in accordance with CoA D34 to confirm sensitive receivers (including critical working areas such as operating theatres and precision laboratories) potentially exposed to construction noise and vibration and construction ground-borne noise as a result of the Project, refer **Figure 2** to **Figure 5**.

Receivers potentially sensitive to noise and vibration have been categorised as residential buildings, commercial/industrial buildings, or 'other sensitive' land uses which includes educational institutions, childcare centres, medical facilities, places of worship, outdoor recreation areas, etc.

This assessment identifies the likely maximum impacts for each receiver in the vicinity of the Project. Some buildings may contain more than one use, for example residential apartments with commercial uses on ground floor. Where this occurs, the building is categorised using the most stringent criteria. Receiver types and locations are shown in **Figure 2** to **Figure 5**.

2.3 Unattended Noise Monitoring

Unattended noise monitoring was completed for the Sydney Metro West Project between March and July 2019 as part of the EIS. The measured 2019 baseline noise levels surrounding the Project have been used to determine the existing noise environment and to set the criteria used to assess the potential impacts from the Project.

The monitoring equipment was positioned to measure existing noise levels that are representative of receivers potentially most affected by the Project. The noise monitoring equipment continuously measured existing noise levels in 15-minute periods during the daytime, evening and night-time.

The noise monitoring locations are shown in **Figure 2** to **Figure 5** and the results are summarised in **Table 4**. Further information regarding the monitoring, including methodology and detailed data, is provided in the EIS (Technical Paper 2 - Noise and Vibration). This unattended noise monitoring data is considered sufficient for the assessment of construction noise and additional baseline noise monitoring is not proposed for the preparation of the DNVIS.

Table 4 Summary of Ambient and Background Noise Levels

Study Area	ID	NCA	Address	Measured Noise Levels (dBA)					
				Background Noise (RBL)			Average Noise (L_{Aeq})		
				Day	Evening	Night	Day	Evening	Night
Westmead	B.01	NCA02	8-12 Alexandra Avenue, Westmead	49	47	37	67	67	62
	B.02	NCA01	14A Central Avenue, Westmead	48	46	41	58	53	51
Parramatta	B.03	NCA03	Arthur Phillip High School, Parramatta	58	53	43	69	67	62

Study Area	ID	NCA	Address	Measured Noise Levels (dBA)					
				Background Noise (RBL)			Average Noise (L_{Aeq})		
				Day	Evening	Night	Day	Evening	Night
Clyde / Rosehill	B.04	NCA04	5 Hope Street, Rosehill	51	48	41	61	58	57
	B.05	NCA05	9 A'Beckett Street, Granville	50	49	45	56	55	53
	B.06	NCA06	4B Gray Street, Granville	52	51	44	58	57	55
	B.07	NCA07	10 Carnarvon Street, Silverwater	46	44	41	60	57	55
Sydney Olympic Park	B.08	NCA08	1 Herb Elliot Avenue, Sydney Olympic Park	48	48	46	55	54	52
	B.09	NCA09	6 Parkview Drive, Sydney Olympic Park	48	46	41	57	58	53

Note 1: The assessment periods are the daytime which is 7 am to 6 pm Monday to Saturday and 8 am to 6 pm on Sundays and public holidays, the evening which is 6 pm to 10 pm, and the night-time which is 10 pm to 7 am on Monday to Saturday and 10 pm to 8 am on Sunday and public holidays. See the NSW EPA *Noise Policy for Industry*.

3 Assessment Criteria

3.1 Construction Noise and Vibration Guidelines

The standards and guidelines relevant to the Project are listed in **Table 5**. These guidelines aim to protect the community and environment from excessive noise and vibration impacts during construction of projects.

Table 5 Construction Noise and Vibration Standards and Guidelines

Guideline/Policy Name	Where Guideline Used
Interim Construction Noise Guideline (ICNG) (DECC, 2009)	Assessment of airborne noise impacts on sensitive receivers
Construction Noise and Vibration Strategy (TfNSW CNVS) (TfNSW, 2019)	Assessment and management protocols for airborne noise, ground-borne noise and vibration impacts for construction of rail infrastructure projects
Sydney Metro Construction Noise and Vibration Standard (Sydney Metro CNVS) (Sydney Metro, 2020)	Assessment and management protocols for construction of Sydney Metro projects. This Sydney Metro standard is based on the requirements of the ICNG and Transport for NSW CNVS, as appropriate to Sydney Metro and is the guiding strategy for assessing and managing the potential impacts during construction of Sydney Metro West
Road Noise Policy (RNP) (DECCW, 2011)	Assessment of construction traffic impacts
BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2, BSI, 1993	Assessment of vibration impacts (structural damage) to non-heritage sensitive structures
DIN 4150:Part 3-2016 Structural vibration – Effects of vibration on structures, Deutsches Institute fur Normung, 1999	Screening assessment of vibration impacts (structural damage) to heritage sensitive structures, where the structure is found to be unsound

Guideline/Policy Name	Where Guideline Used
Assessing Vibration: a technical guideline (AVTG) (DEC, 2006)	Assessment of vibration impacts on sensitive receivers

3.2 Interim Construction Noise Guideline

The NSW *Interim Construction Noise Guideline* (ICNG) is used to assess and manage impacts from construction noise on residences and other sensitive land uses in NSW.

The ICNG contains procedures for determining project specific Noise Management Levels (NMLs) for sensitive receivers based on the existing background noise in the area. The 'worst-case' noise levels from construction of a project are predicted and then compared to the NMLs in a 15-minute assessment period to determine the likely impact of the project.

The NMLs are not mandatory limits, however, where construction noise levels are predicted or measured to be above the NMLs, feasible and reasonable work practices to minimise noise emissions are to be investigated.

Residential Receivers

The ICNG approach for determining NMLs at residential receivers is shown in **Table 6**.

Table 6 ICNG NMLs for Residential Receivers

Time of Day	NML $L_{Aeq(15minute)}$	How to Apply
Standard Construction Hours Monday to Friday 7:00 am to 6:00 pm Saturday 8:00 am to 1:00 pm No work on Sundays or public holidays	Noise affected RBL[1] + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise Where the predicted or measured $L_{Aeq(15minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly Noise Affected 75 dBA	The Highly Noise Affected (HNA) level represents the point above which there may be strong community reaction to noise Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restructuring the hours that the very noisy activities can occur, taking into account: Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools or mid-morning or mid-afternoon for works near residences If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Time of Day	NML $L_{Aeq(15minute)}$	How to Apply
Outside Standard Construction Hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours The proponent should apply all feasible and reasonable work practices to meet the noise affected level Where all feasible and reasonable practises have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Note 1: The RBL is the Rating Background Level and the ICNG refers to the calculation procedures in the NSW *Industrial Noise Policy* (INP). The INP has been superseded by the NSW EPA *Noise Policy for Industry* (NPfI).

Sleep Disturbance

The Sydney Metro CNVS has adopted the NPfI method for assessing sleep disturbance. Although the NPfI sleep disturbance criteria relates to industrial noise, it is also considered relevant for reviewing potential impacts from construction noise as a screening criterion to identify the need for further assessment.

The NPfI notes that a detailed maximum noise level assessment should be undertaken where a project results in night-time noise levels which exceed 52 dBA L_{AFmax} or the prevailing background level plus 15 dB, whichever is the greater.

Project Residential NMLs

Residential NMLs for the Project have been determined in accordance with the requirements of the ICNG and the Sydney Metro CNVS as described above and are shown in **Table 7**.

Table 7 Project Residential NMLs

NCA	Receiver Type	Representative Logger Location	Noise Management Level ($L_{Aeq(15minute)}$ – dBA)				Sleep Disturbance Screening Level (52 dBA or RBL +15 dB whichever is higher) (L_{Amax} dBA)
			Approved Construction Hours (RBL+10dB)	Out of Hours (RBL+5dB)			
			Daytime	Daytime[1]	Evening	Night-time	Night-time
NCA01	Residential	B.02	58	53	51	46	56
NCA02	Residential	B.01	59	54	52	42	52
NCA03	Residential	B.03	68	63	58	48	58
NCA04	Residential	B.04	61	56	53	46	56
NCA05	Residential	B.05	60	55	54	50	60
NCA06	Residential	B.06	62	57	56	49	59
NCA07	Residential	B.07	56	51	49	46	56
NCA08	Residential	B.08	58	53	53	51	61
NCA09	Residential	B.09	58	53	51	46	56

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

'Other Sensitive' Land Uses and Commercial Receivers

The NMLs for 'other sensitive' non-residential land uses are shown in **Table 8** and **Table 10**. These have been adopted from the ICNG, Sydney Metro CNVS, *AS2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors,* and previous assessments undertaken for the Sydney Metro West Project (eg EIS and modification reports).

Table 8 NMLs for 'Other Sensitive' Receivers - ICNG

Land Use	Assessment Period	Noise Management Level $L_{Aeq(15minute)}$ (dBA)	
		Internal	External
ICNG 'Other Sensitive' Receivers			
Classrooms at schools and other educational institutions	When in use	45	55[1]
Hospital wards and operating theatres	When in use	45	65[2]
Places of worship	When in use	45	55[1]
Active recreation areas (characterised by sporting activities and activities which generate noise)	When in use	-	65
Passive recreation areas (characterised by contemplative activities that generate little noise)	When in use	-	60
Commercial	When in use	-	70
Industrial	When in use	-	75

Note 1: It is assumed that these receivers have windows partially open for ventilation which results in internal noise levels being around 10 dB lower than the external noise level.

Note 2: It is assumed that these receivers have fixed windows which conservatively results in internal noise levels being around 20 dB lower than the external noise level.

Table 9 NMLs for 'Other Sensitive' Receivers – Additional

Land Use	Assessment Period	Noise Management Level $L_{Aeq(15minute)}$ (dBA)	
		Internal	External
Non-ICNG 'Other Sensitive' Receivers			
Hotel[3]	Day / Evening	50	70[2]
	Night-time	40	60[2]
Café / Bar / Restaurant[3]	When in use	50	70[2]
Child Care Centres – Sleeping areas[4]	When in use	40	50[1]
Public Building	When in use	50	60[1]
Recording Studio	When in use	25	45[2]
Theatre/Auditorium	When in use	30	50[2]

Land Use	Assessment Period	Noise Management Level $L_{Aeq(15minute)}$ (dBA)	
		Internal	External
Rosehill Gardens Racecourse Stables[5]	When in use	-	60

Note 1: It is assumed that these receivers have windows partially open for ventilation which results in internal noise levels being around 10 dB lower than the external noise level.

Note 2: It is assumed that these receivers have fixed windows which conservatively results in internal noise levels being around 20 dB lower than the external noise level.

Note 3: Adopted from AS2107.

Note 4: Adopted from *Association of Australian Acoustical Consultants Guideline for Child Care Centre Acoustic Assessment*.

Note 5: Adopted from the ICNG – passive recreation.

3.3 Construction Road Traffic Noise Guidelines

The potential impacts from construction traffic on public roads are assessed under the NSW EPA *Road Noise Policy* (RNP) and the Sydney Metro CNVS.

An initial screening test is first applied to evaluate if existing road traffic noise levels are expected to increase by more than 2.0 dB as a result of construction traffic. Where this is considered likely, further assessment is required using the RNP base criteria shown in **Table 10**.

Table 10 RNP Criteria for Assessing Construction Vehicles on Public Roads

Road Category	Type of Project/Land Use	Assessment Criteria (dBA)	
		Daytime (7 am – 10 pm)	Night-time (10 pm – 7 am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	$L_{Aeq(15hour)}$ 60 (external)	$L_{Aeq(9hour)}$ 55 (external)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq(1hour)}$ 55 (external)	$L_{Aeq(1hour)}$ 50 (external)

3.4 Ground-borne Noise

Construction work can cause ground-borne (structure-borne or regenerated) noise impacts in nearby buildings when vibration intensive equipment is in use, such as during tunnelling or excavation work using tunnel boring machines, roadheaders or rockbreakers. Vibration can be transmitted through the ground and into nearby buildings, which can then create audible noise impacts inside the building.

Ground-borne noise NMLs are applicable where ground-borne noise levels are likely to be higher than airborne noise levels, which can occur where work is underground or where surface work is shielded by noise barriers or other structures.

The internal ground-borne noise criteria for residential and commercial receivers are shown in **Table 11**.

Table 11 Ground-borne Noise Criteria

Receiver Type	Noise Management Level ($L_{Aeq(15minute)}$ – dBA)		
	Daytime[1]	Evening[2]	Night-time[2]
Residential	45	40	35
Commercial	50	n/a	n/a

Note 1: Daytime ground-borne noise NMLs taken from preceding Sydney Metro planning applications for consistency. Daytime ground-borne noise NMLs are not specified in the ICNG or Sydney Metro CNVS.

Note 2: Specified in the Sydney Metro CNVS and ICNG.

For other sensitive receivers, including commercial receivers such as offices and retail areas, the ICNG and CNVS do not provide guidance in relation to acceptable ground-borne noise levels. For the purpose of this DNVIS, the internal airborne NMLs presented in **Table 8** and **Table 9** will also be adopted for ground-borne noise.

3.5 Vibration Guidelines

The effects of vibration from construction work can be divided into three categories:

- Those in which the occupants of buildings are disturbed (**human comfort**). People can sometimes perceive vibration impacts when vibration generating construction work is located close to occupied buildings. Vibration from construction work tends to be intermittent in nature and the AVTG (DEC, 2006) provides criteria for intermittent vibration based on the Vibration Dose Value (VDV), as shown in **Table 12**.
- Those where the integrity of the building may be compromised (**structural/cosmetic damage**). If vibration from construction work is sufficiently high, it can cause cosmetic damage to elements of affected buildings. Industry standard cosmetic damage vibration limits are specified in British Standard BS 7385 and German Standard DIN 4150. The limits are shown in **Table 13** and **Table 14**.
- Those where building contents may be affected (**building contents**). People perceive vibration at levels well below those likely to cause damage to building contents. For most receivers, the human comfort vibration criteria are the most stringent and it is generally not necessary to set separate criteria for vibration effects on typical building contents. Exceptions to this can occur when vibration sensitive equipment, such as electron microscopes or medical imaging equipment, are in buildings near to construction work, refer **Section 3.5.2**.

Table 12 Human Comfort Vibration – Vibration Dose Values for Intermittent Vibration

Building Type	Assessment Period	Vibration Dose Value[1] ($m/s^{1.75}$)	
		Preferred	Maximum
Critical Working Areas (eg operating theatres or laboratories)	Day or night-time	0.10	0.20
Residential	Daytime	0.20	0.40
	Night-time	0.13	0.26
Offices, schools, educational institutions and places of worship	Day or night-time	0.40	0.80
Workshops	Day or night-time	0.80	1.60

Note 1: The VDV accumulates vibration energy over the daytime and night-time assessment periods, and is dependent on the level of vibration as well as the duration.

Table 13 Cosmetic Damage – BS 7385 Transient Vibration Values for Minimal Risk of Damage

Group	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures. Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 1: Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%.

Table 14 Cosmetic Damage – DIN 4150 Guideline Values for Short-term Vibration on Structures

Group	Type of Structure	Guideline Values Vibration Velocity (mm/s)				
		Foundation, All Directions at a Frequency of			Topmost Floor, Horizontal	Floor Slabs, Vertical
		1 to 10 Hz	10 to 50 Hz	50 to 100 Hz	All frequencies	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40	20
2	Residential buildings and buildings of similar design and/or occupancy	5	5 to 15	15 to 20	15	20
3	Structures that, because of their particular sensitivity to vibration, cannot be classified as Group 1 or 2 **and** are of great intrinsic value (eg heritage listed buildings)	3	3 to 8	8 to 10	8	20[1]

Note 1: It may be necessary to lower the relevant guideline value markedly to prevent minor damage.

3.5.1 Heritage Buildings or Structures

Heritage listed buildings and structures should be considered on a case-by-case basis but as noted in the Sydney Metro CNVS, should not be assumed to be more sensitive to vibration, unless structurally unsound. In accordance with CoA D46, where a heritage building is deemed to be sensitive (following inspection), a more conservative cosmetic damage criterion of 2.5 mm/s peak component particle velocity (from DIN 4150) must be applied, refer **Table 14** (group 3). Chapter 12 and Technical Paper 3 of the EIS identified the following heritage structures within and nearby the Project sites with the potential for impacts:

- 41-59 George Street, Parramatta (I703) – *Parramatta Local Environmental Plan 2011*. This building is a two storey Victorian Regency shops with plain sandstone façade. It is located to the north of the Parramatta Site.
- Convict Drain (I647) – *Parramatta Local Environmental Plan 2011*. The brick barrel drain consists of double skin of sandstock bricks loosely cemented with mud mortar and packed with sand and clay. The drain begins near the junction of Church and Darcy Streets and runs north-east to Parramatta River. It is located to the south-east of the Parramatta Site.
- Roxy Theatre (I00711) – *Parramatta Local Environmental Plan 2011*, and *State Heritage Register* (00711). This heritage item is an Inter-War Spanish Mission purpose-built cinema building flanked on either side by loggias containing shops. It is located to the north-east of the Parramatta Site.
- Horse Parapet Façade (I656) – *Parramatta Local Environmental Plan 2011*. This building is a Victorian Italianate two-storey shops and offices with parapet decorated with two prancing plaster horses. It is located to the south-west of the Parramatta Site.
- Kia Ora (I716) – *Parramatta Local Environmental Plan 2011*. This building is a two storey townhouse of rendered brick on sandstone foundation with gabled slate roof. It is located to the south of the Parramatta Site.
- RTA Depot (I576) – *Parramatta Local Environmental Plan 2011*. This heritage item includes a main multi-storey framed industrial workshop as well as a number of other workshops, structures and remnants of a rail siding. This item is located within the boundary of the Clyde MSF site.
- Capral Aluminium (I575) – *Parramatta Local Environmental Plan 2011*. This heritage item includes a multi-storey office building which was developed in late 1930. This item is located adjacent to the Rosehill site.

These heritage structures are currently in use and/or classified with 'Good' physical condition on the state heritage inventory and are therefore not deemed structurally unsound, or more sensitive to vibration.

Additional heritage items are located across the Project area (eg adjacent to the Sydney Olympic Park site), however these items are not considered at risk from construction related vibration.

Following pre-construction surveys, it has been confirmed that all heritage items in the vicinity of the project are deemed structurally sound and therefore the BS 7385 cosmetic damage criteria presented in **Table 13** are applicable. Minimum working distances are also shown in **Table 16**.

3.5.2 Sensitive Scientific Equipment

Some scientific equipment, such as electron microscopes and microelectronics manufacturing equipment, can require more stringent vibration objectives. Other sensitive equipment used for various business requirements, such as medical equipment, may also have specific vibration goals. Vibration sensitive equipment is, however, often housed in buildings/rooms specifically designed and constructed for that purpose, which can help mitigate any potential impacts.

Vibration limits for the operation of sensitive scientific and medical equipment should be taken from manufacturer's data. Where this is not available the Vibration Criterion (VC) curves outlined in the Sydney Metro CNVS shown in **Table 15** can be used. Where the criteria are exceeded all appropriate feasible and reasonable mitigation and management measures would be considered to minimise the impacts.

Table 15 VC Curves for Vibration Sensitive Equipment

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

Note 1: As measured in one-third octave bands of frequency over the frequency range 8 to 100 Hz.

Note 2: The detail size refers to the line widths for microelectronics fabrication, the particle (cell) size for medical and pharmaceutical research, etc. The values given take into account the observation requirements of many items depend upon the detail size of the process.

The following receivers nearby the Project sites have been identified to contain Sensitive Scientific Equipment:

- Westmead Private Hospital - 12 Mons Rd, Westmead
- Westmead Hospital - 176 Hawkesbury Rd, Westmead
- Westmead Oral and Maxillofacial Surgeons - 163-171 Hawkesbury Rd, Westmead
- SunDoctors Skin Cancer Clinics Parramatta - 239 Church St, Parramatta
- Orthodontics Sydney Wide - 35 Smith St, Parramatta

3.5.3 Minimum Working Distances for Vibration Intensive Works

Minimum working distances for typical vibration intensive construction equipment are provided in the TfNSW CNVS and are shown in **Table 16**. The minimum working distances are for both cosmetic damage (from BS 7385 and DIN 4150) and human comfort (from AVTG). They are calculated from empirical data which suggests that where work is further from receivers than the quoted minimum distances then impacts are not considered likely.

Table 16 Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Rating/Description	Minimum Distance		
		Cosmetic Damage		Human Response (NSW EPA Guideline)
		Residential and Light Commercial (BS 7385)	Heritage Items (DIN 4150, Group 3)	
Vibratory Roller	<50 kN (1–2 tonne)	5 m	11 m	15 m to 20 m
	<100 kN (2–4 tonne)	6 m	13 m	20 m
	<200 kN (4–6 tonne)	12 m	25 m	40 m
	<300 kN (7–13 tonne)	15 m	31 m	100 m
	>300 kN (13–18 tonne)	20 m	40 m	100 m
	>300 kN (>18 tonne)	25 m	50 m	100 m
Small Hydraulic Hammer	300 kg (5 to 12 t excavator)	2 m	5 m	7 m
Medium Hydraulic Hammer	900 kg (12 to 18 t excavator)	7 m	15 m	23 m
Large Hydraulic Hammer	1,600 kg (18 to 34 t excavator)	22 m	44 m	73 m
Very Large Hydraulic Hammer[1]	3,930 kg (49t excavator)	39 m	80 m	140 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	5 m to 40 m	20 m
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	5 m	4 m
Jackhammer	Hand held	1 m (nominal)	3 m	2 m

Note 1: Additional working distances determined for very large hammers assume a site exponent of 1.6.

The minimum working distances are indicative and will vary depending on the particular item of equipment and local geotechnical conditions. The distances apply under typical geotechnical conditions.

4 Airborne Noise Impact Assessment

4.1 Modelling Description

A noise model of the study area has been used to predict noise levels from the proposed construction work to all surrounding receivers. The model uses ISO 9613 algorithms in SoundPLAN software. The local terrain profile, receiver buildings and structures were digitised in the noise model to develop a three-dimensional representation of the construction sites and surrounding areas.

Construction sheds have been modelled for the following construction sites:

- Westmead – Spoil Shed (with acoustic treatment)
- Clyde Dive – Shaft Excavation (with acoustic treatment)
- Rosehill – Spoil Shed (enclosed) and Segment Shed (with permanent openings for the gantry crane on the southwest and northeast ends)

These sheds are designed to cover specific excavation sites, gantry cranes and spoil handling activities. Details on the acoustic properties assumed for the sheds are in **Appendix F**.

4.2 Modelled Work Scenarios Summary

4.2.1 Westmead

The representative construction scenarios developed to assess potential impacts during construction of the Project at the Westmead site are described in **Table 17**. Equipment lists for each scenario and sound power level data is provided in **Appendix B.**

Table 17 Work Activities – Westmead

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule

WM.01	Site preparation work	• Establishing site security measures:
		  ◦ Noise barriers
		  ◦ Hoarding around the perimeter of the site
		  ◦ Signage with site specific contact details (ie site supervisor)
		• Establishing initial temporary facilities such as:
		  ◦ Crib room
		  ◦ Training room
		  ◦ Ablution facilities including toilets, change room and locker room
		  ◦ Security room.
		• Localised earthworks.
			Approved Hours	4 weeks

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule
WM.02	Initial investigation work	• Heritage investigations, protection, and archival recordings • Additional geotechnical, contamination and utility investigations • Building condition surveys • Road dilapidation survey.	Approved Hours	5 weeks
WM.03	Vegetation removal and grubbing	• Any localised vegetation removal will be conducted within the first week of site access.	Approved Hours	1 week
WM.04	Protecting and/or relocating utilities	• Any services identified that may be impacted by Project work will be appropriately managed in consultation with the relevant service/utility provider which may include diversion, protection or support.	Approved Hours	5 weeks
WM.05	Establishment/ Demobilisation of site amenities	• Establishing site compound and ancillary facilities such as offices, amenities, and workshops. • Demobilisation of site compound and ancillary facilities such as offices, amenities, and workshops at project completion.	Approved Hours	8 weeks
WM.06	Establishment/ Demobilisation of Water Treatment Plant (WTP)	• Construction of Water Treatment Plant and associated equipment. • Existing concrete hardstand will be removed via saw cut and grab. • Concrete will be removed off site via concrete waste. • Demobilisation of WTP at project completion.	Approved Hours	12 weeks

WM.07	Establishment/ Removal of vehicle access and egress points	• Establishing vehicle access and egress points:
		  ◦ Site access gates
		  ◦ traffic signage
		  ◦ Temporary parking.
		• Removal at project completion.
			Approved Hours	5 weeks

WM.08	Establishment/ Removal of concrete slabs or piling platforms	• The GLC team intends to re-use all existing concrete slabs and hardstands except for heavy-duty structures such as heavy lifting crane and piling platforms. • The GLC team will seek geotechnical advice and conduct verification to confirm these assumptions upon access into site. • Removal of concrete slabs / piling platforms as required at project completion.	Approved Hours	5 weeks
WM.09	Establishing spoil shed (slab)	• Construction of the slab and footings for the spoil shed • Existing concrete hardstand will be removed via saw cut and grab • Concrete will be removed off site via concrete waste.	Approved Hours	12 weeks
WM.10	Establish spoil shed (structure)	• The spoil shed steel works construction will commence following the slab and footings. • No piles are to be constructed for the spoil shed.	Approved Hours	
WM.11	Station Box bored piling	• Bored piling associated with the Station box excavation.	Approved Hours	10 weeks
WM.12	Station Box pile breakback	• Pile breakback / trim associated with the Station box excavation.	Approved Hours	5 weeks

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule
WM.13	Establishment/removal of truck wheel wash or rumble grid	• Existing concrete hardstand will be removed via saw cut and grab. • Concrete will be removed off site via concrete waste. • Install wheel wash and connect to temporary LV power.	Approved Hours	5 weeks
WM.14	Box excavation ground support – Ground anchors / shotcrete / rockbolts	• Ground support for box excavation including: Ground anchors, Shotcrete and Rockbolts.	Approved Hours, OOHW1	5 weeks
WM.15	Box excavation ground support – Internal struts and water install	• Construction of internal reinforced concrete struts and walers.	Approved Hours	3 weeks
WM.16a	Box excavation (from surface)	• Bulk excavation work commencing from the surface • Material will either be loaded directly into Truck and Dogs for removal of spoil off site or transferred into the temporary spoil shed via the dump trucks.	Approved Hours, OOHW1	30 weeks
WM.16b	Box excavation (with hydraulic hammer)	• Excavation work with hydraulic hammers commencing at depth of about 2 m, prior to installation of box enclosure. • Material will either be loaded directly into Truck and Dogs for removal of spoil off site or transferred into the temporary spoil shed via the dump trucks.	Approved Hours	
WM.17a	Box excavation (with acoustic shed / cover)	• Continuation of box excavation through rock. • Excavation box covered with acoustic panels. • Excavation at depth including rock hammering. • Material will either be loaded directly into Truck and Dogs for removal of spoil off site or transferred into the temporary spoil shed via the dump trucks.	Approved Hours, OOHW1 & 2	30 weeks
WM.17b	Box excavation – rockbolting/ shotcrete (with acoustic shed / cover)	• Excavation box covered with acoustic panels. • Rockbolting / Shotcrete works within the enclosed excavation box.	OOHW1 & 2	
WM.18	Mined Tunnel Excavation	• Mined tunnel excavation via roadheader from the base of the excavation box, along the tunnel alignment.	Approved Hours, OOHW1 & 2	52 weeks
WM.19	Delivery of Equipment / Heavy Vehicle Deliveries	• Heavy Vehicle deliveries for tunnelling support, equipment and concrete deliveries to the site will occur as approved and out-of-hours work. • Heavy Vehicles working within Acoustic Shed (refer **Appendix B**)	Approved Hours, OOHW1	Ongoing
WM.19b[3]	Delivery of Equipment / Heavy Vehicle Deliveries	• Heavy Vehicle deliveries for tunnelling support, equipment and concrete deliveries to the site will enter and exit the site via Hawkesbury Road during the night-time period. • Heavy Vehicles working within Acoustic Shed (refer **Appendix B**)	OOHW2	Ongoing

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule
WM.19c	Delivery of Equipment / Heavy Vehicle Deliveries	• Heavy Vehicle deliveries for tunnelling support, equipment (flatbed trucks only) to the site will enter and exit the site via Hawkesbury Road during the night-time period. • Heavy Vehicles working within Acoustic Shed (refer **Appendix B**)	OOHW2	Ongoing
WM.20	TBM Retrieval	• Following completion of TBM work from Rosehill to Westmead, the TBM and supporting equipment will be removed from the Station Box at Westmead.	Approved Hours, OOHW1 & 2	11 weeks
WM.21	General operation of ancillary facility	• General activities involving the continual operation of the ancillary facility (eg light vehicles, and stationary noise sources).	Approved Hours, OOHW1 & 2	Ongoing
WM.22	Gantry Crane Operation	• Loading out material from the excavation box into the spoil shed.	Approved Hours, OOHW1 & 2	Ongoing
WM.23	Permanent Tunnel Lining and FRP	• Assembly and disassembly of formwork and installation of waterproofing, rebar, and concrete. • Deliveries of concrete, with concrete to be pumped from within the acoustic shed.	Approved Hours, OOHW1 & 2	12 Weeks
WM.24	Installation of Monitoring Equipment	• Installation of Instrumentation & Monitoring (I&M) equipment – Inclinometers and Extensometers. • Where possible this activity will be undertaken during approved hours. Some locations may require ROLs for road closures and will therefore be required to occur during OOHW periods.	Approved Hours, OOHW1 & 2	Various discrete events
WM.25	Removal of acoustic/spoil shed	• Disassembly and removal of acoustic/spoil shed	Approved Hours, OOHW1 & 2[4]	12 Weeks

Note 1: Equipment lists for each scenario and sound power level data is provided in **Appendix B**.

Note 2: All OOHW must be approved in accordance with the CNVMP and OOHW Protocol or EPL prior to commencing. Refer **Section 1.1.5**.

Note 3: 24hr Heavy Vehicle Deliveries (eg concrete trucks/20T trucks) have been assessed under a Memo prepared by SLR (610.30644-M11-v1.1-20240604) to demonstrate compliance with the Road Noise Policy, as per the instruction from DPHI (refer **Section 4.4**).

Note 4: Removal of the spoil shed will be adjacent to public roadways and footpaths. Due to interaction with the public and vehicles, works may be required to be undertaken under an ROL outside of peak traffic times and therefore may be required during OOHW periods.

4.2.2 Parramatta

The representative construction scenarios developed to assess potential impacts during construction of the Project at the Parramatta site are described in **Table 18**. Equipment lists for each scenario and sound power level data is provided in **Appendix B.**

Table 18 Work Activities - Parramatta

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule

PM.01	Site preparation work	• Establishing site security measures:
		  ◦ Noise barriers
		  ◦ Hoarding around the perimeter of the site
		  ◦ Signage with site specific contact details (ie site supervisor)
		• Establishing initial temporary facilities such as:
		  ◦ Crib room
		  ◦ Training room
		  ◦ Ablution facilities including toilets, change room and locker room
		  ◦ Security room
			Approved Hours, OOHW1 & 2	3 weeks

PM.02	Initial investigation work	• Geotechnical, contamination and utility investigations • Building condition surveys • Road dilapidation survey.	Approved Hours	8 weeks
PM.03	Archaeological clearance	• Heritage investigations, protection, and archival recordings.	Approved Hours, OOHW1 & 2	156 weeks
PM.04	Removal and/or relocating utilities	• Any services identified that may be impacted by Project work will be appropriately managed in consultation with the relevant service/utility provider which may include diversion, protection or support.	Approved Hours, OOHW1 & 2	12 weeks
PM.05	Demolition	• Demolition and removal of existing structures.	Approved Hours	94 weeks
PM.06	Establishing Water Treatment Plant (WTP)	• Construction of Water Treatment Plant and associated equipment • Existing concrete hardstand will be removed via saw cut and grab • Concrete will be removed off site via concrete waste.	Approved Hours	12 weeks

PM.07	Establishing vehicle access and egress points	• Establishing vehicle access and egress points:
		  ◦ Site access gates
		  ◦ traffic signage
		  ◦ Temporary parking
			Approved Hours	7 weeks

PM.08a	Establishing concrete slabs or piling platforms and D-Wall infrastructure	• The GLC team intends to re-use all existing concrete slabs and hardstands except for heavy-duty structures such as heavy lifting crane and piling platforms. • The GLC team will seek geotechnical advice and conduct verification to confirm these assumptions upon access into site.	Approved Hours	16 weeks
PM.08b	Establishing D-Wall infrastructure	• Placement of concrete into diaphragm wall panels • Cleaning off Concrete Pours for diaphragm Wall Panels	Approved Hours, OOHW1 & 2	40 weeks
PM.09a	Station box D-Wall Excavation and Construction	• Saw cut box footprint through concrete slab and D-wall construction • Remove concrete within the footprint. Existing concrete will be removed via saw cut and grab. • All concrete removed off site via concrete waste. • Excavation for Diaphragm Wall Panel Installation using Hydraulic Grab • Excavation for Diaphragm Wall Panels Installation using Hydraulic Cutters	Approved Hours, OOHW1 & 2	

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule
PM.09b	Station box D-Wall reduced fleet 1	• Excavation for Diaphragm Wall Panel Installation, reduced equipment fleet.	Approved Hours, OOHW1 & 2	
PM.09c	Station box D-Wall reduced fleet 2	• Excavation for Diaphragm Wall Panel Installation, reduced equipment fleet. • Minor Servicing of Plant & Equipment	Approved Hours, OOHW1 & 2	
PM.10	Station box pile breakback/trim	• Pile breakback / trim associated with the Station box excavation.	Approved Hours	4 weeks
PM.11	FRP (Form, Reo and Pour – concrete works)	• Form, reo and pour for permanent concrete base slab laydown, capping beams, ring beams and in-situ stitch pours.	Approved Hours, OOHW1	10 weeks
PM.12	Internal haul road and station box bridge	• Establishment of on-site haul roads and bridge over station box excavation.	Approved Hours	7 weeks
PM.14	Box excavation ground support – internal struts and waler install	• Bulk excavation work within the D-wall perimeter • Excavation commencing from the surface. • Construction of internal reinforced concrete struts and walers.	Approved Hours, OOHW1 & 2	52 weeks
PM.15	Box excavation to – 26m	• Continuation of box excavation through rock • Excavation at depth including spoil haulage. • High noise generating activities such as rock hammering and saw cutting will be limited to approved hours.	Approved Hours, OOHW1 & 2	40 weeks
PM.16	Delivery of Equipment / General Truck Movements	• Delivery of equipment to the site will occur as out-of-hours work. • General truck movements in and out of the site.	Approved Hours, OOHW1 & 2	Ongoing
PM.17a	Nozzle construction and demobilisation - fissure grouting	• Core drill through D-Wall concrete, drill through rock and pressure grout holes	Approved Hours, OOHW1 & 2	2 weeks
PM.17b	Nozzle construction and demobilisation - canopy tube installation	• Core drill through D-Wall concrete, drill through rock, install canopy tubes and grout	Approved Hours, OOHW1 & 2	3 weeks
PM.17c	Nozzle construction and demobilisation - Concrete D-Wall removal	• Concrete D-Wall removal	Approved Hours, OOHW1 & 2	3 weeks
PM.17d	Nozzle construction and demobilisation - ground support and excavation	• Shotcrete installation, lattice girder installation and rock bolting • Excavate with twin header & hammer rock, move material from face of nozzle & stockpile.	Approved Hours, OOHW1 & 2	5 months

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule
PM.17e	Nozzle Construction and demobilisation - tunnel spoil loadout	• Loadout of spoil	Approved Hours, OOHW1 & 2	5 months
PM.17f	Nozzle Construction and demobilisation – Rock bolting	• Shotcrete installation, lattice girder installation and rock bolting	OOHW1 & 2	5 months
PM.18	General operation of ancillary facility	• General activities involving the continual operation of the ancillary facility (eg light vehicles, trucks, and stationary noise sources).	Approved Hours, OOHW1 & 2	Ongoing
PM.19	Tunnel invert concreting work	• Surface work associated with tunnel concreting work, including concrete trucks and concrete pumps.	Approved Hours, OOHW1	12 weeks
PM.20	Cross passage work	• Surface work associated with tunnel cross passage work, including cranes, dump trucks and concrete trucks.	Approved Hours, OOHW1	20 weeks
PM.21	Tunnel vent fan operation	• Ongoing operation of tunnel ventilation fans.	Approved Hours, OOHW1 & 2	Ongoing
PM.22	Installation of Monitoring Equipment	• Installation of Instrumentation & Monitoring (I&M) equipment – Inclinometers and Extensometers. • Where possible this activity will be undertaken during approved hours. Some locations may require ROLs for road closures and will therefore be required to occur during OOHW periods.	Approved Hours, OOHW1 & 2	Various discrete events
PM23a	Nozzle Tunnel Secondary Lining FRP Works - Form & Reo	• Assembly of Nozzle Lining Formwork system. • Form and reo for permanent concrete secondary lining within nozzle and ring beam.	Approved Hours, OOHW1 & 2	12 weeks
PM23b	Nozzle Tunnel Secondary Lining FRP Works - Concrete pours	• Concrete pours for permanent concrete secondary lining within nozzle and ring beam.	Approved Hours, OOHW1 & 2	12 weeks
PM24	TBM traverse through Parramatta Station box (including preparation /support works)	• Surface and shaft activities related to the refurbishment and relaunch of TBM from Parramatta Station box. • TBM traverse through Parramatta Station box and relaunch.	Approved Hours, OOHW1 & 2	One month
PM25	Sydney Water SEA Works	• Sewer relining works • Macquarie Street water main works	Approved Hours, OOHW1 & 2	8-12 weeks

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule
PM26	Macquarie Street/Horwood Place Local Area Works	• Traffic control • Asphalting • Saw cutting and concrete removal - done on day shift unless ROL requires OOHW1 • Paving, FRP, excavation, fencing, hoarding, line marking, drainage install, water cut overs, backfill • Modelling comprises the following: ○ All equipment, including the use of saw cutting, compaction and hammer demolition occurring during Approved Hours ○ OOHW1 modelling excludes use of compaction and hammer demolition, and includes the use of saw cutting ○ OOHW2 modelling excludes saw cutting, compaction and hammer demolition	Approved Hours, OOHW1 & 2	3-4 months
PM27	240 Church Street Works	• Removal of hoarding, install of steel beams and cladding, exclusion zone set up on Church street footpath for access to first bay of containers. • Removal of existing shipping containers • Bored piling • FRP (steel & cladding) • Concrete & finishing works	Approved Hours, OOHW1 & 2	5-6 months
PM28	Station box maintenance works	• Service installations (electrical & water) and associated supports • Cleaning and scabbling future rebates • Cleaning off spoil from steel beams • Painting steel, concrete patching • Scaffold alterations	Approved Hours, OOHW1 & 2	Ongoing
PM29	Water management/dewatering	• Vac truck and pumping of water	Approved Hours, OOHW1 & 2	Ongoing

Note 1: Equipment lists for each scenario and sound power level data is provided in **Appendix B**.

Note 2: All OOHW must be approved in accordance with the CNVMP and OOHW Protocol or EPL prior to commencing. Refer **Section 1.1.5**.

4.2.3 Clyde Dive

The representative construction scenarios developed to assess potential impacts during construction of the Project at the Clyde Dive Site are described in **Table 19**. Equipment lists for each scenario and sound power level data is provided in **Appendix B.**

Table 19 Work Activities – Clyde Dive

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule

CD.01a	Construction site establishment / Haul Roads	• Establishing site security measures:
		  ◦ Signage with site specific contact details (ie site supervisor)
		• Establishing initial temporary facilities such as:
		  ◦ Crib room
		  ◦ Training room
		  ◦ Ablution facilities including toilets, change room and locker room
		  ◦ Security room
		• Localised earthworks and establishing haul roads
			Approved Hours	24 weeks

CD.01b	Demolition of former Rosehill Station	• Demolition and removal of the former Rosehill Station platforms.	Approved Hours	4 Weeks
CD.02	Establishing piling platforms	• The GLC team intends to re-use all existing concrete slabs and hardstands except for heavy-duty structures such as heavy lifting crane and piling platforms. • The GLC team will seek geotechnical advice and conduct verification to confirm these assumptions upon access into site.	Approved Hours	4 weeks
CD.03	Tree Clearing	• Tree clearance along the ATC boundary at Clyde Dive site.	Approved Hours	6 weeks
CD.04	Shaft construction (excavation and piling)	• Excavation of shaft to Spur line tunnel and associated piling work • Transport of excavated material to Clyde MSF.	Approved Hours	20 weeks
CD.05	Establishing concrete slabs / acoustic shed	• The GLC team intends to re-use all existing concrete slabs and hardstands except for heavy-duty structures such as heavy lifting crane and piling platforms. • Construction of the acoustic shed at the Clyde Dive site.	Approved Hours	16 weeks
CD.06	Bulk earthworks	• Bulk earthworks cut and fill across Clyde Dive site • Truck and Dogs will be utilised to transport the material from satellite sites to Clyde Dive • Placement of fill will typically commence in the lowest points utilising Compactor and Dozer in combination. • Supporting equipment will include an excavator, roller and watercart.	Approved Hours	12 weeks
CD.07	Haul road FRP (form reo pour) and hoarding install	• Form reo pour for permanent concrete base slab laydown, capping beams and in-situ stitch pours. • Construction of noise barriers and hoarding around site	Approved Hours, OOHW1	16 weeks
CD.08a	Decline structure construction (piling)	• Excavation and construction of the decline structure • Commencing at the spur line tunnel from the northern end and progressing south to the surface level.	Approved Hours	12 weeks
CD.08b	Decline structure construction (capping beam – 50% overlap with piling)	• Excavation and construction of the decline structure • Commencing at the spur line tunnel from the northern end and progressing south to the surface level.	Approved Hours	90 weeks

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule
CD.08c	Decline structure construction (10% overlap with capping beam)	• Excavation and construction of the decline structure • Commencing at the spur line tunnel from the northern end and progressing south to the surface level. • Concrete pours of base slabs within the dive structure	Approved Hours	60 weeks
CD.09	Spur Line excavation	• Underground work and supporting equipment on the surface. • Excavation of the spur line tunnel • Transport of excavated material to Clyde MSF.	Approved Hours, OOHW 1 & 2	52 weeks
CD.10	Spur line lining	• Underground work and supporting equipment on the surface. • Concrete works associated with lining the spur line tunnel. • Assembly of Line Erection Machine	Approved Hours, OOHW1 & 2	24 weeks
CD.11	Junction excavation	• Underground work and supporting equipment on the surface. • Excavation of Clyde junction • Transport of excavated material to Clyde MSF.	Approved Hours, OOHW1 & 2	32 weeks
CD.12	Junction lining	• Underground work and supporting equipment on the surface. • Concrete works associated with lining the Clyde Junction.	Approved Hours, OOHW1 & 2	20 weeks
CD.13	Demobilisation	• Site demobilisation and removal of equipment. • Deconstruction of acoustic shed	Approved Hours	Ongoing
CD.14	General operation of ancillary facility	• General activities involving the continual operation of the ancillary facility (eg light vehicles, trucks, and stationary noise sources).	Approved Hours, OOHW1 & 2	24 weeks
CD.15	Watermain diversion	• Watermain diversion at the southern end of the Clyde Dive Site including trenching, piling and concreting work.	Approved Hours, OOHW1 & 2	2 weeks
CD.16	Carlingford Rail Line Oversized Deliveries	• Oversized deliveries to the Clyde Dive Site during OOHW periods. • Deliveries would enter the site via the Carlingford rail line corridor from Parramatta Road. • Normal Deliveries: one night a week for 24 months. • TBM deliveries: three times per week for six weeks	Approved Hours, OOHW1 & 2	Ongoing discrete events
CD.17	Utility Protection Slab	• Installation of concrete protection slab over utilities including trenching, piling and concreting work.	Approved Hours	15 weeks
CD.18	ATC Boundary Installation - Retaining wall construction and security fence installation	• Retaining wall and drainage construction • Security fence installation	Approved Hours	26 weeks

Note 1: Equipment lists for each scenario and sound power level data is provided in **Appendix B**.

Note 2: All OOHW must be approved in accordance with the CNVMP and OOHW Protocol or EPL prior to commencing. Refer **Section 1.1.5**.

4.2.4 Clyde MSF

The representative construction scenarios developed to assess potential impacts during construction of the Project at the Clyde MSF site are described in **Table 20**. Equipment lists for each scenario and sound power level data is provided in **Appendix B.**

Table 20 Work Activities – Clyde MSF

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule

MSF.01a	Construction site establishment / demolition of structures	• Establishing site security measures:
		  ◦ Noise barriers
		  ◦ Hoarding around the perimeter of the site
		  ◦ Signage with site specific contact details (ie site supervisor)
		• Demolition of existing structures on-site.
			Approved Hours, OOHW1	40 weeks

MSF01b	Traffic adjustments	• Linemarking and signage	Approved, OOHW1 & 2	40 weeks
MSF.02	Haul Roads and Site Amenities	• Establishment of on-site haul roads • Installing site amenities.	Approved Hours, OOHW1 & 2	40 weeks
MSF.03	Earthworks	• Bulk earthworks cut and fill across the Clyde MSF • Truck and Dogs will be utilised to transport the material from satellite sites to Clyde MSF • Placement of fill will typically commence in the lowest points utilising Compactor and Dozer in combination. • Supporting equipment will include an excavator, roller and watercart.	Approved Hours, OOHW1 & 2	136 weeks
MSF.04	Drainage installation & Combined Services Route	• Construction of drainage and combined services route to the southwest of the Clyde MSF around A'Becketts and Duck Creek • Work will include trenching and installation of the conduits and pits. • Construction of Unwin Street realignment storm drainage	Approved Hours, OOHW1 & 2	56 weeks
MSF.05	Utility trench and services corridor	• Excavation of the combined utility trench will commence on the south side of Clyde MSF and progress around the eastern boundary to the connection points at the northeast area of the site.	Approved Hours, OOHW1 & 2	92 weeks
MSF.06	FRP works, Concrete works and retaining walls	• Form reo pour for permanent concrete base slab laydown, capping beams and in-situ stitch pours.	Approved Hours, OOHW1 & 2	64 weeks
MSF.07a	Water Conveyancing Structure - Construction	• Construction of Water Conveyancing Structure including flood control culvert crossings, inlet structures, outlet basin structure, earthworks and associated retaining structure to the southwest of the Clyde MSF around A'Becketts and Duck Creek. • Earthworks involved with the creek diversion works to facilitate the water conveyance structures	Approved Hours, OOHW1 & 2	120 weeks

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule
MSF.07b	Water Conveyancing Structure – Delivery	• Delivery of precast planks for the Water Conveyancing Structure.	OOHW1 & 2	120 weeks
MSF.08	Water Conveyancing Structure - Finishing Works	• Finishing works associated with Water Conveyancing Structure to the southwest of the Clyde MSF around A'Becketts and Duck Creek.	Approved Hours, OOHW1 & 2	56 weeks
MSF.09	Unwin Street Diversion - Construction	• Road works associated with the re-alignment of Unwin Street.	Approved Hours, OOHW1 & 2	88 weeks
MSF.10	Unwin Street Diversion - Finishing Works	• Finishing works associated with re-alignment of Unwin Street.	Approved Hours, OOHW1 & 2	52 weeks
MSF.11	Demobilisation	• Site demobilisation and removal of equipment.	Approved Hours	12 weeks
MSF.12a	Unwin Street Overpass (Piling, FRP, Earthworks, Heavy Lifting)	• Construction of a B-Double road overpass over A'Becketts and Duck creeks connecting Unwin Street to Wentworth Street.	Approved Hours	60 weeks
MSF.12b	Unwin Street Overpass - Delivery	• Delivery of Super T's for the Unwin Street overpass structure.	OOHW1 & 2	60 weeks
MSF.13	General operation of ancillary facility	• General activities involving the continual operation of the ancillary facility (eg light vehicles, trucks, and stationary noise sources).	Approved Hours, OOHW1 & 2	Ongoing
MSF.14	Utility adjustment works	• Activities relating to the decommissioning and adjustment of utilities.	Approved Hours, OOHW1 & 2	Ongoing
MSF.15	Clearing Vegetation	• Clearing vegetation along creek alignment	Approved Hours	40 weeks
MSF.16	Ground Improvement Work	• Ground improvement work across the Clyde MSF	Approved Hours	40 weeks
MSF.17	Creek Adjustment works	• Creek diversion works relating to the Water Conveyance Structures and ongoing maintenance of temporary creek crossings.	Approved Hours, OOHW1 & 2	40 weeks
MSF.18	Duck Creek Detailed Site investigations	• Detailed site investigation and weeding removal works within the Duck Creek easement.	Approved Hours	40 weeks

Note 1: Equipment lists for each scenario and sound power level data is provided in **Appendix B**.

Note 2: All OOHW must be approved in accordance with the CNVMP and OOHW Protocol or EPL prior to commencing. Refer **Section 1.1.5**.

4.2.5 Rosehill

The representative construction scenarios developed to assess potential impacts during construction of the Project at the Rosehill site are described in **Table 21**. Equipment lists for each scenario and sound power level data is provided in **Appendix B.**

Table 21 Work Activities – Rosehill

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule
RH.16a	Diaphragm wall (D-wall) construction	• Saw cut box footprint through concrete slab • Remove concrete within the footprint. Existing concrete will be removed via saw cut and grab • All concrete removed off site via concrete waste • Local excavation for D-wall and capping beam construction.	Approved Hours	27 weeks
RH.16b	Diaphragm wall (D-wall) construction	• Local excavation for D-wall and capping beam construction • Note: no saw cutting during out-of-hours work (OOHW).	OOHW1 & 2	
RH.17	Box excavation (from surface)	• Bulk excavation work within the D-wall perimeter • Excavation commencing from the surface • Material will either be loaded directly into Truck and Dogs for removal of spoil off site or transferred into the temporary spoil shed via the dump trucks.	Approved Hours	27 weeks
RH.18	Box excavation (rock at depth)	• Continuation of box excavation through rock • Excavation at depth including rock hammering • Material will either be loaded directly into Truck and Dogs for removal of spoil off site or transferred into the temporary spoil shed via the dump trucks.	Approved Hours, OOHW1 & 2	
RH.19	FRP (form reo pour - concrete works)	• Form reo pour for permanent concrete base slab laydown, capping beams and in-situ stitch pours • Construction of internal reinforced concrete struts and walers.	Approved Hours, OOHW1 & 2	27 weeks
RH.20	Delivery of Equipment	• Delivery of equipment to the site will occur as out-of-hours work.	Approved Hours, OOHW1 & 2	Ongoing
RH.21	TBM Support and Spoil Handling	• General operations at the facility supporting the TBM while working underground, generally within the segment shed • Moving of spoil within the Segment and Spoil sheds.	Approved Hours, OOHW1 & 2	Ongoing
RH.22	General operation of ancillary facility	• General activities involving the continual operation of the ancillary facility (eg light vehicles, trucks, water treatment plant and stationary noise sources).	Approved Hours, OOHW1 & 2	Ongoing

Note 1: Equipment lists for each scenario and sound power level data is provided in **Appendix B**.

Note 2: All OOHW must be approved in accordance with the CNVMP and OOHW Protocol or EPL prior to commencing. Refer **Section 1.1.5**.

4.2.6 Sydney Olympic Park

The representative construction scenarios developed to assess potential impacts during construction of the Project at the Sydney Olympic Park site are described in **Table 22**. Equipment lists for each scenario and sound power level data is provided in **Appendix B.**

Table 22 Work Activities – Sydney Olympic Park

Work ID	Scenario	Description[1]	Hours of Work[2]	Approximate Schedule
SOP.01	Construction site establishment	• Establishing site security measures: ◦ Noise barriers ◦ Hoarding around the perimeter of the site ◦ Signage with site specific contact details (ie site supervisor) • Establishing initial temporary facilities such as: ◦ Crib room ◦ Training room ◦ Ablution facilities including toilets, change room and locker room ◦ Security room.	Approved Hours	1 week
SOP.02	TBM Retrieval	• Following completion of TBM work from Rosehill to Sydney Olympic Park, the TBM and supporting equipment will be removed from the Station Box at Sydney Olympic Park.	Approved Hours, OOHW1 & 2	8 weeks
SOP.02b	TBM Retrieval + Material load out and shotcreting of cross passages	• TBM Retrieval work as described above. • Material load out and shotcreting of cross passages occurring concurrently with TBM retrieval. ◦ Spoil truck used up to 3 trips per day (10 per week). ◦ Sporadic concrete/shotcrete work to occur following sufficient cross passage spoil load out.	Approved Hours, OOHW1 & 2	6 weeks
SOP.03	Nozzle Construction	• Concreting works associated with nozzle construction at Sydney Olympic Park.	Approved Hours, OOHW1 & 2	41 weeks
SOP.04	General operation of ancillary facility (approved and out-of-hours work)	• General activities involving the continual operation of the ancillary facility (eg light vehicles, trucks, and stationary noise sources).	Approved Hours, OOHW1 & 2	Ongoing
SOP.05	Tree Trimming for TBM Retrieval	• Tree trimming along access routes for oversized vehicles associated with the TBM Retrieval.	Approved Hours, OOHW1 & 2	1 Week
SOP.06	Demobilisation	• Demobilisation of equipment associated with WTP Project.	Approved Hours	12 weeks
SOP.07	Cross passage concrete pours	• Cross passage concrete pours – extensive pours (280m3/day) • These pours would occur continuously given the size of pours required to pour the cross passage lining. They would occur during the day and potentially run into the evening and night.	Approved Hours, OOHW1 & 2	16 weeks

Note 1: Equipment lists for each scenario and sound power level data is provided in **Appendix B**.

Note 2: All OOHW must be approved in accordance with the CNVMP and OOHW Protocol or EPL prior to commencing. Refer **Section 1.1.5**.

4.3 Predicted Noise Impacts

The following overview is based on the predicted impacts at the most affected receivers and is representative of the worst-case (15 minute) noise levels that are likely to occur during Project work. The predicted levels include consideration of the project specific mitigation and management measures outlined in **Section 8.2**.

The assessment shows the predicted impacts based on the exceedance of the management levels, as per the categories in **Table 23**.

Table 23 Exceedance Bands and Impact Colouring

Exceedance of Management Level	Impact Colouring
No exceedance	
1 to 10 dB	
11 dB to 20 dB	
21 dB to 30 dB	
>30 dB	

Note 1: Exceedance band classifications follow the approach outlined in the Sydney Metro CNVS for reporting of construction impacts in Detailed Noise and Vibration Impact Statements. The subjective response would vary and depends on the period in which the impacts occur (ie people are generally more sensitive to impacts during the evening and night-time).

A summary of the number of buildings where NML exceedances are predicted for the various work activities is shown in the following respective subsections. Maps of the predicted (worst-case) noise impacts are presented in **Appendix C**. Maps are not produced for work scenarios where all predicted noise levels are below the NMLs.

The assessment is generally considered conservative as the calculations assume all items of construction equipment are in use at the same time within individual scenarios. In reality, there would frequently be periods when construction noise levels are much lower than the worst-case levels predicted as well as times when no equipment is in use and no noise impacts occur.

The potential for these work activities to overlap and at times occur concurrently has also been considered (refer **Section 4.2**). Due to the dominant influence of the work conducted closest to the most affected receiver, the influence of other work occurring on the site (at greater distances) would likely be masked. When evaluating potential effects of concurrent work, it is also important to consider how noise levels add together. For example:

- If two separate activities are occurring on site and the noise level from each is 55 dBA at the receiver, then the resultant noise level is 58 dBA. A 3 dBA increase in noise level will be just perceptible and a significant change in impact is considered unlikely.
- If two separate activities are occurring and the noise level from one is 55 dBA and the other is 53 dBA, then the resultant noise level is 57 dBA. A 2 dBA increase in noise will be hardly perceptible in practice and a significant change in impact is highly unlikely.

4.3.1 Westmead

Table 24 Overview of NML Exceedances – All Receiver Types - Westmead

Rec Category	NCA	Total	Number of Receivers With NML Exceedance – Exceedance Category	WM.1	WM.2	WM.3	WM.4	WM.5	WM.6	WM.7	WM.8	WM.9	WM. 10	WM. 11	WM. 12	WM. 13	WM. 14	WM. 15	WM. 16a	WM. 16b	WM. 17a	WM. 17b	WM. 18	WM. 19	WM. 19b	WM. 19c	WM. 20	WM. 21	WM. 22	WM. 24	WM. 25
				AH	AH	AH	AH	AH	AH	AH	AH	AH	AH	AH	AH	AH	OOHW1	AH	OOHW1	AH	OOHW2	OOHW2	OOHW2	OOHW1	OOHW2	OOHW2	OOHW2	OOHW2	OOHW2	OOHW2	OOHW2
Residential	NCA01	229	1-10 dB	5	8	1	15	7	-	29	17	12	-	-	13	7	6	-	23	25	-	-	-	-	-	-	-	-	-	34	27
			11-20 dB	-	-	-	-	-	-	5	-	-	-	-	-	-	17	-	-	10	-	-	-	-	-	-	-	-	-	18	3
			21-30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		26	HNA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**18**	**3**
	NCA02	522	1-10 dB	12	12	11	20	19	2	42	21	17	4	8	18	17	25	1	23	38	-	-	-	-	2	-	7	11	-	69	45
			11-20 dB	1	5	-	6	3	-	12	7	3	-	-	3	3	19	-	8	14	-	-	-	-	-	-	-	3	-	29	22
			21-30 dB	-	-	-	-	-	-	1	-	-	-	-	-	-	5	-	-	1	-	-	-	-	-	-	-	-	-	13	4
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
		83	HNA	-	-	-	-	**1**	-	**6**	**1**	-	-	-	-	-	**2**	-	-	**5**	-	-	-	-	-	-	-	-	-	**4**	-
			SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**3**	-	**45**	**26**
Other Sensitive	All NCA	513	1-10 dB	27	26	23	24	21	-	13	25	22	9	20	26	22	17	-	18	22	-	-	-	-	-	-	-	1	-	19	17
			11-20 dB	7	11	3	15	11	-	27	15	6	-	-	9	16	23	-	-	19	-	-	-	-	-	-	-	-	-	7	-
			21-30 dB	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes: AH = Approved Hours, OOHW = out-of-hours work (refer **Table 2**), HNA = Highly Noise Affected, SD = Sleep Disturbance.

The assessment of the predicted worst-case noise levels at Westmead shows:

- Noise impacts are expected to occur throughout construction at Westmead. Nearby residential and 'other sensitive' receivers will be impacted throughout the works.
- The highest noise impacts are expected to occur during the '*Installation of Monitoring Equipment*' scenario (ie WM.24) and *'Removal of acoustic/spoil shed'* (ie WM.25). Where possible these activities will be undertaken during approved hours. Where ROLs are required for road closures (eg Alexandra Avenue) work would be required to occur during OOHW periods.
- Noise impacts surrounding the Westmead site are generally predicted to remain between '1-10 dB' and '11-20 dB' above NMLs throughout the Project. Higher impacts are expected at the closest receivers where noisy works are required, especially during OOHW periods (eg WM.07, WM.14, WM.24 and WM.25).
- Noise levels above the NML are predicted at 2 receivers during OOHW2 for WM.19b. Noise levels are predicted to be below NMLs while trucks are working with the Acoustic Shed. As vehicles exit the site onto Hawkesbury Road exceedances of ≤1 dBA are predicted at these two receivers. GLC therefore propose to undertake a trial period of deliveries in consultation with the Acoustic Advisor to demonstrate if deliveries can successfully be achieved to meet the NMLs at these receivers (refer **Section 8.2.1.1**).
- Predicted noise levels are above the HNA NML of 75 dBA at the nearest residential receivers during the following scenarios: WM.05, WM.07, WM.08, WM.14, WM.16b and WM.24.
- L_{AFmax} noise levels have the potential to exceed the sleep disturbance screening level at the nearest residential receivers during OOHW for scenarios WM.21, WM.24 and WM.25. Best-practice construction management should be implemented to reduce L_{AFmax} noise events as far as practicable, refer **Section 8**.
- The majority of work scenarios will occur during the approved project hours (AH). 13 work scenarios are anticipated to occur during out-of-hours periods. These scenarios are WM.14, WM.16a and WM.17a to WM.025.

Recommended noise mitigation and management measures are discussed in **Section 8.**

4.3.2 Parramatta

Table 25 Overview of NML Exceedances – All Receiver Types - Parramatta

Receiver Category	NCA	Total	Exceedance Category	Number of Receivers																																								
				With NML Exceedance																																								
				PM.01	PM.02	PM.03	PM.04	PM.05	PM.06	PM.07	PM.08a	PM.08b	PM.09a	PM.09b	PM.09c	PM.10	PM.11	PM.12	PM.13	PM.14	PM.15a	PM.15b	PM.16	PM.17a	PM.17b	PM.17c	PM.17d	PM.17e	PM.17f	PM.18	PM.19	PM.20	PM.21	PM.22	PM.23a	PM.23b	PM.24	PM.25	PM.26a	PM.26b	PM.26c	PM.27	PM.28	PM.29
				AH	AH	OOHW2	OOHW2	AH	AH	AH	AH	OOHW2	OOHW2	OOHW2	OOHW2	AH	OOHW1	AH	AH	OOHW2	AH	OOHW2	OOHW2	OOHW2	OOHW2	OOHW2	OOHW1	OOHW2	OOHW2	OOHW2	OOHW1	OOHW1	OOHW2	OOHW2	OOHW2	OOHW2	OOHW2	OOHW2	AH	OOHW1	OOHW2	OOHW2	OOHW2	OOHW2
Residential	NCA03	108	1-10 dB	-	-	3	20	-	-	-	-	3	13	3	3	-	1	-	-	2	3	17	3	2	3	3	3	1	-	3	-	-	-	8	-	3	3	21	-	1	3	9	-	3
			11-20 dB	-	-	-	3	-	-	-	-	-	3	-	-	-	-	-	-	1	-	3	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	3	-	-	1	2	-	-
			21-30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		32	HNA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			SD	-	-	**1**	**5**	-	-	-	-	**2**	**3**	**2**	**1**	-	-	-	-	**3**	-	**3**	-	-	**1**	**1**	**3**	-	-	**1**	-	-	-	**4**	-	**3**	**3**	**8**	-	-	**3**	**2**	-	**3**
Other Sensitive	All NCA	722	1-10 dB	8	16	9	41	24	23	20	21	11	28	10	10	42	18	15	6	21	68	31	9	10	11	12	32	8	4	9	13	16	4	7	3	16	16	47	39	15	12	19	1	16
			11-20 dB	-	5	-	10	9	7	9	4	2	9	1	-	11	4	4	-	4	25	10	-	1	3	4	7	1	1	-	3	4	-	4	-	3	3	11	10	3	3	5	-	3
			21-30 dB	-	-	-	-	-	2	-	-	-	-	-	-	1	-	-	-	-	9	-	-	-	-	1	1	-	-	-	-	-	-	4	-	-	-	1	3	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes: AH = Approved Hours, OOHW = out-of-hours work (refer **Table 2**), HNA = Highly Noise Affected, SD = Sleep Disturbance.

The assessment of the predicted worst-case noise levels at Parramatta shows:

- Noise impacts are expected throughout the construction at the Parramatta site, with nearby ‘other sensitive’ receivers predominately affected.
- Noise impacts surrounding the Parramatta site are generally predicted to remain between ‘1-10 dB’ and ‘11-20 dB’ above NMLs throughout the Project. Higher impacts are expected at the closest receivers where noisy works are required, especially during OOHW periods (eg PM.06, PM.10, PM.17c, PM17d, PM.22, PM.25 and PM.26a).
- High noise impacts are predicted at the Roxy Theatre located directly adjacent to the Project site. This Roxy Theatre is currently not in use. Other Sensitive Receivers should only be considered impacted 'when in use'.
- The highest noise impacts are expected to occur during the PM.17d, PM.22 and PM.25 scenarios. Where possible these activities will be undertaken during approved hours. Some locations for PM.22 may require ROLs for road closures and will therefore be required to occur during OOHW periods.
- Predicted noise levels are below the HNA NML of 75 dBA at nearby residential receivers for all scenarios.
- L_{AFmax} noise levels have the potential to exceed the sleep disturbance screening level at the nearest residential receivers during OOHW for scenarios PM.03, PM.04, PM.08b, PM.09a-PM.09c, PM.14, PM.15, PM.17b-PM.17d, PM.18, PM.22, PM.23b-PM.25, PM.26c, PM.27 and PM.29. Best-practice construction management should be implemented to reduce L_{AFmax} noise events as far as practicable, refer **Section 8**.
- 30 work scenarios are anticipated to occur during out-of-hours periods. These scenarios are PM.03, PM.04, PM.08b-PM.09c, PM.11, PM.14-PM.25, and PM.26b-PM.29.

Recommended noise mitigation and management measures are discussed in **Section 8.**

4.3.3 Clyde Dive

Table 26 Overview of NML Exceedances – All Receiver Types – Clyde Dive

Receiver Category	NCA	Total	Number of Receivers																					
			Exceedance Category	With NML Exceedance																				
				CD.01a	CD.01b	CD.02	CD.03	CD.04	CD.05	CD.06	CD.07	CD.08a	CD.08b	CD.08c	CD.09	CD.10	CD.11	CD.12	CD.13	CD.14	CD.15	CD.16	CD.17	CD.18
				AH	AH	AH	AH	AH	AH	AH	OOHW1	AH	AH	AH	OOHW2	OOHW2	OOHW2	OOHW2	AH	OOHW2	OOHW2	OOHW2	AH	AH
Residential	NCA 04	79	1-10 dB	2	5	-	2	7	5	4	2	-	-	2	4	-	4	4	6	5	2	-	-	6
			11-20 dB	-	2	-	-	3	-	-	-	-	-	-	1	-	1	-	2	-	1	-	-	1
			21-30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		9	HNA	-	**2**	-	-	**2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			SD	-	-	-	-	-	-	-	-	-	-	-	**1**	-	**1**	-	-	**2**	**1**	-	-	-
	NCA 05	230	1-10 dB	6	2	5	11	8	-	8	7	6	6	9	8	-	8	5	7	14	19	-	16	45
			11-20 dB	-	-	-	-	-	-	6	-	-	-	6	-	-	-	-	5	3	6	-	-	6
			21-30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		24	HNA	-	-	-	-	-	-	-	-	-	-	**5**	-	-	-	-	-	-	-	-	-	**1**
			SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**5**	**6**	**5**	-	-
	NCA 06	5	1-10 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	-	-
			11-20 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
			21-30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		12	HNA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**12**	-	-
	NCA 07	1	1-10 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
			11-20 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			21-30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		-	HNA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Sensitive	All NCA	170	1-10 dB	8	5	4	12	11	1	14	-	6	5	12	-	-	-	-	11	-	7	1	1	27
			11-20 dB	-	2	-	2	2	1	5	-	-	-	5	-	-	-	-	3	-	-	-	-	10
			21-30 dB	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4

Notes: AH = Approved Hours, OOHW = out-of-hours work (refer **Table 2**), HNA = Highly Noise Affected, SD = Sleep Disturbance.

The assessment of the predicted worst-case noise levels at the Clyde Dive site shows:

- Noise impacts surrounding the Clyde Dive site are generally predicted to remain between ‘1-10 dB’ and ‘11-20 dB’ above NMLs throughout the Project. The highest impacts are expected at the closest receivers where noisy works are required, especially during OOHW periods (eg CD.15) and CD.18.
- Predicted noise levels are above the HNA NML of 75 dBA for scenarios CD.01b, CD.04, CD.08c and CD.18. These activities will be limited to the approved project work hours to avoid noise impacts during more sensitive out-of-hours periods.
- L_{AFmax} noise levels have the potential to exceed the sleep disturbance screening level at the nearest residential receivers during OOHW for scenarios CD.09, CD.11, CD.14, CD.15 and CD.16. Best-practice construction management should be implemented to reduce L_{AFmax} noise events as far as practicable, refer **Section 8**.
- Eight (8) work scenarios are anticipated to occur during out-of-hours periods. These scenarios are CD.07, CD.09 to CD.12 and CD.14 to CD.16.

Recommended noise mitigation and management measures are discussed in **Section 8.**

4.3.4 Clyde MSF

Table 27 Overview of NML Exceedances – All Receiver Types – Clyde MSF

Receiver Category	NCA	Total	Exceedance Category	Number of Receiver With NML Exceedances																				
				MSF.01a	MSF.01b	MSF.02	MSF.03	MSF.04	MSF.05	MSF.06	MSF.07a	MSF.07b	MSF.08	MSF.09	MSF.10	MSF.11	MSF.12a	MSF.12b	MSF.13	MSF.14	MSF.15	MSF.16	MSF.17	MSF.18
				OOHW1	OOHW2	OOHW2	OOHW2	OOHW2	OOHW2	OOHW1	OOHW2	OOHW2	OOHW2	OOHW2	OOHW2	AH	AH	OOHW2	OOHW2	OOHW2	AH	AH	OOHW2	AH
Residential	NCA04	15	1-10 dB	2	-	-	2	2	-	-	3	-	1	11	-	-	-	1	-	2	-	-	-	-
			11-20 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			21-30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		2	HNA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			SD	-	-	-	-	-	-	-	-	-	-	**2**	-	-	-	-	-	-	-	-	-	-
	NCA05	453	1-10 dB	80	13	32	51	37	8	-	68	9	41	86	22	6	10	36	2	55	-	-	18	-
			11-20 dB	6	-	-	-	-	-	-	1	-	-	22	-	-	-	4	-	1	-	-	-	-
			21-30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		113	HNA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			SD	-	**4**	**22**	**10**	**7**	-	-	**18**	-	**6**	**76**	**3**	-	-	**10**	-	**11**	-	-	**1**	-
	NCA06	13	1-10 dB	2	-	-	2	2	-	-	2	1	2	1	1	-	-	2	-	2	-	-	2	-
			11-20 dB	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
			21-30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		4	HNA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			SD	-	-	**1**	-	-	-	-	**2**	-	-	**2**	-	-	-	-	-	-	-	-	-	-
	NCA07	17	1-10 dB	1	1	-	1	1	1	1	-	1	-	1	1	1	1	1	1	-	-	-	1	-
			11-20 dB	1	-	1	-	-	-	-	1	-	1	1	-	-	-	-	-	1	-	-	-	-
			21-30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		9	HNA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			SD	-	**1**	**1**	**1**	**1**	**1**	-	**1**	**1**	**1**	**1**	**1**	-	-	**1**	-	**1**	-	-	**1**	-
Other Sensitive	All NCA	39	1-10 dB	14	-	2	1	-	-	-	-	-	-	10	2	3	3	3	-	1	-	-	-	-
			11-20 dB	1	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-	-	-	-
			21-30 dB	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes: AH = Approved Hours, OOHW = out-of-hours work (refer Table 2), HNA = Highly Noise Affected, SD = Sleep Disturbance.

The assessment of the predicted worst-case noise levels at the Clyde MSF shows:

- Noise impacts surrounding the Clyde MSF site are generally predicted to remain between '1-10 dB' and '11-20 dB' above NMLs throughout the Project. Higher impacts are expected at the closest receivers where noisy works are required, especially during OOHW periods (eg MSF.09).
- Predicted noise levels are below the HNA NML of 75 dBA at nearby residential receivers for all scenarios.
- Work scenarios at the Clyde MSF will be undertaken at various work hours including OOHW1 and OOHW2. Scenarios MSF.11, MSF.12a, MSF.15 and MSF.16 will be limited to the approved hours.
- L_{AFmax} noise levels have the potential to exceed the sleep disturbance screening level at the nearest residential receivers during OOHW for scenarios MSF.01b to MSF.03, MSF.05, MSF.07a, MSF.07b, MSF.08, MSF.09, MSF.10 and MSF.12b. Best-practice construction management should be implemented to reduce L_{AFmax} noise events as far as practicable, refer **Section 8**.

Recommended noise mitigation and management measures are discussed in **Section 8.**

4.3.5 Rosehill

Table 28 Overview of NML Exceedances – All Receiver Types – Rosehill

Receiver Category	NCA	Total	Number of Receivers								
			Exceedance Category	With NML Exceedance							
				RH.016a	RH.16b	RH.17	RH.18	RH.19	RH.20	RH.21	RH.22
				AH	OOHW2	AH	OOHW2	OOHW2	OOHW2	OOHW2	OOHW2
Residential	NCA04	-	1-10 dB	-	-	-	-	-	-	-	-
			11-20 dB	-	-	-	-	-	-	-	-
			21-30 dB	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-
		-	HNA	-	-	-	-	-	-	-	-
			SD	-	-	-	-	-	-	-	-
	NCA05	-	1-10 dB	-	-	-	-	-	-	-	-
			11-20 dB	-	-	-	-	-	-	-	-
			21-30 dB	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-
		-	HNA	-	-	-	-	-	-	-	-
			SD	-	-	-	-	-	-	-	-
	NCA06	-	1-10 dB	-	-	-	-	-	-	-	-
			11-20 dB	-	-	-	-	-	-	-	-
			21-30 dB	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-
		-	HNA	-	-	-	-	-	-	-	-
			SD	-	-	-	-	-	-	-	-
	NCA07	-	1-10 dB	-	-	-	-	-	-	-	-
			11-20 dB	-	-	-	-	-	-	-	-
			21-30 dB	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-
		-	HNA	-	-	-	-	-	-	-	-
			SD	-	-	-	-	-	-	-	-
Other Sensitive	All NCA	1	1-10 dB	-	-	1	-	-	-	-	-
			11-20 dB	-	-	-	-	-	-	-	-
			21-30 dB	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-

Notes: AH = Approved Hours, OOHW = out-of-hours work (refer **Table 2**), HNA = Highly Noise Affected, SD = Sleep Disturbance.

The assessment of the predicted worst-case noise levels shows:

- Minimal noise impacts are expected to occur throughout construction at the Rosehill site. Nearby residential and ‘other sensitive’ receivers will be impacted throughout the works.
- Predicted noise levels are below the HNA NML of 75 dBA at nearby residential receivers for all scenarios.
- Work scenarios at the Rosehill will be undertaken at various work hours including OOHW2.
- Predicted L_{AFmax} noise levels are below the sleep disturbance screening level at all nearby residential receivers for all scenarios during OOHW.

Recommended noise mitigation and management measures are discussed in **Section 8.**

4.3.6 Sydney Olympic Park

Table 29 Overview of NML Exceedances – All Receiver Types – Sydney Olympic Park

Receiver Category	NCA	Total	Number of Receivers									
			Exceedance Category	With NML Exceedance								
				SOP.01	SOP.02	SOP.02b	SOP.03	SOP.04	SOP.05a	SOP.05b	SOP.06	SOP.07
				AH	OOHW	OOHW	OOHW 2	OOHW 2	AH	OOHW 2	AH	OOHW
Residential	NCA08	12	1-10 dB	-	1	2	1	-	4	2	-	1
			11-20 dB	-	-	-	-	-	4	6	-	-
			21-30 dB	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-
		10	HNA	-	-	-	-	-	-	-	-	-
			SD	-	**1**	**1**	**1**	-	-	**7**	-	**1**
	NCA09	18	1-10 dB	-	2	3	3	-	2	8	-	3
			11-20 dB	-	-	-	-	-	-	2	-	-
			21-30 dB	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-
		7	HNA	-	-	-	-	-	-	-	-	-
			SD	-	-	**1**	-	-	-	**6**	-	-
Other Sensitive	All NCA	15	1-10 dB	-	2	4	3	-	4	4	-	3
			11-20 dB	-	-	-	-	-	3	2	-	-
			21-30 dB	-	-	-	-	-	-	-	-	-
			>30 dB	-	-	-	-	-	-	-	-	-

Notes: AH = Approved Hours, OOHW = out-of-hours work (refer **Table 2**), HNA = Highly Noise Affected, SD = Sleep Disturbance.

The assessment of the predicted worst-case noise levels shows:

- Noise impacts surrounding the Sydney Olympic Park site are generally predicted to remain between '1-10 dB' above NMLs throughout the Project.
- Noise impacts during *Tree Trimming for TBM Retrieval* (SOP.05) are predicted at some receivers up to '11-20 dB' above NMLs.
- Predicted noise levels are below the HNA NML of 75 dBA at nearby residential receivers for all scenarios.
- All work scenarios will occur during the approved project hours. The following scenarios will also occur outside the approved hours: *TBM Retrieval* (SOP.02), *TBM Retrieval + Material load out and shotcreting of cross passages* (SOP.02b), *Nozzle Construction* (SOP.03), *General operation of ancillary facility* (SOP.04),*Tree Trimming for TBM Removal* (SOP.05) and *Cross passage concrete pours* (SOP.07).
- L_{AFmax} noise levels have the potential to exceed the sleep disturbance screening level at the nearest residential receivers during OOHW for scenarios SOP.02, SOP.02b, SOP.03, SOP.05 and SOP.07. Best-practice construction management should be implemented to reduce L_{AFmax} noise events as far as practicable, refer **Section 8**.

Recommended noise mitigation and management measures are discussed in **Section 8.**

4.4 Road Traffic Noise

The Roads & Maritime Services (RMS) *Construction Road Traffic Noise Estimator* was used to calculate the change in road traffic noise levels with the introduction of Project traffic.

A summary of the vehicle data for the assessment and predicted increase in traffic noise levels are shown in **Table 30**. Roads presented below are based on the proposed construction traffic route for each site that pass residential receivers.

Table 30 Vehicle Traffic Data

Road Name	Vehicle type[2]	Existing Traffic Volumes[1]		Project Traffic Volumes		Change in Noise Level (dBA)	
		Day (7 am – 10 pm)	Night (10 pm – 7 am)	Day (7 am – 10 pm)	Night (10 pm – 7 am)	Day (7 am – 10 pm)	Night (10 pm – 7 am)
Westmead							
Hawkesbury Rd	LV	15,841	2,992	250	60	0.8	1.5
	HV	16	3	275	108		
Great Western Hwy	LV	42,386	6,908	250	60	0.3	0.7
	HV	451	74	275	108		
Pitt St	LV	14,808	3,268	250	60	0.6	0.8
	HV	586	129	275	79		
Park Parade (Local Rd)[3]	LV	1,376[3]	527[3]	20[3]	20[3]	0.5[3]	0.7[3]
	HV	52[3]	20[3]	20[3]	10[3]		
Hassall St (Local Rd)[3]	LV	660[3]	233[3]	20[3]	20[3]	1.3[3]	1.9[3]
	HV	1[3]	0[3]	20[3]	10[3]		
Parramatta							
Great Western Hwy	LV	42,386	6,908	182	54	0.2	0.7
	HV	451	74	180	126		
Pitt St	LV	14,808	3,268	182	54	0.4	1.1
	HV	586	129	180	126		
O'Connell St	LV	38,800	6,076	182	54	0.2	0.9
	HV	175	27	180	126		
Clyde/Rosehill							
Parramatta Rd	LV	54,075	16,667	828	164	0.7	1.2
	HV	546	168	1320	792		

Road Name	Vehicle type[2]	Existing Traffic Volumes[1]		Project Traffic Volumes		Change in Noise Level (dBA)	
		Day (7 am – 10 pm)	Night (10 pm – 7 am)	Day (7 am – 10 pm)	Night (10 pm – 7 am)	Day (7 am – 10 pm)	Night (10 pm – 7 am)
Sydney Olympic Park							
Parramatta Rd	LV	50,135	16,221	198	54	0.1	0.2
	HV	2,167	701	180	126		
Australia Ave	LV	12,429	4,172	198	54	0.4	0.8
	HV	858	288	180	126		

Note 1: Existing traffic volumes adopted from EIS traffic volumes for 2023.

Note 2: LV = Light Vehicle, HV = Heavy Vehicle

Note 3: Local Road assessment based on worst-case peak hour volumes.

The Project is not anticipated to increase road traffic noise during operation of the project by more than 2 dBA. Differences in noise levels of less than approximately 2 dBA (whether an increase or a decrease) is generally considered to be imperceptible in practice. As such, noise impacts from construction vehicles on public roads are not anticipated. Mitigation and management measures are discussed in **Section 8**.

As noted in **Section 4.2.1**, 24hr Heavy Vehicle Deliveries (eg concrete trucks/20T trucks) have been assessed under a Memo prepared by SLR (610.30644-M11-v1.1-20240604) to demonstrate compliance with the Road Noise Policy, as per the instruction from DPHI. Construction road traffic noise was assessed on the basis that night-time deliveries to the Westmead site would enter and exit the site via Hawkesbury Road. The assessment found that up to 60 light vehicle and 160 heavy vehicle movements can be introduced to Hawkesbury Road during the night-time period (10pm to 7am) without increasing road traffic noise levels by more than 2 dBA. The 160 heavy vehicles equate to 80 heavy vehicles in, and 80 heavy vehicles out of the Site between 10pm and 7am. The required number of vehicle movements for the project are shown in **Table 30** above. As such, noise impacts from construction vehicles on public roads are not anticipated.

5 Construction Vibration

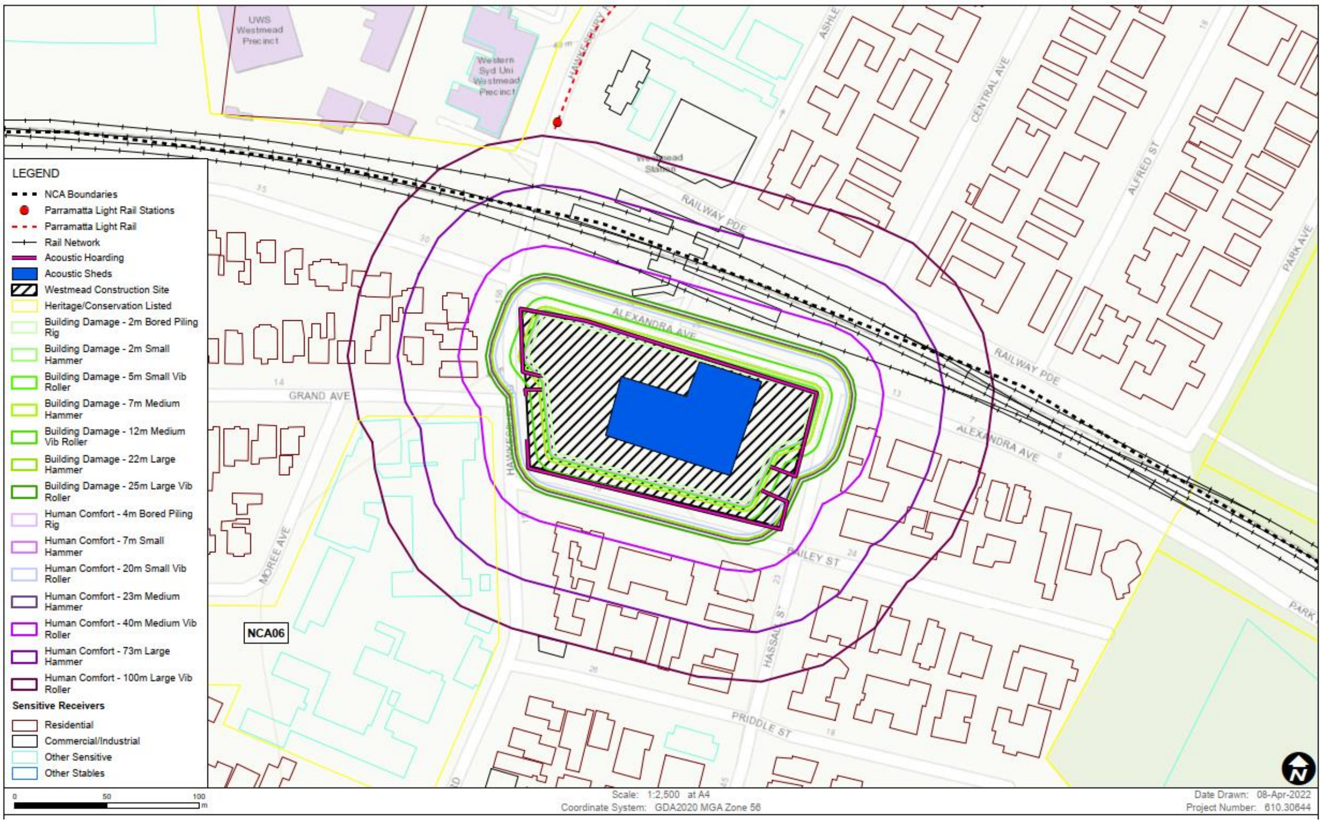
Vibration intensive items of equipment that would be required during the Project include vibratory rollers, hydraulic hammers and bored piling rigs. These items of equipment are required during work scenarios such as; *Establishing concrete slabs or piling platforms*, *Station box excavation,* and *Station box bored piling*.

The minimum working distances for vibration intensive work associated with the Project are shown in **Section 3.5.3**. Where vibration intensive work is undertaken at greater distances, impacts are not considered likely.

The predicted impacts during vibration intensive works are shown for each construction site in the sections below. The predictions are representative of the highest vibration levels that would likely be experienced by the nearest receivers when works are at their closest.

5.1 Westmead

Figure 7 Vibration Assessment - Westmead



The assessment of the vibration intensive work at Westmead shows:

- There are no predicted exceedances of the cosmetic damage screening criteria or the sensitive equipment screening criteria at this site when using large hydraulic hammers and vibratory rollers.
- Sydney trains and Parramatta light rail infrastructure has been assessed against the Industrial and heavy commercial buildings criteria for cosmetic damage. No exceedances are predicted, and impacts to Sydney trains and Parramatta light rail are not anticipated.
- The human comfort criteria are predicted to be exceeded at the closest residential receivers to the surrounding the site and Westmead Train Station to the north when using large hydraulic hammers and vibratory rollers.

It is therefore recommended that:

- small vibratory roller (< 1-2 tonnes) and a medium hydraulic hammer are implemented during the Project works. Note: If larger equipment is required, vibration monitoring will be required to confirm that vibration criteria is not exceeded / building damage does not occur
- adhere to the minimum working distances presented **Table 16** during the Project works

- undertake continuous vibration monitoring with alarms (ie audible and visible / SMS) at the nearest sensitive receivers whenever vibration generating activities need to take place inside the minimum working distances.

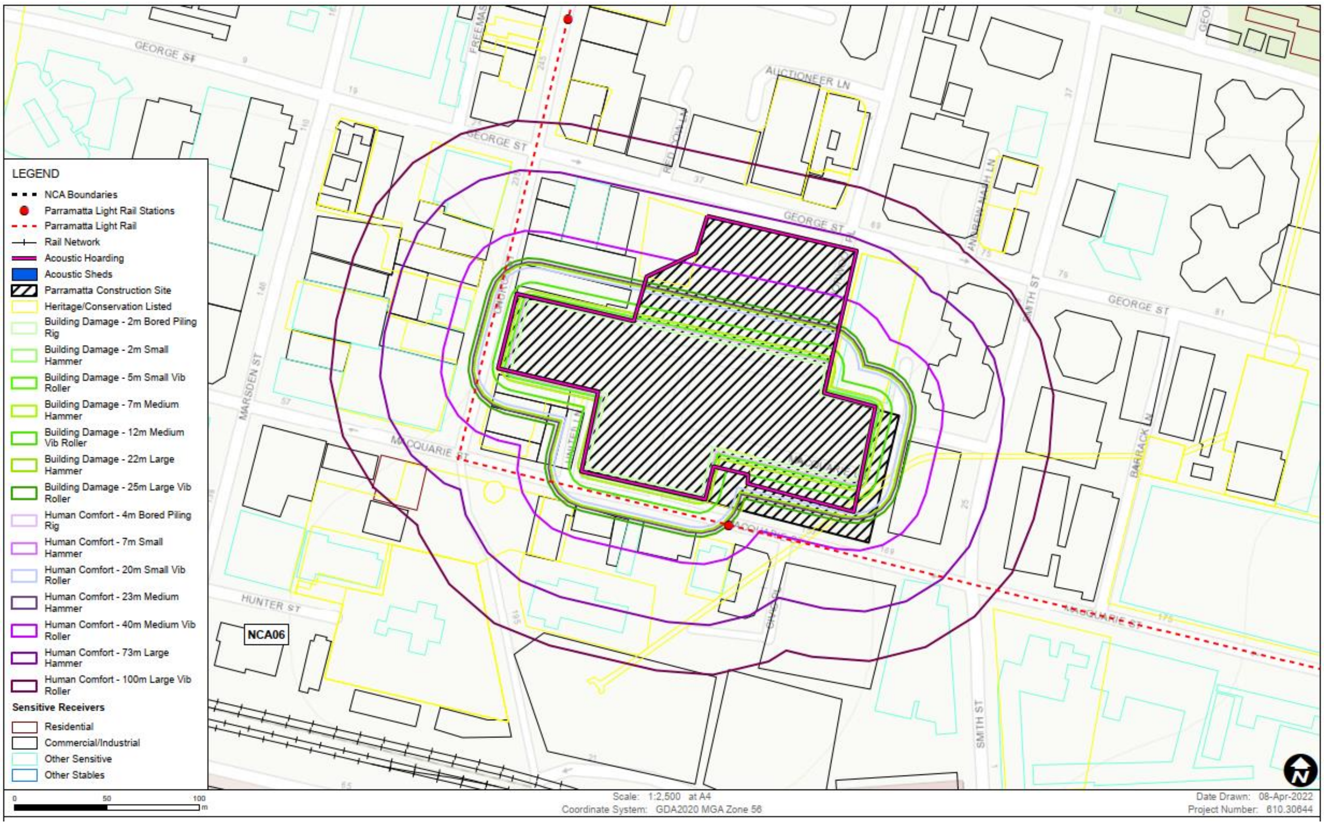
With the implementation of these recommendations, vibration impacts are likely to comply with the cosmetic damage levels, however due to the close proximity of receivers, vibration impacts have the potential to exceed the human comfort levels. Therefore it is recommended that GLC implement community and stakeholder consultation and notification processes outlined in the AMM for ground-borne vibration in **Section 8.3**.

Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is operating nearby.

Further vibration mitigation and management measures are discussed in **Section 8.**

5.2 Parramatta

Figure 8 Vibration Assessment - Parramatta



The assessment of the vibration intensive work at Parramatta shows:

- The cosmetic damage screening criteria have the potential to be exceeded at the six nearest buildings/structures to the site when using large hydraulic hammers and vibratory rollers. This includes the Roxy Theatre to the east, two heritage listed buildings to the west, one heritage listed building to the south and one heritage listed structure (underground services) within the construction site footprint.
- Sydney trains and Parramatta light rail infrastructure has been assessed against the Industrial and heavy commercial buildings criteria for cosmetic damage. No exceedances are predicted, and impacts to Sydney trains and Parramatta light rail are not anticipated.
- The human comfort criteria are also predicted to be exceeded at some of the nearest commercial buildings when using large hydraulic hammers and vibratory rollers.

It is therefore recommended that:

- small vibratory roller (< 1-2 tonnes) and a small hydraulic hammer are implemented during the Project works. Note: If larger equipment is required, vibration monitoring will be required to confirm that vibration criteria is not exceeded / building damage does not occur
- adhere to the minimum working distances presented **Table 16** during the Project works
- undertake continuous vibration monitoring with alarms (ie audible and visible / SMS) at heritage listed buildings adjacent to the Project site.
- undertake continuous vibration monitoring with alarms (ie audible and visible / SMS) at the nearest sensitive receivers whenever vibration generating activities need to take place inside the minimum working distances.

Attended vibration measurements will also be required at the commencement of vibration generating activities in close proximity to the following receivers to confirm that vibration levels satisfy the sensitive equipment VC-A criterion:

- SunDoctors Skin Cancer Clinics Parramatta - 239 Church St, Parramatta
- Orthodontics Sydney Wide - 35 Smith St, Parramatta

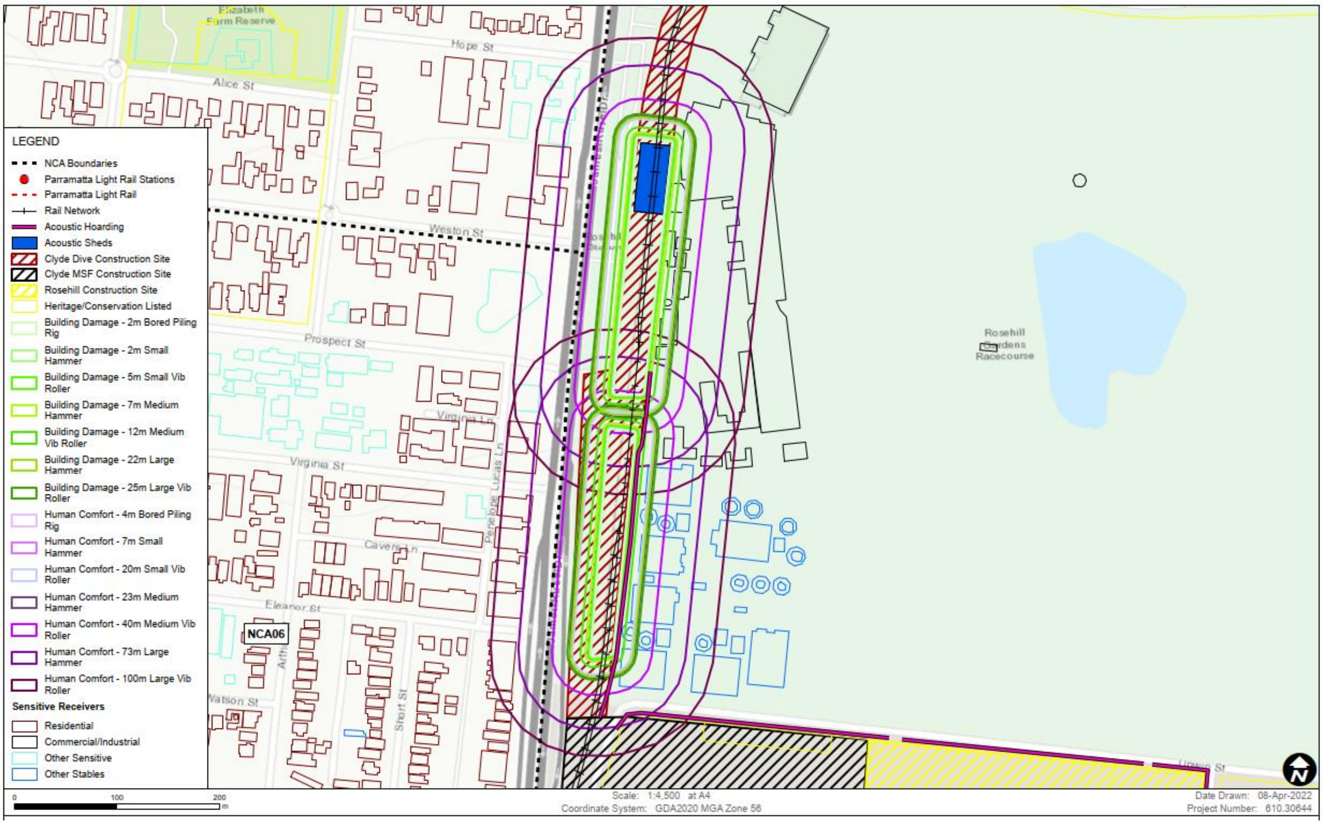
With the implementation of these recommendations, vibration impacts are likely to comply with the cosmetic damage levels, however due to the close proximity of receivers, vibration impacts have the potential to exceed the human comfort levels. Therefore it is recommended that GLC implement community and stakeholder consultation and notification processes outlined in the AMM for ground-borne vibration in **Section 8.3**.

Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is operating nearby.

Further vibration mitigation and management measures are discussed in **Section 8.**

5.3 Clyde Dive Site

Figure 9 Vibration Assessment – Clyde Dive



The assessment of the vibration intensive work at Clyde Dive Site shows:

- The cosmetic damage screening criteria have the potential to be exceeded at the nearest buildings/structures to the east of the site when using large hydraulic hammers and vibratory rollers. This includes the Rosehill Gardens Racecourse and Stables.
- The human comfort criteria are also predicted to be exceeded at several commercial buildings located within the Rosehill Gardens Racecourse and the Stables when using large hydraulic hammers and vibratory rollers.

It is therefore recommended that:

- small vibratory roller (< 1-2 tonnes) and a medium hydraulic hammer are implemented during the Project works. Note: If larger equipment is required, vibration monitoring will be required to confirm that vibration criteria is not exceeded / building damage does not occur
- adhere to the minimum working distances presented **Table 16** during the Project works
- undertake continuous vibration monitoring with alarms (ie audible and visible / SMS) at the nearest sensitive receivers whenever vibration generating activities need to take place inside the ,minimum working distances.

With the implementation of these recommendations, vibration impacts are likely to comply with the cosmetic damage levels, however due to the close proximity of receivers, vibration impacts have the potential to exceed the human comfort levels. Therefore it is recommended that GLC implement community and stakeholder consultation and notification processes outlined in the AMM for ground-borne vibration in **Section 8.3**.

Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is operating nearby.

Further vibration mitigation and management measures are discussed in **Section 8.**

5.4 Clyde MSF

Figure 10 Vibration Assessment – Clyde MSF

The assessment of the vibration intensive work at Clyde MSF shows:

- The cosmetic damage screening criteria are not anticipated to be exceeded at off-site sensitive receivers.
- A stand-alone memo was prepared by SLR in September 2024 to assess construction vibration at the heritage listed building (RTA Depot) at 1 Unwin Street (refer *610.30644-M20-v1.0-20240919*). This building is a heritage listed free-standing building facade and is not occupied.

  - Minimum working distances for minor and major cosmetic damage for vibratory rollers and hydraulics hammers of a range of nominal masses are derived in the memo. SLR recommends vibration monitoring to be conducted before work encroaches on the minimum working distances for cosmetic damage, so that modelling assumptions (such as the site law exponent, and consequently, the minimum working distances) can be updated for local conditions.
  - A number of mitigation and management measures have been recommended in the memo and reproduced below. Where feasible and reasonable these should be applied to the project to control and minimise the impacts during construction as far as practicable.
- The human comfort criteria are predicted to be exceeded at some residential buildings located on James Ruse Drive to the west of the site and some commercial buildings to the east of the site when using large hydraulic hammers and vibratory rollers in close proximity to these receivers.

It is therefore recommended that:

- Medium vibratory roller (< 4-6 tonnes) are implemented during the Project works in close proximity to the receivers identified above. Note: If larger equipment is required, vibration monitoring will be required to confirm that vibration criteria is not exceeded / building damage does not occur
- adhere to the minimum working distances presented **Table 16** during the Project works
- undertake continuous vibration monitoring with alarms (ie audible and visible / SMS) at the nearest sensitive receivers whenever vibration generating activities need to take place inside the minimum working distances.

With the implementation of these recommendations, vibration impacts are likely to comply with the human comfort levels. It is recommended that GLC implement community and stakeholder consultation and notification processes outlined in the AMM for ground-borne vibration in **Section 8.3**.

Where impacts are perceptible, they would likely only be apparent for relatively short durations when vibration intensive equipment is operating nearby.

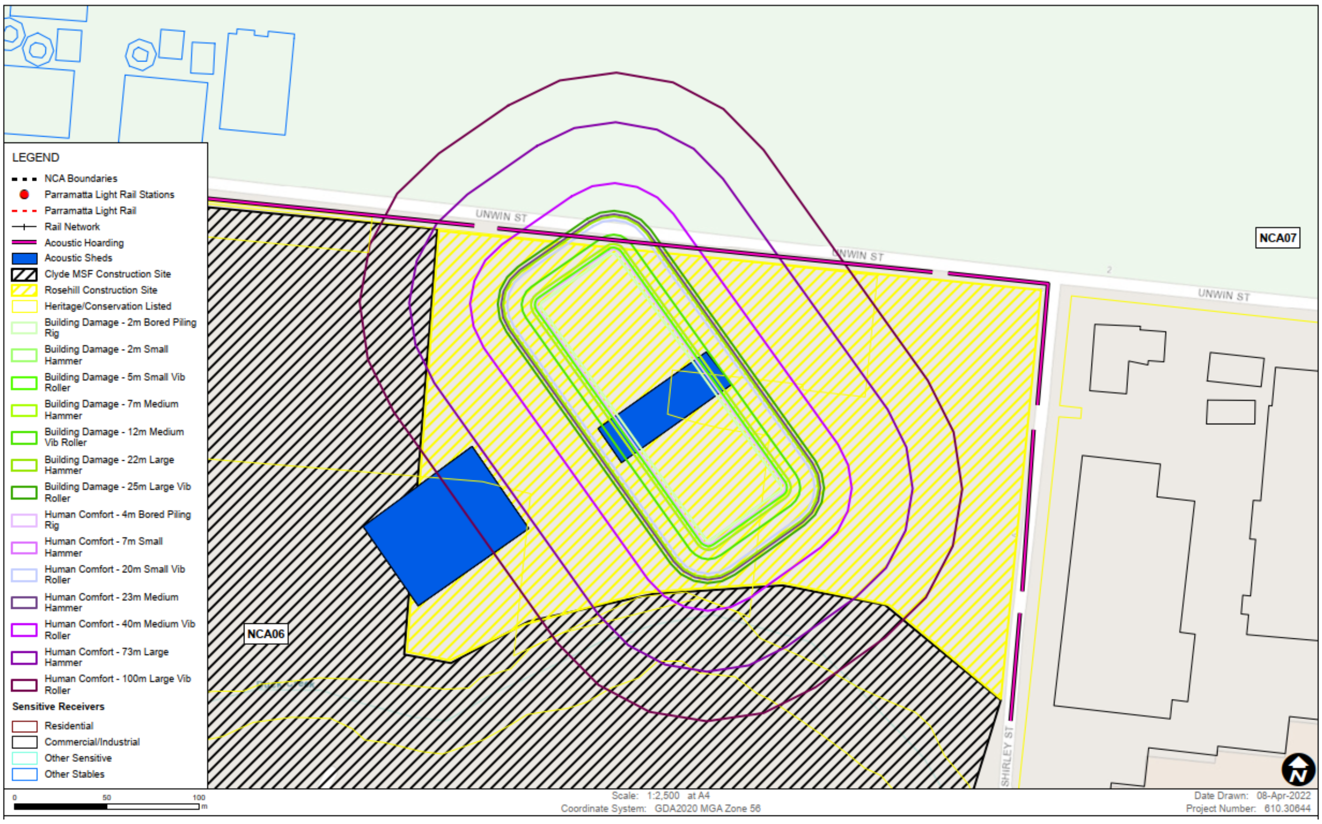
The following recommendations relate to the heritage listed building (RTA Depot) at 1 Unwin Street (refer *610.30644-M20-v1.0-20240919*):

- Saw cutting before rock breaking to reduce vibration transmission from the work area to nearby sensitive structures.
- Ensure the minimum sized equipment necessary to complete the work are used.
- Where compaction requirements are achievable via static rolling (ie without vibration applied) this should be implemented near sensitive structures (ie within minimum working distances).
- Conduct vibration monitoring before work encroaches on the minimum working distances for cosmetic damage, so that modelling assumptions can be updated for local conditions.
- Conduct ongoing vibration monitoring where vibration intensive works are to be undertaken within the minimum working distances of sensitive receivers or structures (eg the RTA Depot and the brick wall/gate that fronts the Rosehill Gardens).

Further vibration mitigation and management measures are discussed in **Section 8.**

5.5 Rosehill

Figure 11 Vibration Assessment – Rosehill



The assessment of the vibration intensive work at Clyde / Rosehill shows:

- The cosmetic damage screening criteria are not anticipated to occur at nearby sensitive receivers, including the heritage listed building (RTA Depot) at 1 Unwin Street, Rosehill, located to the north of the site. This building is a heritage listed free-standing building facade and is not occupied.
- The human comfort criteria are not predicted to be exceeded at any nearby sensitive receivers.

Recommended vibration mitigation and management measures are discussed in **Section 8.**

5.6 Sydney Olympic Park

No vibration generating activities are proposed at the Sydney Olympic Park site, therefore no construction vibration impacts are anticipated at this site.

6 Tunnelling Impact (Ground-borne Noise and Vibration)

Ground-borne noise and vibration impacts at receivers above the proposed tunnelling works or near to station excavation works have been predicted using a three-dimensional model which includes receiver elevation data and the shaft locations/tunnel alignment.

Vibration is discussed in terms of potential ground-borne vibration and ground-borne noise impacts. Ground-borne vibration refers to vibration impacting buildings from works being completed at ground level or below ground. Ground-borne noise refers to the 'rumble-like' noise generated from the vibration of the building's internal surfaces.

Ground-borne vibration is assessed in terms of Peak Particle Velocity (PPV) and period Vibration Dose Value (VDV), and ground-borne noise is assessed in terms of the 15-minute average noise level.

Ground-borne noise is only required to be assessed where ground-borne noise levels are higher than the corresponding airborne noise levels.

6.1 Key Sources

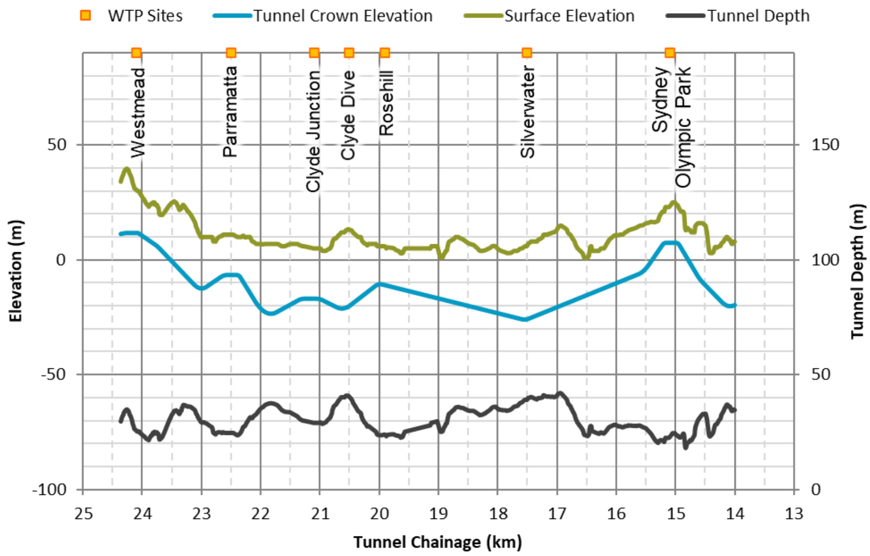
The main sources of vibration generating equipment are:

- Tunnel boring machines (TBMs), which excavate rock and construct the tunnel exterior structure
- Roadheaders (which scrape/grind rock) and rockbreakers which are used to excavate stations, station shafts and cross passages.

The highest ground-borne noise levels are expected from rockbreakers followed by TBMs and then roadheaders. Therefore, the worst-case ground-borne noise impacts are anticipated during the excavation of cross passages.

The proposed tunnel depth is shown in **Figure 12**. The figure shows that the depth generally varies between 20 to 40 metres for most of the alignment. The shallowest parts are near to Sydney Olympic Park metro station, which are around 10 to 20 metres below the surface. The maximum tunnel depth is around 42 metres between Silverwater and Sydney Olympic Park.

Figure 12 Proposed Tunnel Depth and Existing Ground Elevation



6.2 Modelling Approach

The prediction of ground-borne noise and vibration from underground construction sites is a complex and developing technical field. While much research has been undertaken into the various aspects, there is currently no universally accepted modelling approach.

The modelling has been carried out using a combination of theoretical and empirical relationships which use the 3D slant distance from the potentially affected receivers to the closest section of the tunnels or excavation works. The modelling also includes the following assumptions:

- The TBM is seven metres in diameter, has a double shield configuration and is in use for 25 to 50 percent of the assessment period (the rest of the time is spent assembling the tunnel lining and repositioning the TBM)
- The TBM would typically progress at a rate of between 20 to 50 metres per day
- Rockbreakers are 900 kilograms in size, have a 16 Hz drive frequency, are mounted to 12-22t tracked excavator and in use for 33 percent of the assessment period
- Roadheaders have a 80 Hz drive frequency and in use for 50 percent of the assessment period
- The in-tunnel work trains use rubber tyres (ie work trains have effective resilient mounts or wheels), resulting in minimal impacts
- Spoil would be transported from the TBM to the surface via conveyor
- Tunnelling would occur 24/7
- Large buildings with substantially greater mass than a typical residential house have conservatively been assumed to have no additional coupling loss

- A conservative crest factor of 3.0 has been used for rockbreakers and 3.5 for TBMs and 4.0 for Roadheaders.

Predictions have been made to all sensitive receivers within a horizontal distance of around 200 metres of the tunnel alignment.

6.2.1 Source Levels versus Distance

The PPV and ground-borne noise levels used in the modelling are shown in **Figure 13** for TBMs, **Figure 14** for rockbreakers and **Figure 15** for roadheaders. Reference information sources are provided for comparison. The figures show that rockbreakers have higher levels in close proximity compared to the TBMs, but similar levels at larger distances.

Figure 13 Modelled Levels versus Distance for TBMs – Vibration (L), Ground-borne Noise (R)

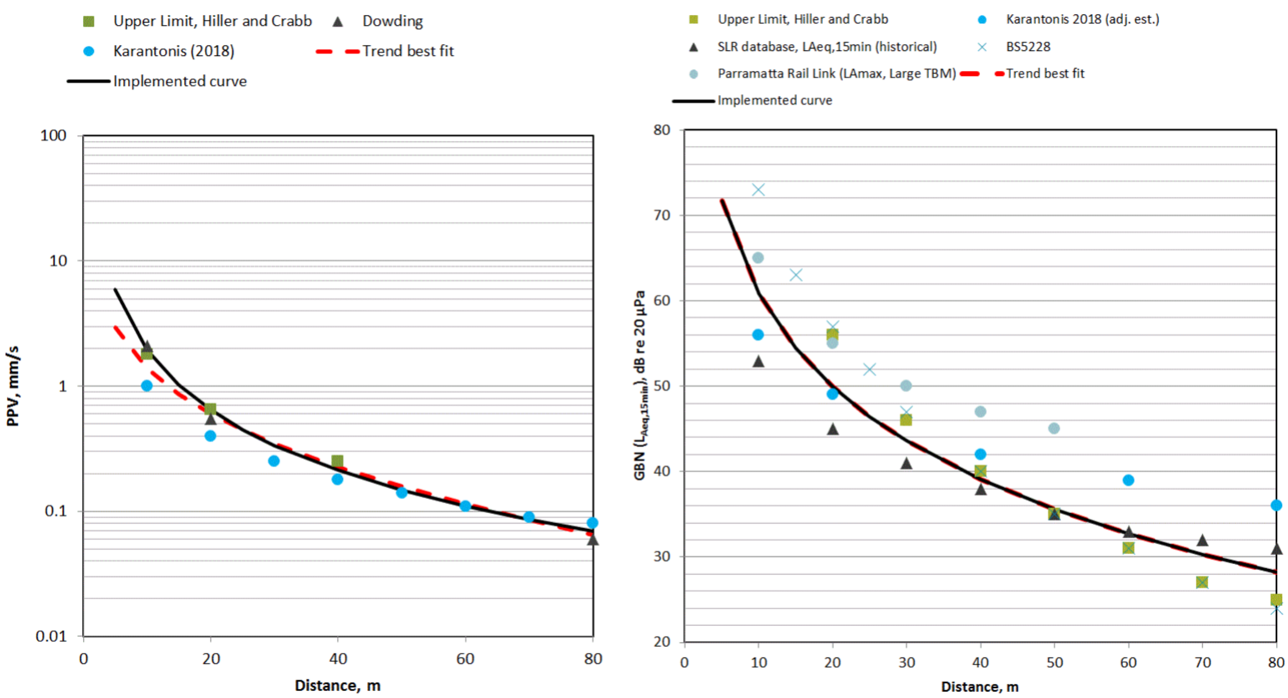


Figure 14 Modelled Levels versus Distance for Rockbreakers – Vibration (L), Ground-borne Noise (R)

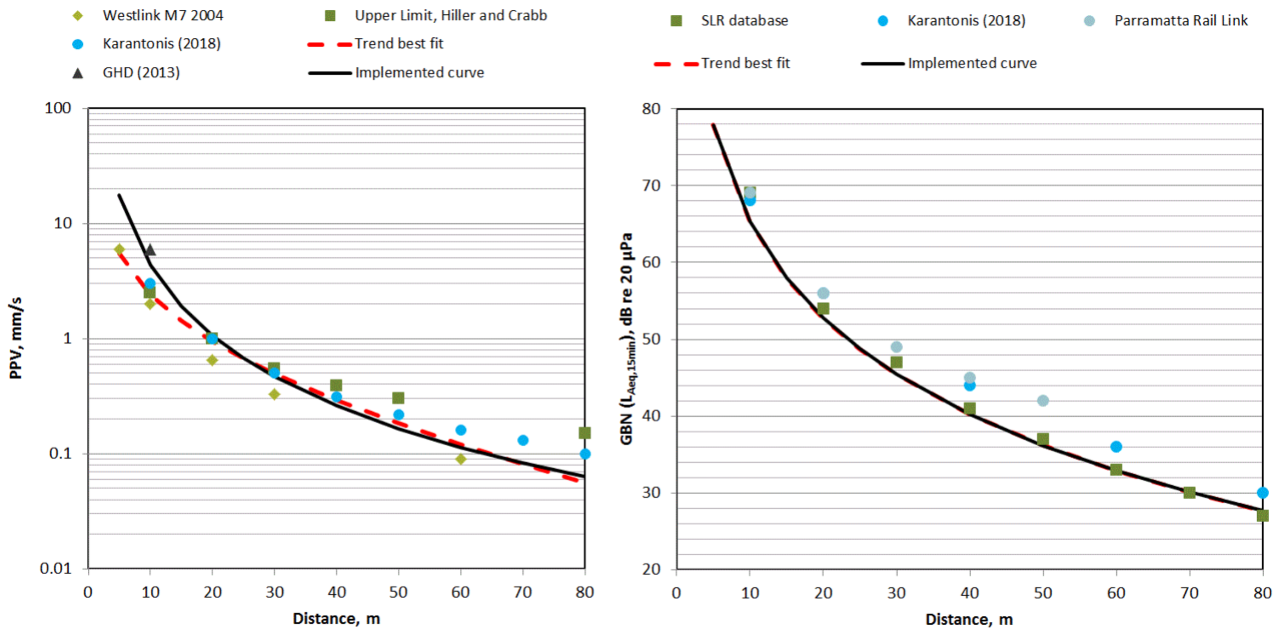
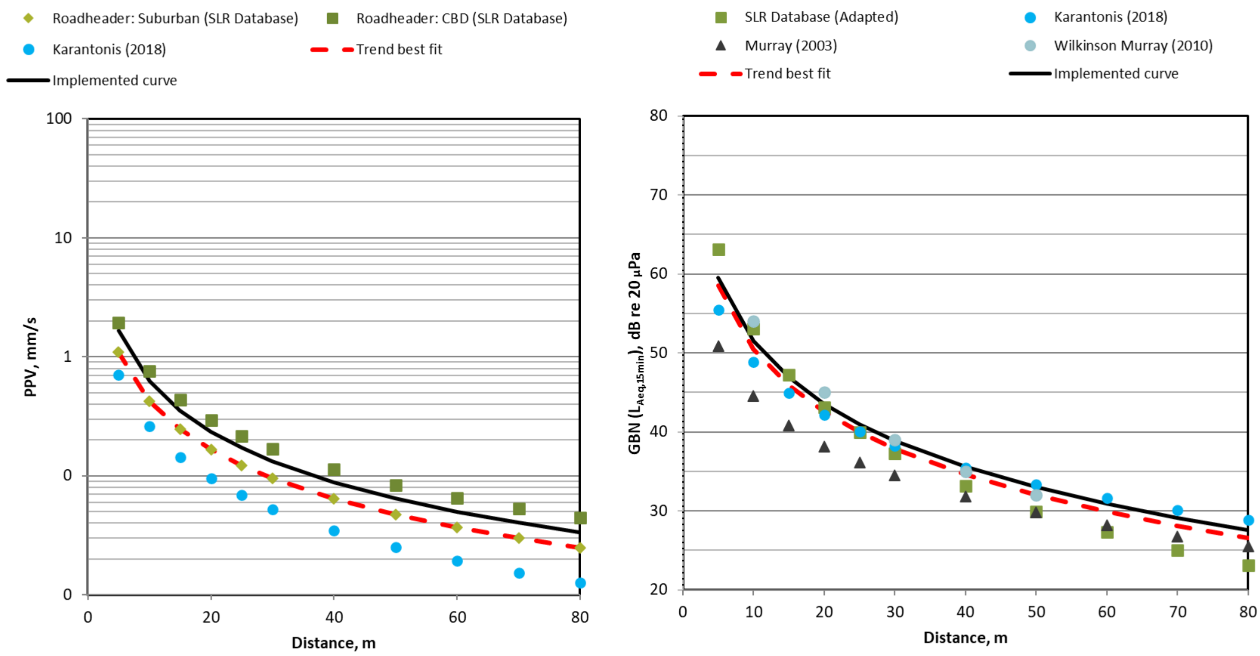


Figure 15 Modelled Levels versus Distance for Roadheaders – Vibration (L), Ground-borne Noise (R)



The implemented curves adopted for tunnel modelling are generally based on the best-fit trend lines. It should be noted that there is a large variability in the measured ground-borne noise the dataset presented in **Figure 13** for TBMs. This variability would be controlled by a number of factors such as the local site geology, the receiver building construction and the operation of the tunnelling equipment. If predictions were based on the upper limits of this dataset, noise levels could be experienced up to 8 dBA higher than predicted based on the implemented curve. µ

This variability will be managed through the ground-borne noise monitoring undertaken as described in the Noise and Vibration Monitoring Program (NVMoP) and **Section 8**. Where ground-borne noise levels are measured to be higher than those predicted in this report, additional mitigation measures will be implemented as outlined in **Section 8.3** based on the level at which the NMLs are exceeded or anticipated to be exceeded.

6.3 Ground-borne Noise Impacts from Tunnelling Activities

The ground-borne noise assessment is based on the worst-case predicted internal ground-borne noise levels for sensitive receivers above the proposed tunnel alignment. The predictions represent the likely highest noise levels when the TBMs, roadheaders and rockbreakers are directly below each receiver. TBMs have been assessed for the full tunnel alignment between Westmead and Sydney Olympic Park. Roadheaders and Rockbreakers have been assessed for station excavations, cross passages and the spur tunnel alignment.

6.3.1 TBMs

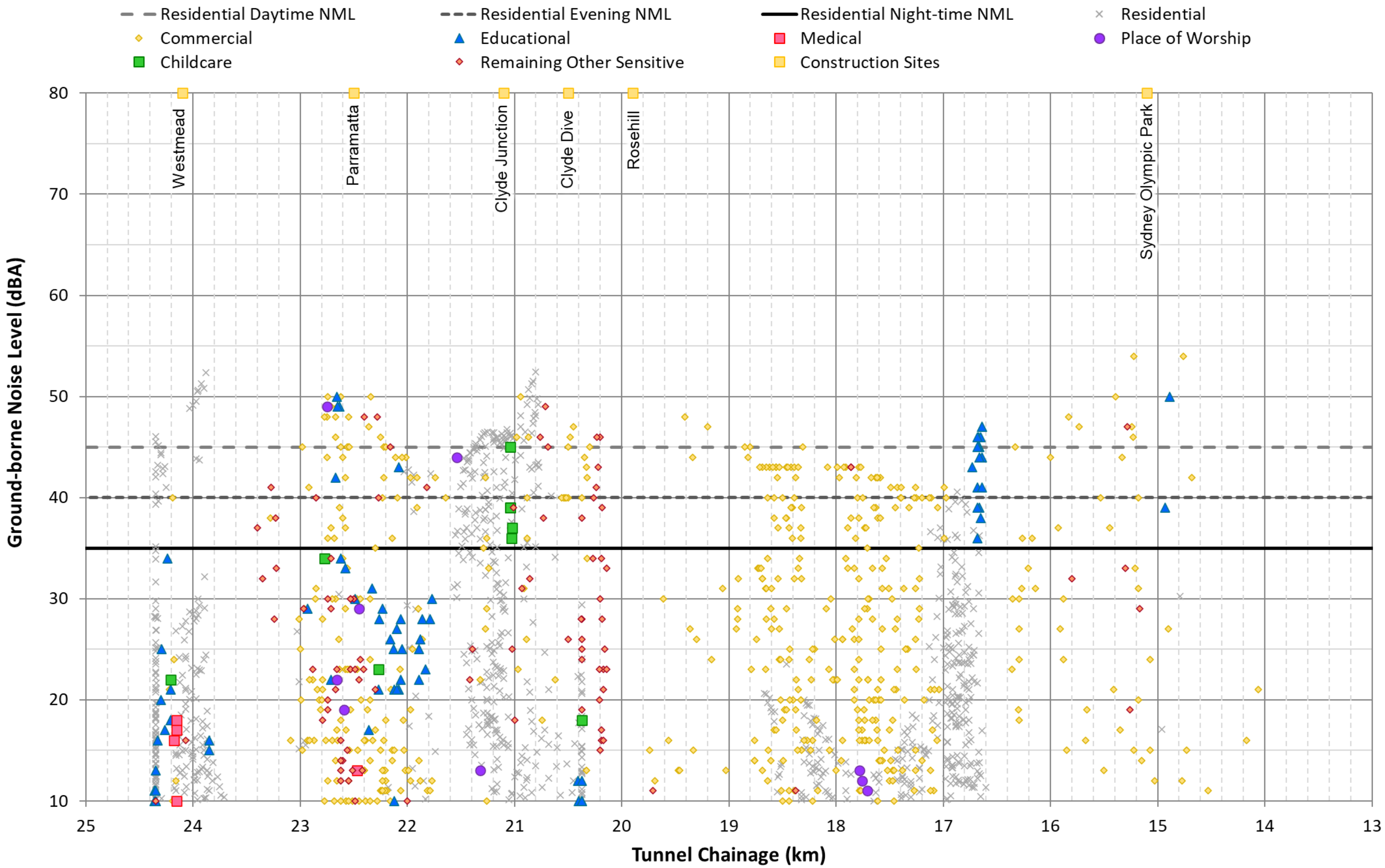
A summary of the predicted ground-borne noise levels from TBMs in each NCA is shown in **Table 31**. The results are also presented in a scatter graph in **Figure 16** which shows the highest predicted ground-borne noise level at each receiver and in **Appendix D** which shows the highest predicted NML exceedance for each receiver building.

Table 31 Overview of Tunnelling Ground-borne Noise Exceedances – All Receiver Types

Precinct	NCA	Number of Receivers									
		Total	Tunnelling with TBM NML Exceedance[1]								
			Standard Daytime			Evening			Night-time		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
Westmead	NCA01	340	-	-	-	-	-	-	-	-	-
	NCA02	788	10	-	-	18	4	-	15	10	-
Parramatta	NCA03	499	4	-	-	5	-	-	8	-	-
Clyde / Rosehill	NCA04	392	42	-	-	84	4	-	83	41	-
	NCA05	482	-	-	-	-	-	-	-	-	-
	NCA06	207	-	-	-	-	-	-	-	-	-
Clyde / Silverwater	NCA07	1,979	5	-	-	1	-	-	15	-	-
Sydney Olympic Park	NCA08	91	3	-	-	-	-	-	-	-	-
	NCA09	34	-	-	-	-	-	-	-	-	-

Note 1: Based on worst-case predicted noise levels in each NCA.

Figure 16 TBM Tunnelling Ground-borne Noise Predictions



The TBM ground-borne noise assessment shows that:

- The worst-case ground-borne noise impacts from TBM tunnelling during the daytime are predicted to generally be compliant with the NML or result in only '1-10 dB' above NML.
- During the evening and night-time, the worst-case impacts are more wide-spread due to a lower and more stringent NML. The worst-case impacts are predicted to be '11-20 dB' above the NML in the Westmead and Clyde study areas.
- The majority of the impacted receivers are residential properties. Several 'other sensitive' receivers are also predicted to impacted to various degrees along the alignment.
- The ground-borne noise predictions are based on the nearest sensitive receivers and most exposed floor (ie ground floor for commercial and assumed lowest habitable floor for residential). The ground-borne noise impacts would reduce for sensitive receivers which are further away from the alignment or for receivers higher up in buildings.

The TBMs are expected to progress at a rate of between 20 to 50 metres per day. This means the worst-case ground-borne noise impacts from tunnelling at a receiver would likely only be apparent for a few days for each TBM as the tunnelling works pass beneath.

As the works progress and move away, a receiver's exposure to ground-borne noise would reduce as illustrated in **Figure 17**. The figure shows the indicative worst-case internal ground-borne noise levels from TBM tunnelling as works progresses towards and past a particular location.

Figure 17 Example TBM Ground-borne Noise Levels (Progress = 20m/day)

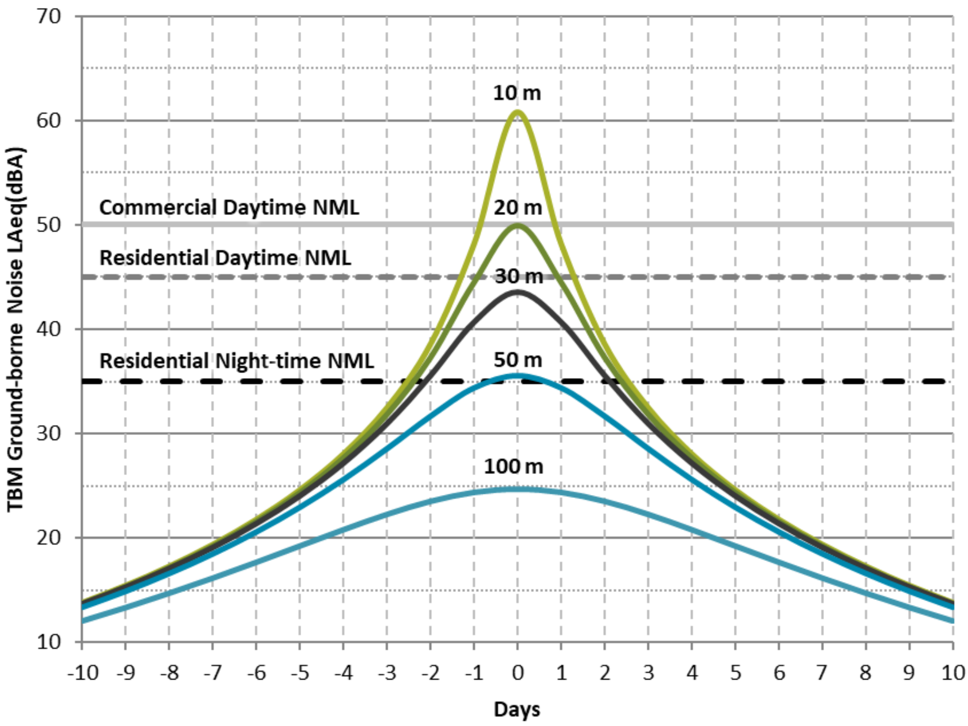


Figure 17 shows that where a residential receiver has a slant distance of 20 metres from the nearest tunnel (ie considering the tunnel depth and the horizontal offset distance), internal ground-borne noise levels are likely to exceed the 35 dB night-time ground-borne NML for around five days.

If the rate of progress increased to 50 metres per day, the exceedance of the night-time NML decreases to around 2.5 days. The actual rate of progress would depend on several factors and may vary along the alignment based on the local geology.

Where residential receivers have a slant distance of greater than around 50 metres, exceedances of the night-time NML are not considered likely.

6.3.2 Roadheaders

A summary of the predicted ground-borne noise levels from roadheaders in each NCA is shown in **Table 32**. The results are also presented in **Appendix D** which shows the highest predicted NML exceedance for each receiver building.

Table 32 Overview of Tunnelling Ground-borne Noise Exceedances – All Receiver Types

Precinct	NCA	Number of Receivers									
		Total	Tunnelling with Roadheaders NML Exceedance[1]								
			Standard Daytime			Evening			Night-time		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
Westmead	NCA01	340	-	-	-	-	-	-	-	-	-
	NCA02	788	-	-	-	8	-	-	21	-	-
Parramatta	NCA03	499	-	-	-	-	-	-	4	-	-
Clyde / Rosehill	NCA04	392	-	-	-	36	-	-	84	-	-
	NCA05	482	-	-	-	-	-	-	-	-	-
	NCA06	207	-	-	-	-	-	-	-	-	-
Clyde / Silverwater	NCA07	1,979	-	-	-	-	-	-	1	-	-
Sydney Olympic Park	NCA08	91	-	-	-	-	-	-	-	-	-
	NCA09	34	-	-	-	-	-	-	-	-	-

Note 1: Based on worst-case predicted noise levels in each NCA.

The roadheader ground-borne noise assessment shows that:

- The worst-case ground-borne noise impacts from roadheader tunnelling during the daytime are predicted to be compliant with the NML.
- During the evening and night-time, the worst-case impacts are more wide-spread due to a lower and more stringent NML. The worst-case impacts are predicted to be '1-10 dB' above the NML in the Westmead and Clyde study areas.

- The majority of the impacted receivers are residential properties. Several 'other sensitive' receivers are also predicted to impacted to various degrees along the alignment.
- The ground-borne noise predictions are based on the nearest sensitive receivers and most exposed floor (ie ground floor for commercial and assumed lowest habitable floor for residential). The ground-borne noise impacts would reduce for sensitive receivers which are further away from the alignment or for receivers higher up in buildings.

The roadheaders are expected to progress at a rate of between 5 metres per day. This means the worst-case ground-borne noise impacts from tunnelling at a receiver would likely only be apparent for a few days for each roadheader as the tunnelling works pass beneath.

As the works progress and move away, a receiver's exposure to ground-borne noise would reduce as illustrated in **Figure 18**. The figure shows the indicative worst-case internal ground-borne noise levels from Roadheader tunnelling as works progresses towards and past a particular location.

Figure 18 Example Roadheader Ground-borne Noise Levels (Progress = 5m/day)

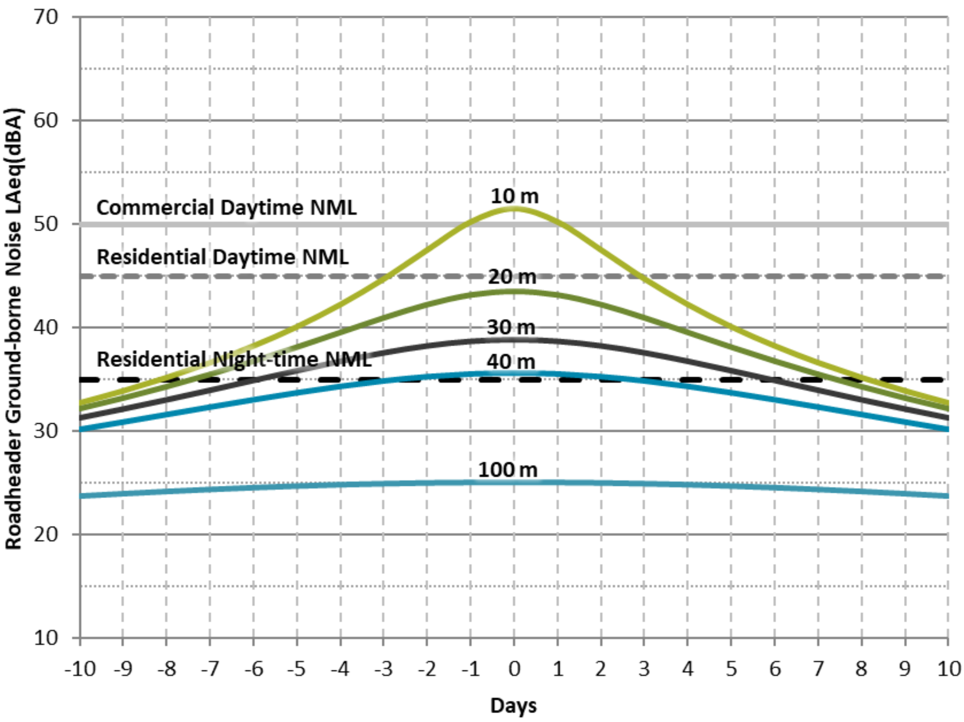


Figure 18 shows that where a residential receiver has a slant distance of 40 metres from the nearest tunnel (ie considering the tunnel depth and the horizontal offset distance), internal ground-borne noise levels are likely to exceed the 35 dB night-time ground-borne NML for around five days. If the rate of progress increased to 10 metres per day, the exceedance of the night-time NML decreases to around 3 days.

Where residential receivers have a slant distance of greater than around 42 metres, exceedances of the night-time NML are not considered likely.

6.3.3 Rockbreakers

A summary of the predicted ground-borne noise levels from rockbreakers in each NCA is shown in **Table 33**. The results are also presented in **Appendix D** which shows the highest predicted NML exceedance for each receiver building.

Table 33 Overview of Tunnelling Ground-borne Noise Exceedances – All Receiver Types

Precinct	NCA	Number of Receivers									
		Total	Tunnelling with Rockbreakers NML Exceedance[1]								
			Standard Daytime			Evening			Night-time		
			1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB	1-10 dB	11-20 dB	>20 dB
Westmead	NCA01	34	-	-	-	-	-	-	-	-	-
	NCA02	788	12	-	-	12	8	-	11	12	-
Parramatta	NCA03	499	5	-	-	5	-	-	6	-	-
Clyde / Rosehill	NCA04	392	58	-	-	70	13	-	62	55	-
	NCA05	482	-	-	-	-	-	-	-	-	-
	NCA06	207	-	-	-	-	-	-	-	-	-
Clyde / Silverwater	NCA07	1,979	1	-	-	-	-	-	4	-	-
Sydney Olympic Park	NCA08	91	1	-	-	-	-	-	-	-	-
	NCA09	34	-	-	-	-	-	-	-	-	-

Note 1: Based on worst-case predicted noise levels in each NCA.

The rockbreakers ground-borne noise assessment shows that:

- The worst-case ground-borne noise impacts from roackbreaker tunnelling during the daytime are predicted to generally be compliant with the NML or result in only '1-10 dB' above the NML.
- During the evening and night-time, the worst-case impacts are more wide-spread due to a lower and more stringent NML. The worst-case impacts are predicted to be '11-20 dB' in the Westmead and Clyde study areas.
- The majority of the impacted receivers are residential properties. Several 'other sensitive' receivers are also predicted to impacted to various degrees along the alignment.

The ground-borne noise predictions are based on the nearest sensitive receivers and most exposed floor (ie ground floor for commercial and assumed lowest habitable floor for residential). The ground-borne noise impacts would reduce for sensitive receivers which are further away from the alignment or for receivers higher up in buildings.

6.4 Vibration Impacts from Tunnelling Activities

The ground-borne vibration assessment is based on the worst-case predicted ground-borne vibration level for sensitive receivers above the proposed tunnel alignment. The predictions represent the likely highest vibration level when the TBMs, roadheaders and rockbreakers are directly below each receiver. TBMs have been assessed for the full tunnel alignment between Westmead and Sydney Olympic Park. Roadheaders and Rockbreakers have been assessed for station excavations, cross passages and the spur tunnel alignment.

6.4.1 TBMs

A summary of the predicted ground-borne vibration levels from TBM tunnelling in each NCA is shown in **Table 34**.

Table 34 Overview of Vibration Criteria Exceedances – All Receiver Types

Precinct	NCA	Number of Receivers					
		Total	Tunnelling with TBM Criteria Exceedance[1]				
			Cosmetic Damage	Human Comfort		Sensitive Equipment	
			D/N	Day	Night	D/N	
Westmead	NCA01	340	-	-	-	-	
	NCA02	788	-	2	8	-	
Parramatta	NCA03	499	-	-	-	-	
Clyde / Rosehill	NCA04	392	-	3	15	-	
	NCA05	482	-	-	-	-	
	NCA06	207	-	-	-	-	
Clyde / Silverwater	NCA07	1,979	-	-	-	-	
Sydney Olympic Park	NCA08	91	-	-	-	-	
	NCA09	34	-	-	-	-	

Note 1: Based on worst-case predicted vibration levels.

The TBM tunnelling vibration assessment shows the following:

- No receivers are predicted to exceed the cosmetic damage or sensitive equipment screening criteria during tunnelling work.
- Potential exceedances of the human comfort criteria are likely in the Westmead and Clyde/Rosehill study areas, meaning perceptible levels of vibration may occur when tunnelling works are below these areas.

Exceedances of the daytime human comfort criteria are likely at residential receivers with a slant distance of less than 20 metres from the tunnel crown and at commercial receivers with a slant distance of less than 11 metres.

Exceedances of the night-time human comfort criteria are likely at residential receivers with a slant distance of less than 25 metres from the tunnel crown.

The location of all human comfort vibration criteria exceedances are shown in **Appendix E**.

6.4.2 Roadheaders

A summary of the predicted ground-borne vibration levels from roadheader tunnelling in each NCA is shown in **Table 34**.

Table 35 Overview of Vibration Criteria Exceedances – All Receiver Types

Precinct	NCA	Number of Receivers				
		Total	Tunnelling with Roadheaders Criteria Exceedance[1]			
			Cosmetic Damage	Human Comfort		Sensitive Equipment
			D/N	Day	Night	D/N
Westmead	NCA01	340	-	-	-	-
	NCA02	788	-	4	8	-
Parramatta	NCA03	499	-	-	-	-
Clyde / Rosehill	NCA04	392	-	5	18	-
	NCA05	482	-	-	-	-
	NCA06	207	-	-	-	-
Clyde / Silverwater	NCA07	1,979	-	-	-	-
Sydney Olympic Park	NCA08	91	-	-	-	-
	NCA09	34	-	-	-	-

Note 1: Based on worst-case predicted vibration levels.

The roadheader tunnelling vibration assessment shows the following:

- No receivers are predicted to exceed the cosmetic damage or sensitive equipment screening criteria during tunnelling work.
- Potential exceedances of the human comfort criteria are likely in the Westmead and Clyde/Rosehill study areas, meaning perceptible levels of vibration may occur when tunnelling works are below these areas.

Exceedances of the daytime human comfort criteria are likely at residential receivers with a slant distance of less than 20 metres from roadheader activity and at commercial receivers with a slant distance of less than 12 metres.

Exceedances of the night-time human comfort criteria are likely at residential receivers with a slant distance of less than 25 metres from roadheader activity.

The location of all human comfort vibration criteria exceedances are shown in **Appendix E**.

6.4.3 Rockbreakers

A summary of the predicted ground-borne vibration levels from Rockbreaker tunnelling in each NCA is shown in **Table 36**.

Table 36 Overview of Vibration Criteria Exceedances – All Receiver Types

Precinct	NCA	Number of Receivers				
		Total	Tunnelling with Rockbreakers Criteria Exceedance[1]			
			Cosmetic Damage	Human Comfort		Sensitive Equipment
			D/N	Day	Night	D/N
Westmead	NCA01	340	-	-	-	-
	NCA02	788	-	8	9	-
Parramatta	NCA03	499	-	-	-	-
Clyde / Rosehill	NCA04	392	-	12	44	-
	NCA05	482	-	-	-	-
	NCA06	207	-	-	-	-
Clyde / Silverwater	NCA07	1,979	-	-	1	-
Sydney Olympic Park	NCA08	91	-	-	-	-
	NCA09	34	-	-	-	-

Note 1: Based on worst-case predicted vibration levels.

The rockbreaker tunnelling vibration assessment shows the following:

- No receivers are predicted to exceed the cosmetic damage or sensitive equipment screening criteria during tunnelling work.
- Potential exceedances of the human comfort criteria are likely in the Westmead and Clyde/Rosehill study areas, meaning perceptible levels of vibration may occur when tunnelling works are below these areas.

Exceedances of the daytime human comfort criteria are likely at residential receivers with a slant distance of less than 23 metres from rockbreaker activity and at commercial receivers with a slant distance of less than 14 metres.

Exceedances of the night-time human comfort criteria are likely at residential receivers with a slant distance of less than 28 metres from rockbreaker activity.

The location of all human comfort vibration criteria exceedances are shown in **Appendix E**.

6.4.4 Vibration Related Settlement

CoA D63 requires vibration monitoring at buildings close to construction sites and the tunnel route during construction. Where monitoring indicates vibration levels exceeding the criteria in **Section 3.5**, construction affecting settlement must cease and not resume until rectified or revised methods selected.

Vibration criteria in **Section 3.5** are adopted from BS7385-2 (1993) for residential and commercial buildings and DIN 4150-3 (2016) for buildings of heritage value, which may be more sensitive to vibration. However, no specific vibration criteria are recommended within these standards to minimise the risk of settlement.

Annexure C of BS7385-2 (1993) and Annex C of DIN 4150-3 (2016) discuss the potential for settlement due to construction vibration sources. Where soils are non-cohesive, i.e. the grains remain separate from each other and do not form clods, such as uniformly graded sands, silts and gravels, vibration can cause densification or consolidation of the soil. This may lead to differential settlement and higher potential for building damage. BS7385-2 (1993) and research by Massarsch & Fellenius (2014) note a low risk of settlement when peak particle velocity exceeds 10mm/s in loose sand.

The Soil and Water Management Plan notes the station boxes are generally located on Blacktown soil landscape which is classified as a type D, dispersible soil by the Managing Urban Stormwater: Soils and construction - Volume 1 “Blue Book”. These types of soils are not characterised as cohesionless. Since the cosmetic damage vibration criteria for the project are below this level, at 7.5mm/s, these triggers would be met and works stopped or otherwise corrected before reaching a 10mm/s criteria relevant to settlement.

In line with CoA D63, vibration monitoring must be undertaken at the nearest buildings to the construction sites during times of vibration intensive works. Where exceedances of the criteria are recorded, corrective actions in line with CoA D63 would be implemented where soils at risk of vibration-induced settlement are identified (ie all construction affecting settlement must cease immediately and must not resume until fully rectified or a revised method of construction is established that will ensure protection of affected buildings).

7 Cumulative Construction Impacts

Cumulative construction impacts can occur where multiple construction projects are being completed in the same area at the same time. The potential cumulative impacts from other major projects are discussed in the EIS. Other major projects relevant to this assessment are summarised below.

Table 37 Nearby Major Developments

Project	Details
Parramatta Light Rail Stage 1 and 2	Parramatta Light Rail involves the construction of a new light rail network. Stage 1 of the project is between Westmead and Carlingford, via Parramatta CBD and Camellia, and is currently under construction. Enabling works for Stage 1 began in late-2018 and construction is expected to be complete by early 2023. Stage 2 is proposed to connect Parramatta CBD to Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park. Stage 2 is currently in the planning phase.
Western Sydney University Westmead Campus Upgrade	Western Sydney University is upgrading its four-hectare Westmead campus into a retail, business and residential hub to support the Westmead study area. Construction of a 19-storey building, landscaping and public domain works are currently occurring in the south-west portion of the campus.
Westmead Medical Precinct Redevelopment	Upgrade and redevelopment of various health services, education and medical research facilities will occur across the 75 hectare Westmead Medical Precinct over the coming years. These works are anticipated to extend to 2036.
Parramatta North Urban Transformation Area	UrbanGrowth NSW is creating new public domain spaces which will preserve the site's existing parkland character. The proposed recreational amenities will service new residents and visitors with new play spaces, open spaces, river walks, BBQ and outdoor dining areas as well as new high quality streetscapes with generous tree planting. The project is in the planning stages and construction timeframes are not currently known.
New Powerhouse Museum	The new Powerhouse Precinct at Parramatta will feature the largest museum in NSW and be home to Australia's largest planetarium. Early works are planned to commence in 2019 with completion expected in 2024.
Central City District Plan	This Central City District Plan is a 20-year plan to manage growth in the context of economic, social and environmental matters to achieve the 40-year vision of Greater Sydney. The plan covers Blacktown, Cumberland, Parramatta and The Hills.
Camellia Town Centre	A strategy for renewal of Camellia is being developed. It would provide for a new riverside town centre positioned on the Parramatta Light Rail, as well as a proposed new primary school, 13 hectares of new open space and affordable housing. The project is in the planning stages and construction timeframes are not currently known.
Clyde Terminal Conversion Project	Viva Energy Australia is converting what was an operating refinery into a more efficient fuel import and storage terminal. The project includes demolition and removal of redundant refining infrastructure as well as works to improve the environmental and operational performance of the facility. Construction is expected to last for five to 10 years from project approval (which was in 2015).
WestConnex M4 Widening	WestConnex M4 Widening involved building an additional lane in each direction on the M4 Motorway between Parramatta and Homebush. The project was constructed between 2015 and mid-2017 and is now complete.

Project	Details
	Transport for NSW is proposing to modify the project by building a westbound off-ramp from the M4 Motorway onto Hill Road and Parramatta Road at Lidcombe. The project is in the planning stages and construction timeframes are not currently known.
Sydney Olympic Park Masterplan 2030	The Sydney Olympic Park Masterplan aims to develop a sustainable and active Sydney Olympic Park. The Master Plan 2030 includes: • 10,700 homes for 23,500 residents • 34,000 job opportunities • Retail space increased to 100,000m2 • More local parks • Possibilities for new primary and secondary schools.
Sydney Metro West – Central Tunnelling Package (CTP)	Acciona Ferrovial Joint Venture (AFJV) has been awarded the contract to design and construct the Sydney Metro West – Central Tunnelling Package. The contract includes the delivery of twin 11 kilometre tunnels and excavation of five station boxes at Sydney Olympic Park, North Strathfield, Burwood North, Five Dock and The Bays. Construction started in September 2021.

Based on review of the nearby major projects, the following conclusions were made in each study area:

- Westmead:
  - The Parramatta light rail alignment runs along Hawkesbury Road in Westmead, which is to the north of the Westmead metro station construction site. Parramatta Light Rail Stage 1 is currently in construction and is expected to be complete in 2023. Receivers near to Westmead metro station construction site in NCA01 and NCA02 would potentially be affected by concurrent noise impacts from the construction of both projects
- Parramatta:
  - The Parramatta light rail alignment also passes the Parramatta metro station construction site on Church Street and Macquarie Street in Parramatta. Receivers near to Parramatta metro station construction site in NCA03 would potentially be affected by concurrent noise impacts from the construction of both projects.
- Clyde / Rosehill
  - The Parramatta light rail alignment passes through the north of Rosehill along Tramway Avenue and to the north of Grand Avenue. A stabling and maintenance facility is also located to the east of Rosehill Gardens Racecourse. The projects are separated by around 850 m therefore cumulative impacts are unlikely.
  - Cumulative noise impacts with the Camellia Town Centre project are not considered a risk as it is currently in the planning stages and construction timeframes are not known.

    - Conversion work at the Clyde Terminal are located to the east of the Project and cumulative noise impacts may affect receivers in Clyde area between both projects. These receivers are largely commercial with relatively low sensitivity to construction noise, therefore cumulative impacts would be considered low.
- Sydney Olympic Park
    - Various projects of the Sydney Olympic Park Masterplan 2030 may be in construction at the same time as construction of Sydney Olympic Park construction site and concurrent noise impacts may affect receivers around this construction site. Most of the receivers surrounding the Project are commercial. Details of other projects that would be constructed near the Project are not currently known.
    - Sydney Metro West – Central Tunnelling Package (CTP) is currently under construction. Receivers near the Sydney Olympic Park metro station construction site in NCA08 and NCA09 would potentially be affected by concurrent noise impacts from the construction of both projects. GLC will maintain regular and frequent communication with CTP with managing OOHW and any potential cumulative impacts.

8 Mitigation and Management Measures

8.1 Standard Mitigation Measures

The overall objective of construction noise and vibration management is to limit impacts on nearby receivers. This can be achieved by implementing the requirements of the CNVS which reflects the intent and purpose of the ICNG. Therefore, the following hierarchical approach should be used as far as practicable:

- Where site noise levels are above goals or criteria, implement reasonable and feasible good practice environmental controls to minimise noise and vibration emissions and/or exposure duration at affected receivers.
- Where the use of best practice environmental control mitigation measures do not adequately address exceedances of goals or criteria, adopt alternative measures/methodologies to minimise impacts on the community.
- Liaise with the local community regarding scheduled works which are predicted to have increased impacts.

It is recommended that the standard noise mitigation measures presented in Section 4 of the CNVS be adopted for all works undertaken as part of the Project. The management, source control and path control measures should be implemented.

8.2 Project Specific Mitigation and Management Measures

Noise impacts may be apparent at the nearest receivers at certain times during the Project. The Project should apply all feasible and reasonable mitigation measures to minimise the impacts, particularly during highly noise intensive work, such as concrete sawing, rock hammering and vibratory rolling.

The following measures shown in **Table 38** must be implemented in accordance with the CNVMP and CoA D39 to minimise the potential impacts from the works. Reference to applicable CoA and Revised Environmental Mitigation Measures (REMMs) are provided for each of these measures.

Table 38 Recommended Mitigation and Management Measures

ID	Project stage	Measure	Reference / Notes
NV01	Scheduling	Where feasible and reasonable, construction should be carried out during the approved Project working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.	CoA D35
NV02		Highly noise intensive works (ie concrete sawing, rock hammering and vibratory rolling) should only be undertaken during the following approved hours, unless otherwise assessed and justified: 7 am to 6 pm Mondays to Fridays, inclusive; and 8 am to 1 pm Saturdays; and at no time on Sundays or public holidays.	CoA D36 REMM NV04
NV03		Provide appropriate respite periods as per the Sydney Metro CNVS when highly noise intensive works are undertaken or during periods of high noise impacts (eg one hour of respite for every three hours of noise intensive work).	CoA D36 REMM NV02, NV03
NV04		Carry out community consultation to determine the need and frequency of respite periods, as required by the CoA. This should include consultation with the Rosehill Gardens Racecourse.	CoA D38, D41, D51 REMM NV01, NV15
NV05		Co-ordination should occur between potentially interacting projects to minimise concurrent or consecutive works in the same areas, where possible.	CoA D50, REMM NV18
NV06		Noise generating work in the vicinity of potentially-affected community, religious, educational institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) resulting in noise levels above the NMLs must not be timetabled within sensitive periods, unless other reasonable arrangements with the affected institutions are made at no cost to the affected institution.	CoA D41
NV07		During night-time works at the Clyde MSF, high noise generating activities should be avoided in the vicinity of the Rosehill Gardens Racecourse Stables (eg <100 m). Work adjacent to the stables should be scheduled for less sensitive periods.	CoA D42, Best Practice **Appendix C**

ID	Project stage	Measure	Reference / Notes
NV08	Site Layout	Compounds and work areas should be one-way to minimise the need for vehicles to reverse.	CoA D42, Best Practice
NV09		Stationary sources of noise, such as generators, should be located away from sensitive receivers.	CoA D42, Best Practice
NV10	Contractor management	Training should be provided to project personnel, including relevant sub-contractors, on noise and vibration requirements and the location of sensitive receivers during inductions and toolbox talks.	CoA D42, Best Practice
NV11	Heavy Vehicles	Delivery vehicles should be fitted with straps rather than chains for unloading, wherever possible.	CoA D42, Best Practice
NV12		Truck drivers should avoid compression braking as far as practicable.	CoA D42, Best Practice
NV13		Trucks should not idle near to residential receivers or the Rosehill Gardens Racecourse Stables.	CoA D42, Best Practice
NV14		Air brake silencers would be used on heavy vehicles that access the construction sites multiple times per night or over multiple nights.	CoA D42, REMM NV05
NV15	Path Control	Construction hoarding around the site perimeter should be erected to control the dispersion of noise offsite (noise modelling has assumed as a minimum 2.4 m high, 17mm solid plywood timber construction hoarding with no gaps, refer acoustic hoarding in **Appendix C**). Where previous contractors have already installed construction hoarding, the existing hoarding can be used.	CoA D42, REMM NV02, NV06 Best Practice
NV16		Additional portable noise barriers may also be used around particularly noisy equipment such as concrete saws, where necessary. (eg in close proximity to the Rosehill Gardens Racecourse Stables)	CoA D42, REMM NV02 Best Practice
NV17		Use onsite structures to shield sensitive receivers from noise such as site shed placement; hoarding; shipping containers; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant.	CoA D42, Best Practice
NV18		Implement acoustic treatment of the Spoil shed and Acoustic shed at Westmead and Clyde Dive Site during establishment of structure, to control the dispersion of noise offsite. Refer **Appendix F** Implement acoustic panels over the box excavation at the Westmead site (where excavation depth permits). Refer **Appendix F**	CoA D42, REMM NV08
NV19	Noise/ Vibration source mitigation	Noise levels of plant and equipment must have operating Sound Power Levels (Lw) compliant with the Sydney Metro CNVS and presented in **Appendix B**.	CoA D42, Best Practice
NV20		Alternative construction methodologies and measures that minimise noise and vibration levels during noise intensive works would be investigated and implemented where feasible and reasonable. Use the minimum sized equipment necessary to complete the work and where possible, use alternative, low-impact construction techniques such as excavator grab instead of hydraulic hammer, bored piling instead of impact piling and electric chainsaws instead of petrol chainsaws (where possible).	CoA D42, REMM NV02, NV09 Best Practice

ID	Project stage	Measure	Reference / Notes
		Alternative construction methodologies and measures would also include consideration of: • Sequencing works to shield noise sensitive receivers by retaining building wall elements • Locating demolition load out areas away from the nearby noise sensitive receivers • Providing respite periods for noise intensive works • Minimising structural-borne noise to adjacent buildings including separating the structural connection prior to demolition through saw-cutting and propping, using hand held splitters and pulverisers or hand demolition • Installing sound barrier screening to scaffolding facing noise sensitive neighbours • Using portable noise barriers around particularly noisy equipment, such as concrete saws • Modifying demolition works sequencing / hours to minimise impacts during peak pedestrian times and / or adjoining neighbour outdoor activity periods.	
NV21		Plant and machinery should be fitted with manufacturer supplied noise suppression devices and maintained where required.	CoA D42 REMM NV02
NV22		Power tools should use mains power where possible rather than generators.	CoA D42, Best Practice
NV23		Shut down machinery, including generators, when not in operation.	CoA D42, Best Practice
NV24		Avoid dropping materials from a height and dampen or line metal trays, as necessary.	CoA D42, Best Practice
NV25		Ensure equipment is operated in the correct manner.	CoA D42, Best Practice
NV26		All equipment should be appropriately maintained and fitted with noise control devices, where practicable (eg attenuated generators).	CoA D42, Best Practice
NV27		Where night-time works are required, equipment/trucks should use broadband reversing alarms.	CoA D42, Best Practice
NV28	Community consultation	Engagement and consultation should be carried out with the affected communities to understand their preferences for mitigation and management measures (eg Rosehill Gardens Racecourse).	CoA D38, D41, D51 REMM NV01, NV15

ID	Project stage	Measure	Reference / Notes
NV29		Undertake consultation with the Rosehill Gardens Racecourse and an equine veterinary expert to help inform noise and vibration objectives for this sensitive receiver prior to construction. A behavioural equine noise study has been undertaken to assess the potential impacts of noise and vibration related to the construction of the Project at the Clyde Dive site immediately adjacent to the stables of the Rosehill Gardens Racecourse and provides recommendations to mitigate the impacts of constructions works on the horses. In accordance with this DNVIS and the recommendations of the study, GLC will adopt all reasonable and feasible mitigation measures where works exceed the NML at the stables. In compliance with REMM NV15, consultation with the owners and operators of the horse stables would be carried out to ensure potential impacts to horses are appropriately managed.	Clyde MSF Mod NV20
NV30		Provide appropriate notice to the affected sensitive receivers prior to starting works and before any noisy periods of works.	CoA D38, D51
NV31		Provide signage with a 24 hour contact number.	CoA A48
NV32		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.	CoA D45
NV33		Where there are complaints regarding noise, review and implement additional control measures, where feasible and reasonable.	CoA B4, D42, Best Practice
NV34	Monitoring	Noise monitoring should be undertaken within the first month of work and periodically throughout the construction period and cover the range of activities being undertaken at the site during day, evening and night-time periods	CoA C16
NV35		Conduct noise and/or vibration monitoring in response to any formal complaints received.	CoA B4, D42, Best Practice
NV36		Conduct vibration monitoring if vibration intensive works are to be undertaken within the minimum working distances of sensitive receivers or structures and where exceedances have been predicted. Vibration testing must be conducted during vibration generating activities that have the potential to impact on Heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and attended monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures. Such measures must include, but not be limited to, review or modification of excavation techniques.	CoA D42, D46 Best Practice

ID	Project stage	Measure	Reference / Notes
NV37		Noise monitoring should be undertaken at the Rosehill Gardens Racecourse Stables during all work scenarios where NMLs are predicted to be exceeded.	CoA D42, Best Practice
NV38		Noise monitoring should be undertaken where NMLs are predicted to be exceeded as defined by the AMM outlined in **Section 8.3**. This includes monitoring of ground-borne noise for tunnelling operations. Where site related airborne or ground-borne noise is measured to exceed predicted levels in this report, additional mitigation measures must be considered to reduce impacts.	CoA D42, Best Practice
NV39	Building Surveys	Condition surveys of buildings and structures near to the tunnel and excavations would be undertaken prior to the commencement of excavation at each site, where appropriate. For heritage buildings and structures the surveys would consider the heritage values of the structure in consultation with a heritage specialist.	CoA D60, REMM NV17
NV40	Ground-borne Noise Cross Passages	The proximity of cross passages to nearby receivers and the corresponding construction ground-borne noise and vibration impacts during the excavation works would be considered when determining locations. Relocation of cross passages to be further away from sensitive receivers to mitigate potential construction impacts would be considered, where feasible and reasonable. Limiting construction hours (to less sensitive periods) at locations where exceedances are predicted will also be considered, where feasible and reasonable.	CoA D42, Best Practice

8.2.1 Measures Identified Through Consultation

In accordance with CoA D43 and D44, ongoing consultation with affected sensitive land users will identify any further mitigation and management measures. Where additional measures are identified, they will be incorporated into an update of this DNVIS.

GLC is committed to undertake consultation in accordance with CoA D44 for any activity predicted to generate noise levels above NMLs and outside the approved project hours (in CoA D35). This consultation will occur prior to the activity commencing, and any specific mitigation measures identified during this consultation will be implemented.

Community consultation has been undertaken in accordance with the Community Communication Strategy (CCS). The CCS outlines key risks and issues associated with the Project. A summary of the identified issues related to noise and vibration are as follows:

- Information about construction
- Construction noise and vibration
- Concerns about property damage
- Cumulative impacts of other projects

A range of proposed community consultation/management measures have been identified to address these key issues. Some of these measures include:

- Early engagement with neighbouring stakeholders on likely noise and vibration impacts
- Implementation of mitigation measures in the CNVS, CNVMP, Minor Works Approval or Out of Hours Approval where relevant
- Noise minimised through, use of appropriate plant, tools and techniques and programming
- High impact noise works staged with respite periods as required by any applicable Environment Protection Licence or planning approval
- Temporary noise screens used around equipment, where appropriate
- Staff Induction and toolbox meetings prior to noisy activities to highlight acceptable work force behaviour
- Noise and or vibration monitoring offered in response to complaints
- Vibration monitoring undertaken on any adjoining heritage structures if outlined in advice from acoustic advisor
- Consult with the community about planned out-of-hours work by providing regular updates to the community about upcoming out-of-hours activities, associated impacts and mitigation measures being implemented as well as invite ongoing feedback to be provided via email, 24-hour phone line or in-person meetings
- An out-of-hours work lookahead of no less than 3 months will be provided to the community on a quarterly basis, with site-specific notifications, via letterbox drop, email and Sydney Metro Connect App will provide regular updates on progress of current out of hours work as well as upcoming work
- Precinct specific newsletters with information about expected out of hours work will be distributed to the wider community
- Community information sessions will be held in each precinct prior to, and/or at the start of major construction stages which may have significant noise and vibration impacts
- Information obtained from the ongoing engagement will be considered as the out-of-hours scope of work is confirmed and where appropriate, targeted mitigation measures would be implemented.

GLC engages with community on noise and vibration on a regular basis and will continue that engagement during the life of the project. Feedback from that ongoing consultation will feed into the design and delivery of noise and vibration mitigation strategies to ensure they meet the needs of the community and stakeholders. The outcomes of consultation to date at each construction site are summarised below:

8.2.1.1 Westmead

- The most significantly impacted are the residential properties surrounding the construction site on Alexandra Avenue, Hassall Street, Bailey Street, Hawkesbury Road and Grand Avenue. Feedback from local Westmead residents to date has been very positive. GLC stakeholder engagement outcomes have been used to develop noise and vibration mitigation strategy.
- Sydney Metro is engaging directly with Westmead Public School on a regular basis. Insights about the school community are important for GLC to reach Westmead residential community. In particular, the Community Hub within the school presents an opportunity to communicate effectively with the community about construction impacts such as noise and vibration.
- An EPL variation was applied for the HV works at Westmead (between Westmead and Parramatta) to allow for 24/7 works and shorten the overall impact length onto nearby residents and businesses. The residents along the HV alignment received respite offers and alternative accommodation as required.
- The residents have been consulted on a range of out of hours work activities that have occurred on site or in the nearby streets, including utility works, road works and tunnel support works. The GLC Team engages with the community regularly and provide them with updates on project progress. The residents received respite offers and alternative accommodation as required.
- Community information sessions have taken place. Feedback from the community has been that they feel well informed of the project and no concerns have been raised.
- No additional specific mitigation measures have been identified to date. Community engagement will continue, and any specific mitigation measures identified will be implemented.
- On the 31st July 2023, DPHI responded to a CoA A4 Clarification Letter detailing the requirements for GLC to undertake concrete and truck deliveries between 10pm-7am at Westmead, given CoA D37 (d)(iii) explicitly prevents this activity from occurring between this set period. As part of this response, DPHI explicitly notes the following:

  "(GLC) are permitted to make deliveries to the Westmead station site out of hours if they meet the noise limits in condition D37(b) of the approval. (GLC) must also meet the noise limits in the NSW Road Noise Policy unless otherwise approved by the Acoustic Advisor under a Detailed Noise and Vibration Impact Statement".

  GLC therefore propose to undertake a trial period of deliveries in consultation with the Acoustic Advisor to demonstrate if deliveries can successfully be achieved to meet the RNP as well as the noise limits in CoA D37(b). GLC propose to undertake up 5 evenings worth of deliveries during which monitoring would be undertaken accompanied by the AA (at AA discretion), and these results made available to the AA for review and consideration. If compliance with the A4 Clarification letter can be achieved, the Activity WM.19/WM.19b in this DNVIS would be appropriately updated to reflect the observed findings before it is resubmitted for endorsement by the AA. After which, further verification monitoring would not be necessary, rather monitoring would proceed as per the NVMP and DNVIS.

8.2.1.2 Parramatta

- To mitigate the noise impacts on businesses surrounding the Parramatta construction site, the GLC Place Manager regularly interacts with individual local businesses around the site to understand their sensitivities to upcoming works and ensure timely communications.
- EPL variations were applied for the HV works at Parramatta (between Westmead and Parramatta), the D-Wall 24/7 works and Parramatta Water Treatment Plant discharge pipeline. The residents along the HV and discharge pipeline alignment received respite offers and alternative accommodation as required.
- The businesses, educational places and residents have been consulted on a range of out of hours work activities that have occurred on site or in the nearby streets, including utility works and footpath repair works. The GLC Team engages with the impacted receivers regularly and provide them with updates on project progress.
- Recent consultation with businesses on footpath rectification works has identified the preference from evening/night-time operating businesses for GLC not to undertake works on Thursday night to avoid impact on late night trading.
- No additional specific mitigation measures have been identified to date. Community engagement will continue, and any specific mitigation measures identified will be implemented.

8.2.1.3 Clyde/Rosehill

- The Australian Turf Club (ATC), the owner of the Rosehill Gardens Racecourse, has been and will continue to be consulted by GLC and Sydney Metro about noise and vibration.
- The ATC is mainly concerned about activities in the Clyde Dive site which is adjacent to the western side of the racecourse. With respect to noise and vibration, their concern is for the welfare of the horses. The ATC prefers works to be conducted when there are fewer horses around and not during trackwork. ATC has expressed to Sydney Metro that the noisiest and most impactful works should be scheduled between 9am and 2pm, if possible. Impactful works before 9am is not preferred because of trackwork. In addition, the ATC prefers more impactful works to be conducted on Mondays and Tuesdays and less works later in the week. The ATC has also indicated that it is more concerned about work at the southern end of the Clyde Dive site because of its proximity to stables, than it is about works at the northern end.
- It is noted that businesses in Clyde, Rosehill and surrounds are mostly industrial or commercial and adjacent to busy roads, with a significant level of background noise. To date, only one business has raised concerns about construction noise. GLC will continue to regularly engage directly with the business to discuss construction impacts and mitigation measures.
- Through consultation, GLC identified most sensitive times for Thrive Child Care and agreed to stop work between 12pm and 2pm to provide respite (for geotechnical works).
- Sydney Metro, GLC and ATC meet regularly to discuss upcoming works, predicted impacts and mitigation measures. ATC is sharing a schedule of events with GLC such as race weekends which GLC endeavour to work around to minimise impacts.
- No additional specific mitigation measures have been identified to date. Community engagement will continue, and any specific mitigation measures identified will be implemented.

8.2.1.4 Sydney Olympic Park

- GLC will use the stakeholder insight from the Acciona Ferrovial Joint Venture (AFJV) Central Tunnel Package (CTP) Sydney Olympic Park DNVIS consultation with Sydney Olympic Park commercial and retail stakeholders to shape the WTP mitigation strategy.
- Pullman, Novotel and Ibis Hotels have requested early dialogue regarding any out of hours work to enable staff to manage customer expectations.
- Businesses in 10 Herb Elliott Avenue have varying day / night operating conditions and tailored communications may be necessary to ensure all disruptive activity is communicated clearly in advance to minimise impact on the daily operations of the various businesses.
- GLC will engage with residential high rise apartment buildings on Australia Avenue and Figtree Drive on the north-east sides of the Sydney Olympic Park construction site. In addition to the hotels, these apartments will be the focus on community engagement with respect to out of hours work.
- GLC will investigate options to utilise battery or electric chainsaws or hydraulic saws over petrol chainsaws as much as is feasibly and reasonably possible when undertaking tree trimming/cutting vegetation.

8.3 Additional Mitigation Measures

Where the predicted 'mitigated' construction noise levels are above the project specific noise management levels (NMLs), a number of additional measures to mitigate such exceedances as identified in the Sydney Metro CNVS would be explored and implemented as required. Implementation of the Additional Mitigation Measures (AMM) will consider prediction as well as results of validation monitoring. The AMM for ground-borne noise and construction vibration are also applicable where predictions are above the relevant management levels. The approach, guided by the AMM, is primarily aimed at pro-active engagement with affected sensitive receivers rather than additional noise reducing mitigation. The AMM applies to all receiver types where these receivers are in-use.

The types of additional mitigation measures are listed in **Table 39** and described in the Sydney Metro CNVS. The AMM for construction noise is identified in **Table 40**.. The AMMM for ground-borne noise and vibration are identified in **Table 41** and **Table 42**.

Table 39 Additional Mitigation Measures

Mitigation / Management Measure	Abbreviation
Alternative accommodation	AA
Monitoring	M
Individual briefings	IB
Letter box drops	LB
Project-specific respite offer	RO
Phone calls and emails	PC
Specific notification	SN

Table 40 Additional Mitigation Measures Matrix - Construction Noise

Time Period		Mitigation Measures Predicted $L_{Aeq(15minute)}$ noise level above NML			
		0 to 10 dBA	11 to 20 dBA	21 to 30 dBA	> 30 dBA
Approved Hours	Mon-Fri (7am – 6pm) Sat (8am – 6pm) Sun/Pub Hol (Nil)	-	LB	LB, M, SN	LB, M, SN
OOHW (Evening)	Mon-Fri (6pm – 10pm) Sat (6pm – 10pm) Sun/Pub Hol (8am -6pm)	LB	LB, M	LB, M, SN, RO	LB, M, SN, IB, PC, RO
OOHW (Night)	Mon-Fri (10pm – 7am) Sat (10pm – 8am) Sun/Pub Hol (6pm -7am)	LB	LB, M, SN, RO	LB, M, SN, IB, PC, RO, AA	LB, M, SN, IB, PC, RO, AA

Table 41 Additional Mitigation Measures Matrix – Ground-borne Construction Noise

Time Period		Mitigation Measures Predicted $L_{Aeq(15minute)}$ noise level above NML		
		0 to 10 dBA	11 to 20 dBA	21 to 30 dBA
Approved Hours	Mon-Fri (7am – 6pm) Sat (8am – 6pm) Sun/Pub Hol (Nil)	-		
OOHW (Evening)	Mon-Fri (6pm – 10pm) Sat (6pm – 10pm) Sun/Pub Hol (8am -6pm)	LB	LB, M, SN	LB, M, SN, IB, PC, RO
OOHW (Night)	Mon-Fri (10pm – 7am) Sat (10pm – 8am) Sun/Pub Hol (6pm -7am)	LB, N, SN	LB, M, SN, IB, PC, RO, AA	LB, M, SN, IB, PC, RO, AA

Table 42 Additional Mitigation Measures Matrix – Ground-borne Vibration

Time Period		Mitigation Measures Predicted vibration level above maximum level (human comfort)
Approved Hours	Mon-Fri (7am – 6pm) Sat (8am – 6pm) Sun/Pub Hol (Nil)	LB, M, RO
OOHW (Evening)	Mon-Fri (6pm – 10pm) Sat (6pm – 10pm) Sun/Pub Hol (8am -6pm)	LB, M, IB, PC, RO, SN

Time Period		Mitigation Measures Predicted vibration level above maximum level (human comfort)
OOHW (Night)	Mon-Fri (10pm – 7am)	LB, M, IB, PC, RO, SN, AA
	Sat (10pm – 8am)	
	Sun/Pub Hol (6pm -7am)	

8.4 Revisions of the DNVIS

In order to ensure continual improvement and assessment of any changes to the construction program, this DNVIS will be reviewed in response to:

- changes in the construction methodology, scope and site conditions
- any further mitigation measures identified through ongoing consultation with affected sensitive land users

Where a change occurs in relation to works described in a DNVIS, it will be updated and resubmitted to Sydney Metro for approval. For example, works during standard working hours being rescheduled outside standard working hours. A copy of the revised DNVIS will be provided to the AA and ER for review before the commencement of the associated works. Copies of the revised DNVIS will also be available for the Planning Secretary (DPHI) and the EPA on request.

8.5 Implementation of Mitigation and Management Measures

A construction representative will be appointed as a "Noise Champion" for each site to proactively manage upcoming works and consider the implementation of the measures detailed in **Table 38** in consultation with the Environmental Advisor to ensure that noise and vibration impacts are minimised as far as practicable.

The noise champion will be a site engineer (or delegate) whose primary role on site each day will include engaging with subcontractors, procuring, scheduling, and planning out works. Planning will include review of the mitigation measures during construction forecasting meetings, which typically includes a three week look ahead.

The senior environmental advisor will brief the noise champion on the DNVIS/CNVMP and the mitigation measures required (**Table 38**). The noise champion will be empowered to make day to day changes where necessary.

9 Conclusion

SLR has been engaged to assess the potential noise and vibration impact from construction activities, tunnelling, construction road traffic of the Sydney Metro West - Western Tunnelling Package. The Project has been divided into six study areas comprising Westmead, Parramatta, Clyde Dive, Clyde Maintenance and Stabling Facility (MSF), Rosehill Stabling Facility and Sydney Olympic Park. This assessment has been prepared to accompany the CNVMP for the Project. The CNVMP was developed as part of the delivery of the Sydney Metro West - Western Tunnelling Package.

Consistent with other major infrastructure projects in suburban/urban areas, noise and vibration impacts during construction are inevitable as works require the use of noise and vibration intensive equipment in proximity to sensitive receivers.

The airborne noise impact assessment finds that predicted noise levels across all construction sites are generally between ‘1-10 dB’ and ‘11-20 dB’ above NMLs throughout the Project. Higher impacts for certain work activities at Westmead, Parramatta, Clyde Dive and Clyde MSF are expected at the closest receivers where noisy works are required, especially during OOHW periods. Where construction activities are proposed to occur during out of hours, there is a potential for sleep disturbance impacts at Westmead, Parramatta, Clyde Dive and Clyde MSF Sites. Best-practice construction management should be implemented to reduce both L_{Aeq} and L_{AFmax} noise levels as far as practicable.

The construction vibration assessment found that a small number of nearby receivers at Paramatta and Clyde near vibration intensive construction works have the potential to exceed the cosmetic building damage screening criteria. Receivers near vibration intensive construction works at the Westmead, Parramatta and Clyde sites also have the potential to exceed the human comfort screening criteria. The vibration assessment concluded that best-practice construction management and control techniques should be implemented to reduce vibration levels as far as practicable. To minimise impacts to human comfort, additional mitigation and management measures will also be warranted. These will need to be implemented in conjunction with community and stakeholder consultation and notification processes outlined in the CNVMP.

Ground-borne noise impacts from tunnelling activities during the daytime are predicted to generally be compliant with the NML or result in only ‘1-10 dB’ above the NML. During the evening and night-time, ground-borne noise impacts are more wide-spread due to a lower and more stringent NML. The worst-case impacts are predicted to be ’11-20 dB’ in the Westmead and Clyde study areas. Ground-borne vibration impacts in relation to cosmetic damage and sensitive equipment are not anticipated during tunnelling work. Potential exceedances of the human comfort criteria are likely in the Westmead and Clyde/Rosehill study areas, meaning perceptible levels of vibration may occur when tunnelling works are below these areas.

Based on the outcomes of the assessment, several best-practice mitigation and management measures should be applied, where feasible and reasonable, to control and minimise the impacts during construction as far as reasonably practicable in accordance with the CNVMP and the CNVS. Reference to the Minister’s Conditions of Approval and Revised Environmental Mitigation Measures are provided for each of these measures.

10 References

British Standard (BS 6472–1992) – **Evaluation of Human Exposure to Vibration in Buildings** (1 Hz to 80 Hz), dated 1992

British Standard BS7385: Part 2-1993 (BS 7385) - **Evaluation and Measurement for Vibration in Buildings — Part 2 – Guide to Damage Levels from Ground-borne Vibration**, dated 1993

Department for Environment, Food and Rural Affairs (DEFRA), **Noise Database for Prediction of Noise on Construction and Open Sites**, December 2004

German Institute for Standardisation – DIN 4150 (1999-02) Part 3 (DIN4150:3) – **Structural Vibration - Effects of Vibration on Structures, dated 1999**

International Organisation for Standardisation (ISO) 9613 Part 2 - 1996 (ISO 9613:2, 1996) - **Acoustics - Attenuation of Sound during Propagation Outdoors - Part 2: General Method of Calculation**

International Organisation for Standardisation (ISO) 17534 – 2015 – (ISO 17534, 2015) – **Acoustics - Software for the Calculation of Sound Outdoors**

NSW Department of Environment and Conservation – **NSW Environmental Noise Management – Assessing Vibration: A Technical Guideline** (AVTG), February 2006

NSW Department of Environment, Climate Change and Water – **NSW Road Noise Policy (RNP)**, March 2011

NSW Department of Environment and Climate Change (DECC) – **NSW Interim Construction Noise Guideline** (ICNG), July 2009

NSW Environment Protection Authority – **Noise Policy for Industry** (NPfI), October 2017

Standards Australia AS1055–2018 (AS1055) – **Description and Measurement of Environmental Noise**

Standards Australia AS 2436–2010 (AS2436) – **Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites**

Sydney Metro - **Construction Noise and Vibration Standard (CNVS)**, SM-20-00098866/4.3, November 2020

Sydney Metro West – **Westmead to The Bays and Sydney CBD – Concept and Stage 1 – EIS Technical Paper 2 Noise and Vibration Impact Assessment**, prepared by SLR dated September 2020

Transport for NSW (TfNSW) - **Construction Noise and Vibration Strategy (CNVS)**, ST-157/4.1, April 2019

APPENDIX A

Acoustic Terminology

1. Sound Level or Noise Level

The terms 'sound' and 'noise' are almost interchangeable, except that 'noise' often refers to unwanted sound.

Sound (or noise) consists of minute fluctuations in atmospheric pressure. The human ear responds to changes in sound pressure over a very wide range with the loudest sound pressure to which the human ear can respond being ten million times greater than the softest. The decibel (abbreviated as dB) scale reduces this ratio to a more manageable size by the use of logarithms.

The symbols SPL, L or LP are commonly used to represent Sound Pressure Level. The symbol LA represents A-weighted Sound Pressure Level. The standard reference unit for Sound Pressure Levels expressed in decibels is 2 x 10^{-5} Pa.

2. 'A' Weighted Sound Pressure Level

The overall level of a sound is usually expressed in terms of dBA, which is measured using a sound level meter with an 'A-weighting' filter. This is an electronic filter having a frequency response corresponding approximately to that of human hearing.

People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4,000 Hz), and less sensitive at lower and higher frequencies. Different sources having the same dBA level generally sound about equally loud.

A change of 1 dB or 2 dB in the level of a sound is difficult for most people to detect, whilst a 3 dB to 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change corresponds to an approximate doubling or halving in loudness. The table below lists examples of typical noise levels.

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerbside of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to quiet
50	General Office	
40	Inside private office	Quiet to very quiet
30	Inside bedroom	
20	Recording studio	Almost silent

Other weightings (eg B, C and D) are less commonly used than A-weighting. Sound Levels measured without any weighting are referred to as 'linear', and the units are expressed as dB(lin) or dB.

3. Sound Power Level

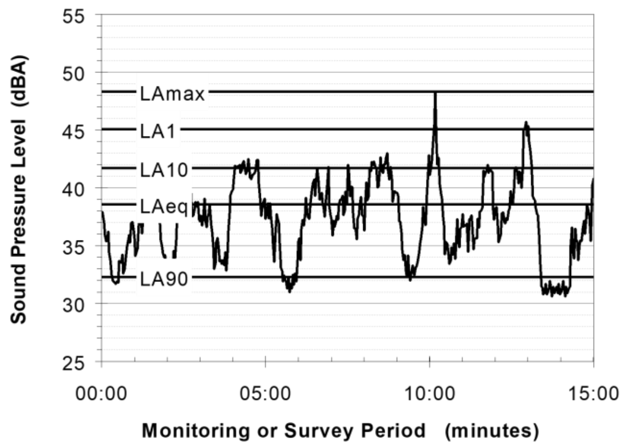
The Sound Power of a source is the rate at which it emits acoustic energy. As with Sound Pressure Levels, Sound Power Levels are expressed in decibel units (dB or dBA), but may be identified by the symbols SWL or LW, or by the reference unit 10^{-12} W.

The relationship between Sound Power and Sound Pressure is similar to the effect of an electric radiator, which is characterised by a power rating but has an effect on the surrounding environment that can be measured in terms of a different parameter, temperature.

4. Statistical Noise Levels

Sounds that vary in level over time, such as road traffic noise and most community noise, are commonly described in terms of the statistical exceedance levels LAN, where LAN is the A-weighted sound pressure level exceeded for N% of a given measurement period. For example, the LA1 is the noise level exceeded for 1% of the time, LA10 the noise exceeded for 10% of the time, and so on.

The following figure presents a hypothetical 15 minute noise survey, illustrating various common statistical indices of interest.



Of particular relevance, are:

LA1 The noise level exceeded for 1% of the 15 minute interval.

LA10 The noise level exceeded for 10% of the 15 minute interval. This is commonly referred to as the average maximum noise level.

LA90 The noise level exceeded for 90% of the sample period. This noise level is described as the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

LAeq The A-weighted equivalent noise level (basically, the average noise level). It is defined as the steady sound level that contains the same amount of acoustical energy as the corresponding time-varying sound.

LAmax The A-weighted maximum sound pressure level of an event measured with a sound level meter.

5. Frequency Analysis

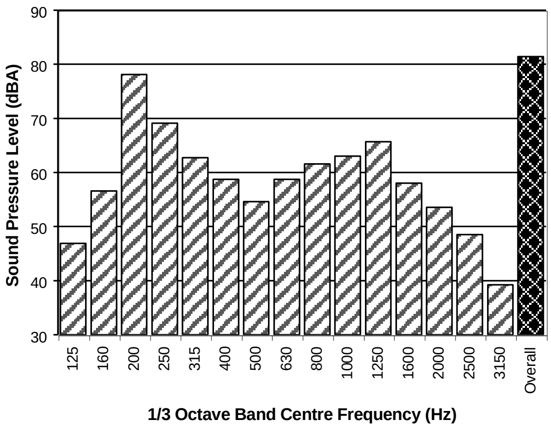
Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal.

The units for frequency are Hertz (Hz), which represent the number of cycles per second.

Frequency analysis can be in:

- Octave bands (where the centre frequency and width of each band is double the previous band)
- 1/3 octave bands (three bands in each octave band)

The following figure shows a 1/3 octave band frequency analysis where the noise is dominated by the 200 Hz band. Note that the indicated level of each individual band is less than the overall level, which is the logarithmic sum of the bands.



6. Annoying Noise (Special Audible Characteristics)

A louder noise will generally be more annoying to nearby receivers than a quieter one. However, noise is often also found to be more annoying and result in larger impacts where the following characteristics are apparent:

- **Tonality** - tonal noise contains one or more prominent tones (ie differences in distinct frequency components between adjoining octave or 1/3 octave bands), and is normally regarded as more annoying than 'broad band' noise.
- **Impulsiveness** - an impulsive noise is characterised by one or more short sharp peaks in the time domain, such as occurs during hammering.
- **Intermittency** - intermittent noise varies in level with the change in level being clearly audible. An example would include mechanical plant cycling on and off.
- **Low Frequency Noise** - low frequency noise contains significant energy in the lower frequency bands, which are typically taken to be in the 10 to 160 Hz region.

7. Vibration

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity. These may be expressed in terms of 'peak' velocity or 'rms' velocity.

The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as 'peak particle velocity', or PPV. The latter incorporates 'root mean squared' averaging over some defined time period.

Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements (ie vertical, longitudinal and transverse).

- Narrow band (where the spectrum is divided into 400 or more bands of equal width)

The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used.

8. Human Perception of Vibration

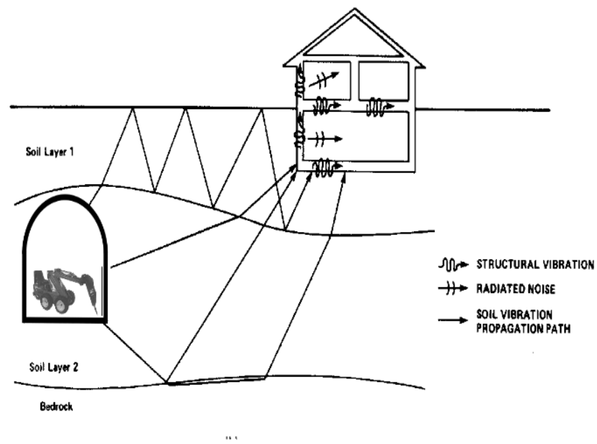
People are able to 'feel' vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as 'normal' in a car, bus or train is considerably higher than what is perceived as 'normal' in a shop, office or dwelling.

9. Ground-borne Noise, Structure-borne Noise and Regenerated Noise

Noise that propagates through a structure as vibration and is radiated by vibrating wall and floor surfaces is termed 'structure-borne noise', 'ground-borne noise' or 'regenerated noise'. This noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air.

Typical sources of ground-borne or structure-borne noise include tunnelling works, underground railways, excavation plant (eg rockbreakers), and building services plant (eg fans, compressors and generators).

The following figure presents an example of the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities occurring within a tunnel.



The term 'regenerated noise' is also used in other instances where energy is converted to noise away from the primary source. One example would be a fan blowing air through a discharge grill. The fan is the energy source and primary noise source. Additional noise may be created by the aerodynamic effect of the discharge grill in the airstream. This secondary noise is referred to as regenerated noise.

APPENDIX B

Construction Scenarios and Equipment

Table B1 Westmead - Construction Scenarios and Equipment

	Equipment	Total Lw (dBA)	Auger Drill Rig[1]	Bobcat	Bulldozer	Compressor[3]	Compressors & Fans[3]	Concrete agitator truck	Concrete pencil vibrator	Concrete pump truck	Concrete Vibrator	Crane - Truck mounted (20-60 tonne)	Crane (mobile)	Crane (tower)	Crane Franna (20 tonne)	Elevated Work Platform	Elevated Work Platform - Scissor Lift	Excavator - Teledipper (70 tonne)	Excavator - Tracked (10 tonne)	Excavator - Tracked (20 tonne)	Excavator - Tracked (30 tonne)	Excavator - Tracked (6 tonne)	Excavator 20-30T + Hammer[1]	Excavator 3-6T + Hammer[1]	Excavator 50T + Hammer[1]	Excavator 50T + Shears	Forklift Crane	Gantry Crane	Generator - attenuated	Gerni (pressure washer)	Grader	Hand tools (electric)	Industrial Fan with attenuator	Jackhammer[1]	Jumbo Drill Rig	Light Vehicle - 4WD	Lighting - Daymaker	Loader - Front-end (wheeled) (23 tonne)	Piling Rig - Bored	Pump - Concrete	Rattle Gun (hand held)	Rockbolter	Roller - smooth drum	Roller - Vibratory[1]	Saw - Concrete[1]	Scrubber Unit	Shotcrete Rig	Telehandler	Tracked Hydraulic Drilling Rig	Truck - Dump	Truck - Medium Rigid (20 tonne)	Truck - road truck/ truck & dog (30 tonne)	Truck - Vacuum (NDD or non-destructive digger	Truck mounted EWP	Tub Grinder/Mulcher (40-50hp)	Tunnel Agitator	Water Treatment Plant	Wrench - Impact
	Sound Power Level (Lw)[2]		118	111	108	90	82	109	103	108	103	108	104	105	98	97	98	115	100	105	110	95	122	115	122	115	106	98	92	99	113	102	88	113	113	103	98	112	112	109	104	104	107	109	118	103	108	99	114	110	103	108	109	103	116	109	93	111
	Estimated utilisation in assessment period (%)		100	50	50	100	100	100	100	50	60	30	30	30	30	30	30	100	100	100	100	100	30	30	30	30	30	30	100	100	50	50	100	30	50	30	100	100	30	100	30	50	100	100	30	100	50	50	50	30	30	30	100	30	30	100	100	30
ID	Construction Scenario																																																									
WM.001	Site preparation work	114													1					1									1		1	4				4							1								2							
WM.002	Initial investigation works	116																											1			2				4													1									
WM.003	Vegetation removal and grubbing	112																		1																															1	1			1			
WM.004	Protecting and/or relocating utilities	118																		1									1							4									1									1				
WM.005	Establishing site amenities	118											1		1	2																2													1			1			1							
WM.006	Establishing Water Treatment Plant (WTP)	104											1		1	2																2																										
WM.007	Establishing vehicle access and egress points	124																		1			1	1								2				4									1								1					
WM.008	Establishing concrete slabs or piling platforms	121																		1		1	1									2												1	1													
WM.009	Establishing spoil shed (slab)	119						1	2						1					1												2								1					1						1							
WM.010	Establishing spoil shed (structure)	110											1		1	4																																			1							2
WM.011	Station Box bored piling	112						1					1																										1												1	1						
WM.012	Station box pile breakback	118																	1													1		3																		1						
WM.013	Establishing truck wheel wash or rumble grid	118													1					1												1													1													
WM.014	Box excavation ground support - Ground anchors / shotcrete / rockbolts	123		1	1			1								1			2						1				1						2												1	1	1							1		
WM.015	Box excavation ground support - internal struts and waler install	104											1			2																									1										1							
WM.016a	Box Excavation (at surface)	116			1													1	1	1																																						
WM.016b	Box excavation (hammers at surface)	127			1														1				1		2																															1		
WM.017a	Box excavation (rock at depth)	120																		1					2																									1								
WM.017b	Box Excavation - Rockbolting / Shotcrete	113																																								1					1	1								2		
WM.018	Mined Tunnel Excavation	121						1								1									2																	1					1	1		1						2		
WM.019a	Delivery of equipment / heavy vehicle deliveries (a)[4]	108																																																		4						
WM.019b	Delivery of equipment / heavy vehicle deliveries (b)[4]	102																																																		1						
WM.019c	Delivery of equipment / heavy vehicle deliveries (c)[5]	97																																																	1							
WM.020	TBM Retreival	114											2	1													1		1			10				1					10											3						
WM.021	General operation of ancilliary facility	108				1	2							1															1				2			1		1																			1	
WM.022	Gantry Crane Operation (OOHW)	113																		1								1					2					1												1								
WM.023	Permanent Tunnel Lining and FRP	119				2			5	1	10	1	3		1	1				1								1		2		1					2				5							2				4				4		
WM.024	Installation of Monitoring Equipment	118	1																																	2	2																1					
WM.025	Removal of acoustic/spoil shed (approved hours)	113											1			2	2				1					1															2																	

Note 1: Equipment classed as 'annoying' in the ICNG and requires a 5 dB correction. An addition of 5 dB for 'annoying' activities has been applied in this DNVIS.

Note 2: Sound power level data is taken from the DEFRA Noise Database, AS2436, TfNSW *Construction Noise and Vibration Strategy* and Sydney Metro *Construction Noise and Vibration Standard.*

Note 3: Sound power level determined from equipment specific data from GLC.

Note 4: WM.19 includes 3 heavy vehicle (eg concrete truck/road truck) movements outside the shed in 15 min period entering from Hassall Street, exiting to Hawkesbury Road. WM.19b includes 1 heavy vehicle movement outside the shed in a 15 min period entering/exiting to Hawkesbury Road only. Modelling assumes trucks are located both inside and outside the Acoustic shed. Where heavy vehicles are located only within the Acoustic shed, NML compliance is achieved.

Note 5: WM.19c includes 20T trucks only. WM.19c includes 1 truck (20T) movement outside the shed in a 15 min period entering/exiting to Hawkesbury Road only. Modelling assumes trucks are located both inside and outside the Acoustic shed.

Table B2 Parramatta - Construction Scenarios and Equipment

	Equipment	Total Lw (dBA)	Compressor	Crane Franna (20 tonne)	Elevated Work Platform	Excavator - Tracked (10 tonne)	Excavator - Tracked (20 tonne)	Excavator 20-30T + hydraulic Hammer [1]	Excavator - Tracked (40 tonne)	Generator - attenuated	Jackhammer [1]	Lighting - Daymaker	Light Vehicle - 4WD	Loader - skidsteer (1 tonne)	Rattle Gun (hand held)	Roller - Vibratory [1]	Saw - Concrete [1]	Truck - Concrete	Truck - Dump	Truck - Medium Rigid (20 tonne)	Truck - road truck/ truck & dog (30 tonne)	Truck - Vacuum (NDD or non-destructive digger	Welding Equipment	Wrench - Impact	Tracked Hydraulic Drilling Rig [1]	Hand tools (electric)	Concrete agitator truck	Concrete pencil vibrator	Concrete pump truck	Water Pump	Slurry/Bentonite Plant	D-Wall Grab	Trench Cutter	Crane (mobile)	Truck mounted EWP	Articulated Dump Truck 23 t	Bulldozer	Forklift	Telehandler	Desander	Excavator - Teledipper (50 tonne)	Excavator - Rock Crusher	Scrubber Unit	Shotcrete Rig	Tunnel Ventiallation Fan	Auger Drill Rig [1]	Crane - 280T	Compressor (1)	Jumbo Drill Rig [1]	Winch System (30T)	Multi Service Vehicle	Tunnel Boring Machine
	Sound Power Level (Lw)		109	98	97	100	105	122	115	92	113	98	103	110	104	109	118	109	110	103	108	109	110	111	114	102	109	103	108	93	98	113	113	104	103	109	108	106	100	104	115	115	103	108	107	118	104	90	113	98	96	111
	Estimated utilisation in assessment period (%)		100	30	25	100	100	30	100	100	100	100	25	50	30	100	30	100	25	25	25	100	30	30	50	50	100	100	100	100	100	50	50	30	30	25	50	50	50	100	100	100	100	50	100	100	30	100	50	0	1	1
ID	Construction Scenario																																																				
PM.01	Site preparation work	109					1			1			4							2						2								1																		
PM.02	Initial investigation works	116				1				1			4												1	2																										
PM.03	Archaeological Clearance	111					2																			2												2														
PM.04	Removal and/or relocating utilities	122					1			1	1		4				1			1		2				2	1								1																	
PM.05	Demolition	120		1			1		1								1				4														2																	
PM.06	Establishing Water Treatment Plant	120			2					1			2				1			1				2		2	1	2	1					1				1														
PM.07	Establishing vehicle access and egress points	117				1							2			1				1		1					1	1	1																							
PM.08a	Establishing concrete slabs or piling platforms and D Wall Infrastructure	118					1				1		2			1				1						2	1		1								1															
PM.08b	Establishing D Wall Infrastructure	113			1								2													3	2							1					1								1					
PM.09a	Station Box D Wall Excavation with Grab & Cutters	120			1	2				3	1		2								2	1				2	5		1		1	1	2	2		1		1		2							1					
PM.09b	Station Box D Wall - reduced fleet 1	112			1		1						2								1	1												1					1								1					
PM.09c	Station Box D Wall - reduced fleet 2	111			1	1							1													1					2			2					1	2							1					
PM.10	Station box pile breakback/trim	123				1					3										1					1																										
PM.11	FRP (form reo pour - concrete works capping beam)	116				1							2													2	3	2	1					1				1														
PM.12	Internal Haul road and Station Box Bridge	116			1		1						2							1				2		2	2	2	1					1				1														
PM.13	Establishing spoil stockpile area	109		1	4															1				2																												
PM.14	Box excavation ground support - internal struts and waler install	116			2								2		4					2						4	2	2	1									1														
PM.15a	Box Excavation to -26m	130						4			3		2				1				6					2								1		4	1				2	1	1									
PM.15b	Box Excavation to -26m (OOHW)	121											2								6					2								1		4	1				2	1	1									
PM.16	Delivery of Equipment / General Truck Movements	110																		4	4													1				1														
PM.17a	Nozzle construction and demobilisation - fissure grouting	117	1		2					1			1												1	3								1																		
PM.17b	Nozzle construction and demobilisation - canopy tube installation	120	1		2		1			1			1												2	3								1																		
PM.17c-1	Nozzle construction and demobilisation - Concrete D-Wall removal	125			2			1	1	1			1				2									1								1																		
PM.17c-2	Nozzle construction and demobilisation - Concrete D-Wall removal (OOHW)	121			2			0	0	1			1				2									1								0																		
PM.17d-1	Nozzle construction and demobilisation - ground support and excavation	127	1		2			2		0			1												2	2	2		1					1		1						2	1	1								
PM.17d-2	Nozzle construction and demobilisation - ground support and excavation (OOHW)	126	0		0			2		0			1												0	2	0		0					0		0						2	1	0								
PM.17e	Nozzle Construction and demobilisation - tunnel spoil loadout	116					1						1							1						1								1		1					1											
PM.17f	Nozzle Construction and demobilisation - Rock bolting	114	1		1																				1		1																									
PM.18	General operation of ancillary facility	111	1										2							1						2				2								1										1				
PM.19	Tunnel invert/secondary lining concreting works	115																									3		1																							
PM.20	Cross passage works	116																									4							1		2																
PM.21	Tunnel vent fan operation	111																																											2							
PM.22	Installation of Monitoring Equipment	118										2	2									1																								1						
PM.23a	Nozzle Tunnel Secondary Lining FRP Works - Form & Reo	115			2					1	1		1		4											4								1					1											2		
PM.23b	Nozzle Tunnel Secondary Lining FRP Works - Concrete pours	117	1		1								1														3		2																							
PM.24	TBM traverse through Parramatta Station box (Including prep/support works)	122			1	1				1				6				2	2		1		1	4		1	3		1					1				1	1							1		1			6	1
PM.25	Sydney Water SEA Works	124				1		1		1		1	2			1	1			2		1				2	2	2	1										1													
PM.26a	Macquarie Street/Horwood Place Local Area Works	124				1		1		1		1	2			1	1			2		1				2		2	2	1									1													
PM.26b	Macquarie Street/Horwood Place Local Area Works (OOHW1)	117				1				1		1	2				1			2		1				2		2	2	1									1													
PM.26c	Macquarie Street/Horwood Place Local Area Works (OOHW2)	115				1				1		1	2							2		1				2		2	2	1									1													
PM.27	240 Church Street Works	117			2		1					2	1		2										1	2	3		1					1		1			1													
PM.28	Station box maintenance works	108			2		1								1											2													1													
PM.29	Water management/dewatering	113								2												2				2													1													

Note 1: Equipment classed as 'annoying' in the ICNG and requires a 5 dB correction. An addition of 5 dB for 'annoying' activities has been applied in this DNVIS.

Note 2: Sound power level data is taken from the DEFRA Noise Database, AS2436, TfNSW *Construction Noise and Vibration Strategy* and Sydney Metro *Construction Noise and Vibration Standard.*

Note 3: Reduced Equipment Fleet for OOHW period.

Note 4: Sound power level provided by GLC for specific equipment.

Table B3 Clyde Dive - Construction Scenarios and Equipment

ID	Construction Scenario	Total Lw (dBA)	Articulated Dump Truck 23 t	Blasting Pump	Bulldozer	Chainsaw[1]	Compressor[4]	Concrete agitator truck	Concrete pump truck	Crane - Fixed	Crane - Mobile	Crane Franna (20 tonne)	Drilling Rig	Electric Grout Pump (NETZSCH)[4]	Elevated Work Platform	Excavator - Clamshell	Excavator - Tracked (20 tonne)	Excavator - Tracked (30 tonne)	Excavator - Tracked (40 tonne)	Excavator - Tracked (50 tonne)	Excavator - Tracked (6 tonne)	Excavator 20-30T + hydraulic Hammer[1]	Forklift[4]	Gantry Crane	Generator - attenuated	Grader	Hand tools (electric)	Industrial Fan with attenuator	Jackhammer[1]	Light Vehicle - 4WD	Light Vehicle - Car	Lining Erection Machine: MSV 35-1-1300[4]	Loader - skidsteer (1 tonne)	Pile Driver - Vibratory	Piling Rig - Bored	Rattle Gun (hand held)	Roadheader	Roller - large pad foot	Roller - smooth drum	Saw - Concrete[1]	Shotcrete Rig	Telehandler	Tub Grinder/Mulcher (40-50hp)	Tower Crane (MK760L)[4]	Tracked Hydraulic Drilling Rig[1]	Trench Roller	Truck - Dump	Truck - Medium Rigid (20 tonne)	Truck - road truck/ truck & dog (30 tonne)	Truck - Vacuum (NDD)	VSD (Variable Speed Drive)[4]	Welding Equipment	Compressor 1500 cfu	Venitlation fans
	Equipment																																																					
	Sound Power Level (Lw)		109	106	108	105	90	109	108	113	113	98	114	66	97	110	105	110	115	115	95	122	92	96	92	113	102	88	113	103	96	82	110	121	112	104	113	109	107	118	108	95	116	82	114	107	110	103	108	109	79	110	103	108
	Estimated utilisation in assessment period (%)		25	100	100	100	100	100	50	50	25	30	50	100	25	100	100	100	100	100	50	30	50	30	100	100	50	100	100	25	100	75	100	50	30	50	50	100	100	30	50	50	30	100	50	100	25	25	25	100	100	50	100	100
ID	Construction Scenario																																																					
CD.01a	Construction site establishment / Haul Roads	117																	1						1		2			1									1								3		3					
CD.01b	Demolition of former Rosehill Station	122															1	1				1																																
CD.02	Piling platforms	113						1	1								1										2			4																		4						
CD.03	Tree Removal	114				1					1										1																						1					1						
CD.04	Shaft Construction (excavation and piling)	124						1	1		1						1		2		1	1								4					2	1							1				2	4						
CD.05	Establishing concrete slabs / acoustic shed	118						1	1		3	1			4		1										2			4										1								4	2					
CD.06	Bulk Earthworks	125	5		1												2	1	1			1											1					1		1									5					
CD.07	Haul Road FRP (Form Reo Pour)	114						2	2																		2																											
CD.08a	Decline Structure Construction (Piling)	118	1		1			1	1		1						1	1																	3	1					1								1					
CD.08b	Decline Structure Construction (Capping Beam - 50% overlap with piling)	116	1		1			2	1			1					1	1																		1												2						
CD.08c	Decline Structure Construction (10% overlap with capping beam)	126		1	1			3	1	1	1		1		1	1	1		2	1					1				1							1				1	1				1				3	1				
CD.09	Spur Line Excavation	109	3				1	4[3]	3[3]												2[3]	1[3]		1	1[3]			3[3]		2						3*						2						2						
CD.10	Spur line lining	96						2[5]						1									1									1												1							1			
CD.11	Junction excavation	108	3				1	4													2[3]			1												2[3]	2[3]				2[3]													
CD.12	Junction lining	110							2		2[3]																			2										1[3]		1					1[3]	4						
CD.13	Demobilisation	123									2	2						3				3			1	1	4			2										1								2						
CD.14	General operation of ancillary facility	108					1																		2		2	3		2												1						2	1				1	2
CD.15	Watermain diversion	119						1	1		1						1								1									1												1						1		
CD.16	Carlingford Rail Line Oversided Deliveries	114																													2																	4						
CD.17	Utility Protection Slab	115						1	1		1						1													1					1															1				
CD.18	ATC Boundary Installation - Retaining wall construction and security fence in	122						1	1		1							1				1																				1							1					

Note 1: Equipment classed as 'annoying' in the ICNG and requires a 5 dB correction. An addition of 5 dB for 'annoying' activities has been applied in this DNVIS.

Note 2: Sound power level data is taken from the DEFRA Noise Database, AS2436, TfNSW *Construction Noise and Vibration Strategy* and Sydney Metro *Construction Noise and Vibration Standard.*

Note 3: Equipment underground - not modelled for airborne noise.

Note 4: Sound power level provided by GLC for specific equipment.

Note 5: Modelled within Acoustic Shed.

Table B4 Clyde MSF - Construction Scenarios and Equipment

	Equipment	Total Lw (dBA)	Asphalt - Truck and Sprayer	Bulldozer	Chainsaw[1]	Compactor	Concrete agitator truck	Concrete pump truck	Crane - Mobile	Crane - Truck mounted (20-60 tonne)	Elevated Work Platform	Excavator - Tracked (10 tonne)	Excavator - Tracked (20 tonne)	Excavator - Tracked (30 tonne)	Excavator - Tracked (40 tonne)	Excavator - Tracked (6 tonne)	Excavator 20-30T + Hammer[1]	Generator - attenuated	Grader	Hand tools (electric)	Light Vehicle - 4WD	Line Marking Truck	Loader - Front-end (wheeled) (23 tonne)	Loader - skidsteer (1 tonne)	Pile Driver - Vibratory	Piling Rig - Bored	Roller - large pad foot	Roller - smooth drum	Roller - Vibratory[1]	Saw - Concrete[1]	Tracked Hydraulic Drilling Rig[1]	Truck - Dump	Truck - Medium Rigid (20 tonne)	Truck - road truck/ truck & dog (30 tonne)	Truck - Vacuum (NDD)	Tub Grinder/Mulcher (40-50hp)	Vibrator - Concrete	Water Cart / Road Sweeper
	Sound Power Level (Lw)[2]		106	108	105	106	109	108	113	108	97	100	105	110	115	95	122	92	113	102	103	108	112	110	121	112	109	107	109	118	114	110	103	108	109	116	113	107
	Estimated utilisation in assessment period (%)		50	50	50	100	100	100	50	50	30	50	50	50	50	50	30	100	50	50	25	50	100	100	50	50	50	50	50	30	50	25	25	25	100	30	50	50
ID	Construction Scenario																																					
MSF.01a	Construction site establishment	126											2				2														3			2	2			2
MSF.01b	Traffic Adjustment	112																			1	2		1														
MSF.02	Haul Roads and Site Amenities	121		1					1						2				1				1	1			1					6		2	2			1
MSF.03	Earthworks	119		1								4	1	3									1	1			2					6		2				1
MSF.04	Drainage installation & Combined Services Route	119					1					1	3							1										1			1		1			1
MSF.05	Utility trench and services corridor	122					1	1	1			4	4	4	1	2		1							1	1		1				1			1			1
MSF.06	FRP works, Concrete works and retaining walls	117					2	1		1	2		1							2														1			2	
MSF.07a	Water Conveyancing Structure - Construction	121						1	2		1		3			1		1		1					1	2						1	3	1	1		1	1
MSF.07b	Water Conveyancing Structure - Delivery	115							2												4													4				
MSF.08	Water Conveyancing Structure - Finishing Works	119													2														2			6						1
MSF.09	Unwin Street Diversion - Construction	125	1	1		1			1					2			1		1				1	1					1	1			2		2			1
MSF.10	Unwin Street Diversion - Finishing Works	115							1					1								1											1		1			1
MSF.11	Demobilisation	122							2			1	1				1	1						1										2				
MSF.12a	Unwin Street Overpass (Piling, FRP, Earthworks, Heavy Lifting)	120				1	2	1	2		1		1										1	1		1		1				2		1			1	1
MSF.12b	Unwin Street Overpass - Delivery	115							2												4													4				
MSF.13	General operation of ancillary facility	111											1					2		2	2													2	1			2
MSF.14	Utility Adjustment	119					1				1		1							2	3									1		1			1			
MSF.15	Clearing Vegetation	113			1								1																							1		
MSF.16	Ground Improvement Work	115					2	1					1													1												
MSF.17	Creek Adjustment works	116							1					2				1		4	2											3	1		1			
MSF.18	Duck Creek Detailed Site investigations	111										1									1										1							

Note 1: Equipment classed as 'annoying' in the ICNG and requires a 5 dB correction. An addition of 5 dB for 'annoying' activities has been applied in this DNVIS.

Note 2: Sound power level data is taken from the DEFRA Noise Database, AS2436, TfNSW *Construction Noise and Vibration Strategy* and Sydney Metro *Construction Noise and Vibration Standard*.

Table B5 Rosehill - Construction Scenarios and Equipment

	Equipment	Total Lw (dBA)	Articulated Dump Truck 23 t	Compressor[3]	Concrete agitator truck	Concrete pencil vibrator	Crane (mobile)	Crane Franna (20 tonne)	Dozer (CAT D10)	D-Wall Grab	Excavator - Tracked (20 tonne)	Excavator - Tracked (30 tonne)	Excavator - Tracked (40 tonne)	Excavator 20-30T + Hammer[1]	Gantry Crane	Generator - attenuated	Grout batch plant	Hand tools (electric)	Industrial Fan with attenuator	Light Vehicle - 4WD	Loader - Front-end (wheeled) (23 tonne)	Pump - Concrete	Saw - Concrete[1]	Slurry Plant	Spoil loading conveyor/stacker	Trench Cutter	Truck - Dump	Truck - Medium Rigid (20 tonne)	Truck - road truck/ truck & dog (30 tonne)
	Sound Power Level (Lw)[2]		109	90	109	103	104	98	121	113	105	110	115	122	98	92	93	102	88	103	112	109	118	98	106	113	110	103	108
	Estimated utilisation in assessment period (%)		25	100	100	100	30	30	50	50	100	100	100	30	30	100	100	50	100	25	100	100	30	100	100	50	25	25	25
ID	Construction Scenario																												
RH.016a	D-Wall construction (Approved Hours)	119					2			1	1												1	1		1			2
RH.016b	D-Wall construction (OOHW)	115					2			1	1													1		1			2
RH.017	Box excavation (at surface)	122					1		1			2	2														4		
RH.018	Box excavation (rock at depth)	126	2				1					2		2							1						2		2
RH.019	FRP (form reo pour - concrete works)	115			2	2	1	1										1				1							
RH.020	Delivery of Equipment (OOHW)	110					2	2																				4	4
RH.021	TBM Support and Spoil Handling	118			1						1				2				2		2				1		4		
RH.022	General operation of ancilliary facility	109		2												2	1	2	2	2					1			2	

Note 1: Equipment classed as 'annoying' in the ICNG and requires a 5 dB correction. An addition of 5 dB for 'annoying' activities has been applied in this DNVIS.

Note 2: Sound power level data is taken from the DEFRA Noise Database, AS2436, TfNSW *Construction Noise and Vibration Strategy* and Sydney Metro *Construction Noise and Vibration Standard.*

Note 3: Sound power level provided by GLC for specific equipment.

Table B6 Sydney Olympic Park - Construction Scenarios and Equipment

ID	Equipment	Total Lw (dBA)	Chainsaw	Compressor[4]	Concrete Agitator	Concrete agitator truck	Concrete pump	Concrete Vibrator	Crane (mobile)	Crane Franna (20 tonne)	Crawler Crane (250T)	Crawler Crane (600T)	Dumper (7t)	Elevated Work Platform	Excavator - Tracked (20 tonne)	Excavator - Tracked (8 tonne)	Forklift	Forklift Crane	Generator - attenuated	Hand tools (electric)	Light Vehicle - 4WD	Pump - Concrete	Telehandler	Tipper Truck	Truck - Medium Rigid (20 tonne)	Truck - road truck/ truck & dog (30 tonne)	Tub Grinder/Mulcher (40-50hp)	Tunnel Agitator	Tunnel Buggy	Water Pump (pressure washer)	Welding Equipment
	Sound Power Level (Lw)[2]		105	90	105	109	103	103	104	98	104	113	104	97	105	100	106	106	92	102	103	109	100	103	103	108	116	104	103	93	110
	Estimated utilisation in assessment period (%)		50	100	100	100	100	60	30	30	30	30	100	30	100	100	50	30	100	50	30	100	50	30	30	30	30	100	50	30	30
ID	Construction Scenario																														
SOP.1	Construction site establishment	110							1						1		1		1	2	4				2						
SOP.2	TBM Retreival	114		1					1	1		1		5			2	1	1	2	4				1	4				1	1
SOP.2b	TBM Retrieval + Material load out and shotcreting of cross passages	117		1		1			1	1	1	1	2	5		1	2	1	1	2	4		1	1	1	4		2		1	1
SOP.3	Nozzle Construction (approved hours)	115		1		2		4	1	1							1			2	1	1	2								
SOP.4	General operation of ancillary facility	106		1															2	2	2				2						
SOP.5a	Tree Trimming for TBM Retrevial	114	2																		2				2		1				
SOP.5b	Tree Trimming for TBM Retrevial (OOHW2)[3]	111	2																		2				2						
SOP.6	Demobilisation	111							1						1		1		1	2	4		2		2						
SOP.7	Cross Passage Concrete Pours	116			2	3	2				1												1					3	2		

Note 1: Equipment classed as 'annoying' in the ICNG and requires a 5 dB correction. An addition of 5 dB for 'annoying' activities has been applied in this DNVIS.

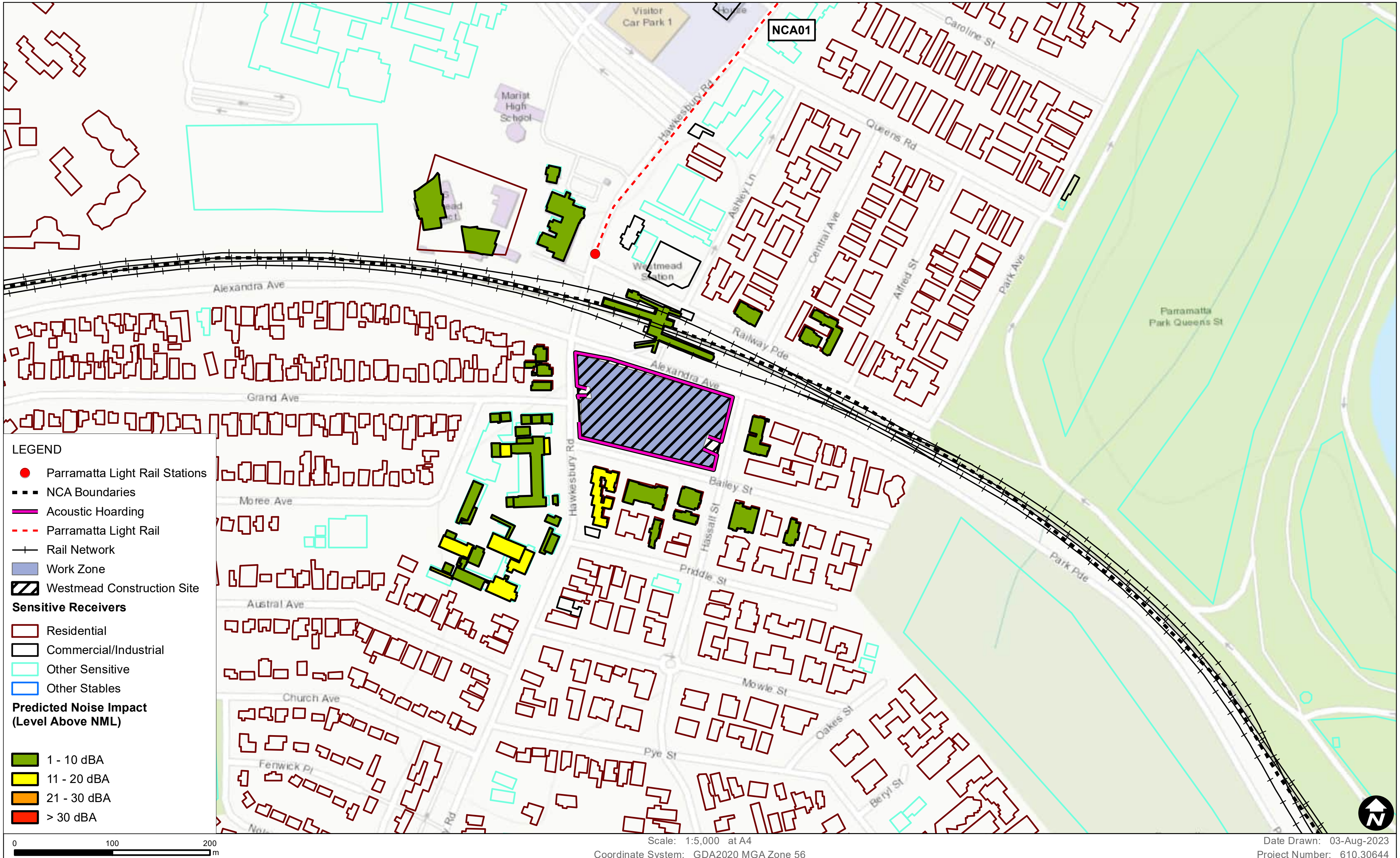
Note 2: Sound power level data is taken from the DEFRA Noise Database, AS2436, TfNSW *Construction Noise and Vibration Strategy* and Sydney Metro *Construction Noise and Vibration Standard.*

Note 3: Reduced equipment fleet for OOHW2

Note 4: Sound power level provided by GLC for specific equipment.

APPENDIX C

Airborne Noise Impact Maps



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

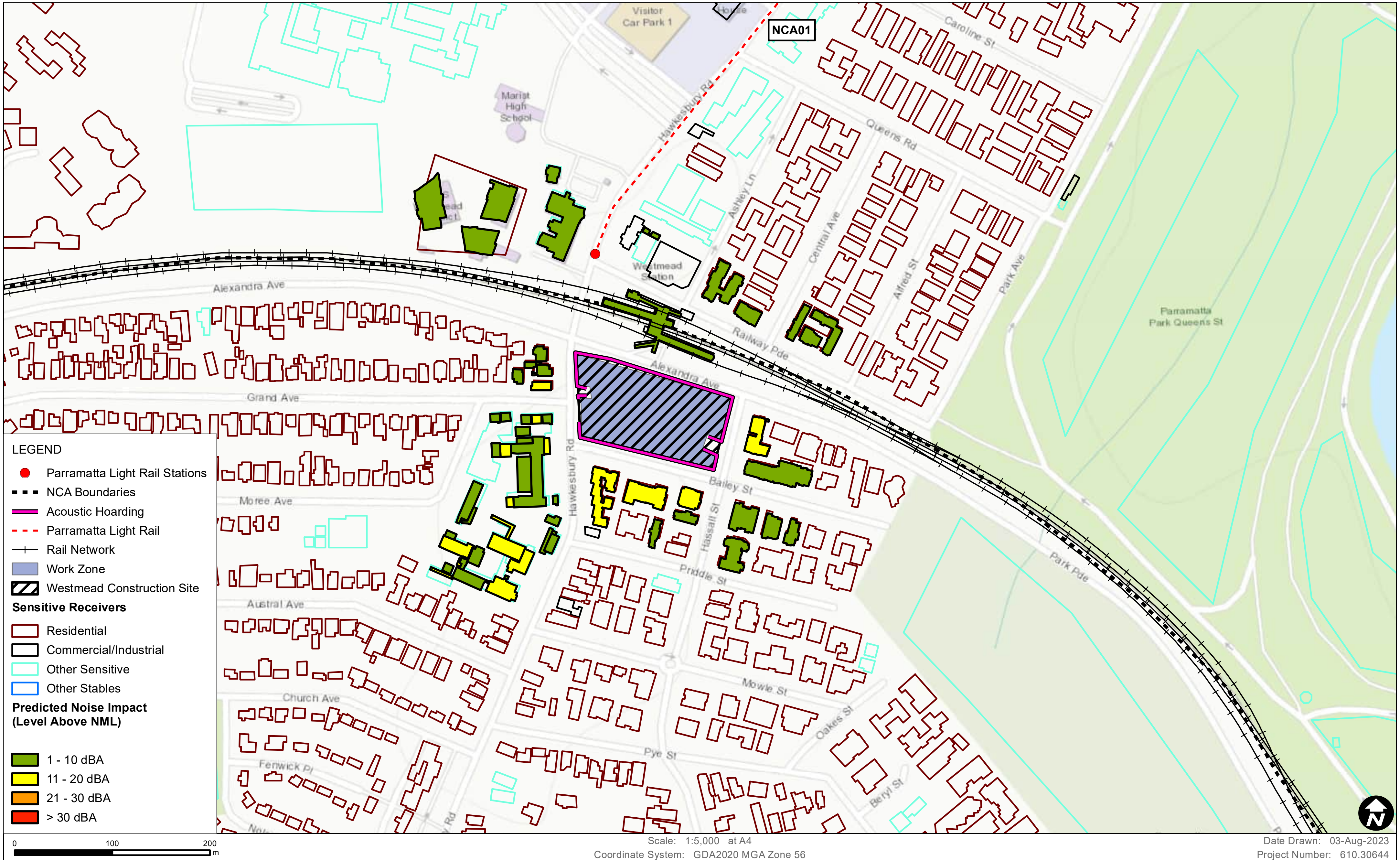
Date Drawn: 03-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.01 Site preparation work
Predicted Noise Impacts
(Approved Hours)

FIGURE C-01



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

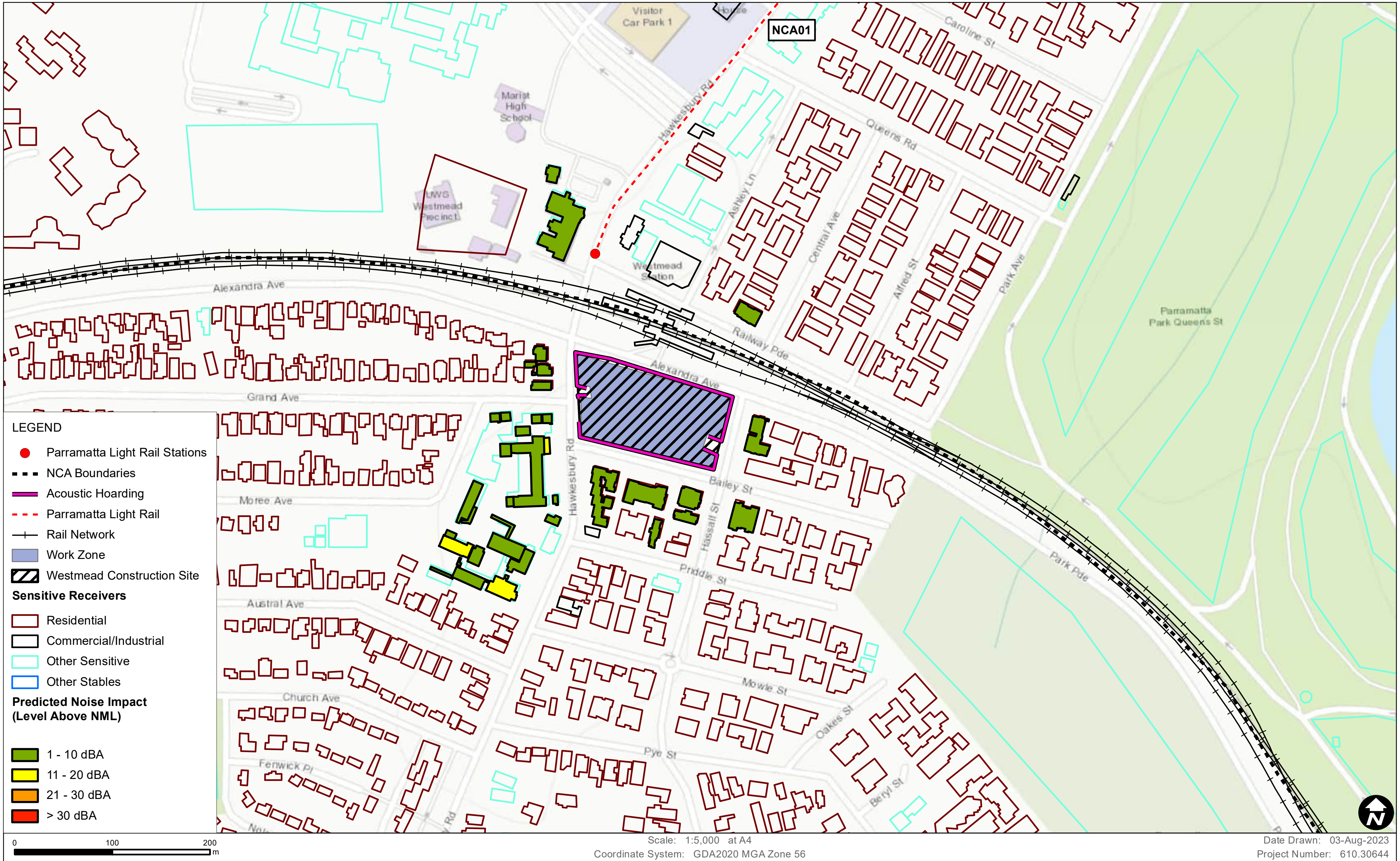
Date Drawn: 03-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.02 Initial investigation works
Predicted Noise Impacts
(Approved Hours)

FIGURE C-02



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Aug-2023
Project Number: 610.30644

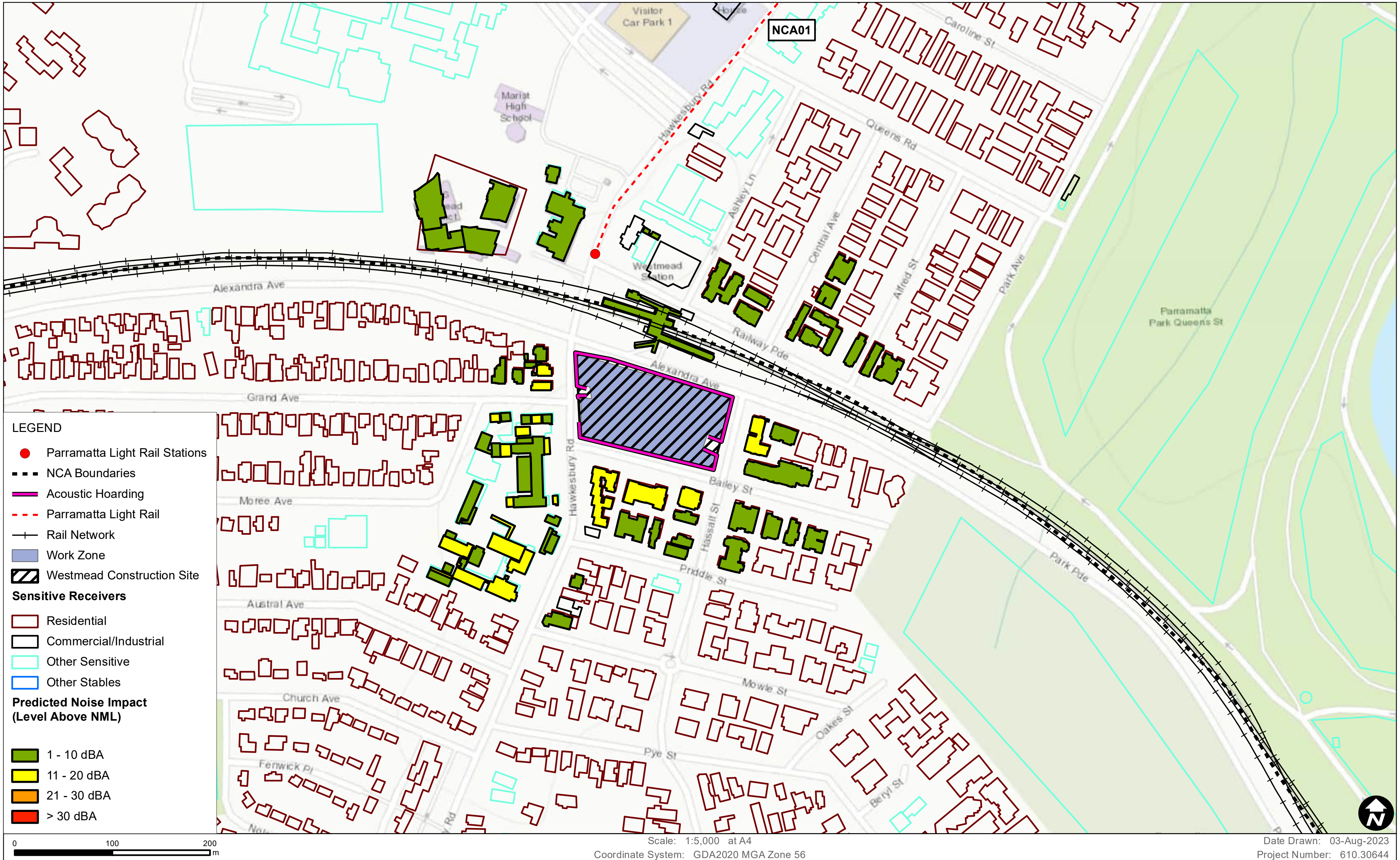
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.03 Vegetation removal and grubbing Predicted Noise Impacts (Approved Hours)

FIGURE C-03

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C03_WM_03_Vegetation_removal_and_grubbing_Day_03.mxd



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Aug-2023
Project Number: 610.30644

SLR

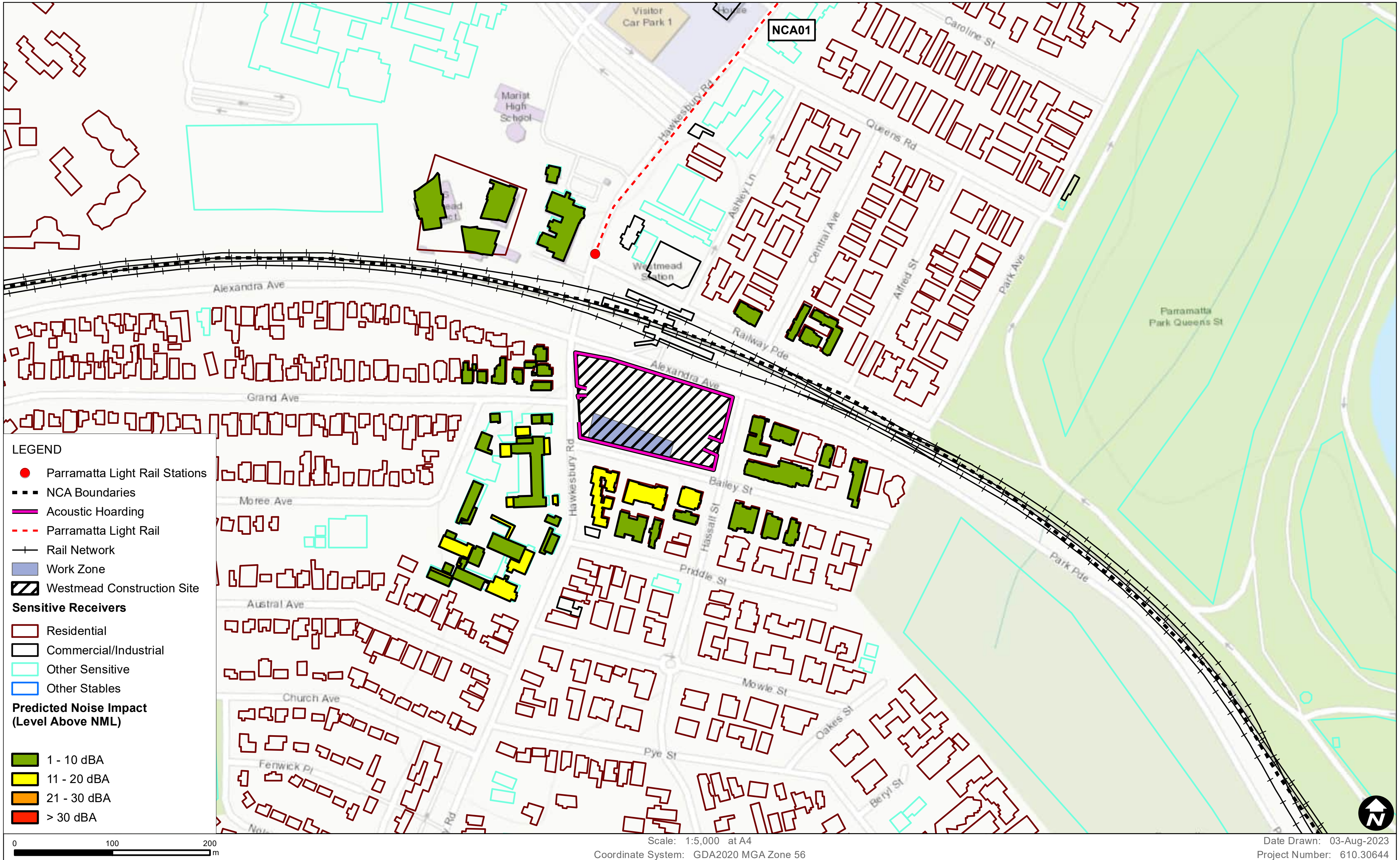
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.04 Protecting and/or relocating utilities Predicted Noise Impacts (Approved Hours)

FIGURE C-04

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C04_WM_04_Protecting_and_or_relocating_utilities_Day_03.mxd



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Aug-2023
Project Number: 610.30644

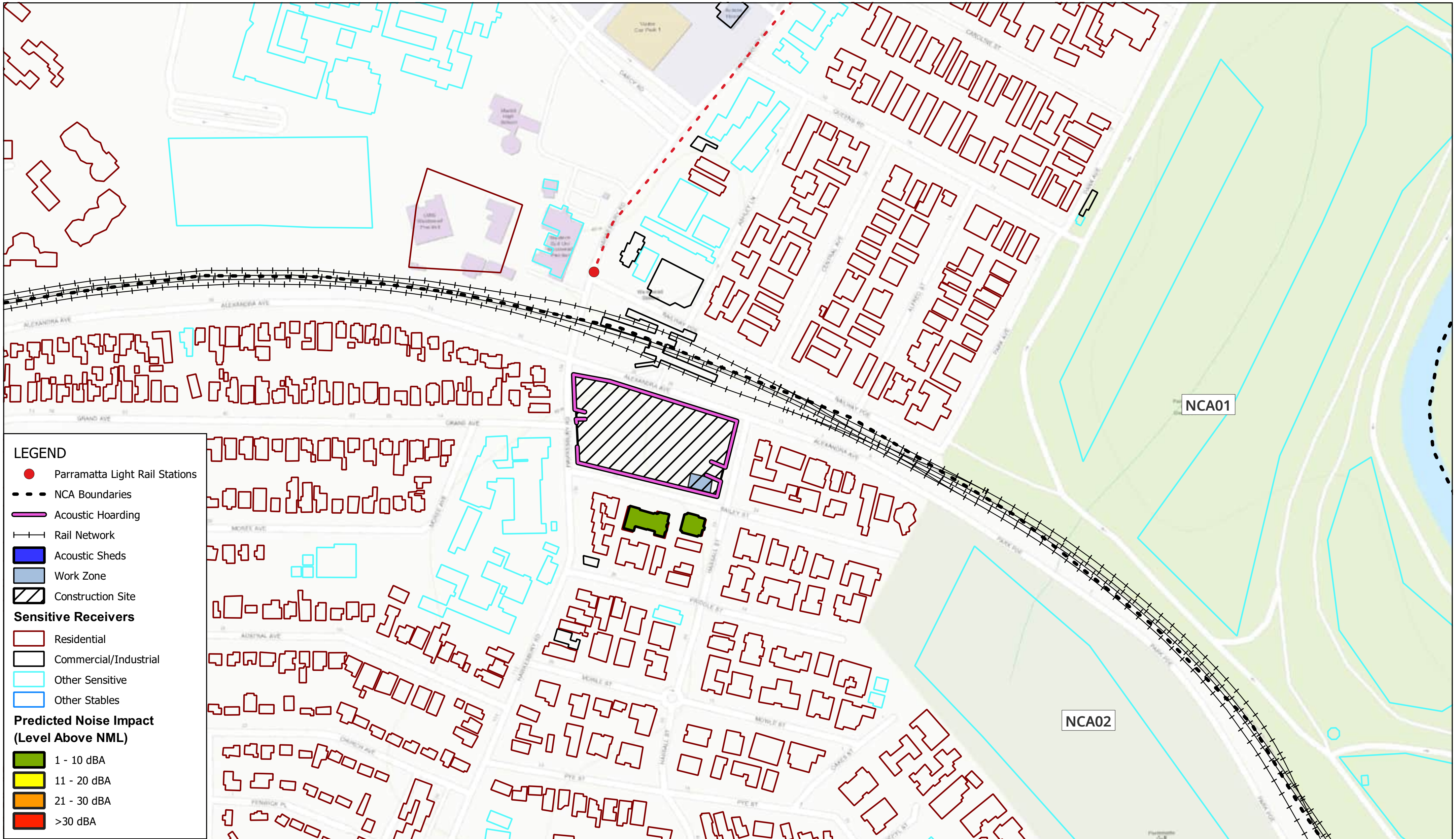
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.05 Establishing Site Amenities
Predicted Noise Impacts
(Approved Hours)

FIGURE C-05



0 150 300 m

Scale: Scale: 1:5,000
Coordinate System: GDA2020 / MGA zone 56

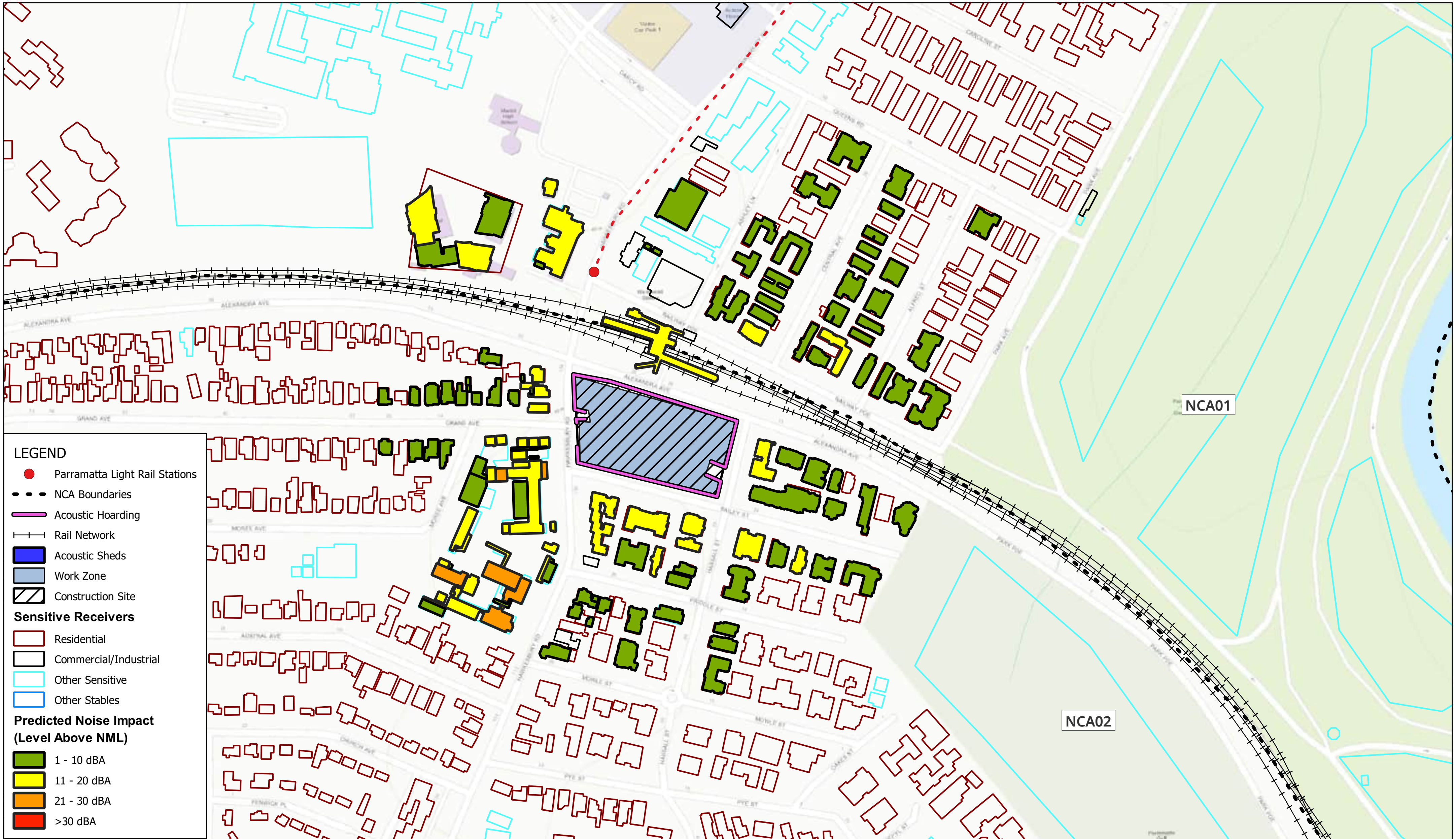
Drawn Date: 16-Jul-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.06 Establishment/ Demobilisation of Water Treatment Plant (WTP) Predicted Noise Impacts (Approved Hours)

FIGURE C-06



Scale: Scale: 1:5,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

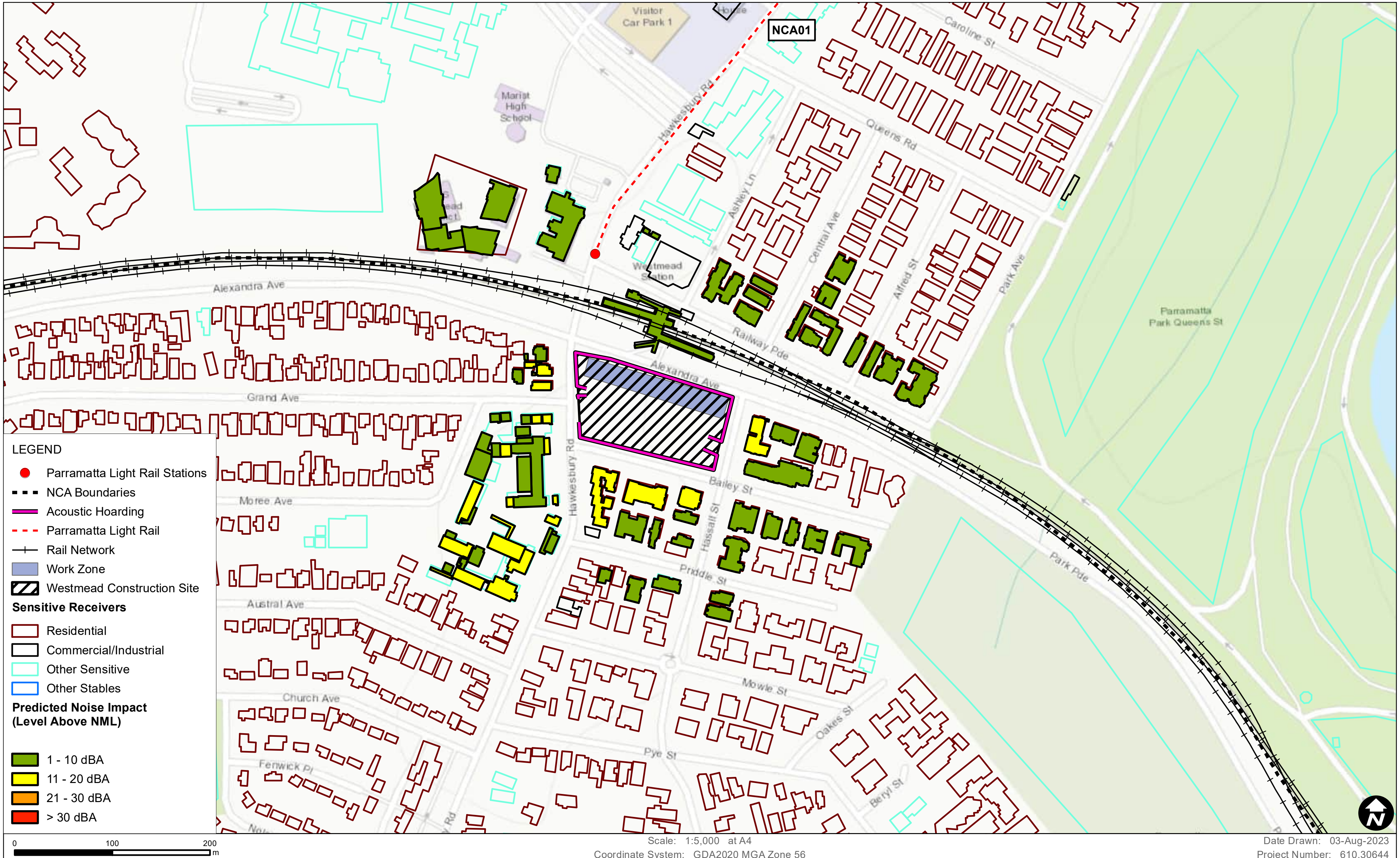
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.07 Establishment/ Removal of vehicle access and egress points Predicted Noise Impacts (Approved Hours)

FIGURE C-07



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Aug-2023
Project Number: 610.30644

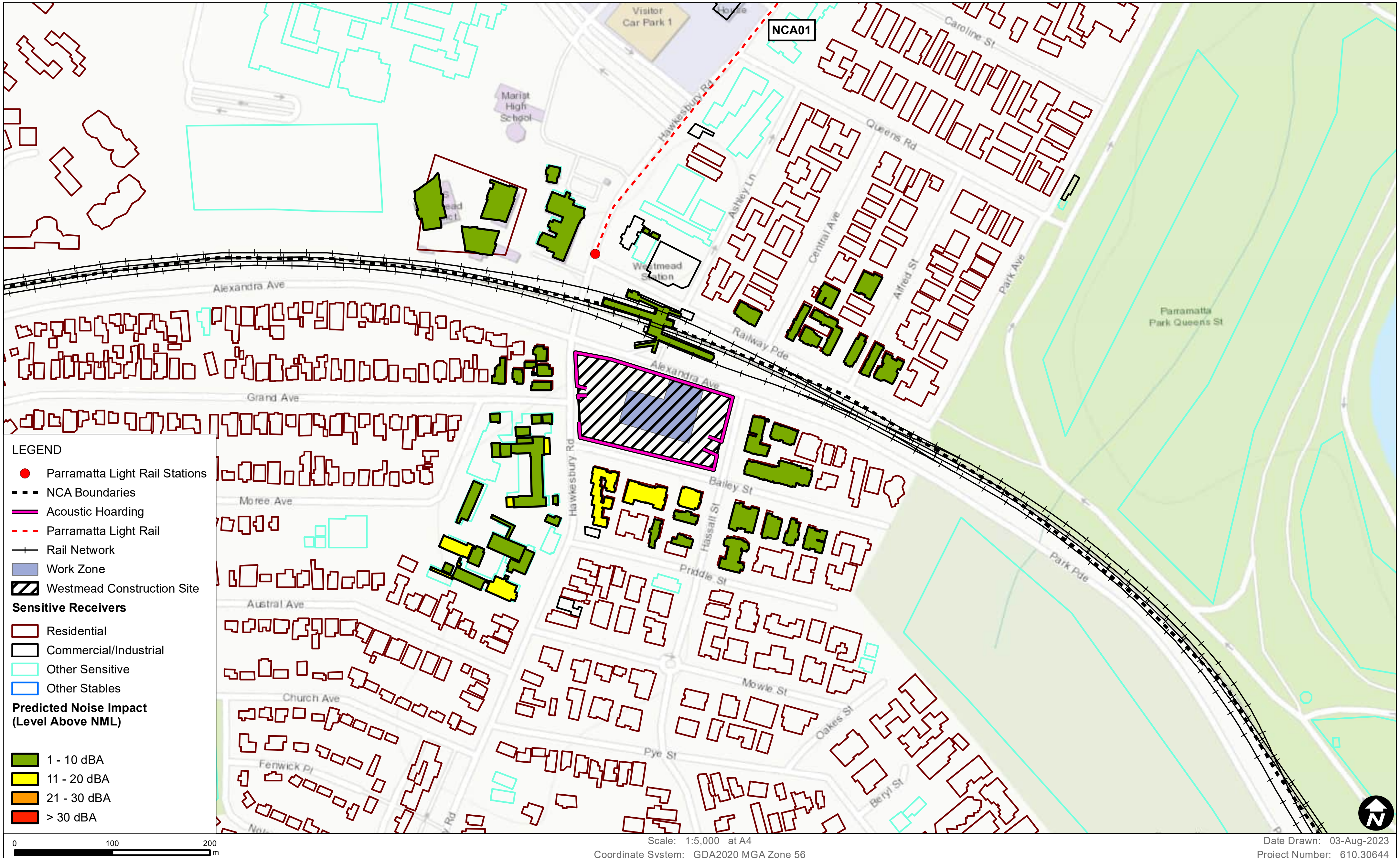
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.08 Establishing concrete slabs or piling platforms Predicted Noise Impacts (Approved Hours)

FIGURE C-08



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Aug-2023
Project Number: 610.30644

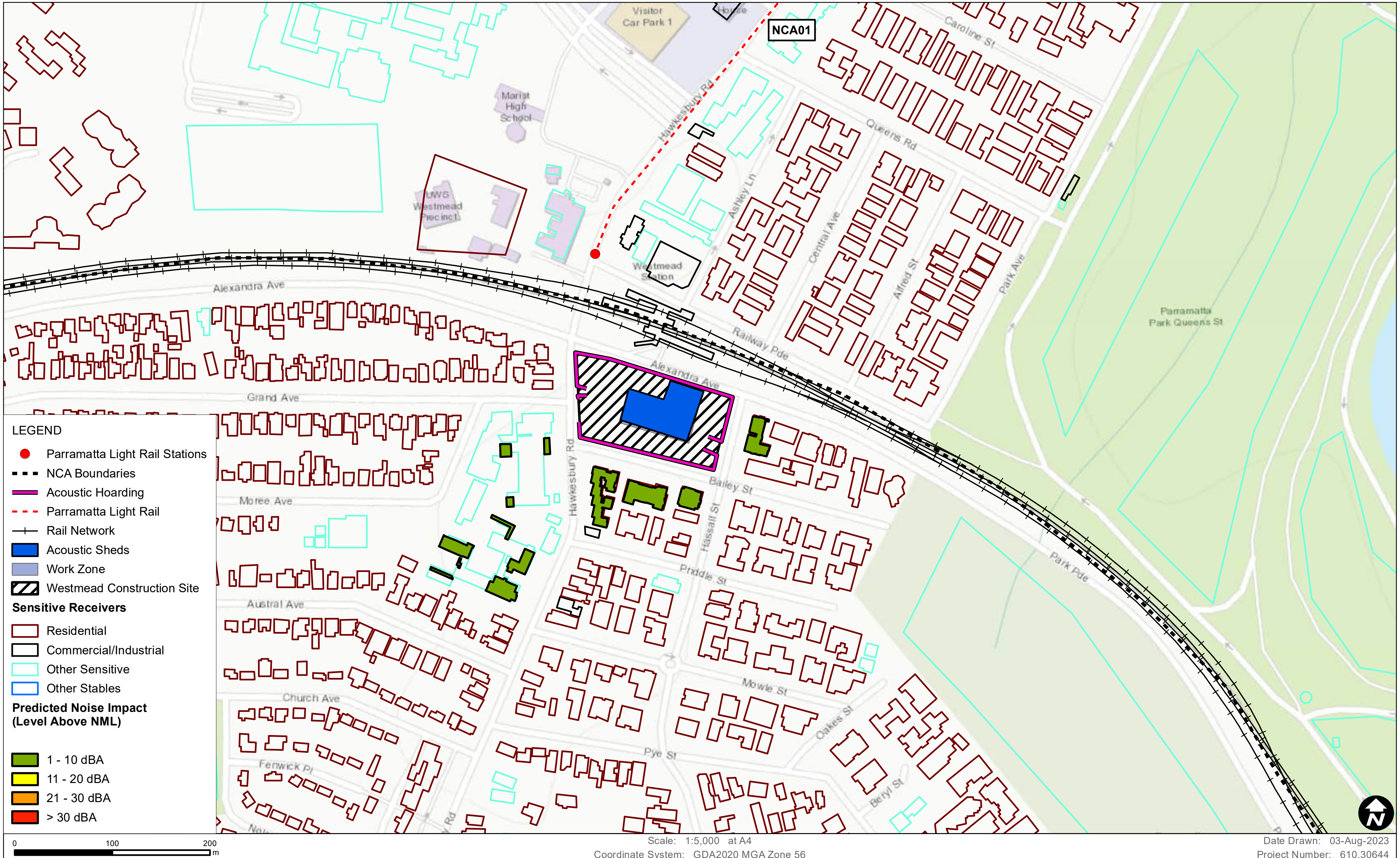
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.09 Establishing spoil shed (slab)
Predicted Noise Impacts
(Approved Hours)

FIGURE C-09

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C09_WM_09_Establishing_spoil_shed_slab_Day_03.mxd



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Aug-2023
Project Number: 610.30644

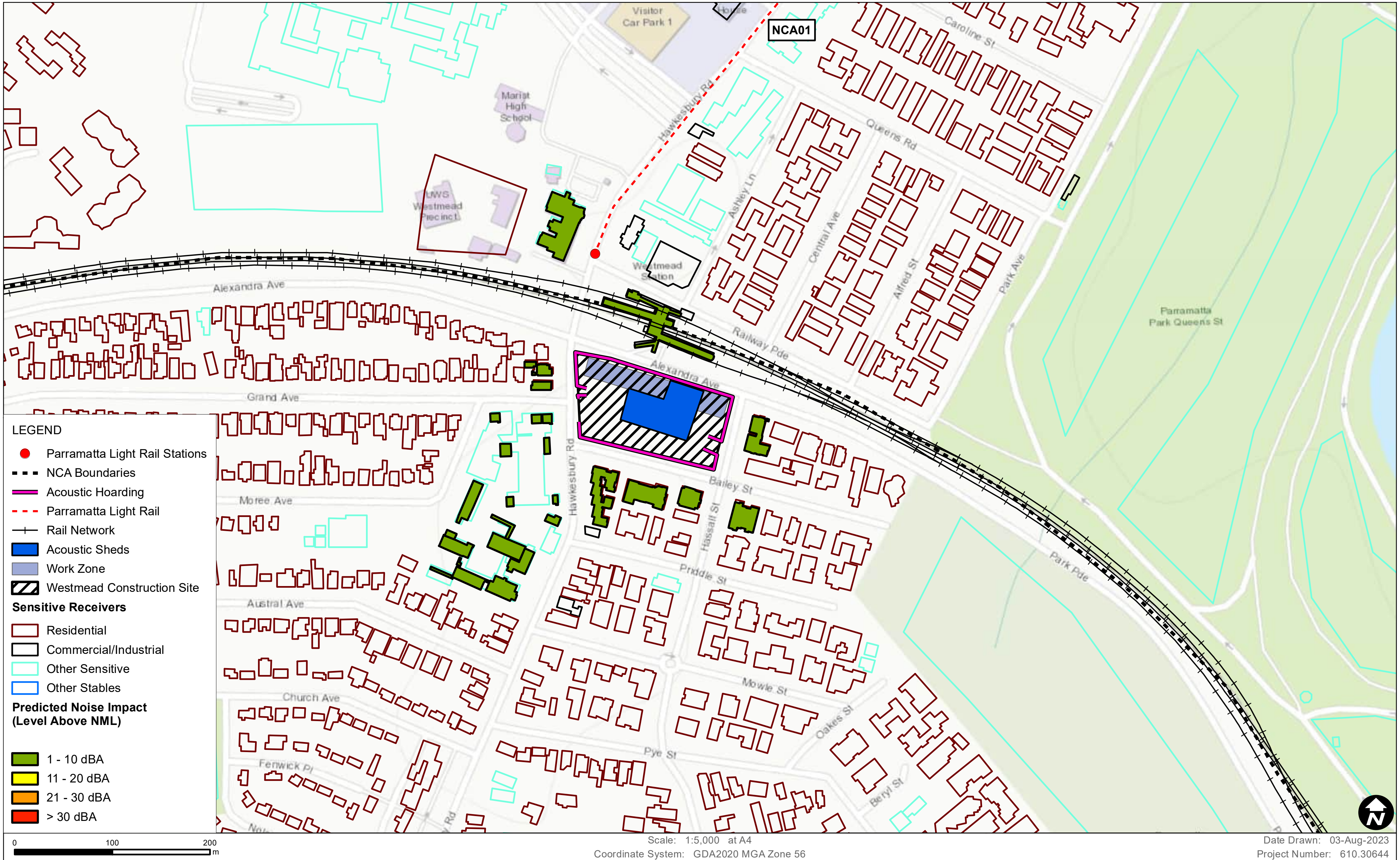
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.10 Establishing spoil shed (structure) Predicted Noise Impacts (Approved Hours)

FIGURE C-10

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C10_WM_10_Establishing_spoil_shed_structure_Day_03.mxd



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Aug-2023
Project Number: 610.30644

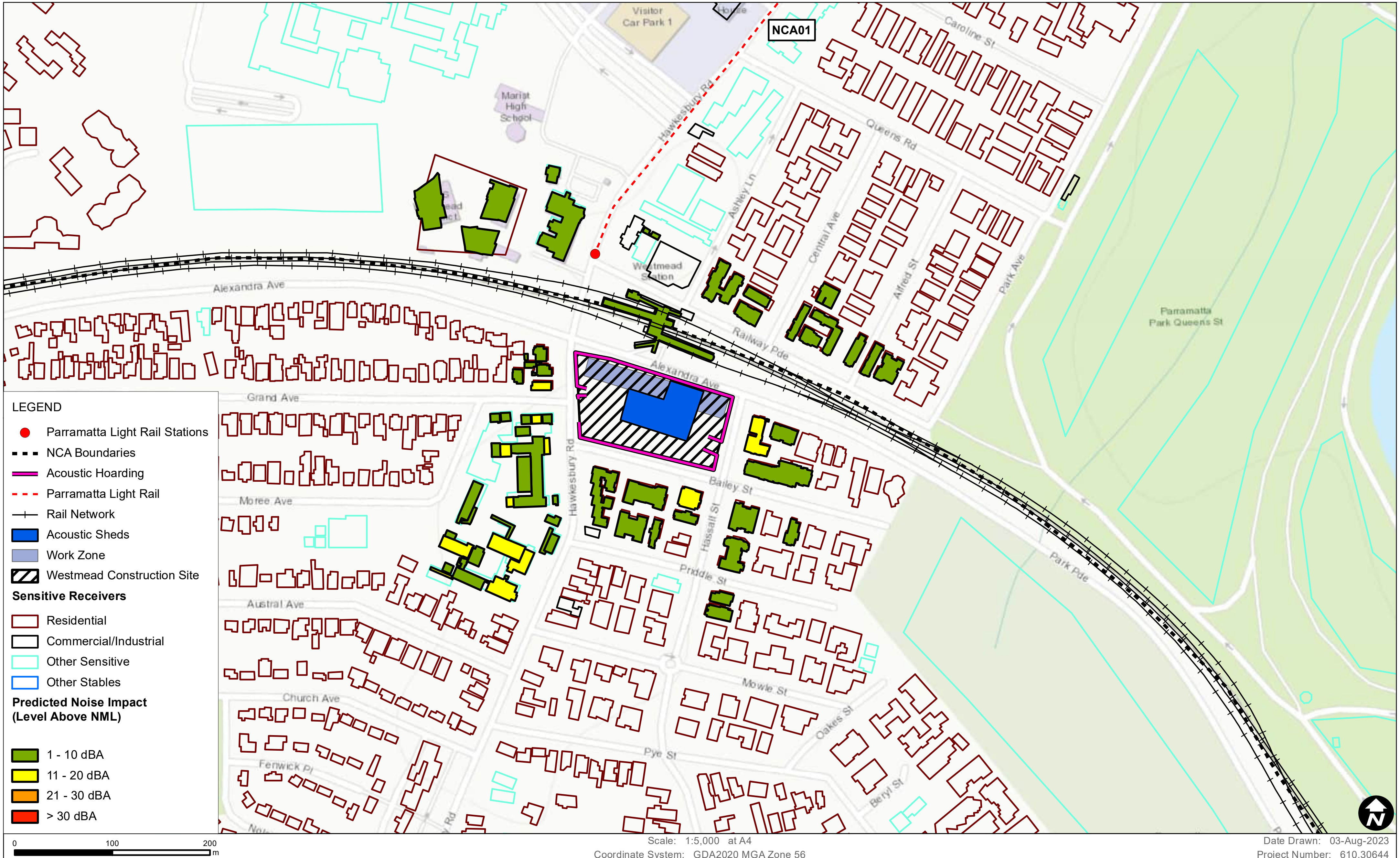
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.11 Station Box bored piling Predicted Noise Impacts (Approved Hours)

FIGURE C-11

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C11_WM_11_Station_Box_bored_piling_Day_03.mxd



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Aug-2023
Project Number: 610.30644

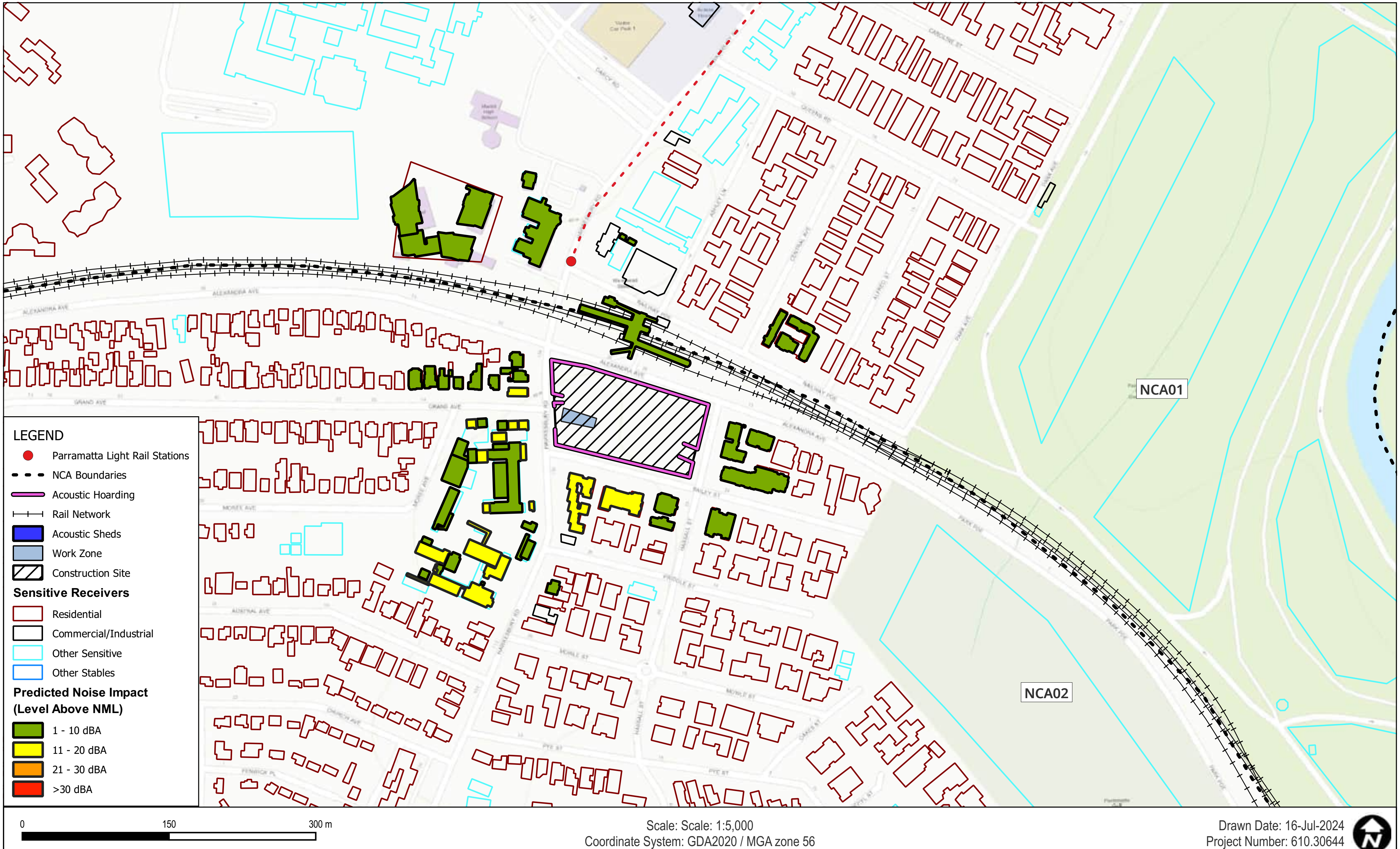
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.12 Station box pile breakback Predicted Noise Impacts (Approved Hours)

FIGURE C-12



Scale: Scale: 1:5,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

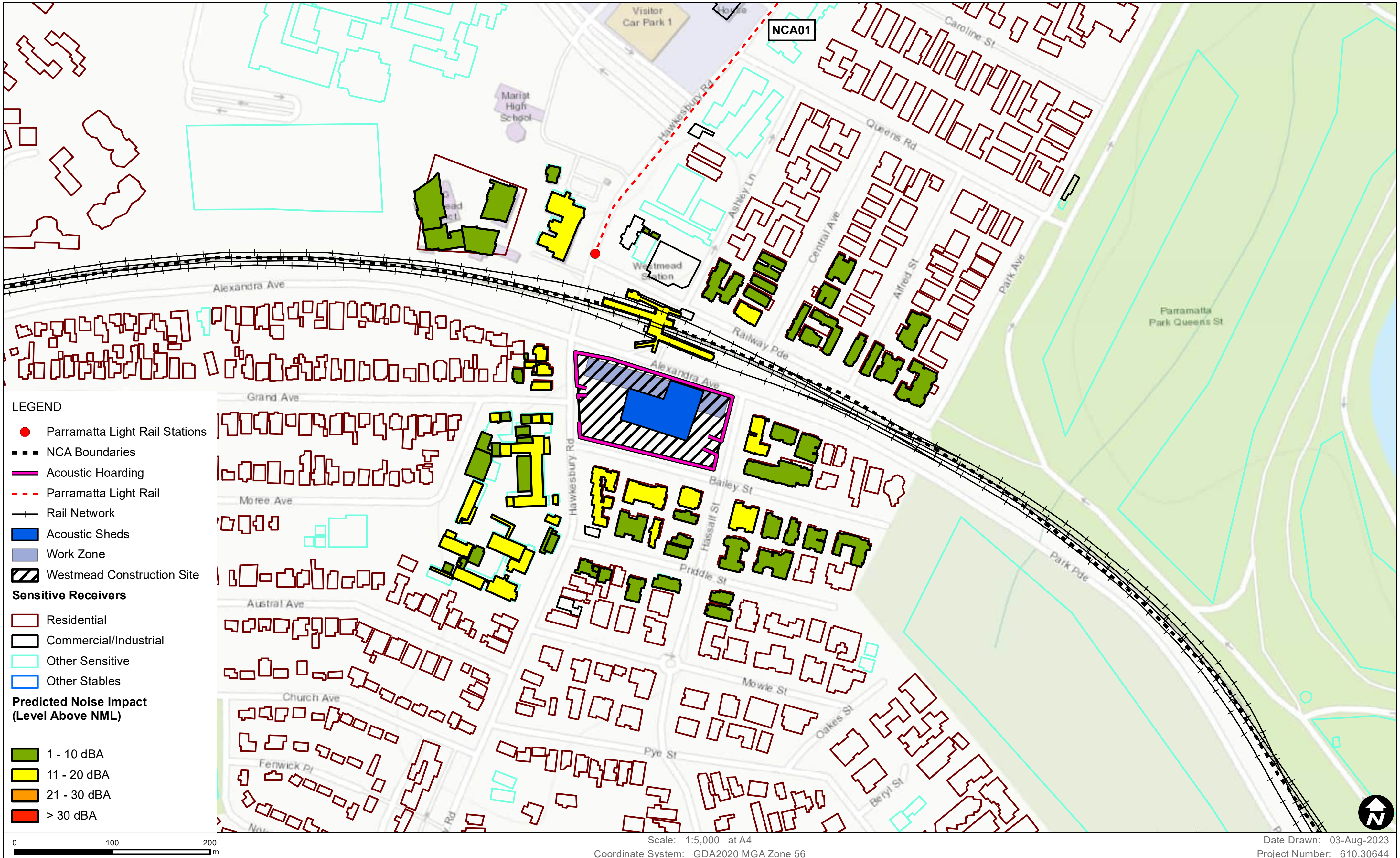
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.13 Establishment/removal of truck wheel wash / rumble grid Predicted Noise Impacts (Approved Hours)

FIGURE C-13



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Aug-2023
Project Number: 610.30644

SLR

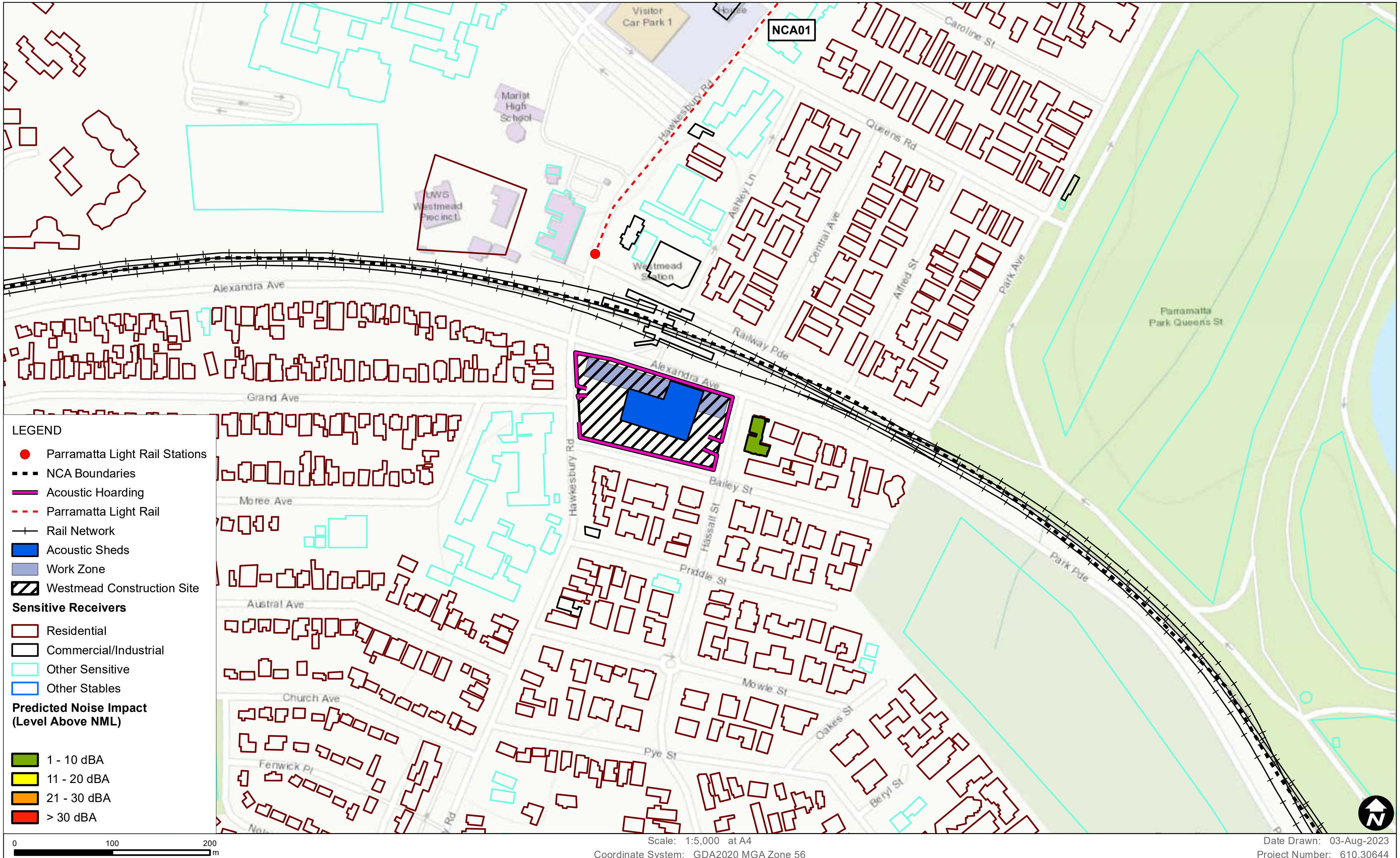
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.14 Box excavation ground support - Ground anchors / shotcrete / rockbolts Predicted Noise Impacts (Approved Hours)

FIGURE C-14

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C14_WM_14_Box_excavation_ground_support_Ground_anchors_shotcrete_rockbolts_Day_03.mxd



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Aug-2023
Project Number: 610.30644

SLR

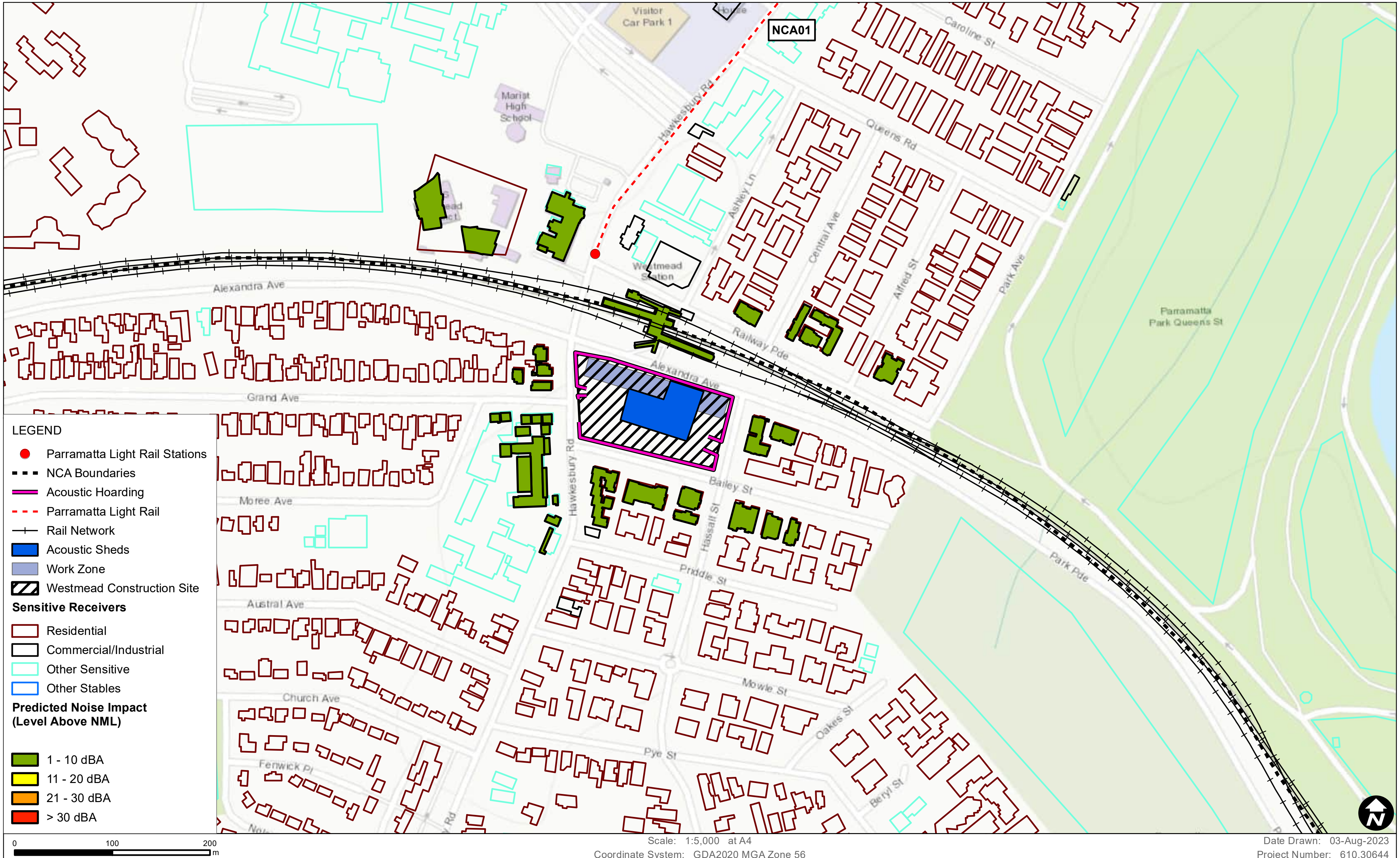
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.15 Box excavation ground support - internal struts and waler install Predicted Noise Impacts (Approved Hours)

FIGURE C-15

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C15_WM_15_Box_excavation_ground_support_internal_struts_and_waler_install_Day_03.mxd



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Aug-2023
Project Number: 610.30644

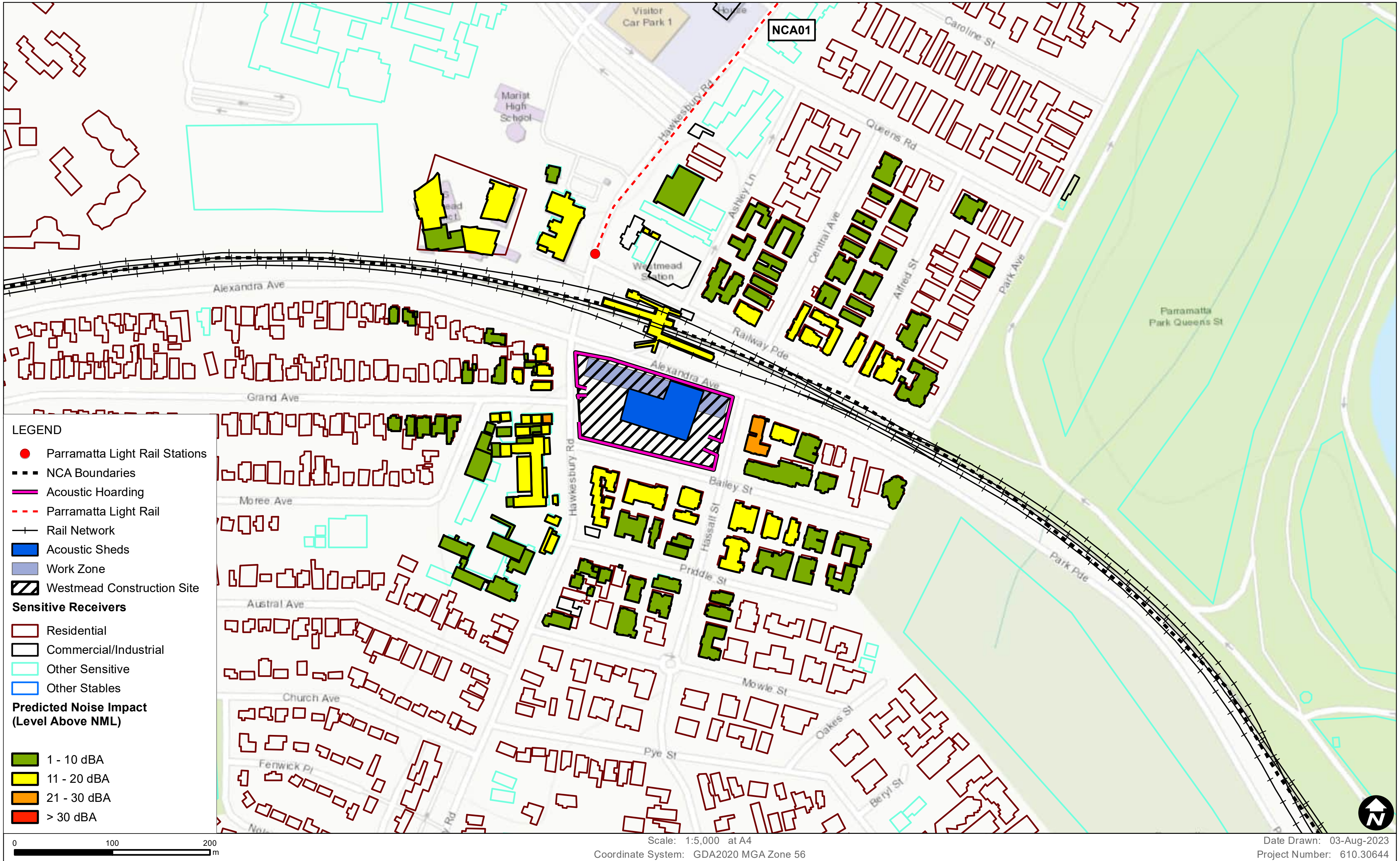
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.16a Box Excavation (at surface)
Ptredicted Noise Impacts
(Approved Hours)

FIGURE C-16

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C16_WM_16a_Box_Excavation_at_surface_Day_03.mxd



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Aug-2023
Project Number: 610.30644

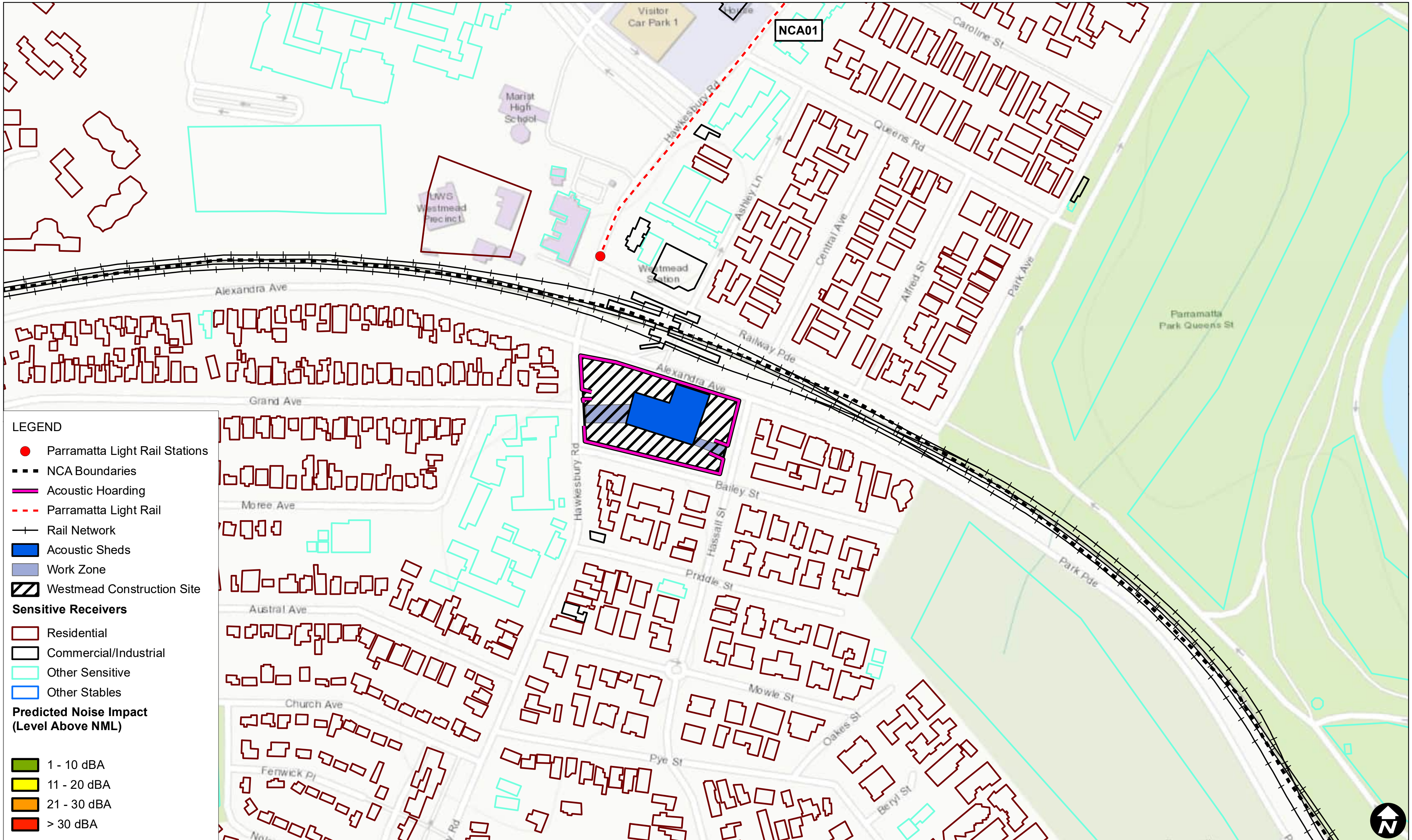
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.16b Box Excavation (with hydraulic hammer) Predicted Noise Impacts (Approved Hours)

FIGURE C-17



0 100 200 m

Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

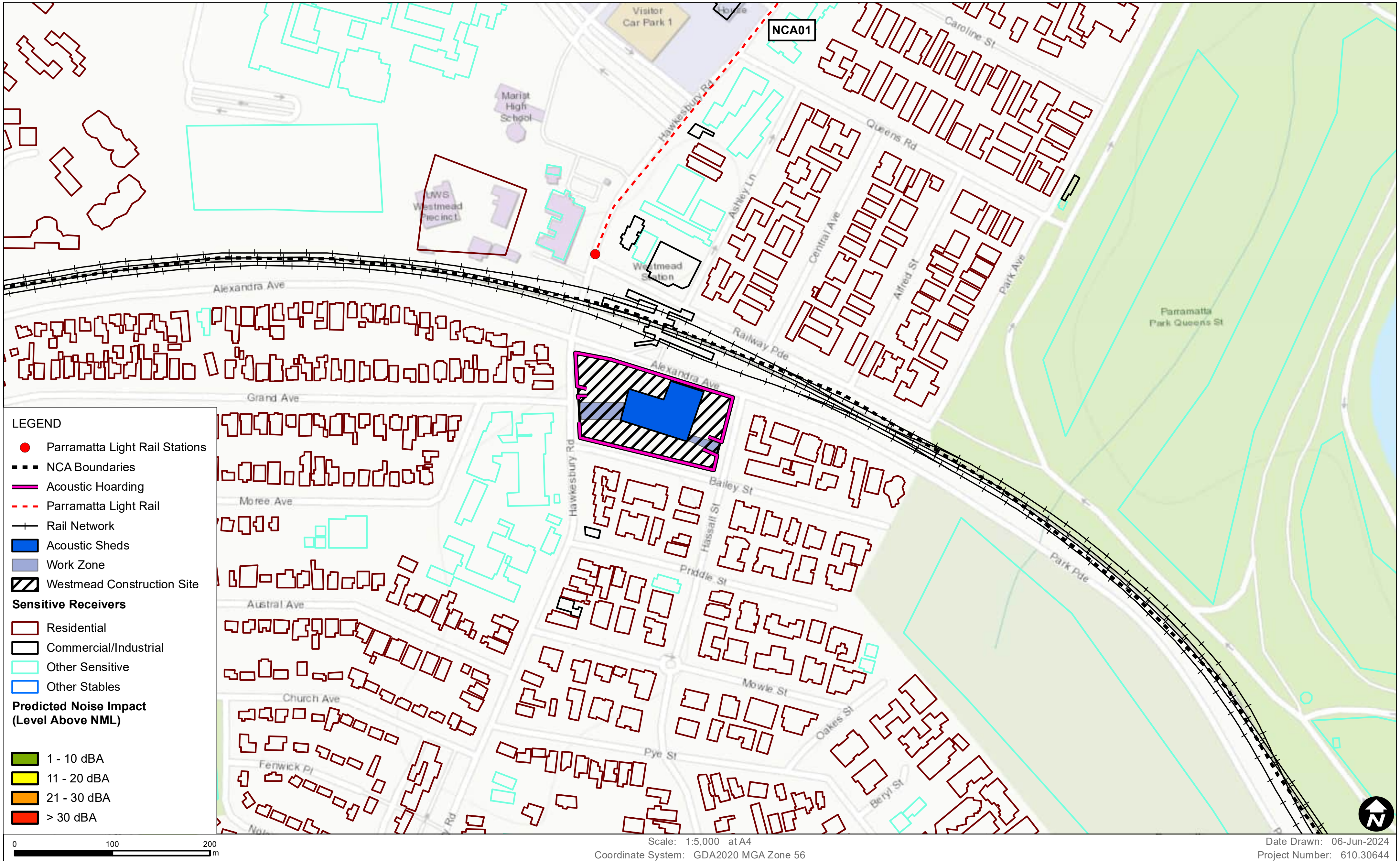
Date Drawn: 06-Jun-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

WM.19 Delivery of Equipment / Heavy Vehicle Deliveries
Predicted Noise Impacts (Approved Hours)

FIGURE C-18

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_WM_19_Delivery of Equipment Heavy Vehicle Deliveries_Day_04.mxd



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

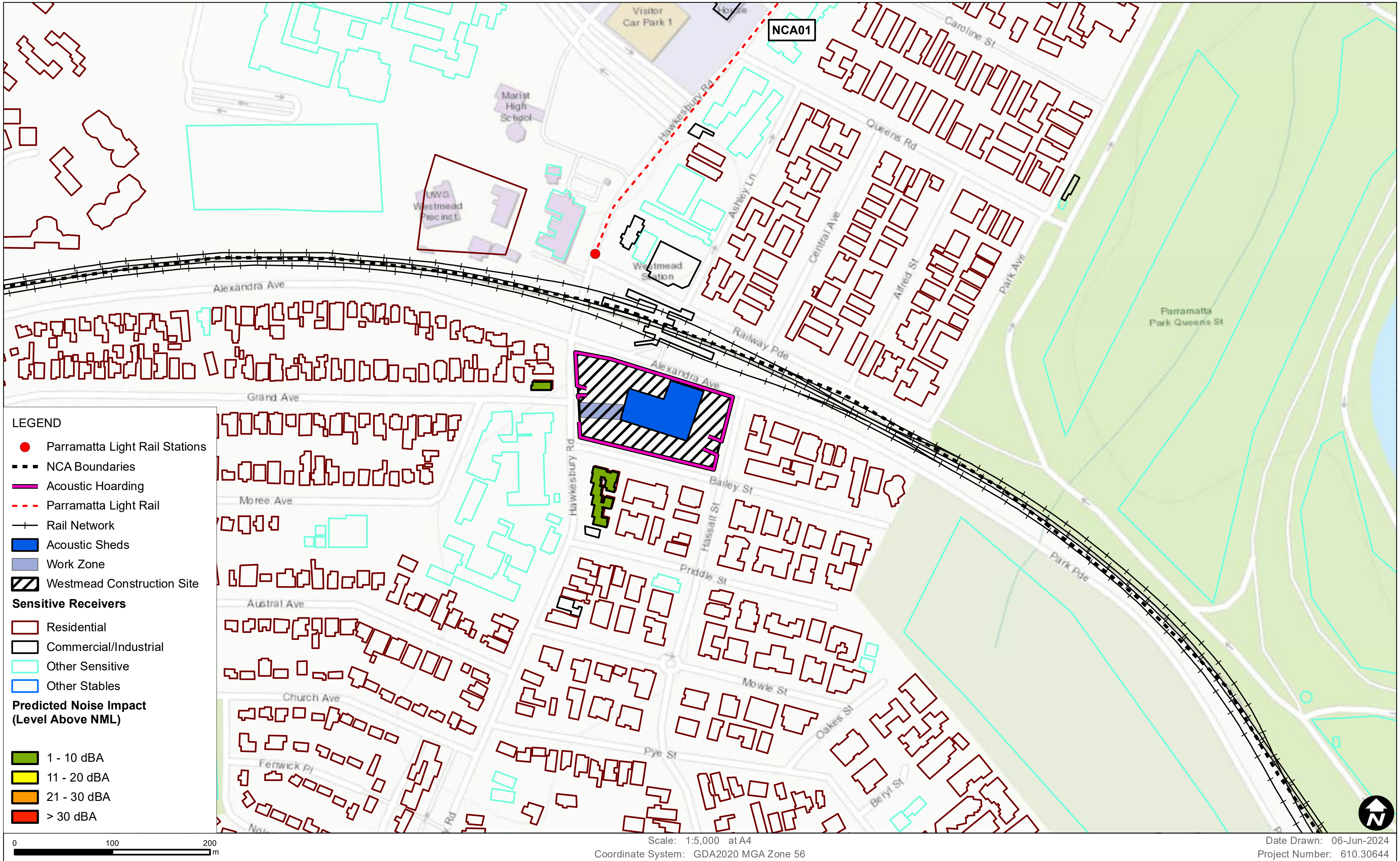
Date Drawn: 06-Jun-2024
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

WM.19 Delivery of Equipment / Heavy Vehicle Deliveries
Predicted Noise Impacts (Evening)

FIGURE C-19



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 06-Jun-2024
Project Number: 610.30644

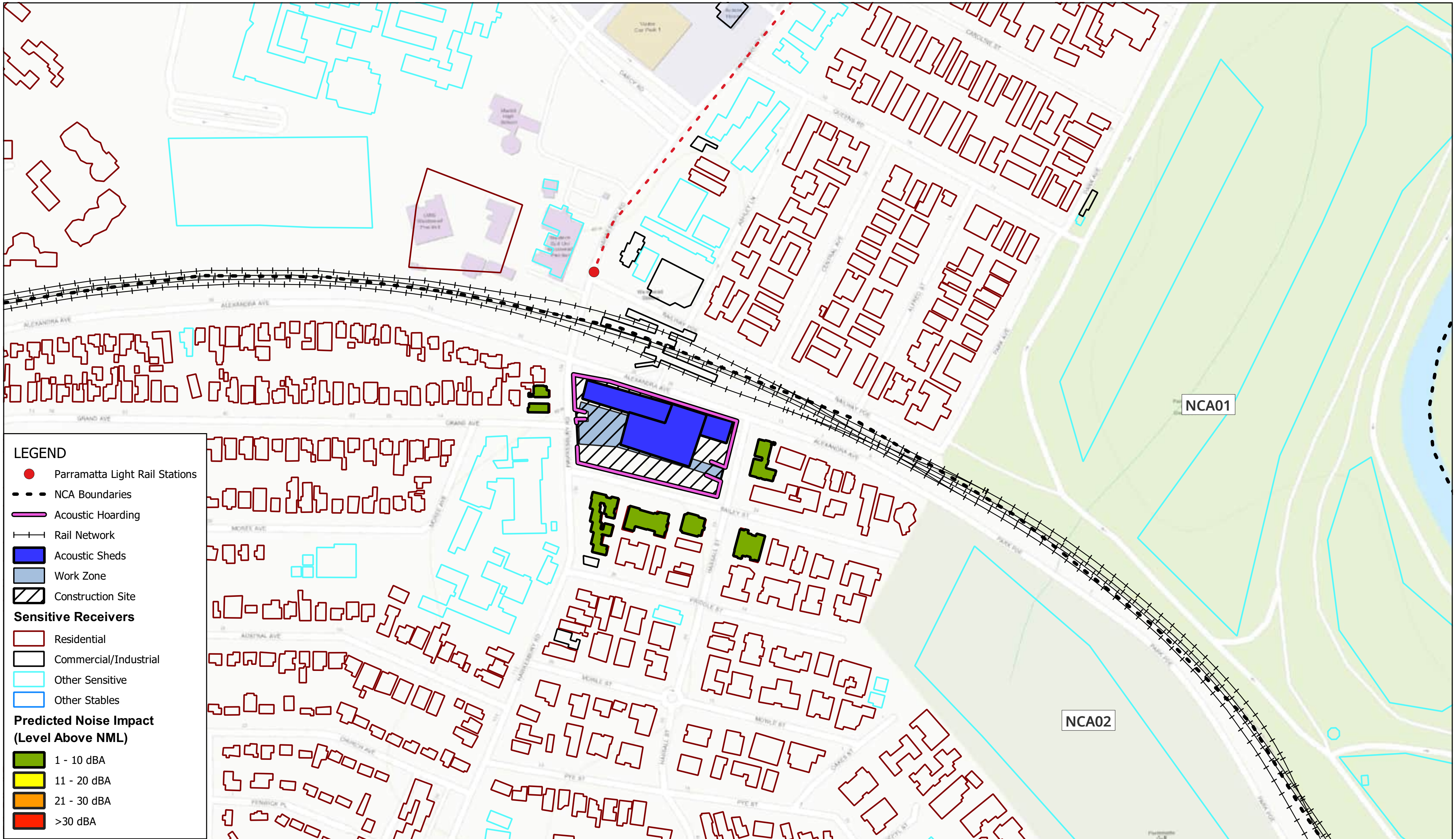
SLR

Data Source:
ESRI Topographic

WM.19b Delivery of Equipment / Heavy Vehicle Deliveries Predicted Noise Impacts (Night)

FIGURE C-20

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_WM_19b_Delivery of Equipment Heavy Vehicle Deliveries_Night_04.mxd



0 150 300 m

Scale: Scale: 1:5,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

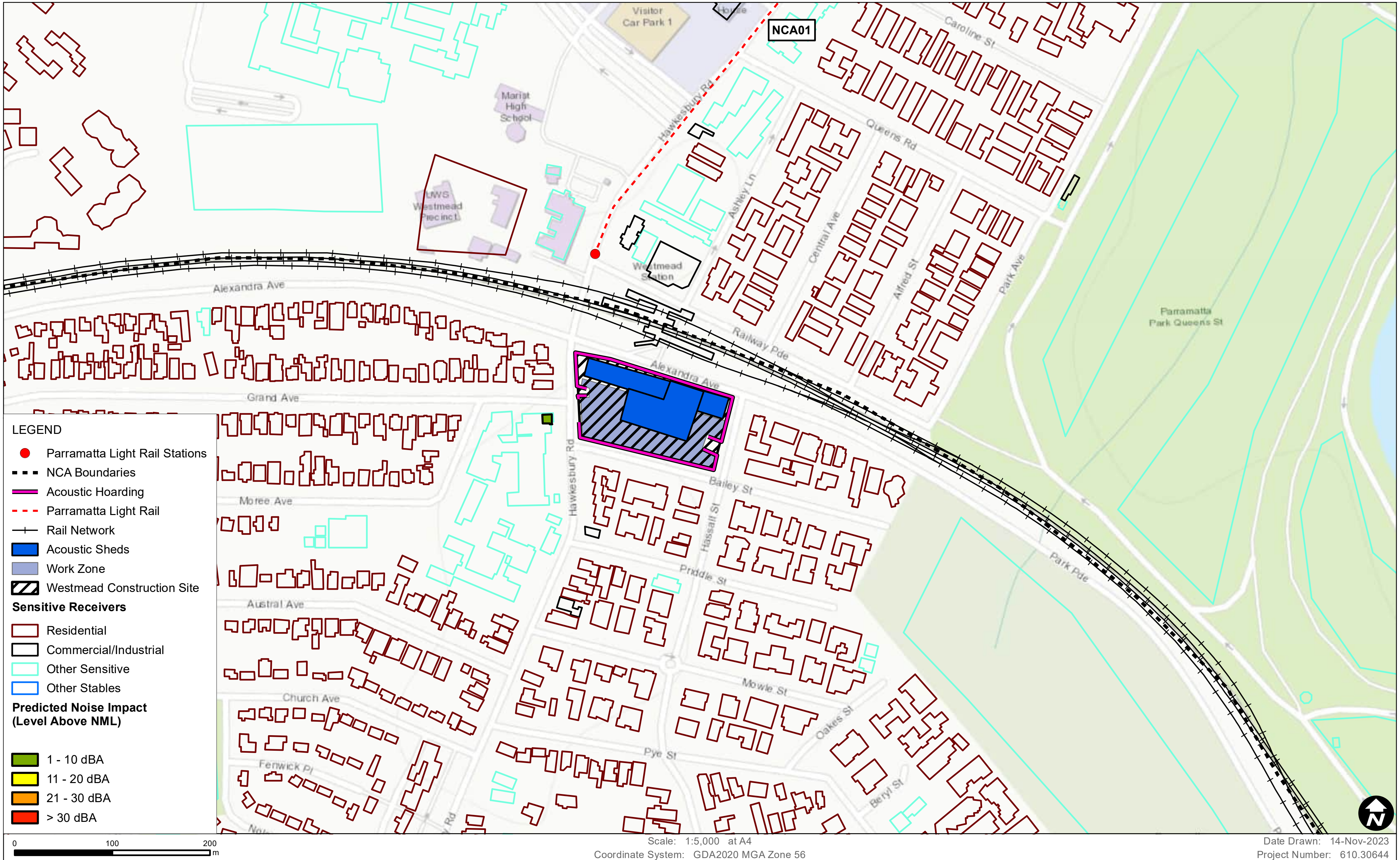
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.20 TBM Retrieval
Predicted Noise Impacts (Night)

FIGURE C-21



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 14-Nov-2023
Project Number: 610.30644

SLR

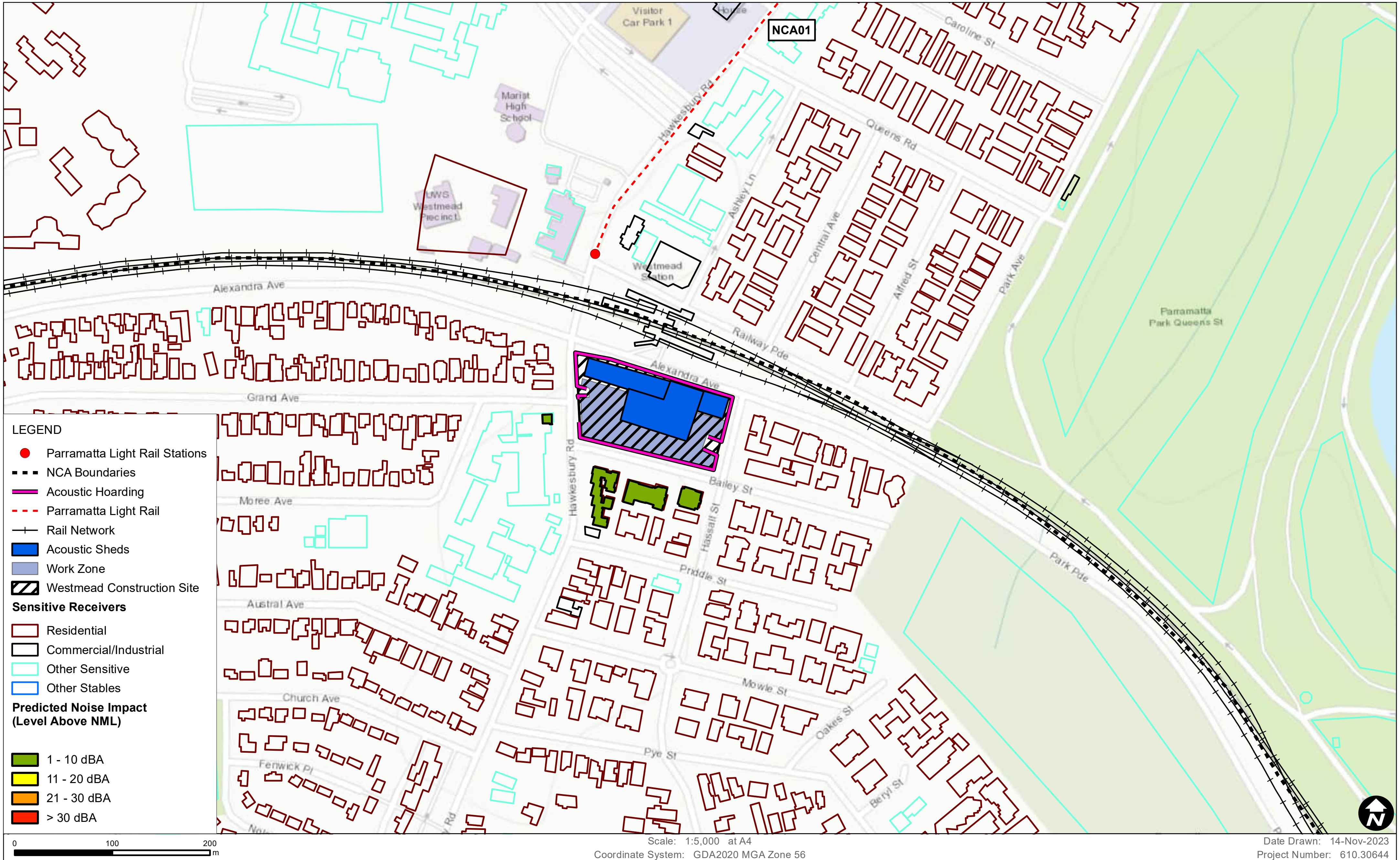
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.21 General operation of ancillary facility
Predicted Noise Impacts (Approved Hours)

FIGURE C-22

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_WM_21_General operation of ancillary facilityl_Day_04.mxd



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

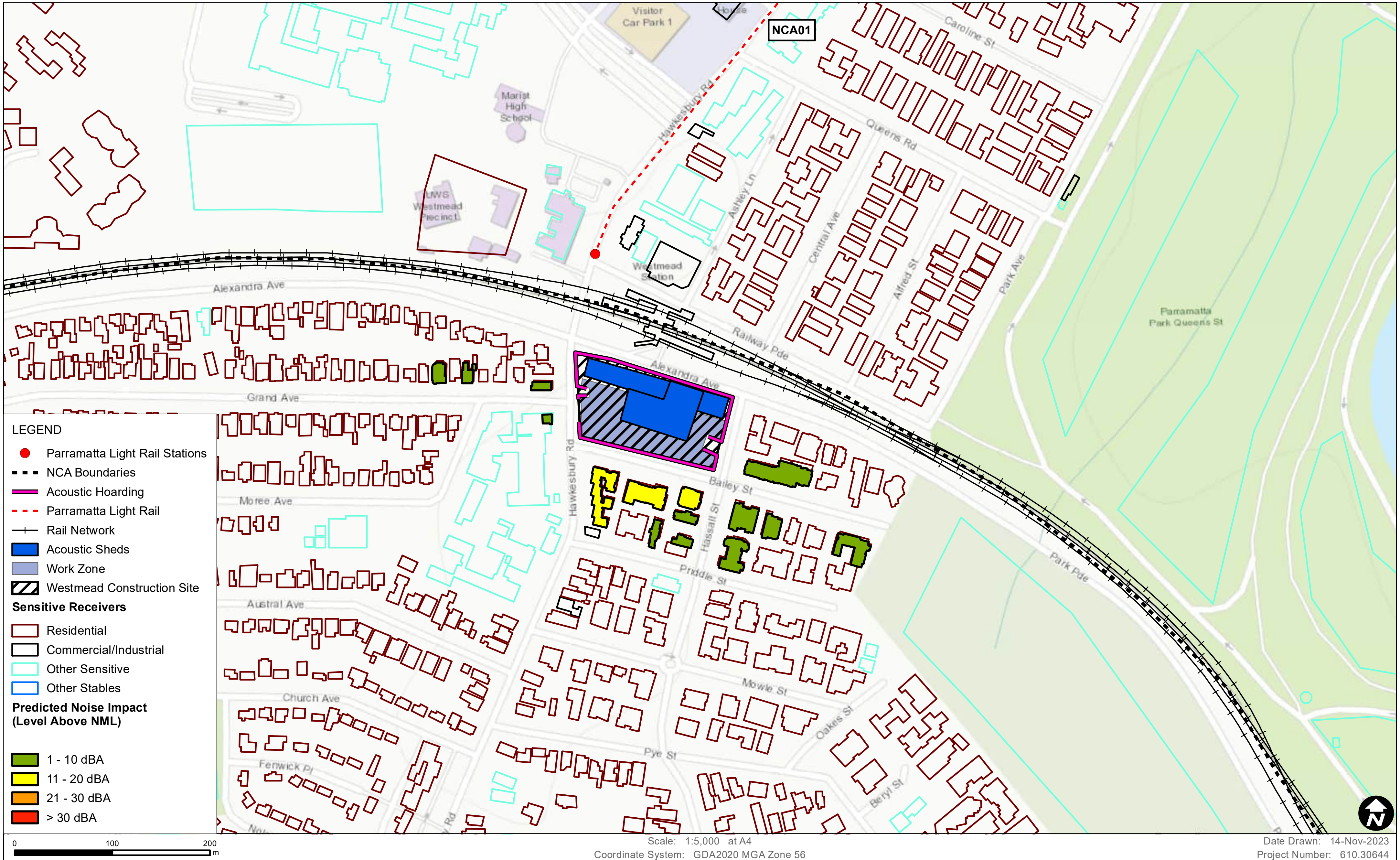
Date Drawn: 14-Nov-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.21 General operation of ancillary facility
Predicted Noise Impacts (Evening)

FIGURE C-23



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 14-Nov-2023
Project Number: 610.30644

SLR

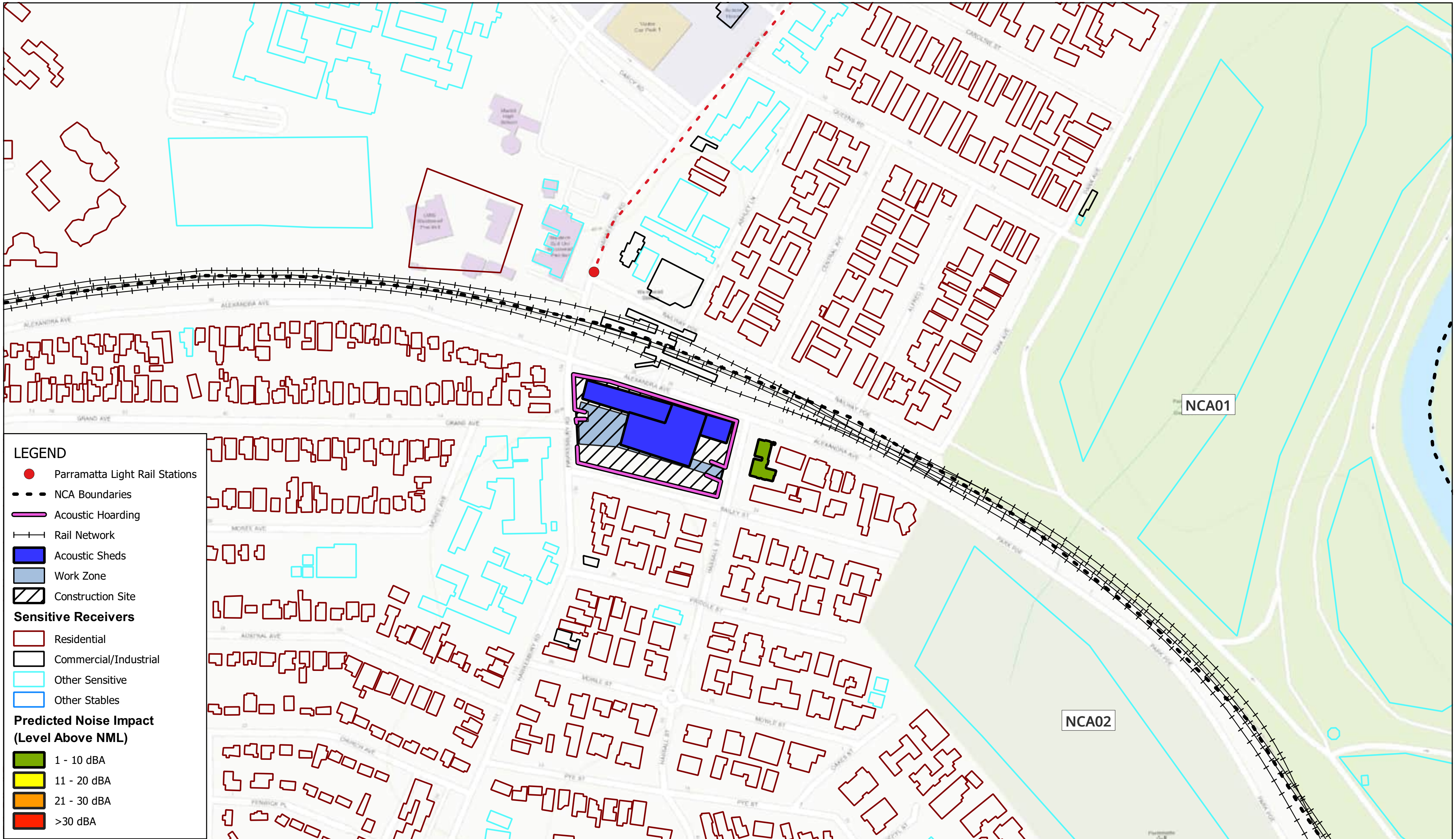
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.21 General operation of ancillary facility
Predicted Noise Impacts (Night)

FIGURE C-24

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_WM_21_General operation of ancillary facilityl_Night_04.mxd



Scale: Scale: 1:5,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

SLR

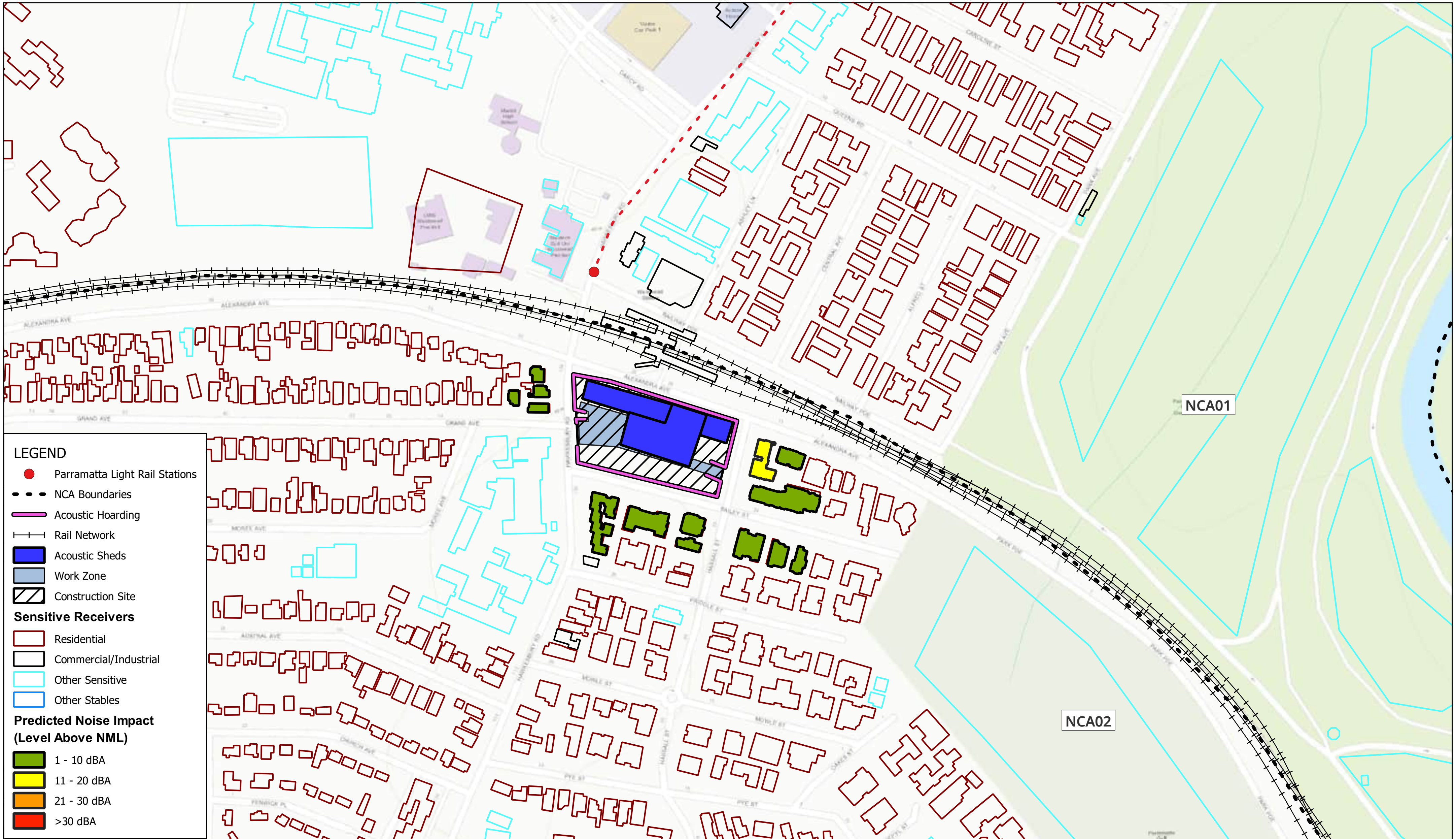
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.23 Permanent Tunnel Lining and FRP
Predicted Noise Impacts (Evening)

FIGURE C-25

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_WM.qgz



Scale: Scale: 1:5,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

SLR

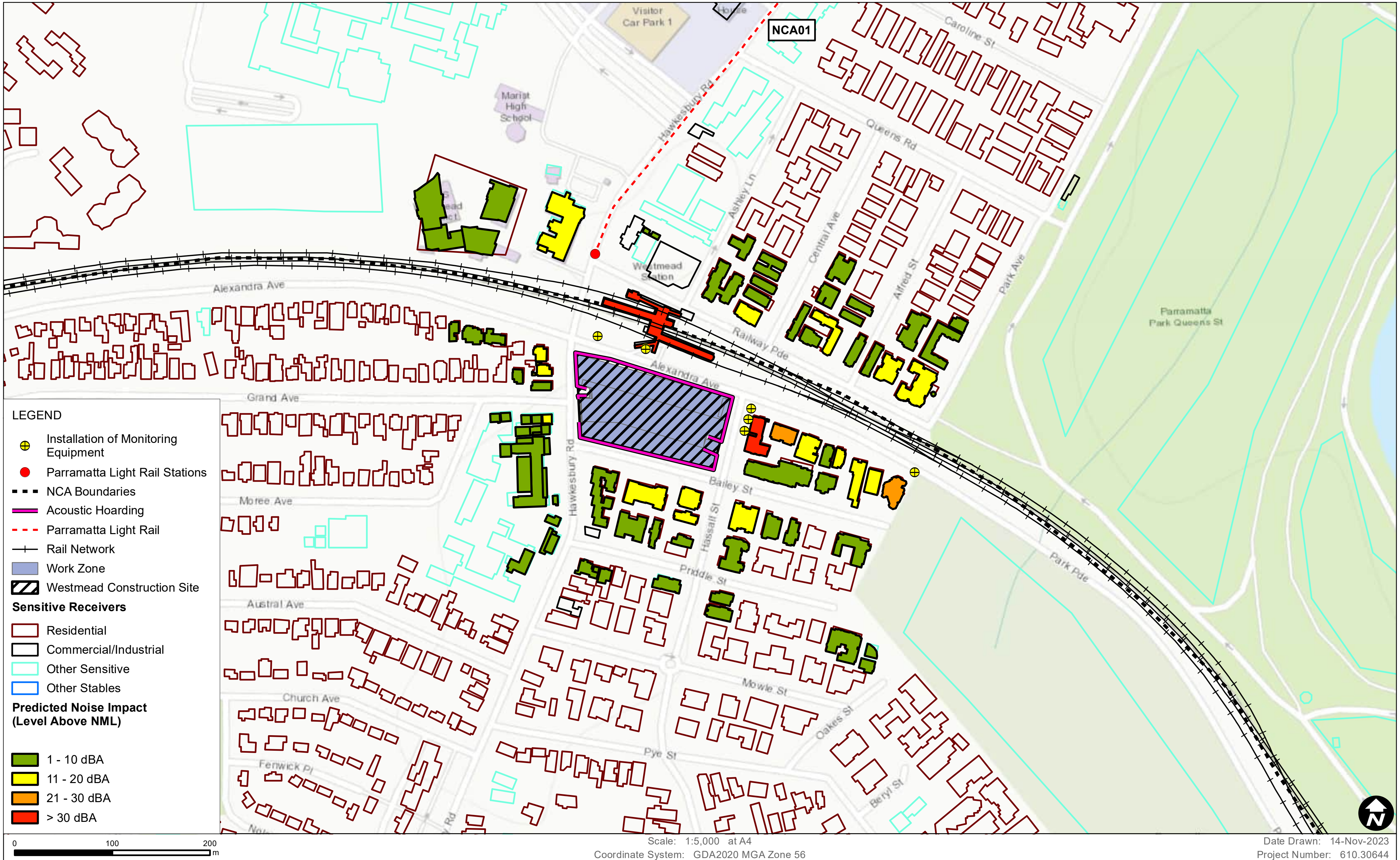
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.23 Permanent Tunnel Lining and FRP Predicted Noise Impacts (Night)

FIGURE C-26

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_WM.qgz



Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

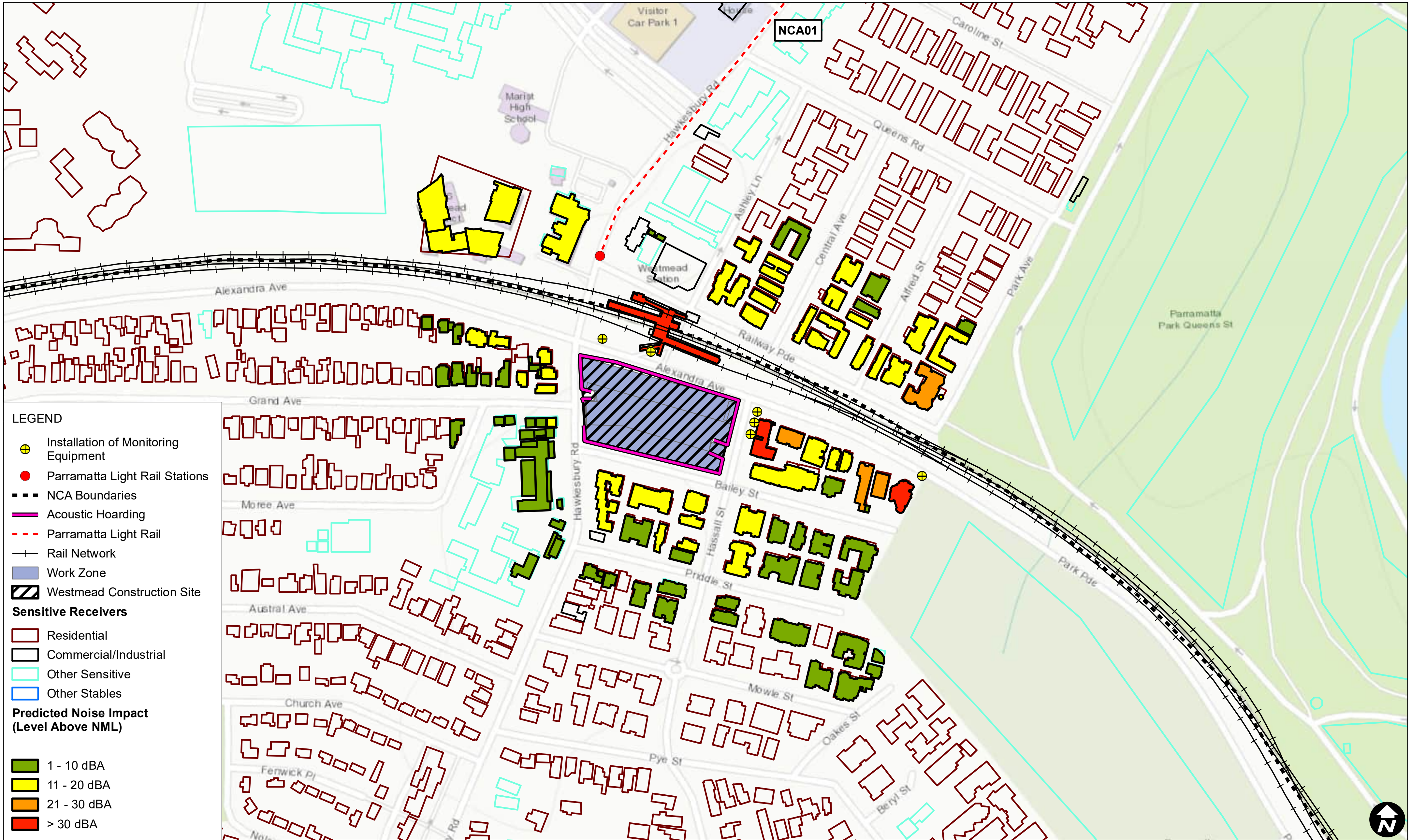
Date Drawn: 14-Nov-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.24 Installation of Monitoring Equipment Predicted Noise Impacts (Approved Hours)

FIGURE C-27



LEGEND

- Installation of Monitoring Equipment
- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Parramatta Light Rail
- Rail Network
- Work Zone
- Westmead Construction Site

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- > 30 dBA

0 100 200 m

Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 14-Nov-2023
Project Number: 610.30644

SLR

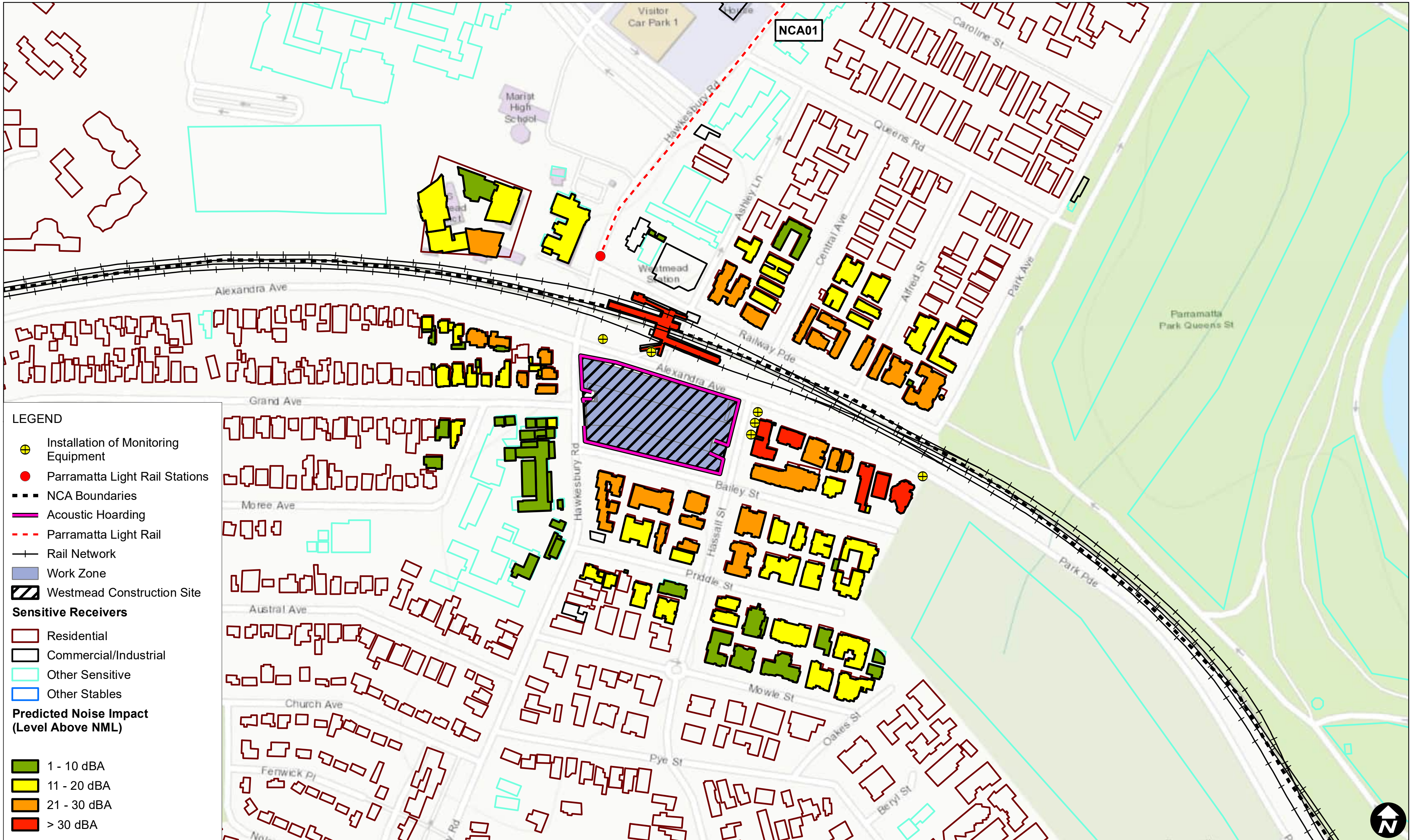
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.24 Installation of Monitoring Equipment
Predicted Noise Impacts (Evening)

FIGURE C-28

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_WM_24_Installation of Monitoring Equipment_Evening_04.mxd



0 100 200 m

Scale: 1:5,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 14-Nov-2023
Project Number: 610.30644

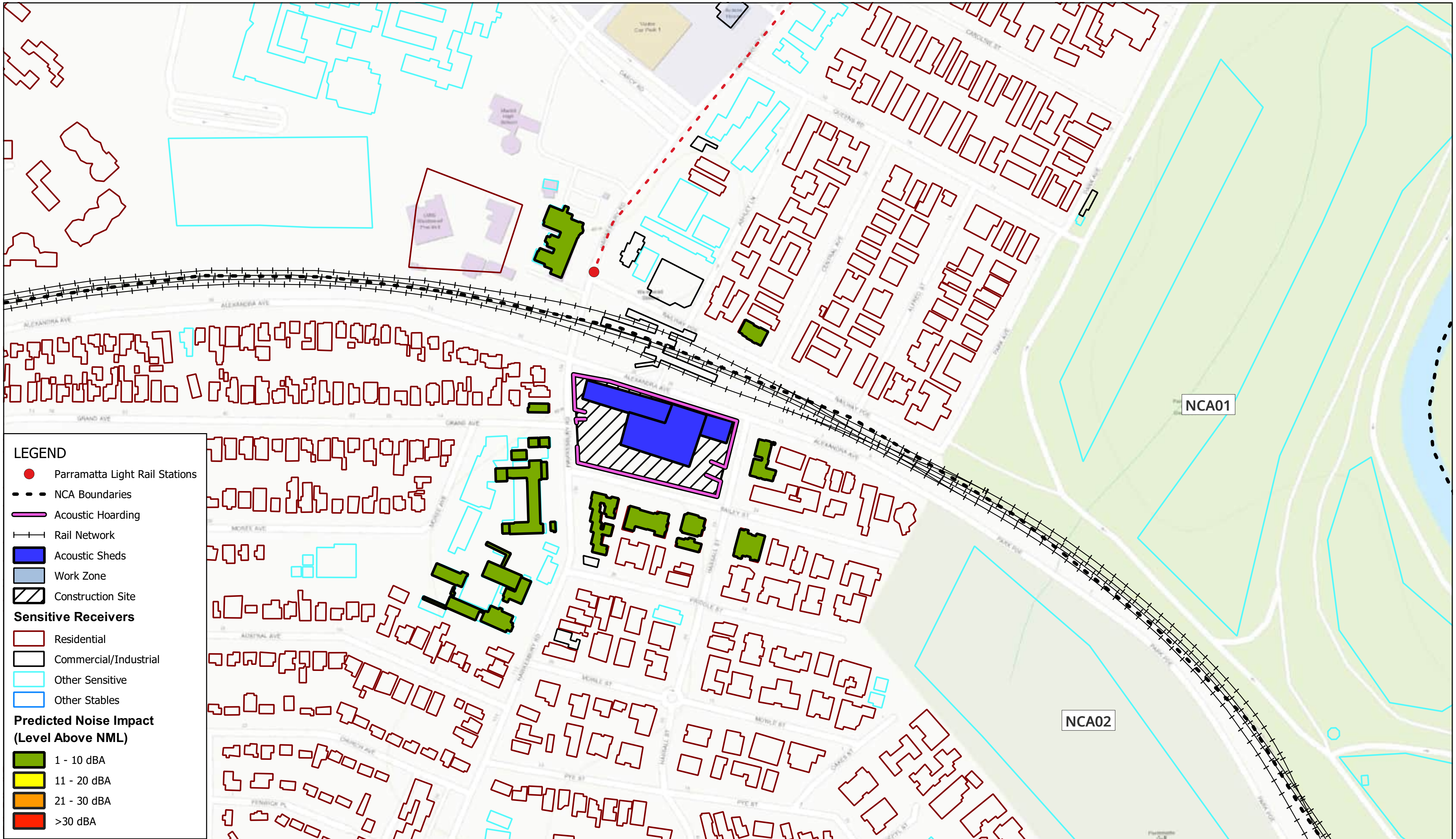
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.24 Installation of Monitoring Equipment
Predicted Noise Impacts (Night)

FIGURE C-29

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_WM_24_Installation of Monitoring Equipment_Night_04.mxd



0 150 300 m

Scale: Scale: 1:5,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

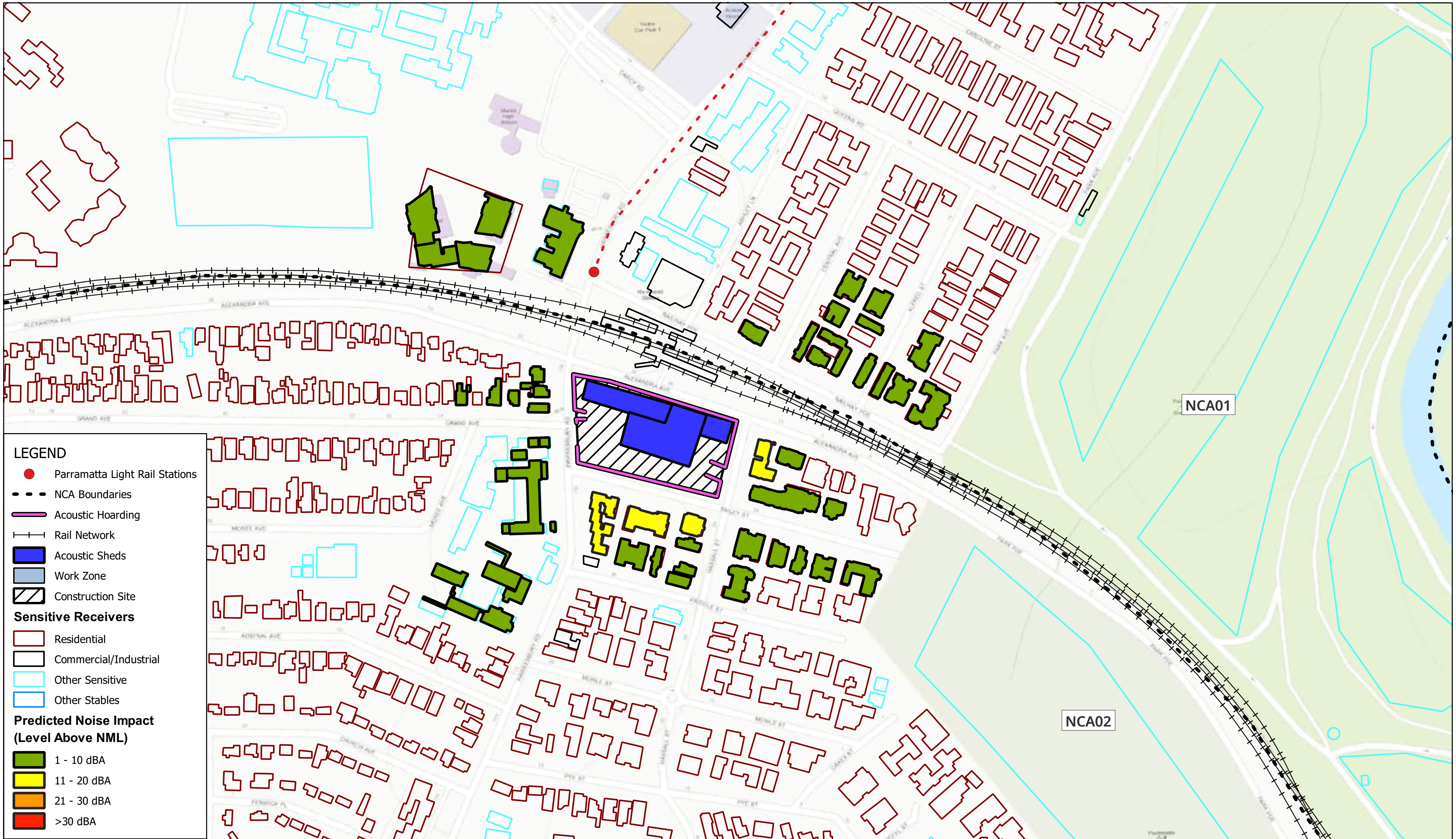
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.25 Removal of Acoustic Shed
Predicted Noise Impacts (Approved Hours)

FIGURE C-30



0 150 300 m

Scale: Scale: 1:5,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

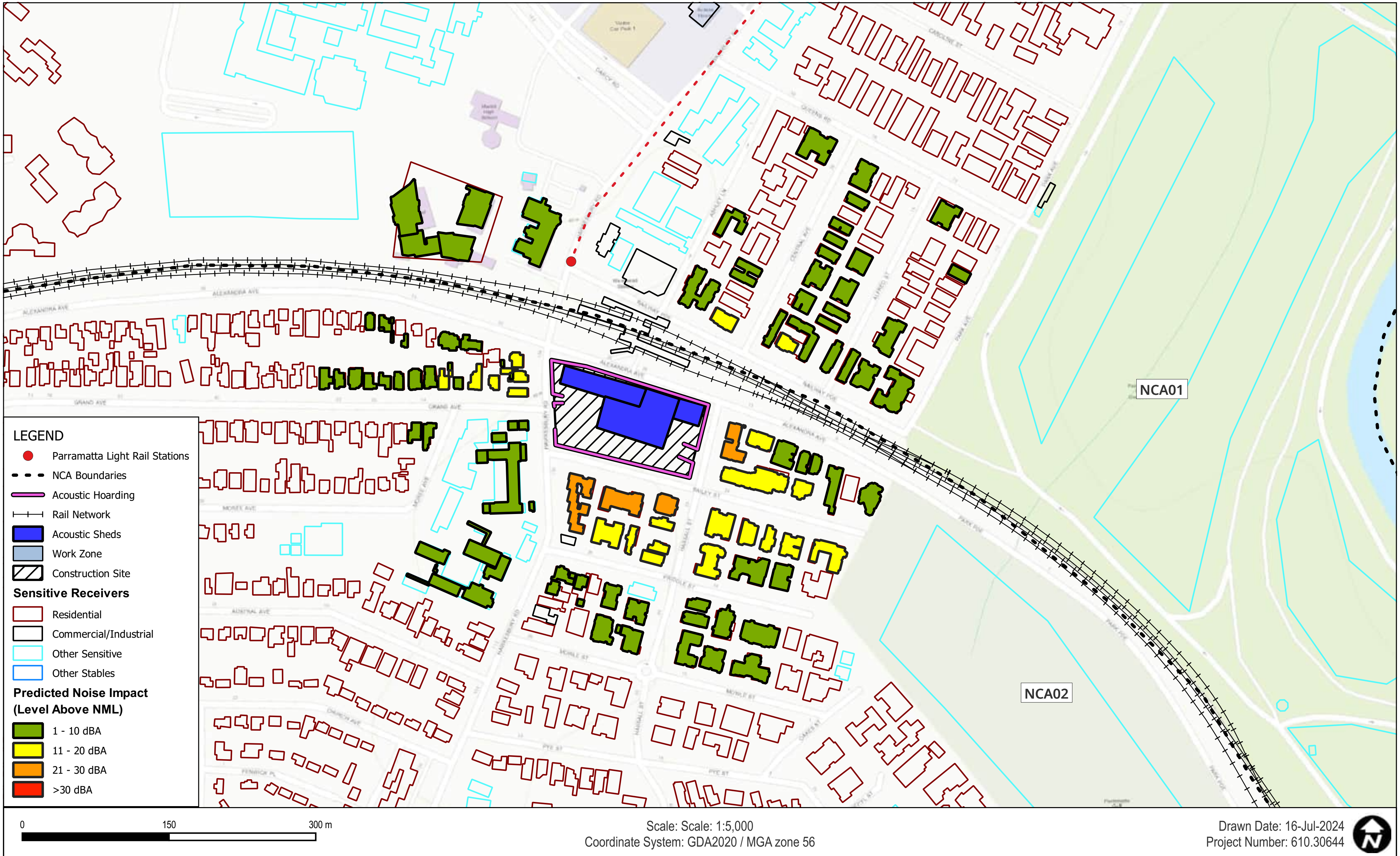
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.25 Removal of Acoustic Shed
Predicted Noise Impacts (Evening)

FIGURE C-31



Scale: Scale: 1:5,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

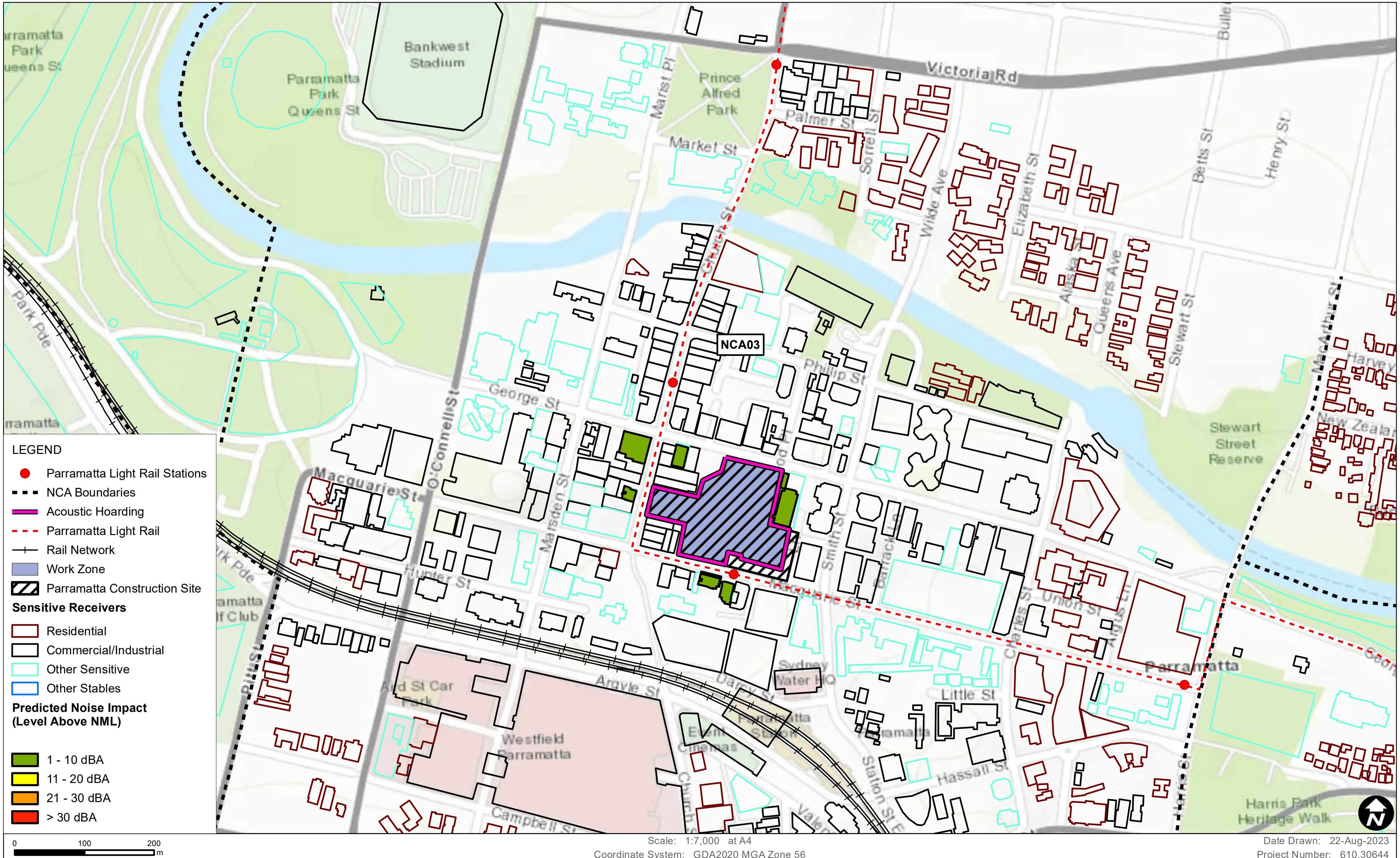
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

WM.25 Removal of Acoustic Shed
Predicted Noise Impacts (Night)

FIGURE C-32



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

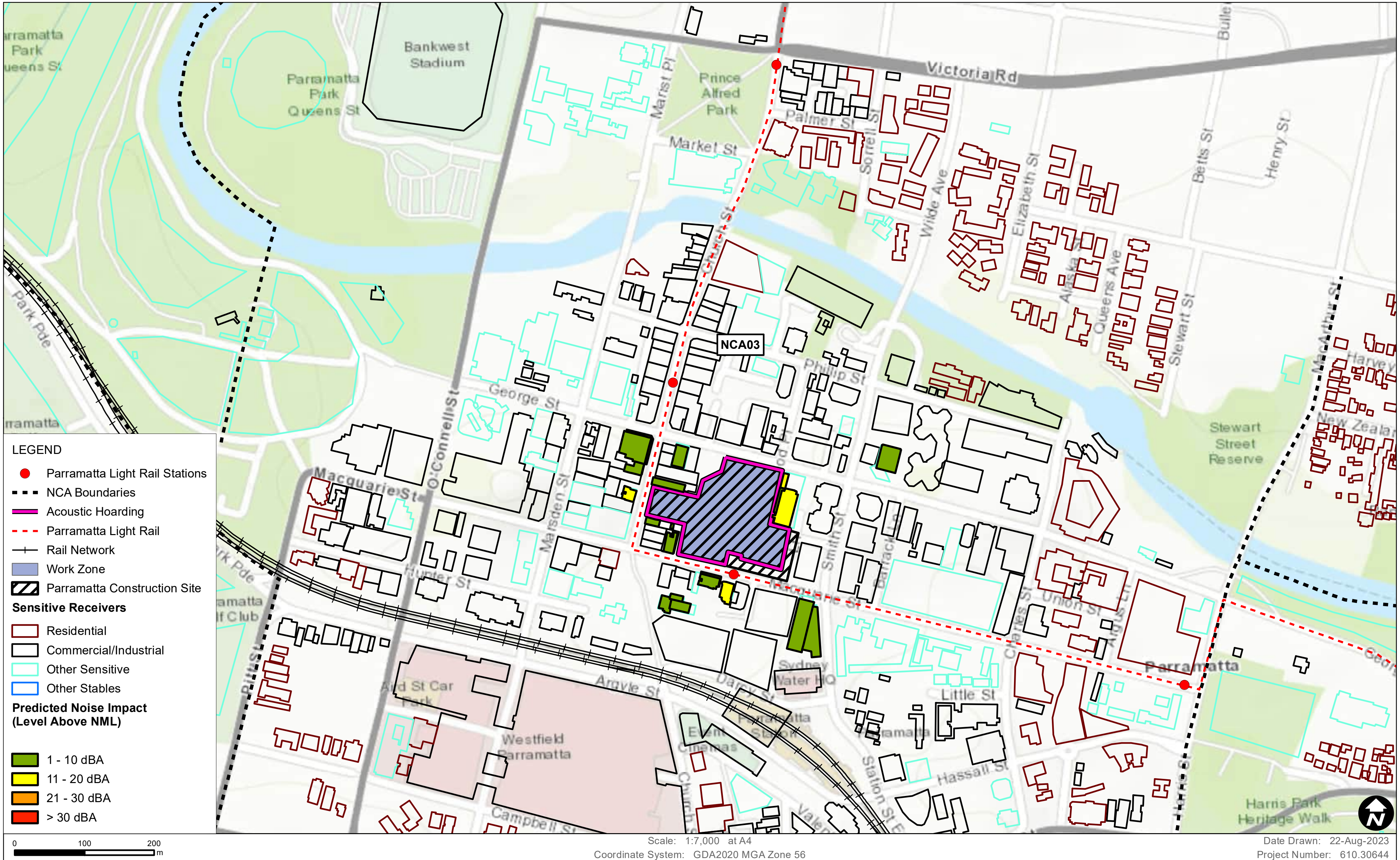
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.01 Site preparation work
Predicted Noise Impacts
(Approved Hours)

FIGURE C-33

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C34_PM_01_Site_preparation_work_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

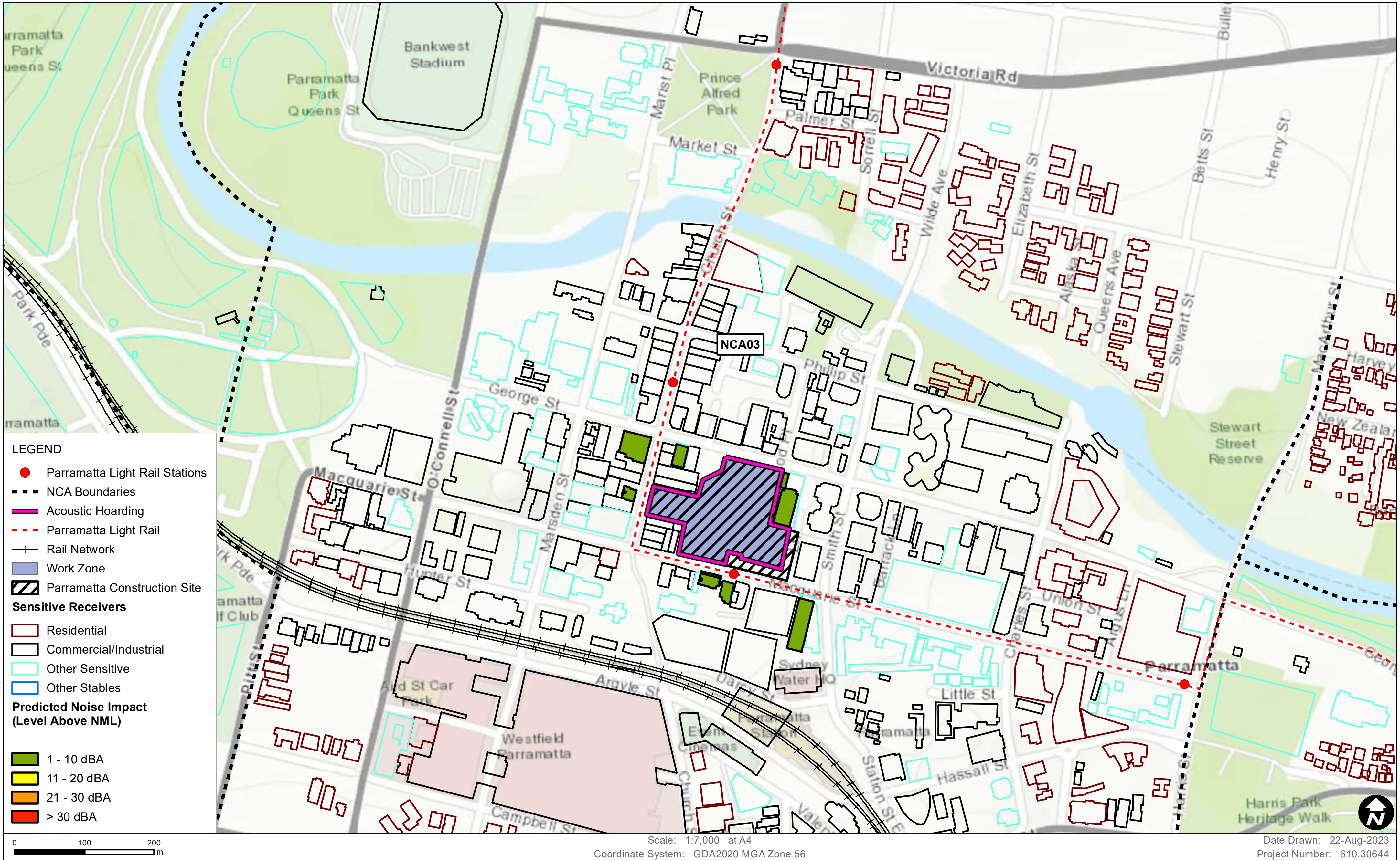
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.02 Initial investigation work
Predicted Noise Impacts
(Approved Hours)

FIGURE C-34

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C35_PM_02_Initial investigation work_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

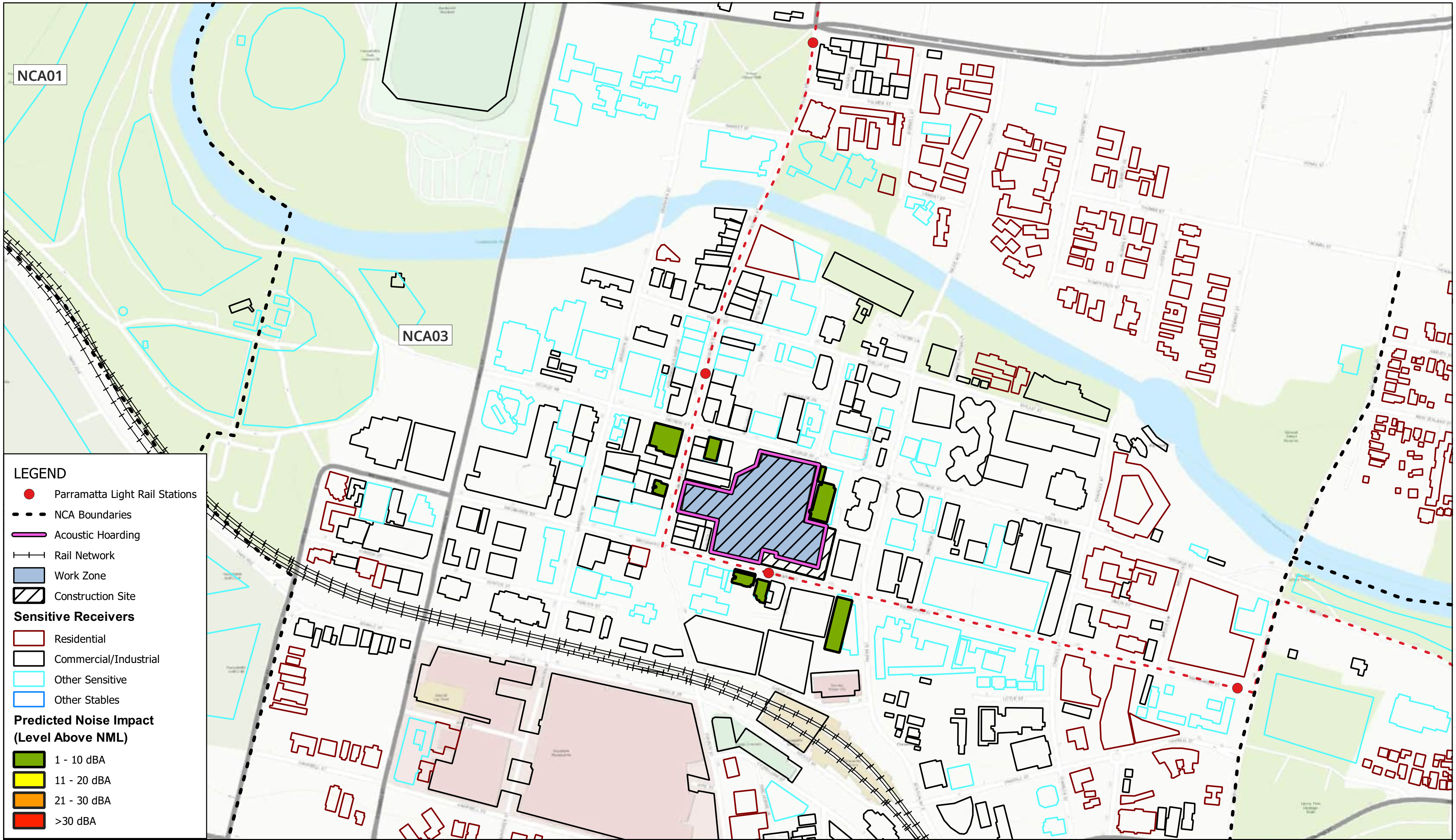
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.03 Archaeological clearance Predicted Noise Impacts (Approved Hours)

FIGURE C-35

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C36_PM_03_Archaeological clearance_Day_03.mxd



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

SLR

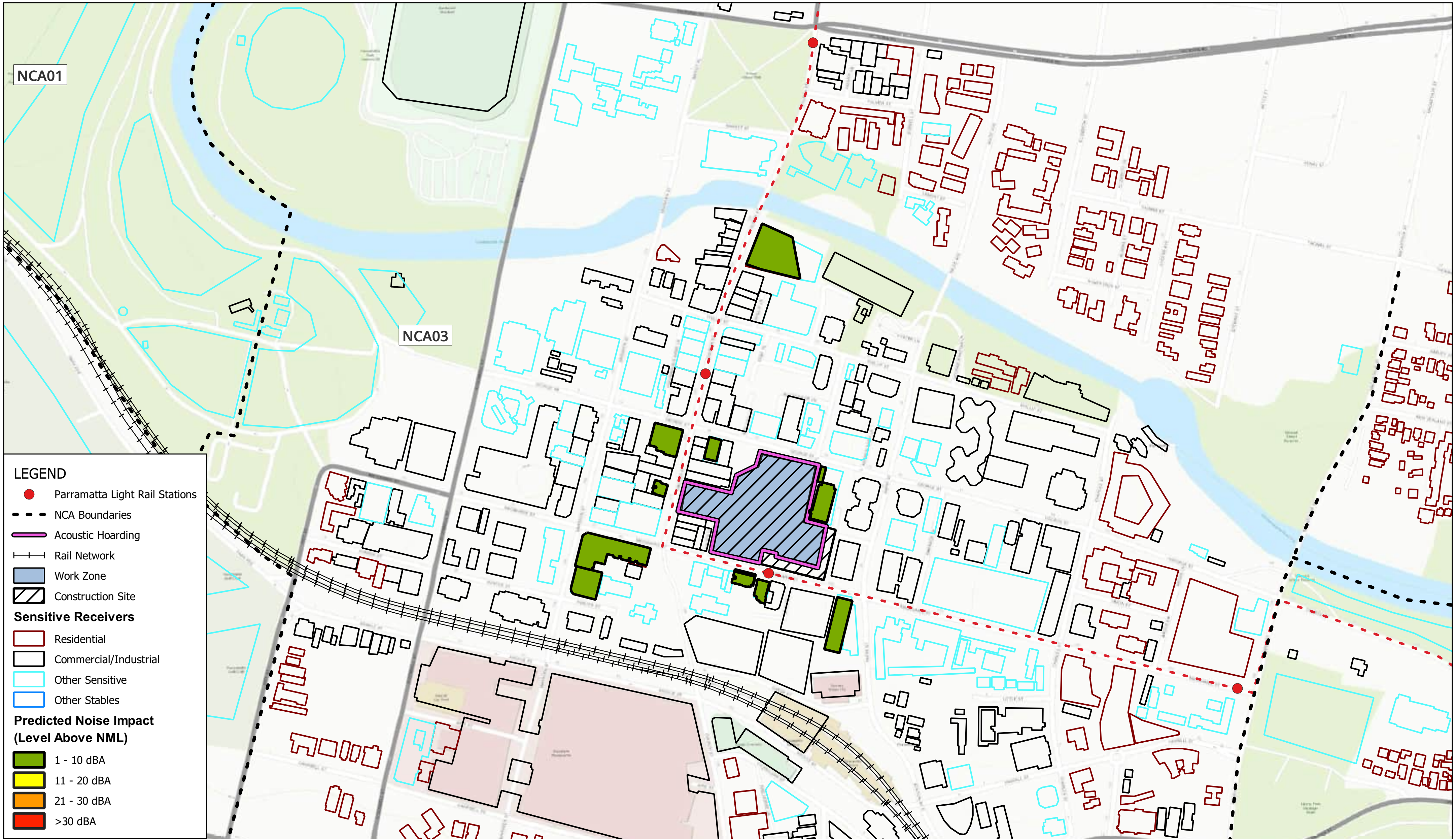
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.03 Archaeological clearance
Predicted Noise Impacts
(Evening)

FIGURE C-36

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_PM.qgz



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

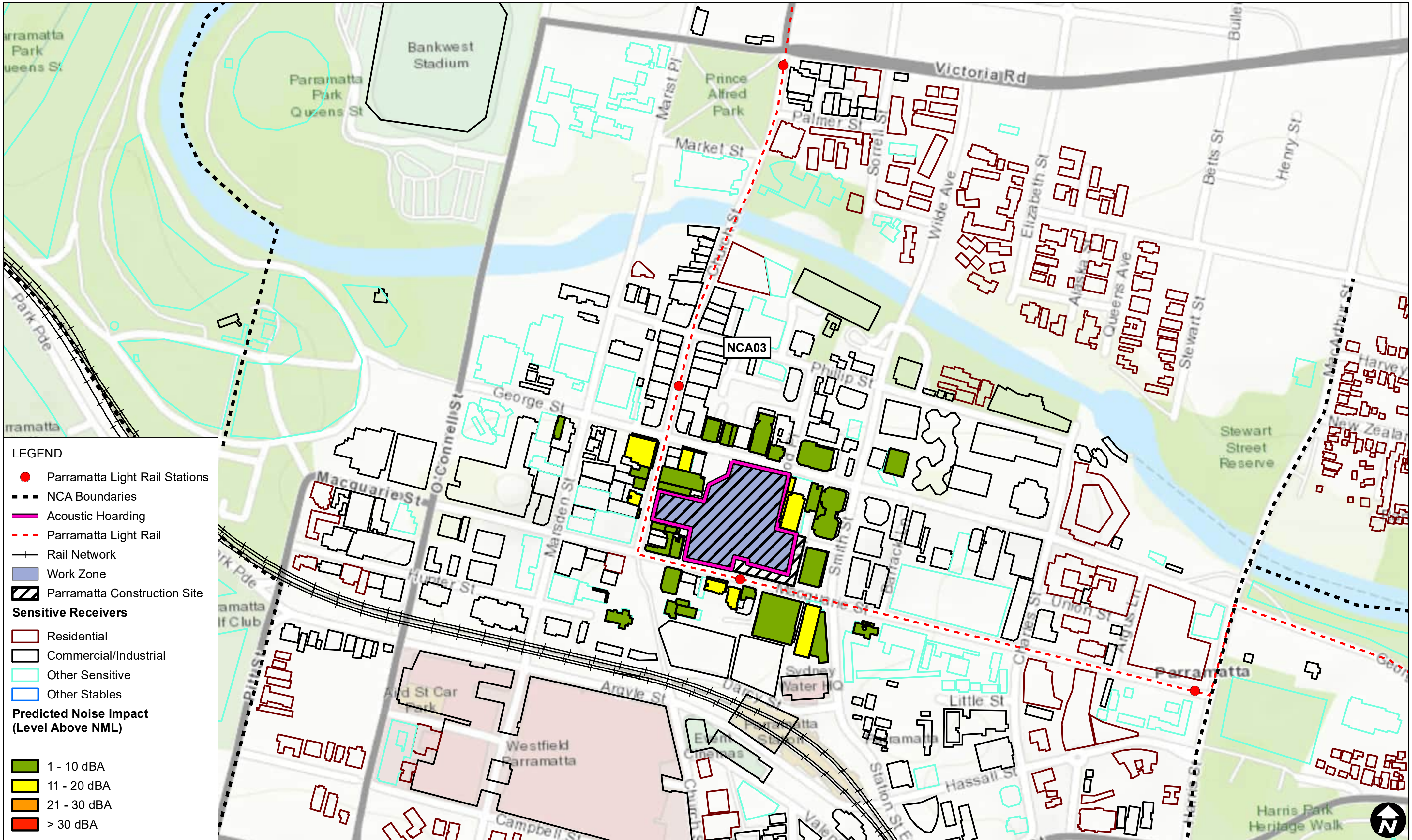
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.03 Archaeological clearance
Predicted Noise Impacts
(Night)

FIGURE C-37

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_PM.qgz



LEGEND

- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Parramatta Light Rail
- Rail Network
- Work Zone
- Parramatta Construction Site

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- > 30 dBA

0 100 200 m

Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

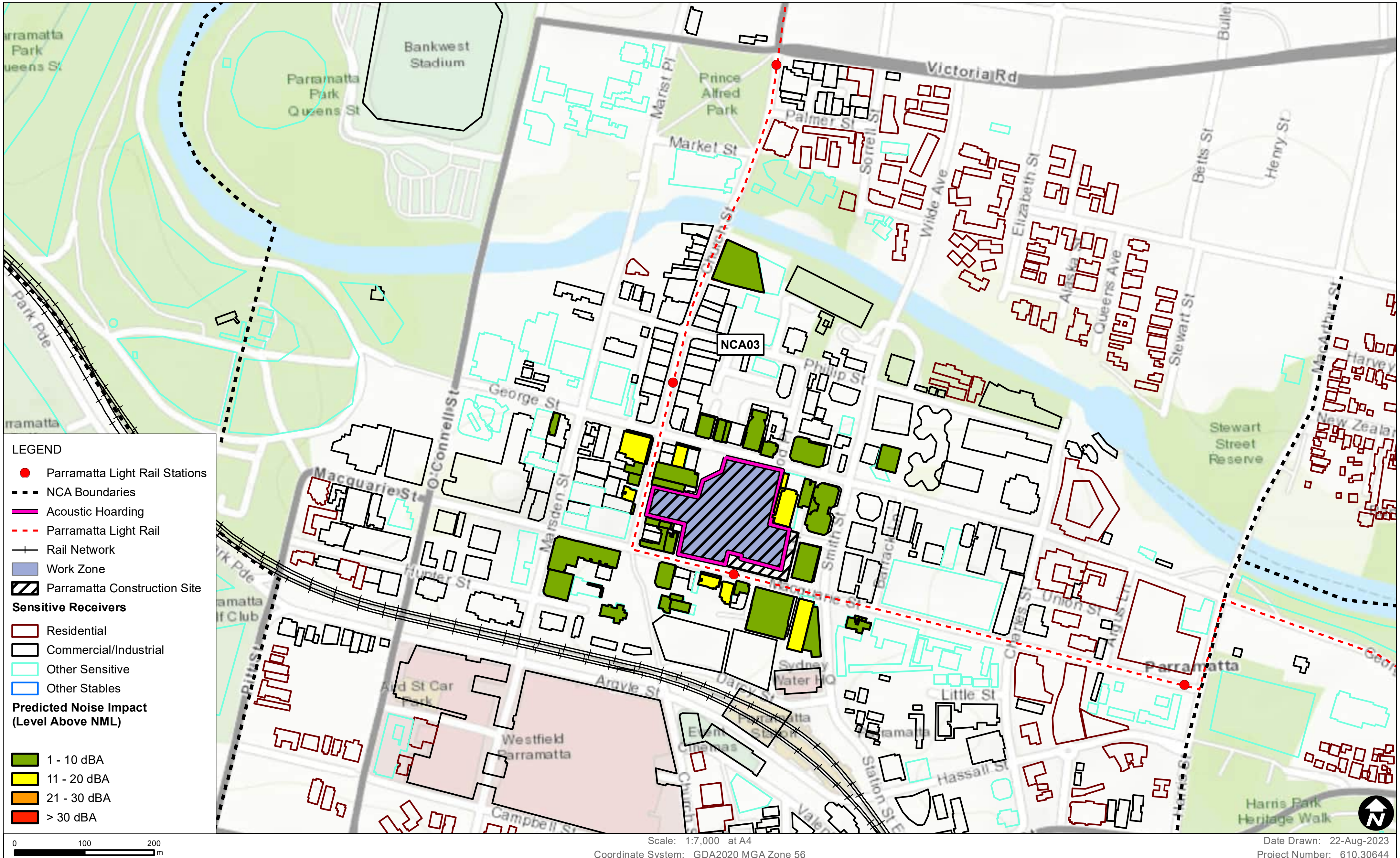
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.04 Removal and/or relocating utilities
Predicted Noise Impacts
(Approved Hours)

FIGURE C-38



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

SLR

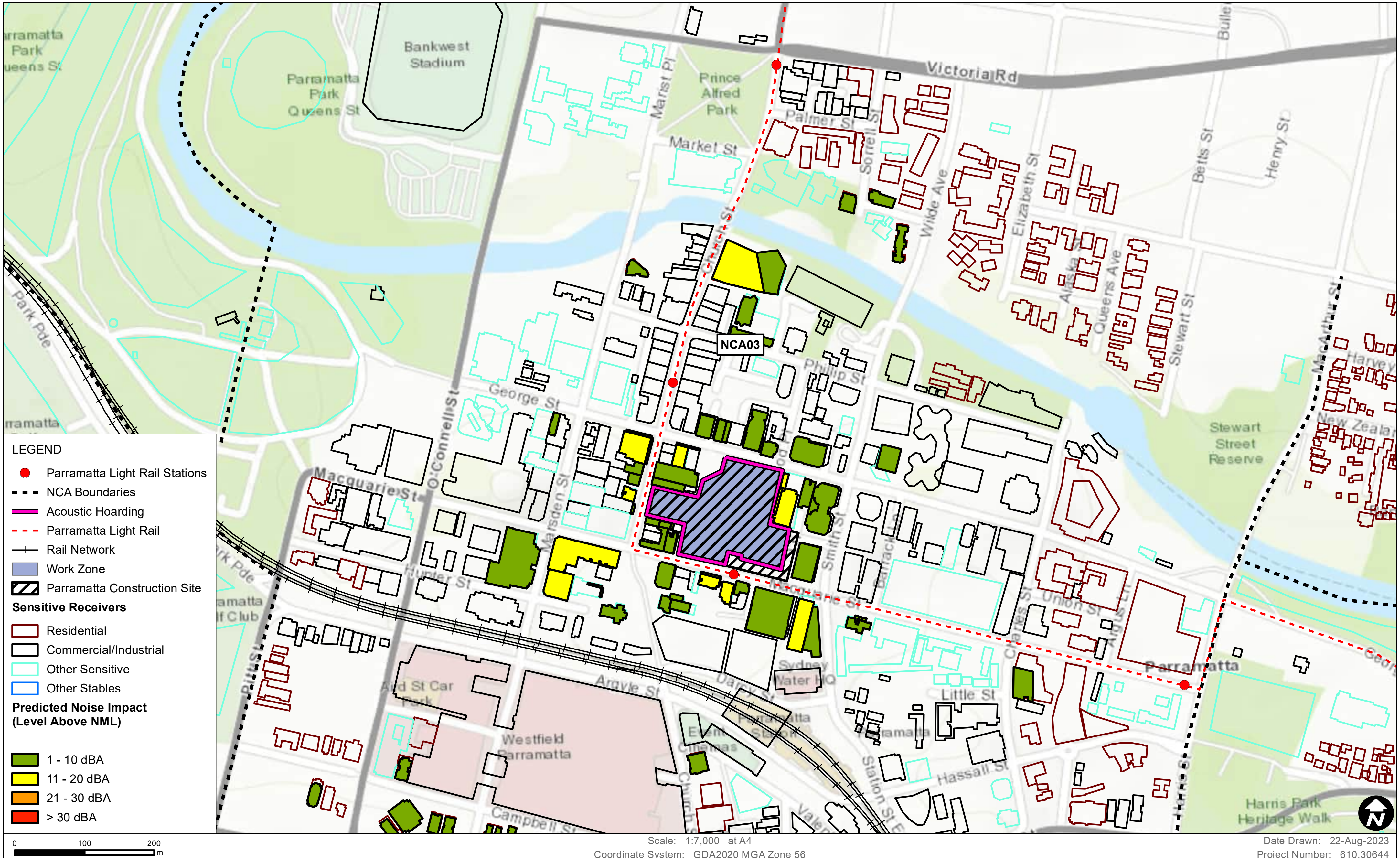
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.04 Removal and/or relocating utilities Predicted Noise Impacts (Evening)

FIGURE C-39

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C38_PM_04_Removal and or relocating utilities_Evening_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

SLR

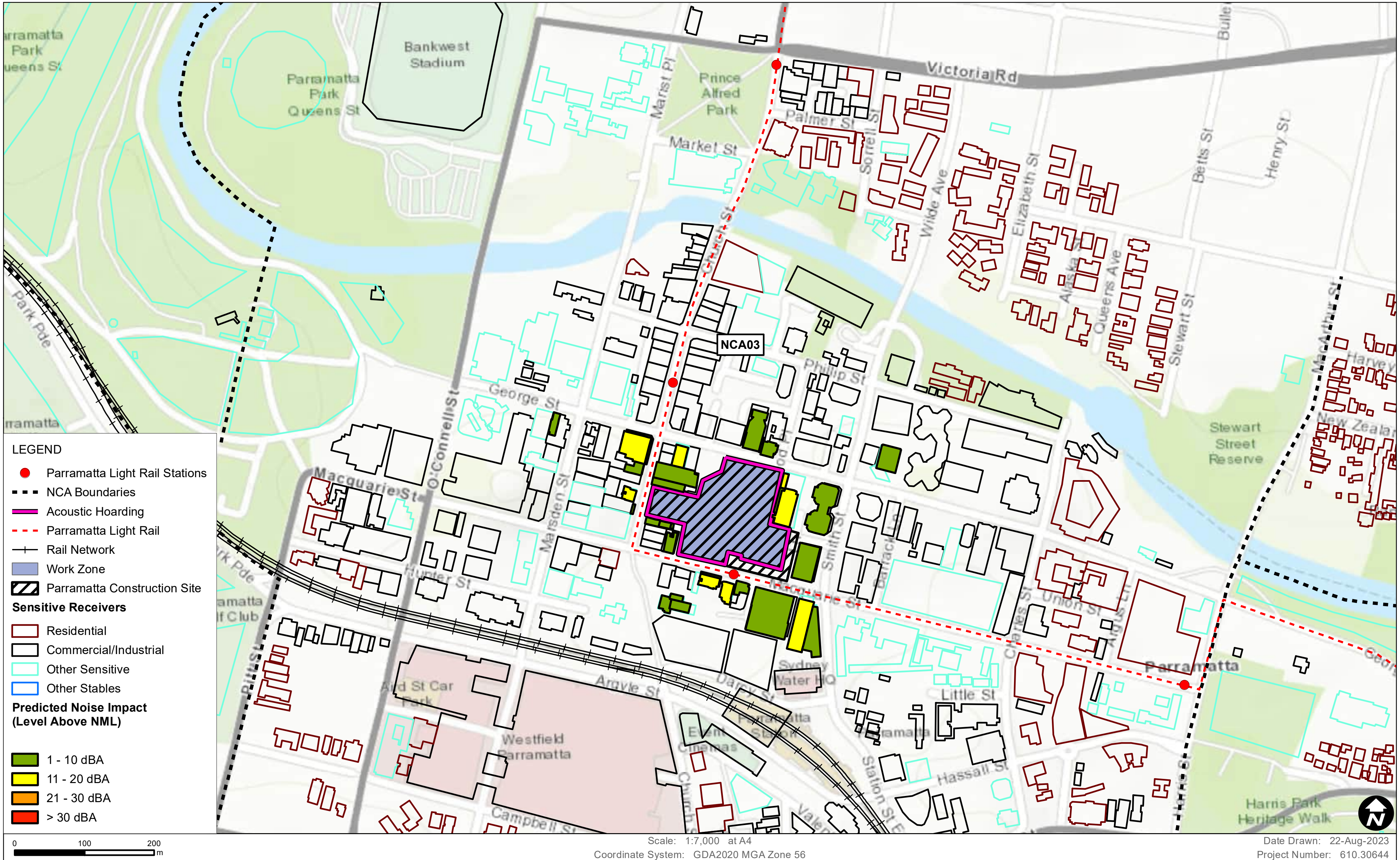
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.04 Removal and/or relocating utilities
Predicted Noise Impacts
(Night)

FIGURE C-40

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C39_PM_04_Removal and or relocating utilities_Night_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

SLR

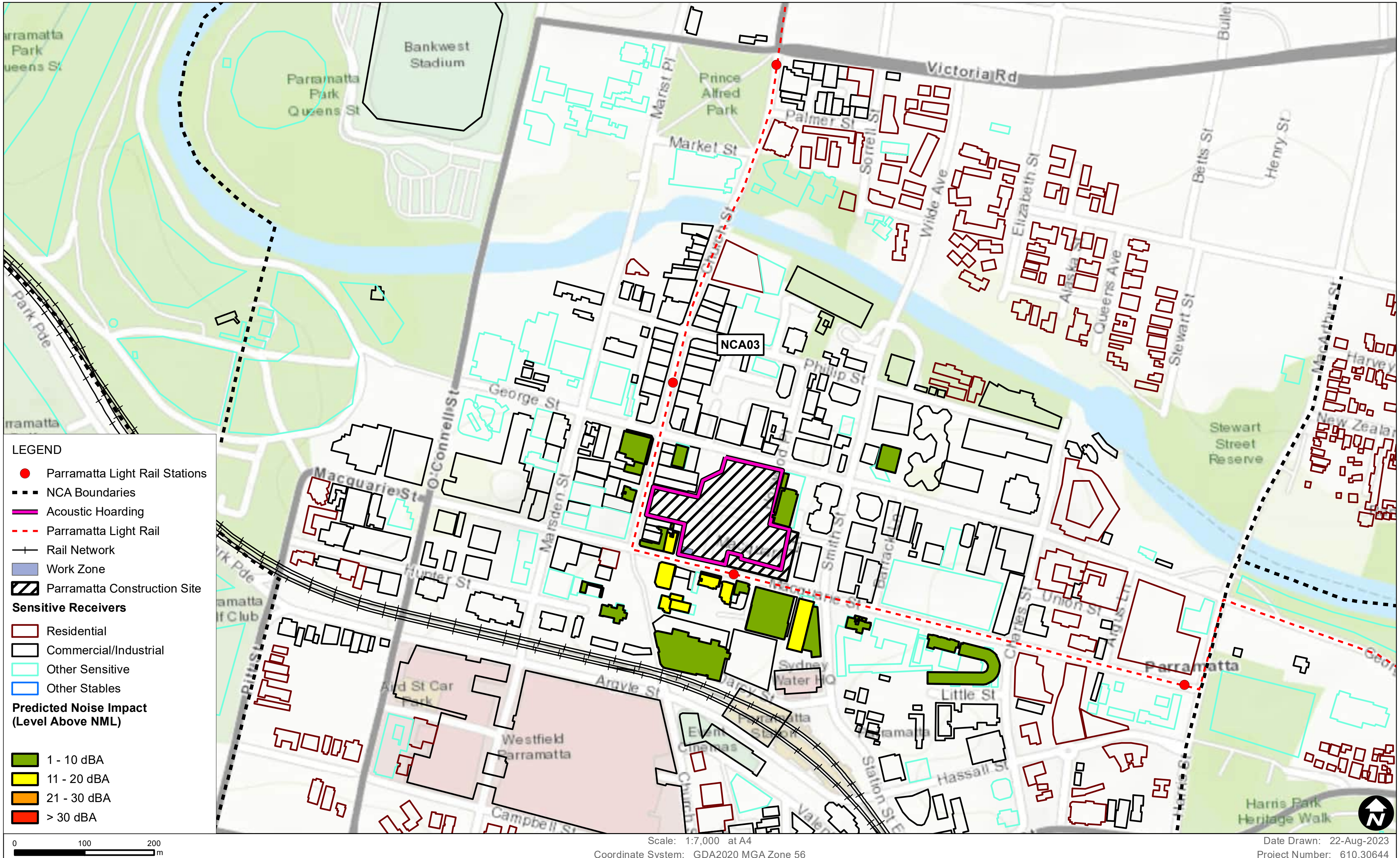
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.05 Demolition
Predicted Noise Impacts
(Approved Hours)

FIGURE C-41

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C40_PM_05_Demolition_Day_03.mxd



Scale: 1:7,000 at A4

Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023

Project Number: 610.30644

SLR

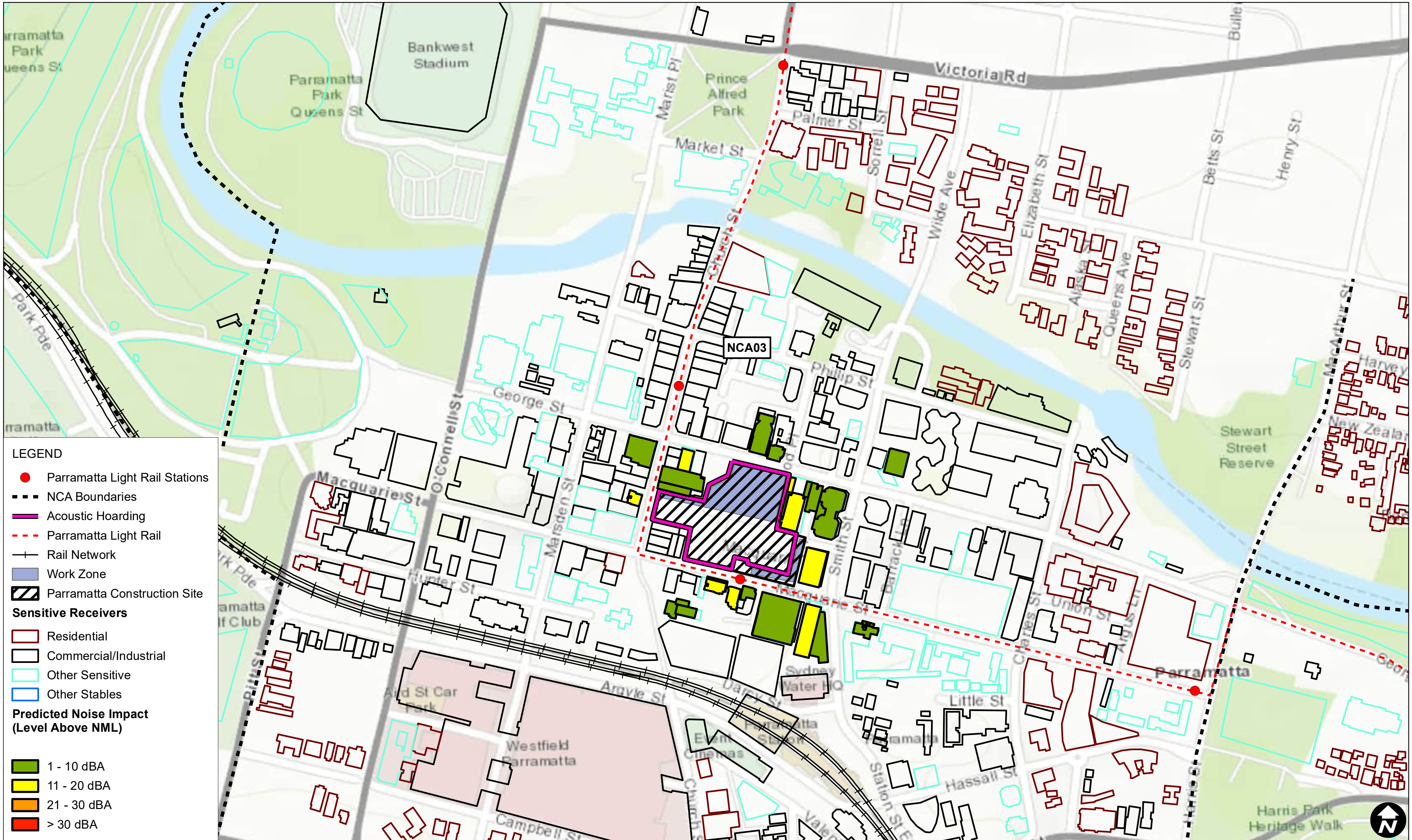
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.06 Establishing Water Treatment Plant
Predicted Noise Impacts
(Approved Hours)

FIGURE C-42

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C41_PM_06_Establishing Water Treatment Plant_Day_03.mxd



LEGEND

- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Parramatta Light Rail
- Rail Network
- Work Zone
- Parramatta Construction Site

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- > 30 dBA

0 100 200 m

Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

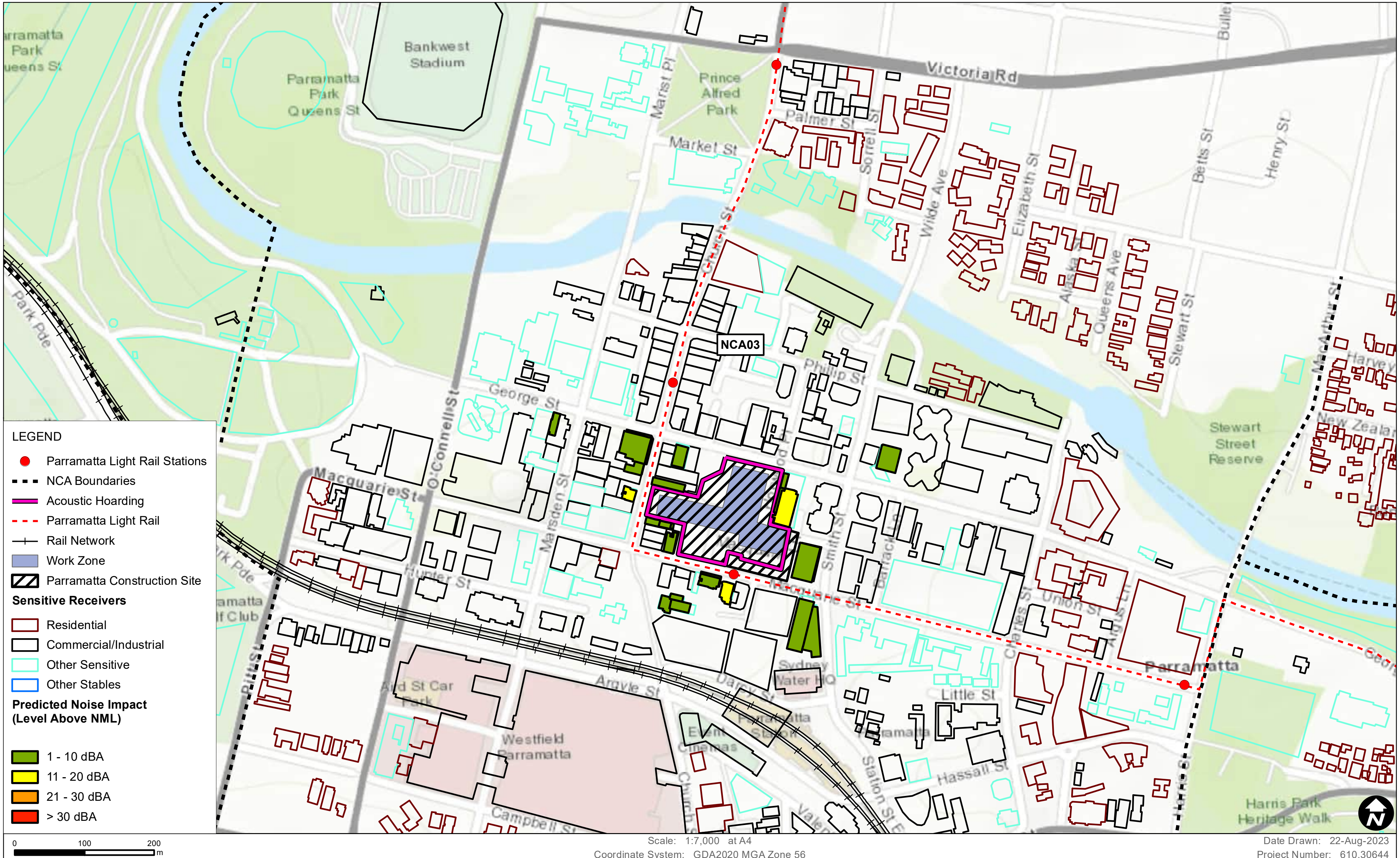
Date Drawn: 22-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.07 Establishing vehicle access and egress points Predicted Noise Impacts (Approved Hours)

FIGURE C-43



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

SLR

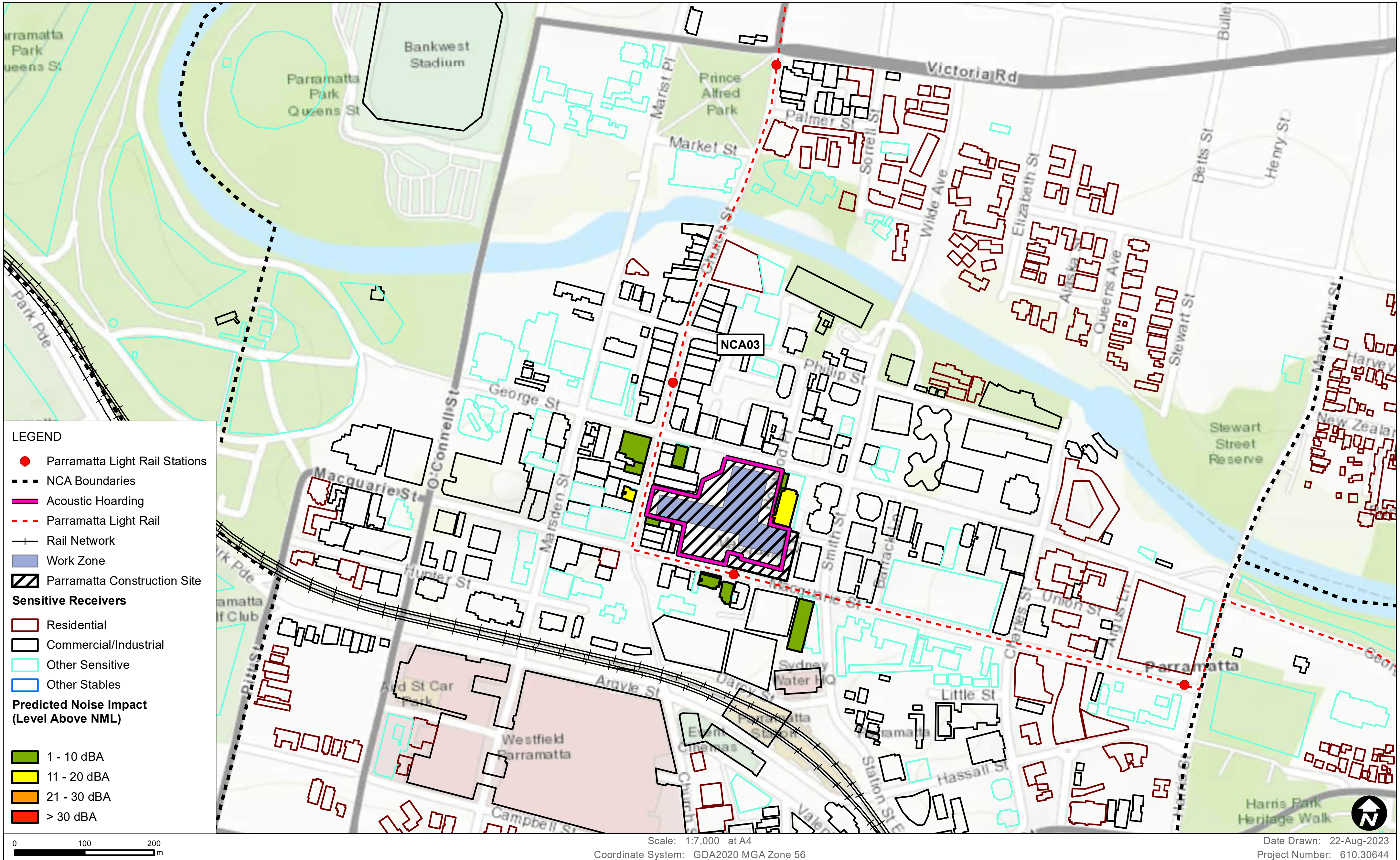
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.08a Establishing concrete slabs or piling platforms and D-Wall Infrastructure Predicted Noise Impacts (Approved Hours)

FIGURE C-44

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C43_PM_08a_Establishing concrete slabs or piling platforms and D-Wall Infrastructure_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

SLR

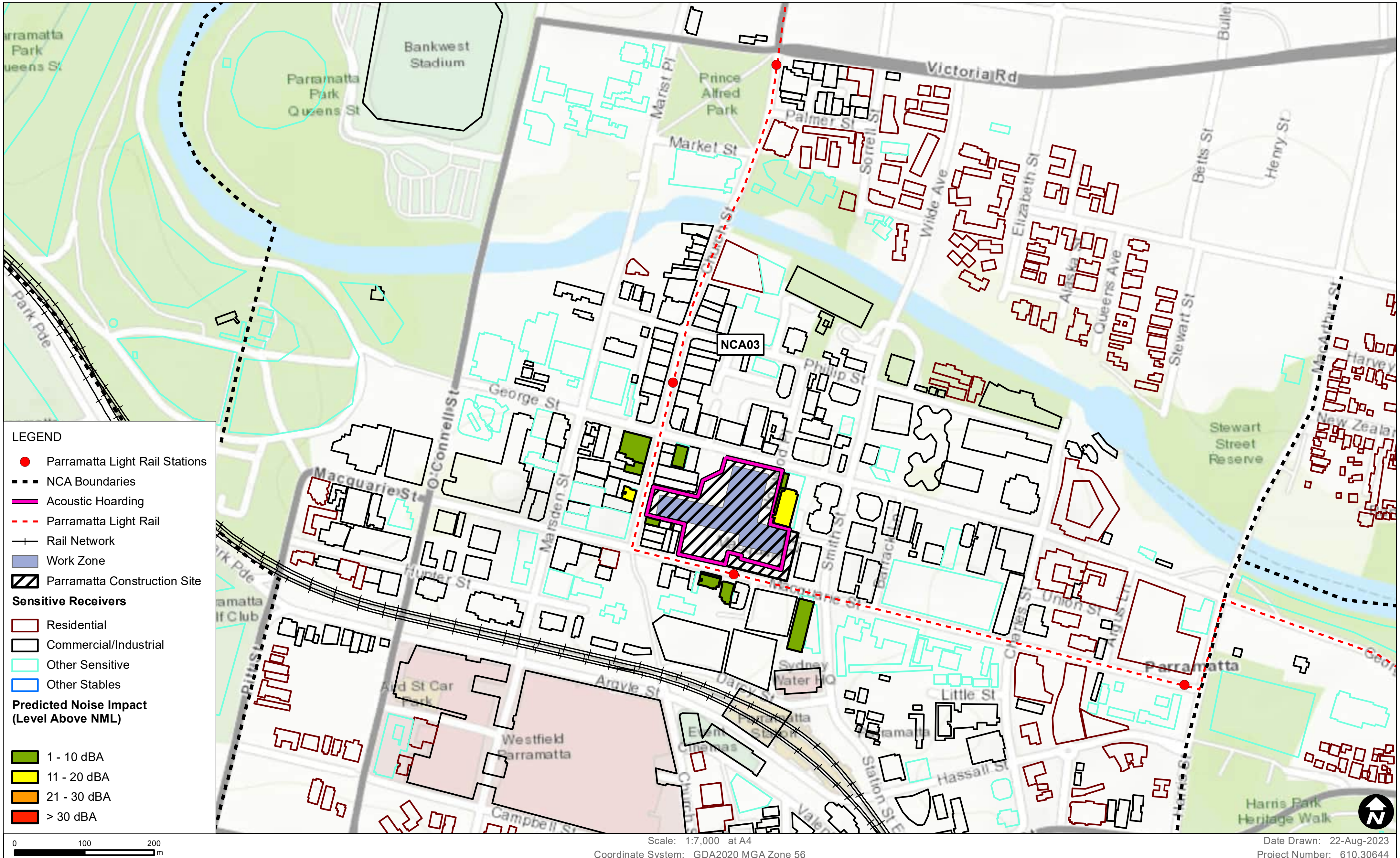
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.08b Establishing concrete slabs or piling platforms and D-Wall Infrastructure Predicted Noise Impacts (Approved Hours)

FIGURE C-45

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C44_PM_08b_Establishing concrete slabs or piling platforms and D-Wall Infrastructure OOHW_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

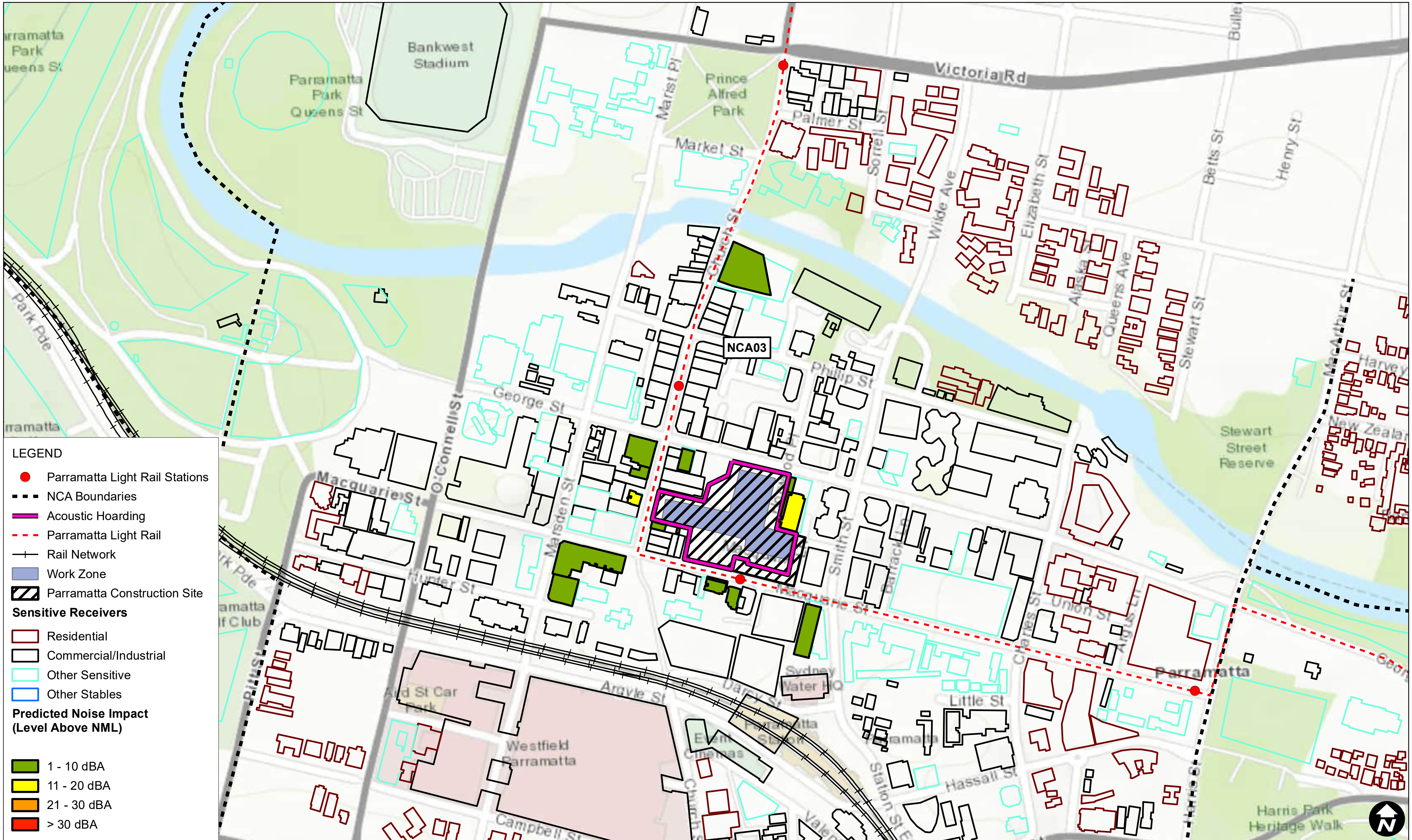
Date Drawn: 22-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.08b Establishing concrete slabs or piling platforms and D-Wall Infrastructure Predicted Noise Impacts (Evening)

FIGURE C-46



LEGEND

- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Parramatta Light Rail
- Rail Network
- Work Zone
- Parramatta Construction Site

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- > 30 dBA

0 100 200 m

Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 20-Sep-2023
Project Number: 610.30644

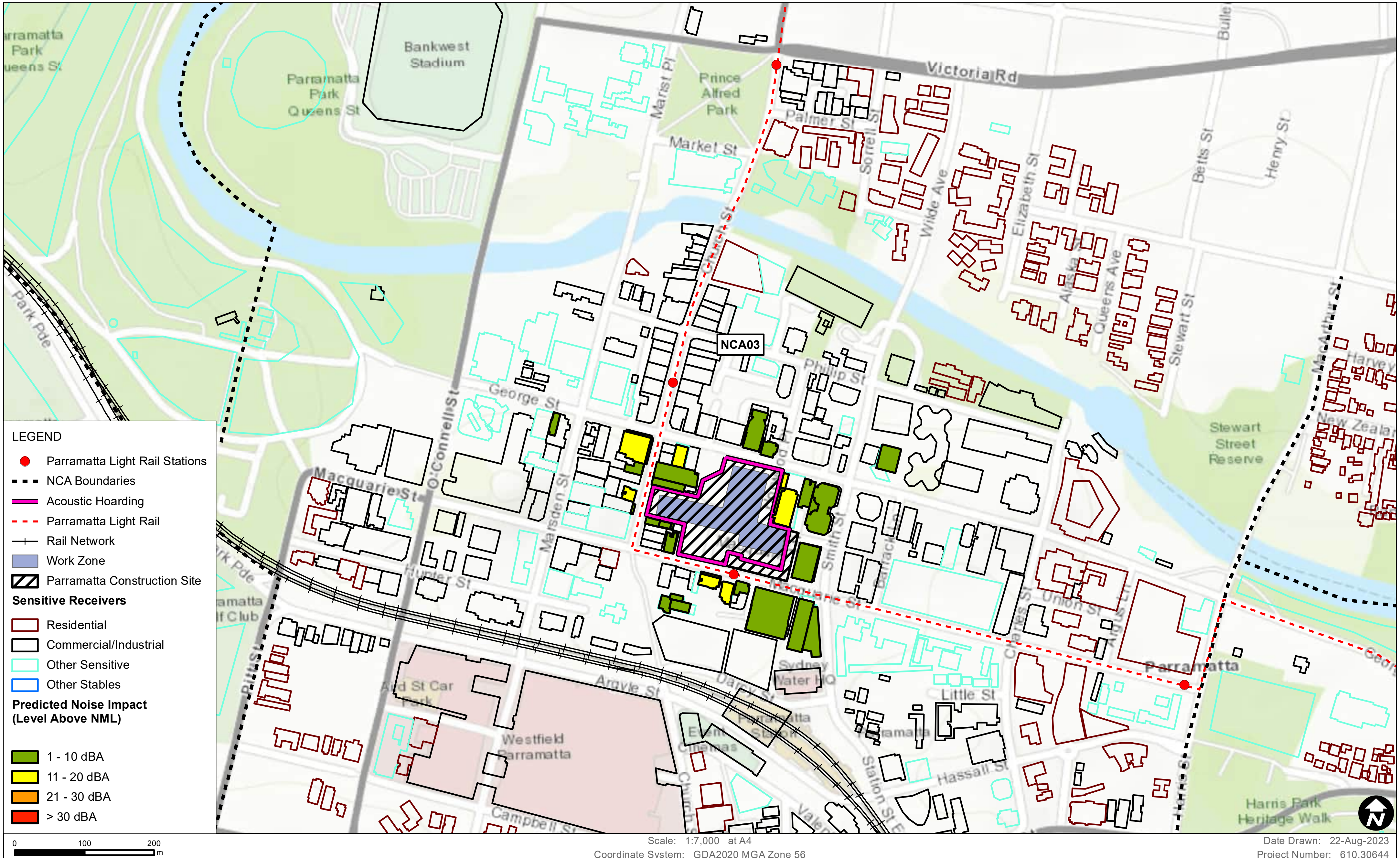
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.08b Establishing concrete slabs or piling platforms and D-Wall Infrastructure Predicted Noise Impacts (Night)

FIGURE C-47



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

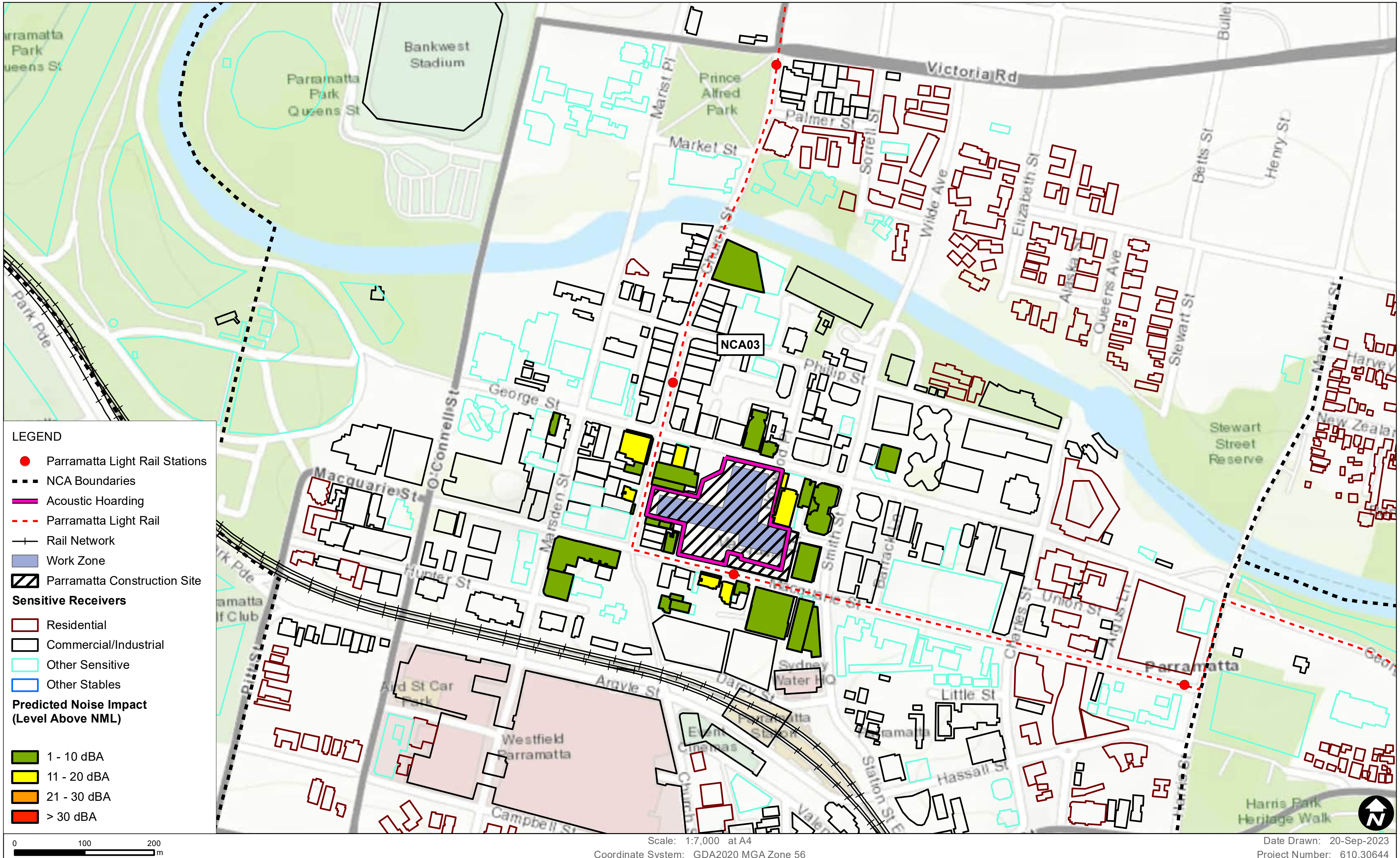
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.09a Station Box D-Wall
Predicted Noise Impacts
(Approved Hours)

FIGURE C-48

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C46_PM_09a_Station Box D-Wall_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 20-Sep-2023
Project Number: 610.30644

SLR

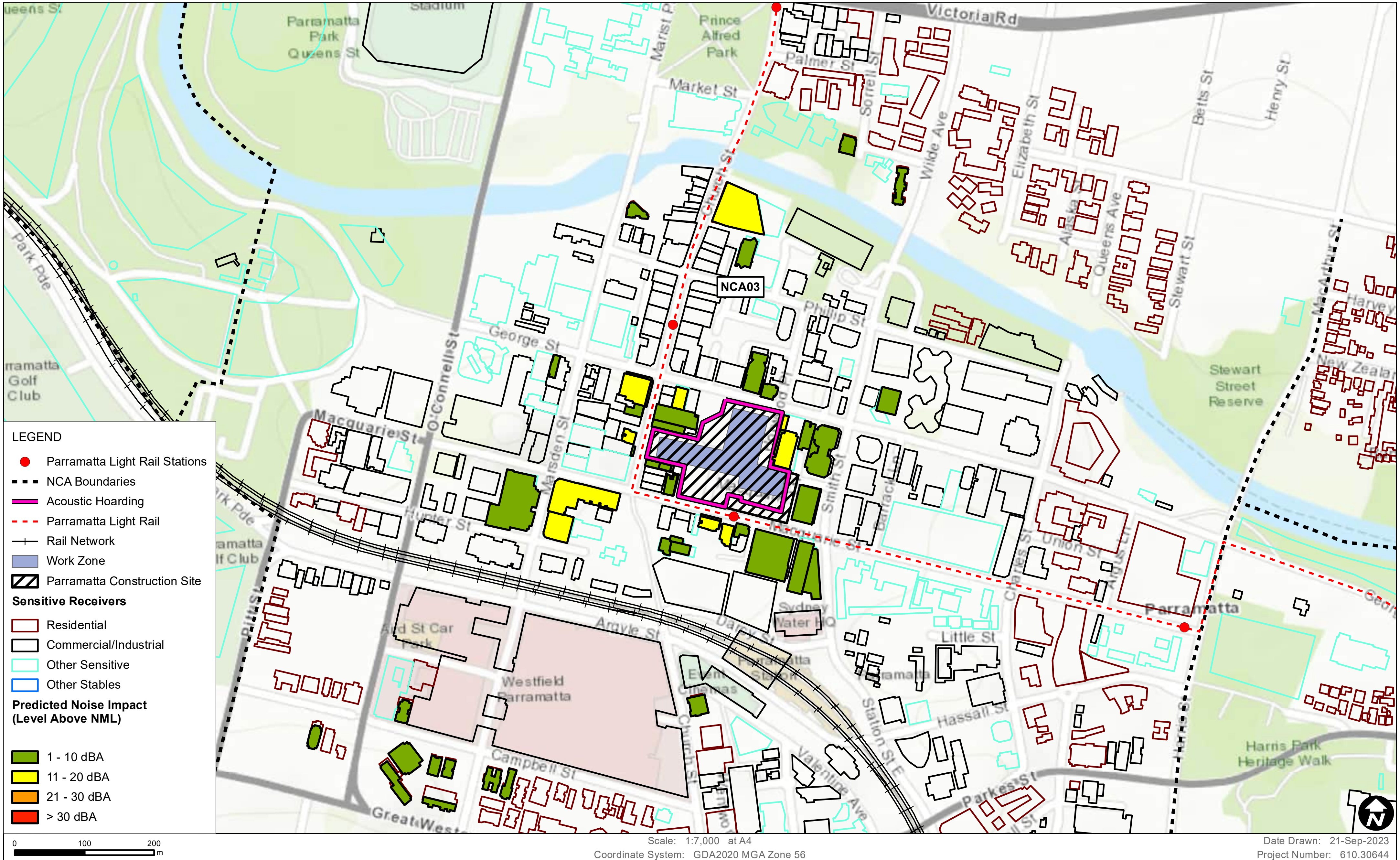
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.09a Station Box D-Wall Predicted Noise Impacts (Evening)

FIGURE C-49

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_PM_09a_Station Box D-Wall_Evening_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

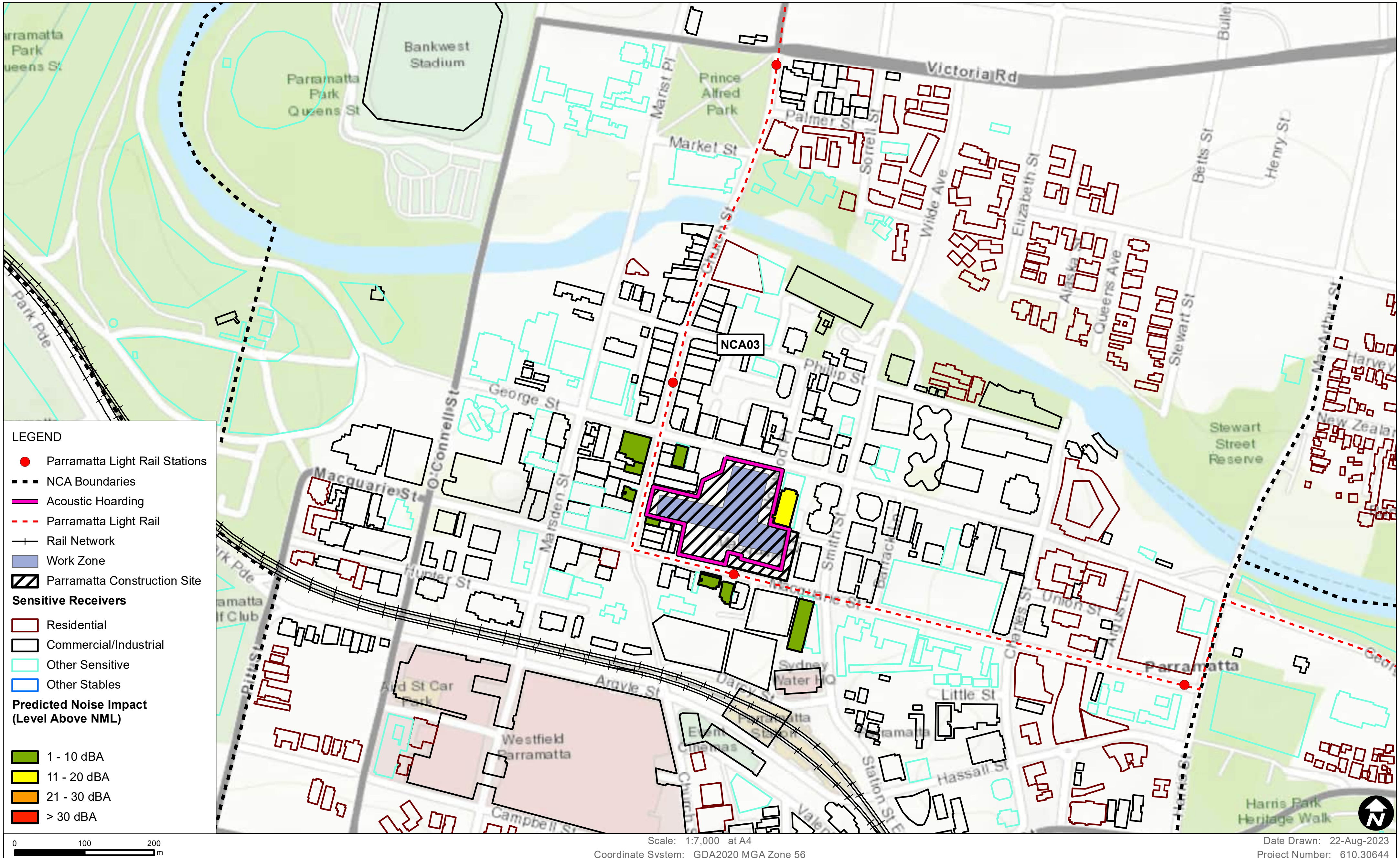
Date Drawn: 21-Sep-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.09a Station Box D-Wall Predicted Noise Impacts (Night)

FIGURE C-50



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

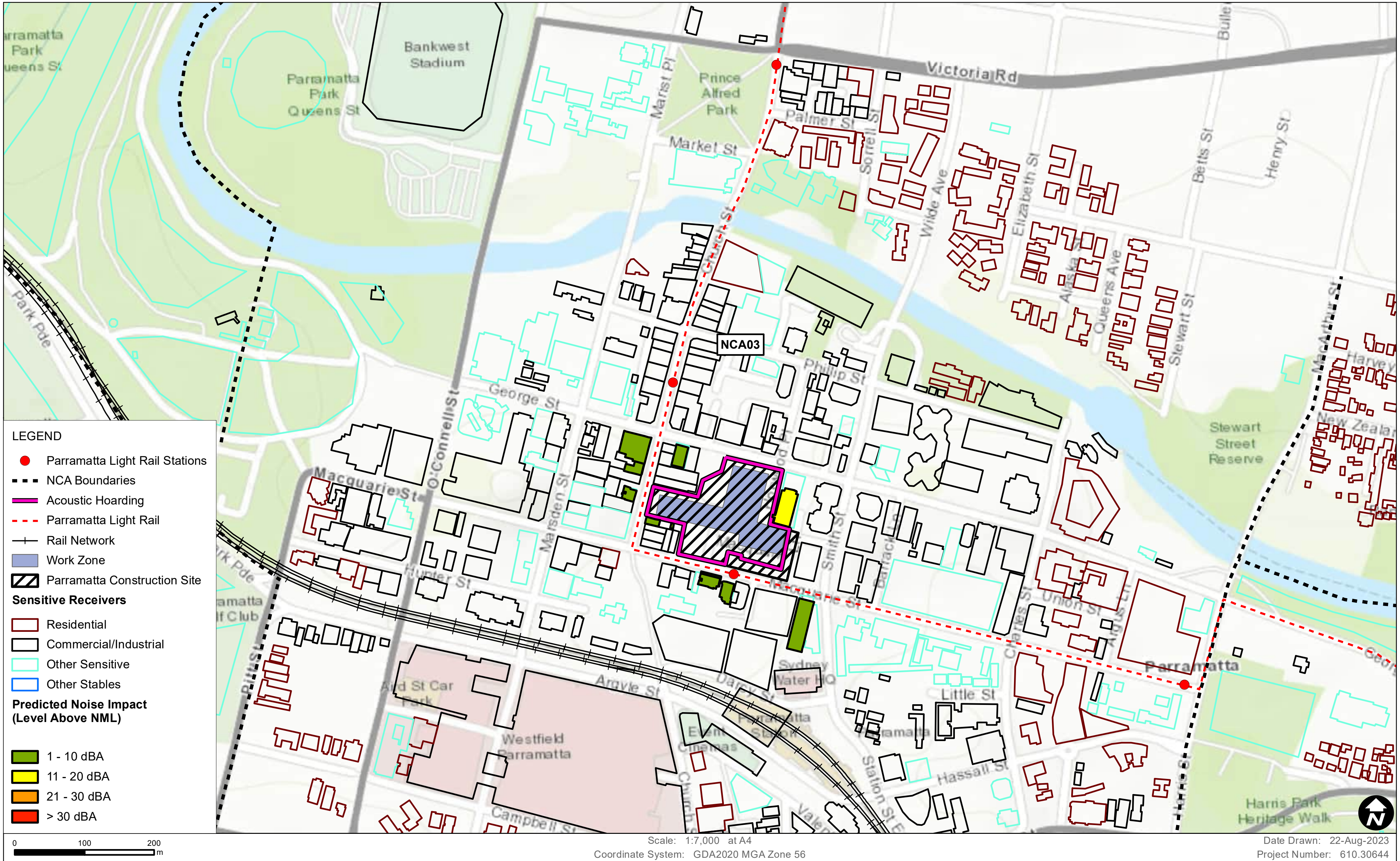
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.09b Station Box D-Wall
Predicted Noise Impacts
(Approved Hours)

FIGURE C-51

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C47_PM_09b_Station Box D-Wall_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

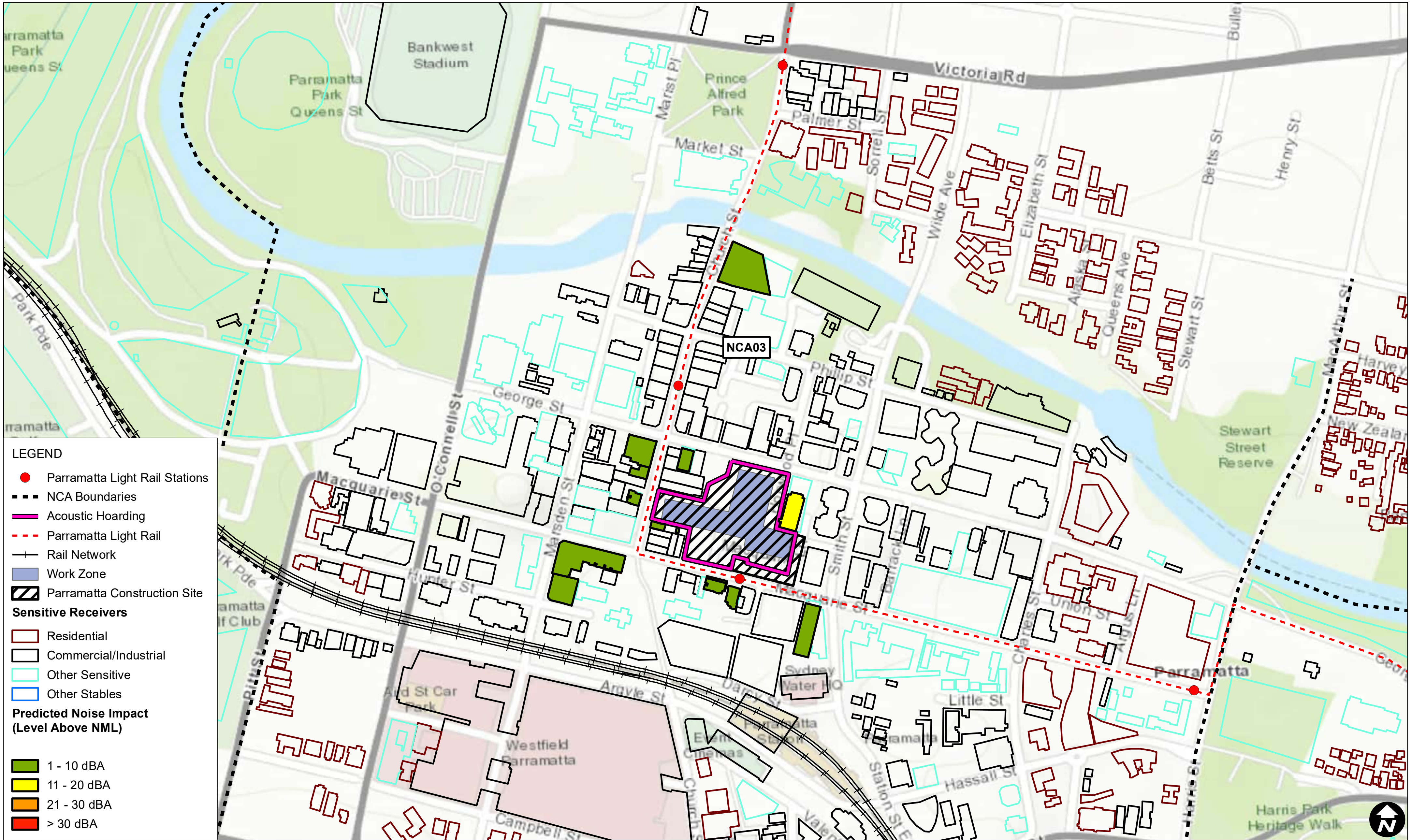
Date Drawn: 22-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.09b Station Box D-Wall Predicted Noise Impacts (Evening)

FIGURE C-52



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 20-Sep-2023
Project Number: 610.30644

SLR

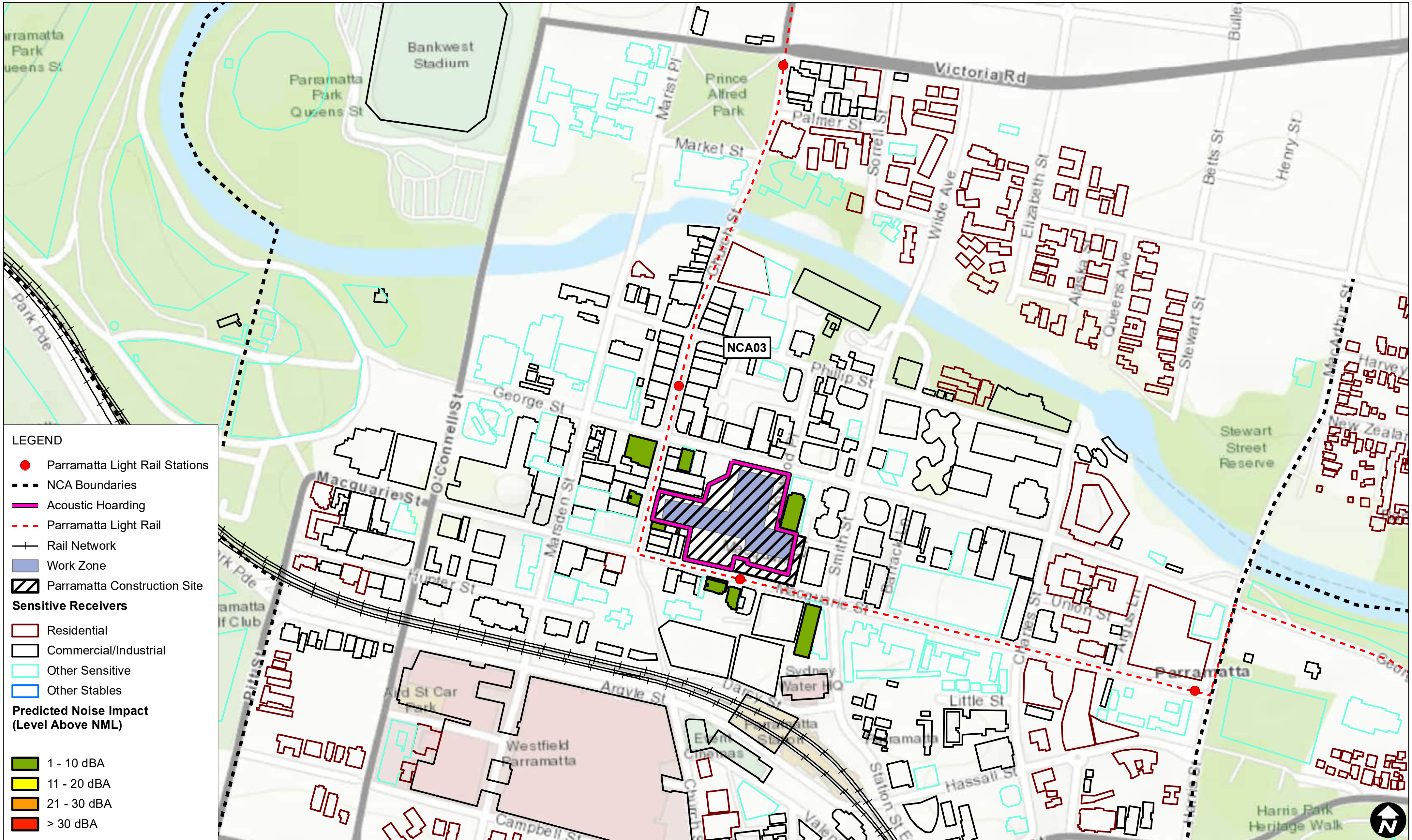
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.09b Station Box D-Wall Predicted Noise Impacts (Night)

FIGURE C-53

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_PM_09b_Station Box D-Wall_Night_03.mxd



0 100 200 m

Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 20-Sep-2023
Project Number: 610.30644

SLR

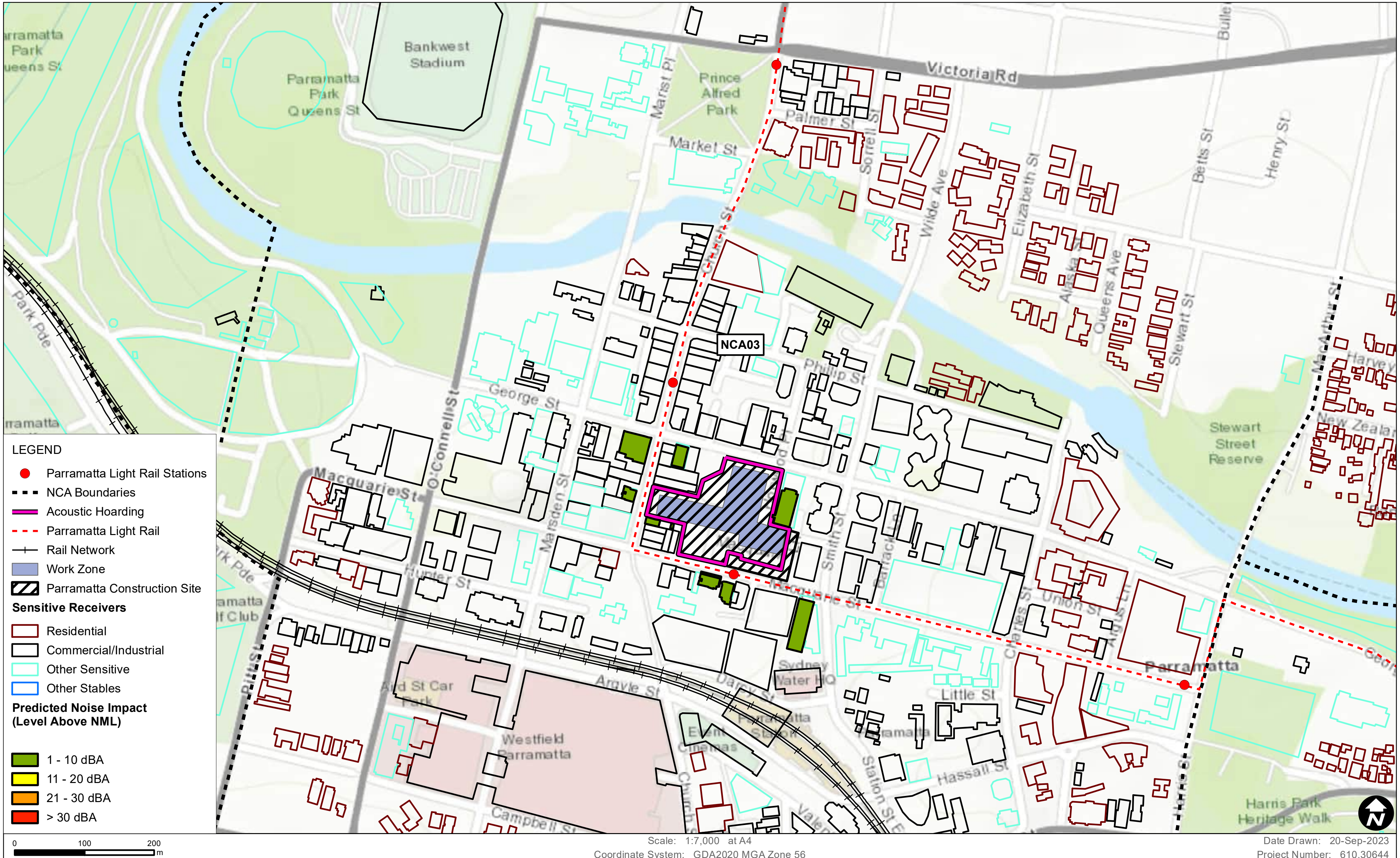
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.09c Station Box D-Wall
Predicted Noise Impacts
(Approved Hours)

FIGURE C-54

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C49_PM_09c_Station Box D-Wall_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

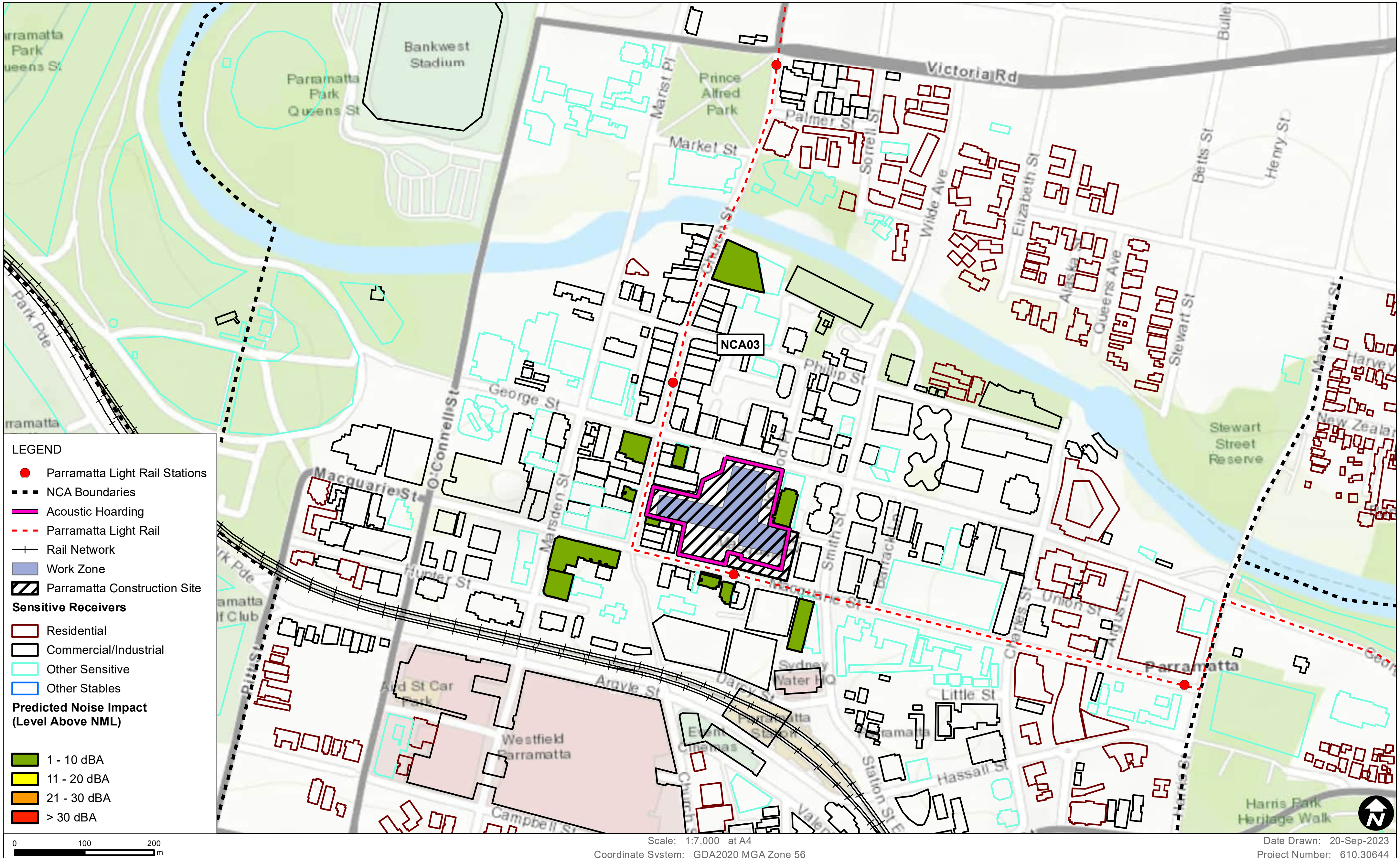
Date Drawn: 20-Sep-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.09c Station Box D-Wall Predicted Noise Impacts (Evening)

FIGURE C-55



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 20-Sep-2023
Project Number: 610.30644

SLR

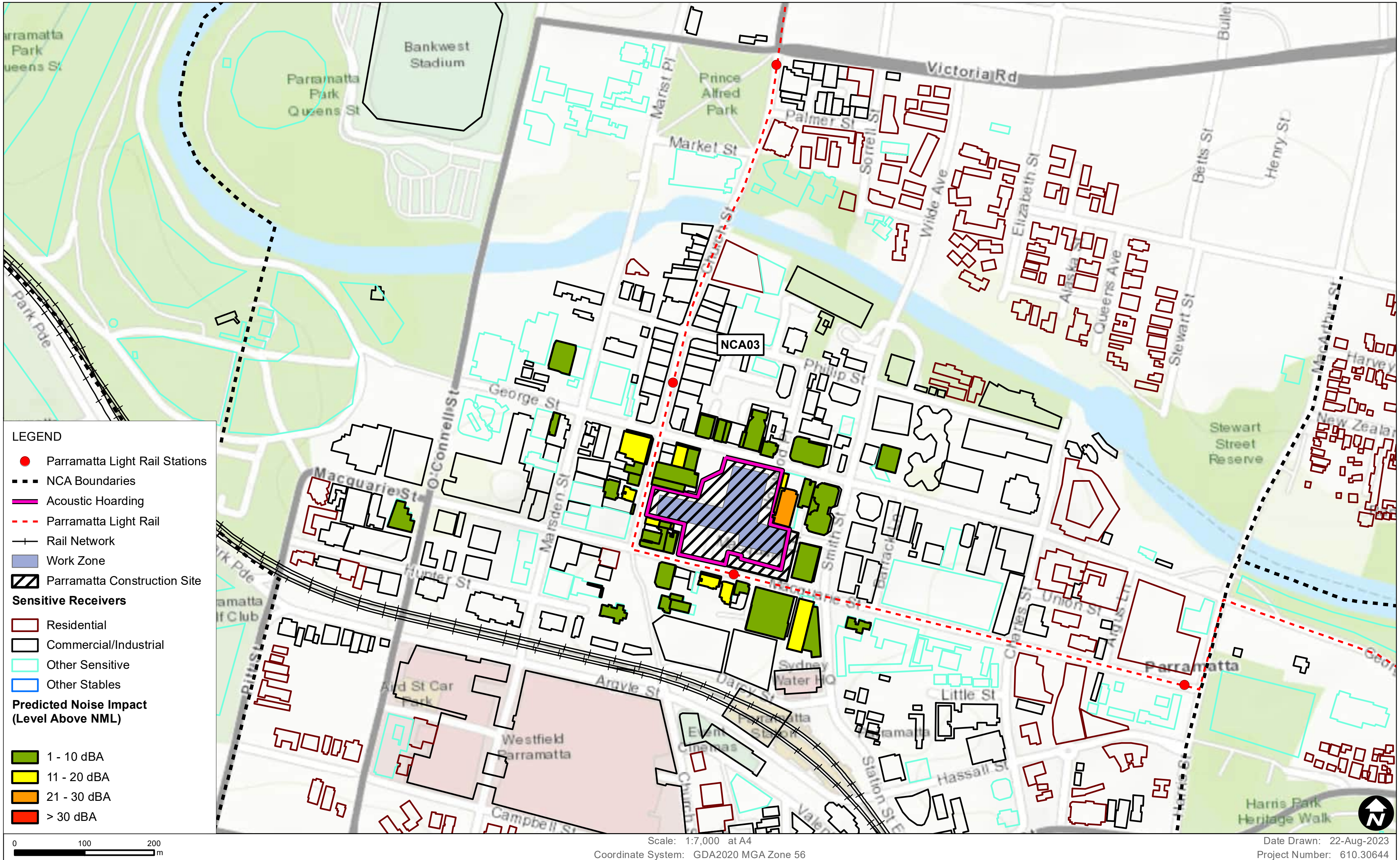
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.09c Station Box D-Wall Predicted Noise Impacts (Night)

FIGURE C-56

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C51_PM_09c_Station Box D-Wall_Night_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

SLR

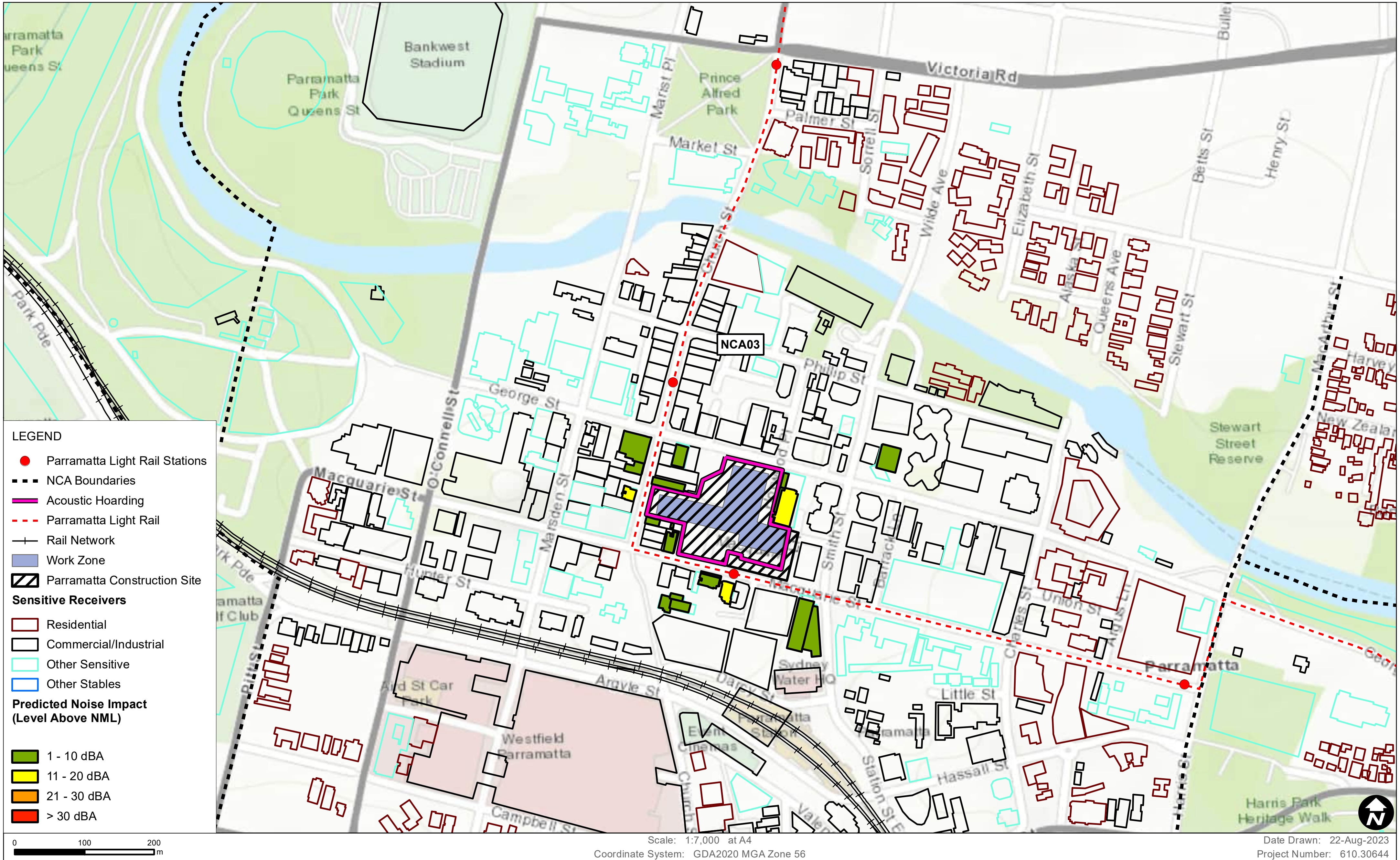
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.10 Station box pile breakback/trim
Predicted Noise Impacts
(Approved Hours)

FIGURE C-57

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C52_PM_10_Station box pile breakback trim_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

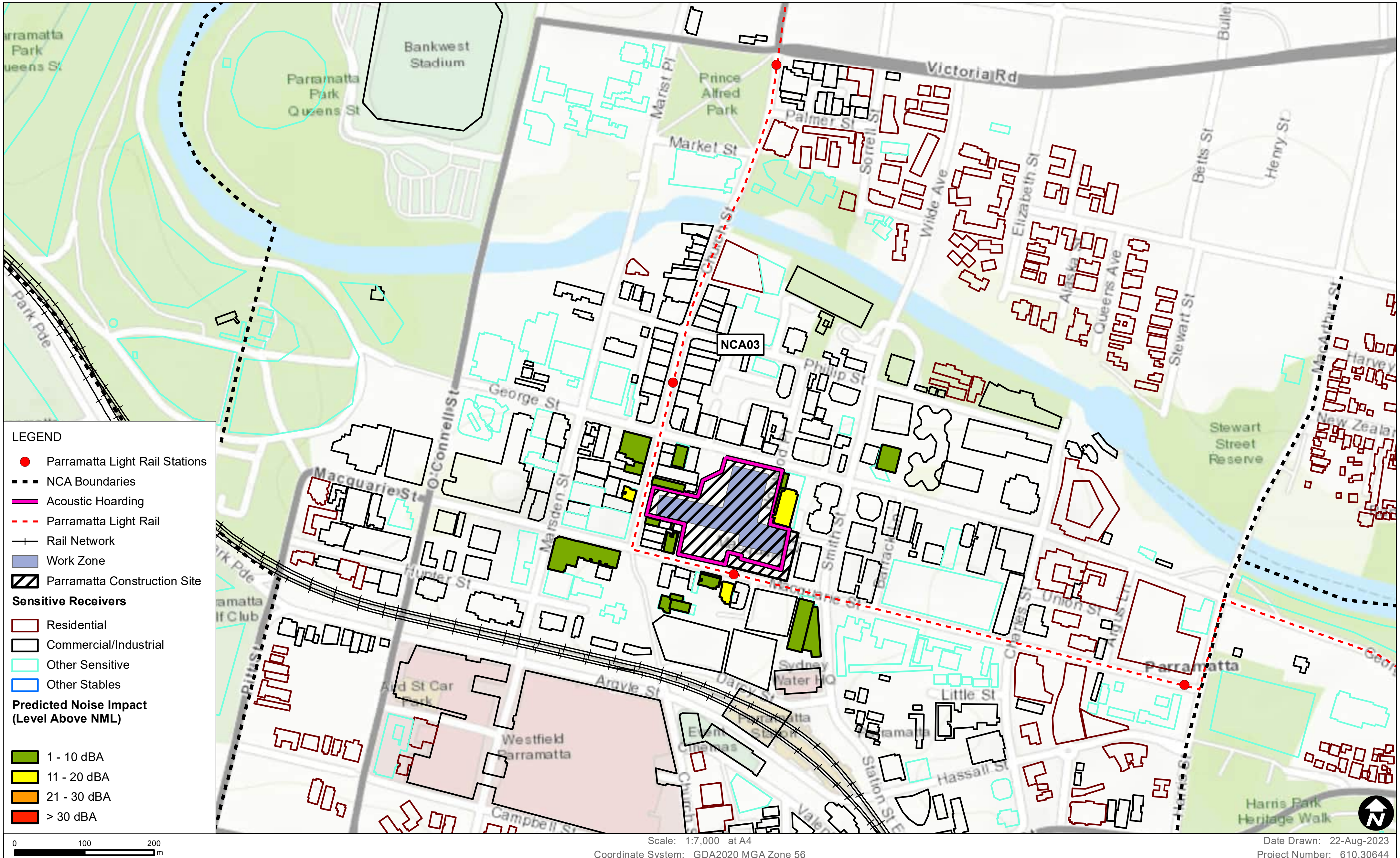
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.11 FRP (Form, Reo and Pour - concrete works)
Predicted Noise Impacts
(Approved Hours)

FIGURE C-58



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

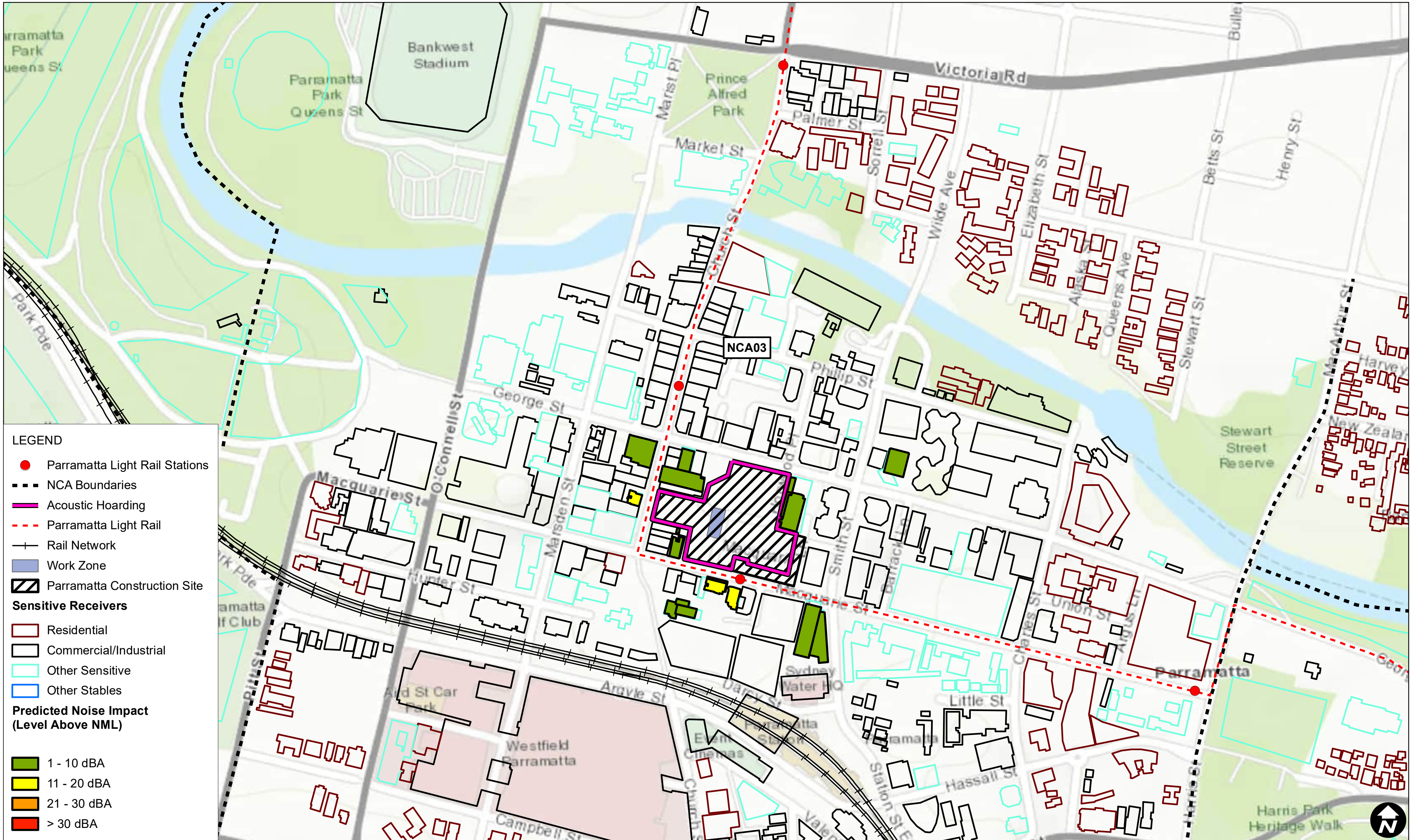
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.11 FRP (Form, Reo and Pour - concrete works)
Predicted Noise Impacts
(Evening)

FIGURE C-59



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

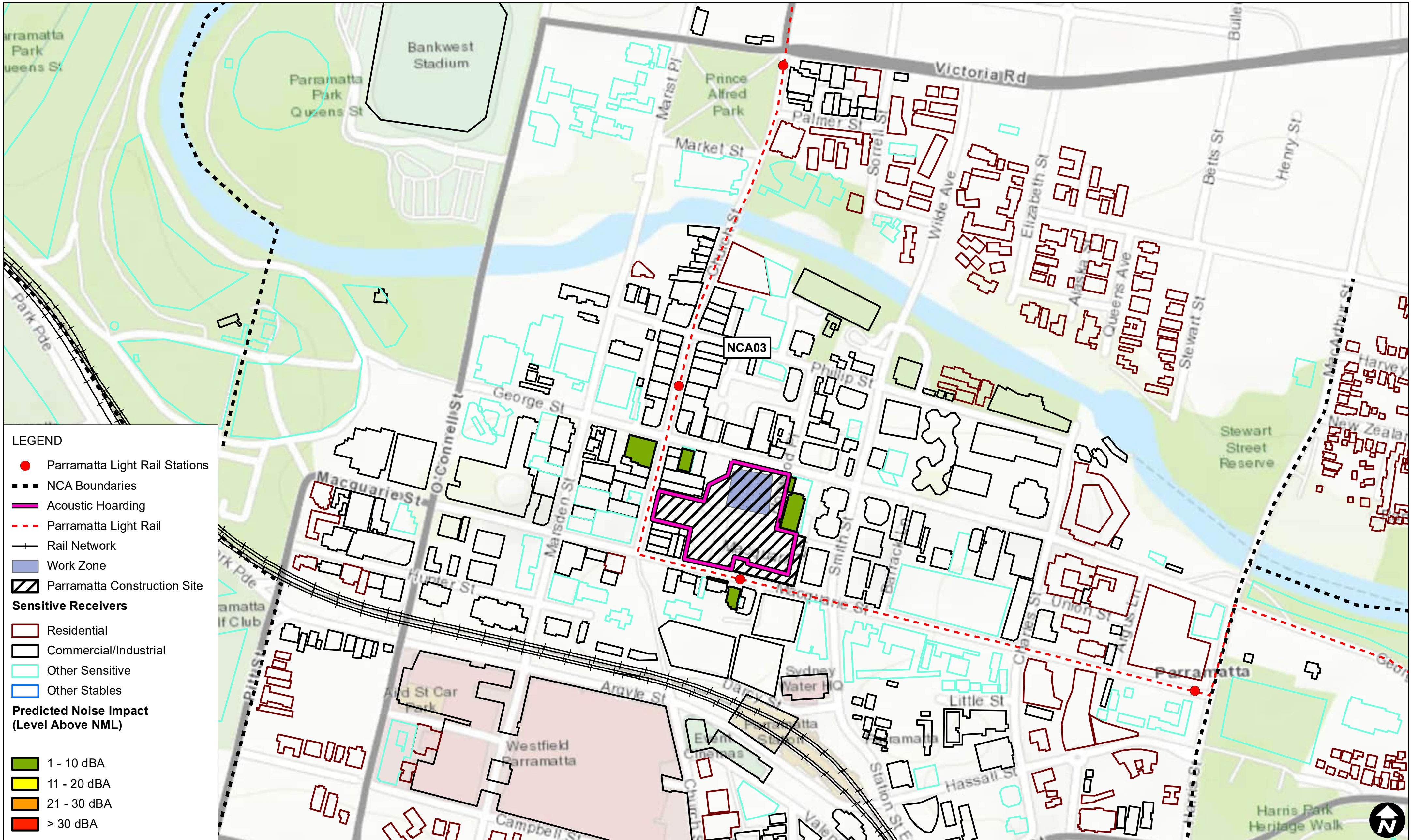
Date Drawn: 22-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.12 Internal haul road and station box bridge
Predicted Noise Impacts (Approved Hours)

FIGURE C-60



LEGEND

- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Parramatta Light Rail
- Rail Network
- Work Zone
- Parramatta Construction Site

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- > 30 dBA

0 100 200 m

Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

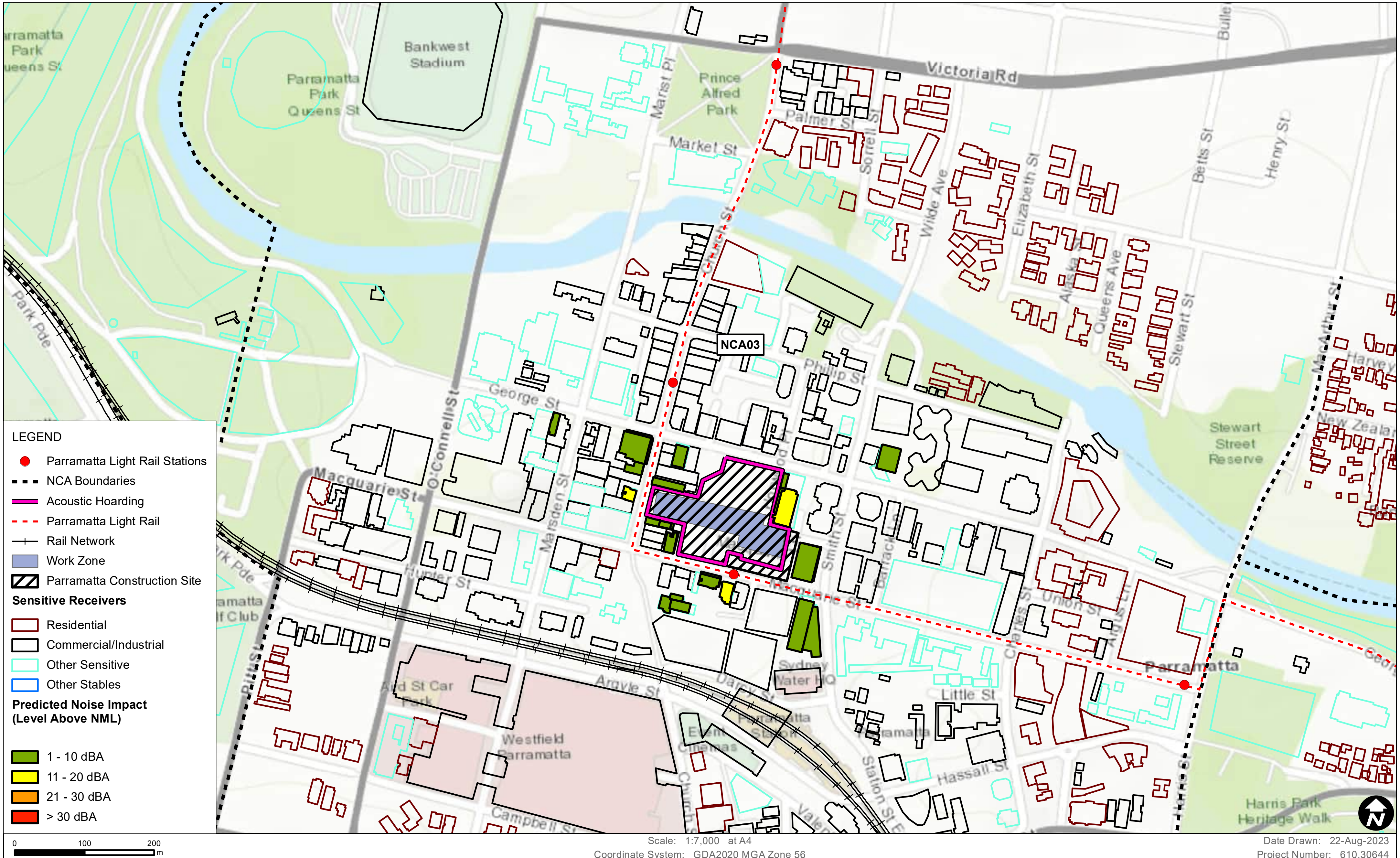
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.13 Establishing spoil stockpile area Predicted Noise Impacts (Approved Hours)

FIGURE C-61

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C56_PM_13_Establishing spoil stockpile area_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

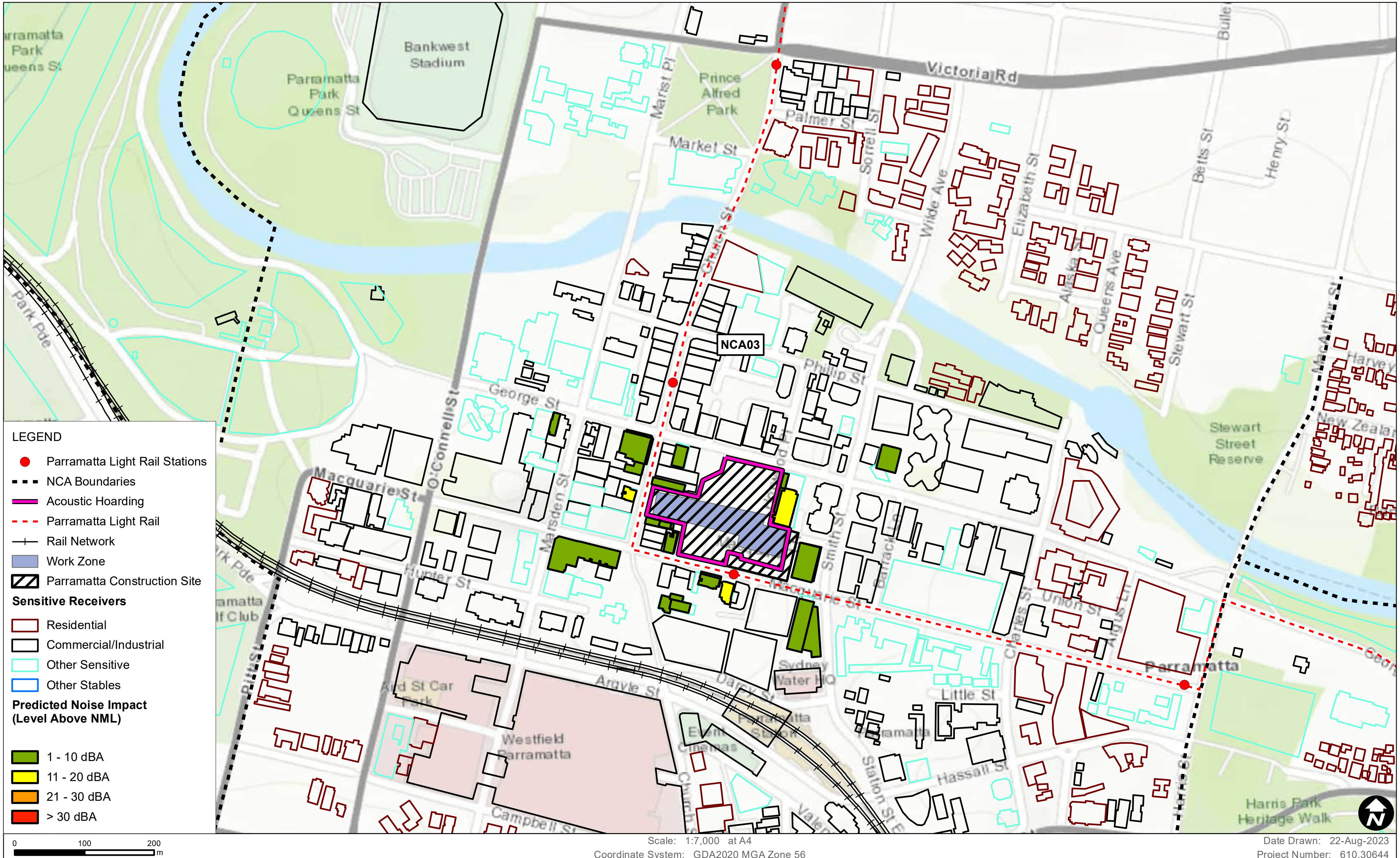
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.14 Box excavation ground support - internal struts and waler install
Predicted Noise Impacts
(Approved Hours)

FIGURE C-62

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C57_PM_14_Box excavation ground support - internal struts and waler install_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

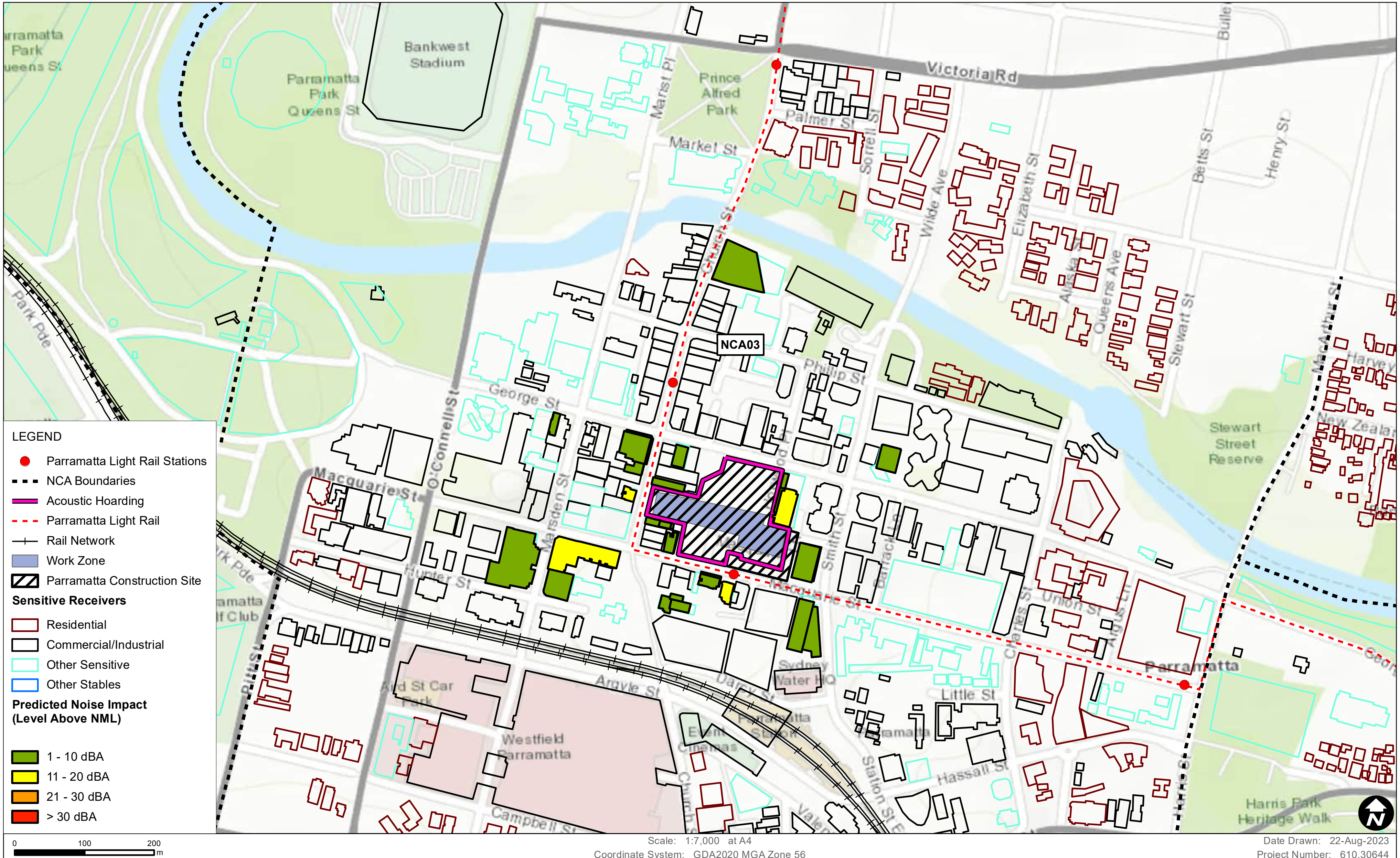
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.14 Box excavation ground support - internal struts and waler install
Predicted Noise Impacts
(Evening)

FIGURE C-63

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C58_PM_14_Box excavation ground support - internal struts and waler install_Evening_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

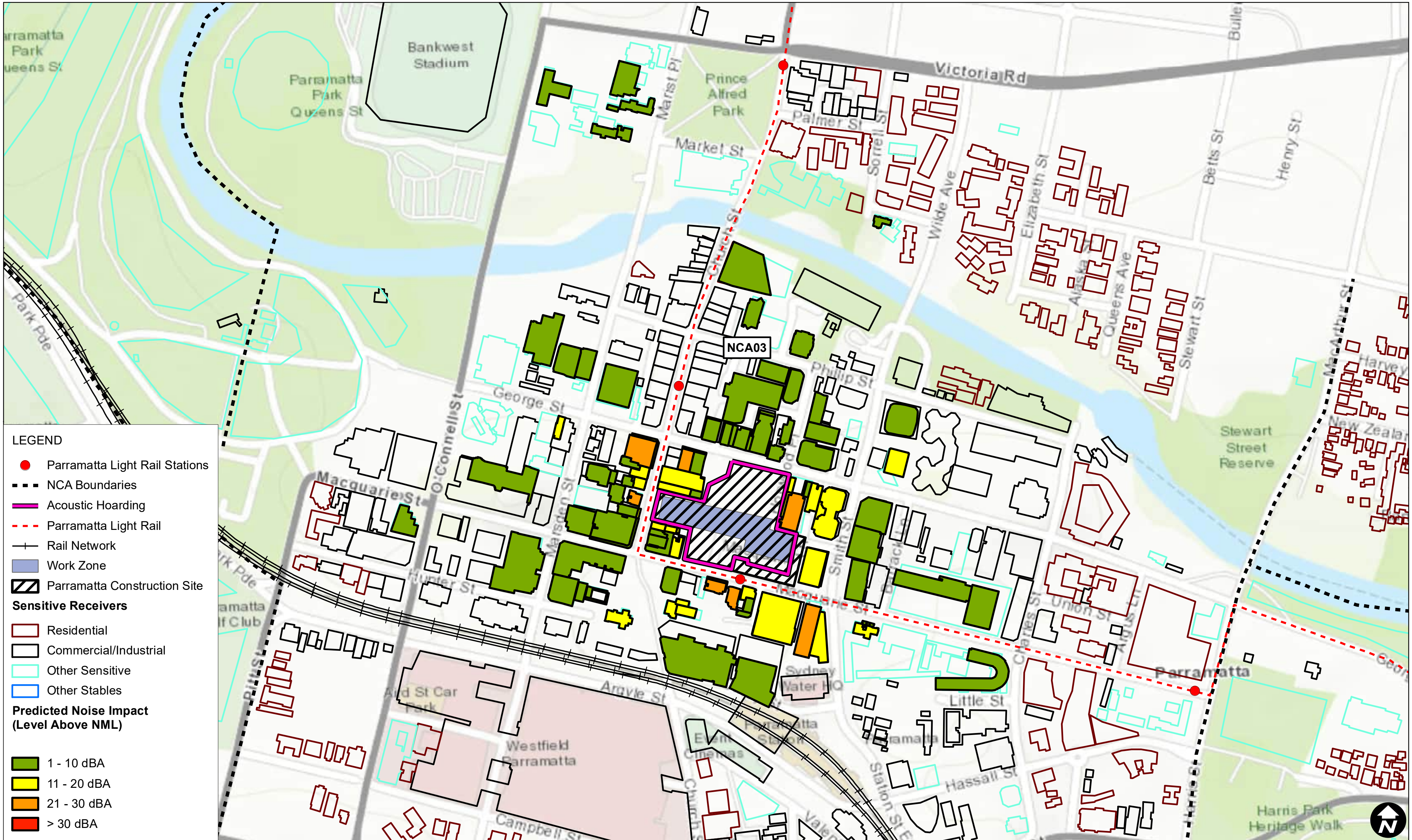
Date Drawn: 22-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.14 Box excavation ground support - internal struts and waler install
Predicted Noise Impacts
(Night)

FIGURE C-64



0 100 200 m

Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

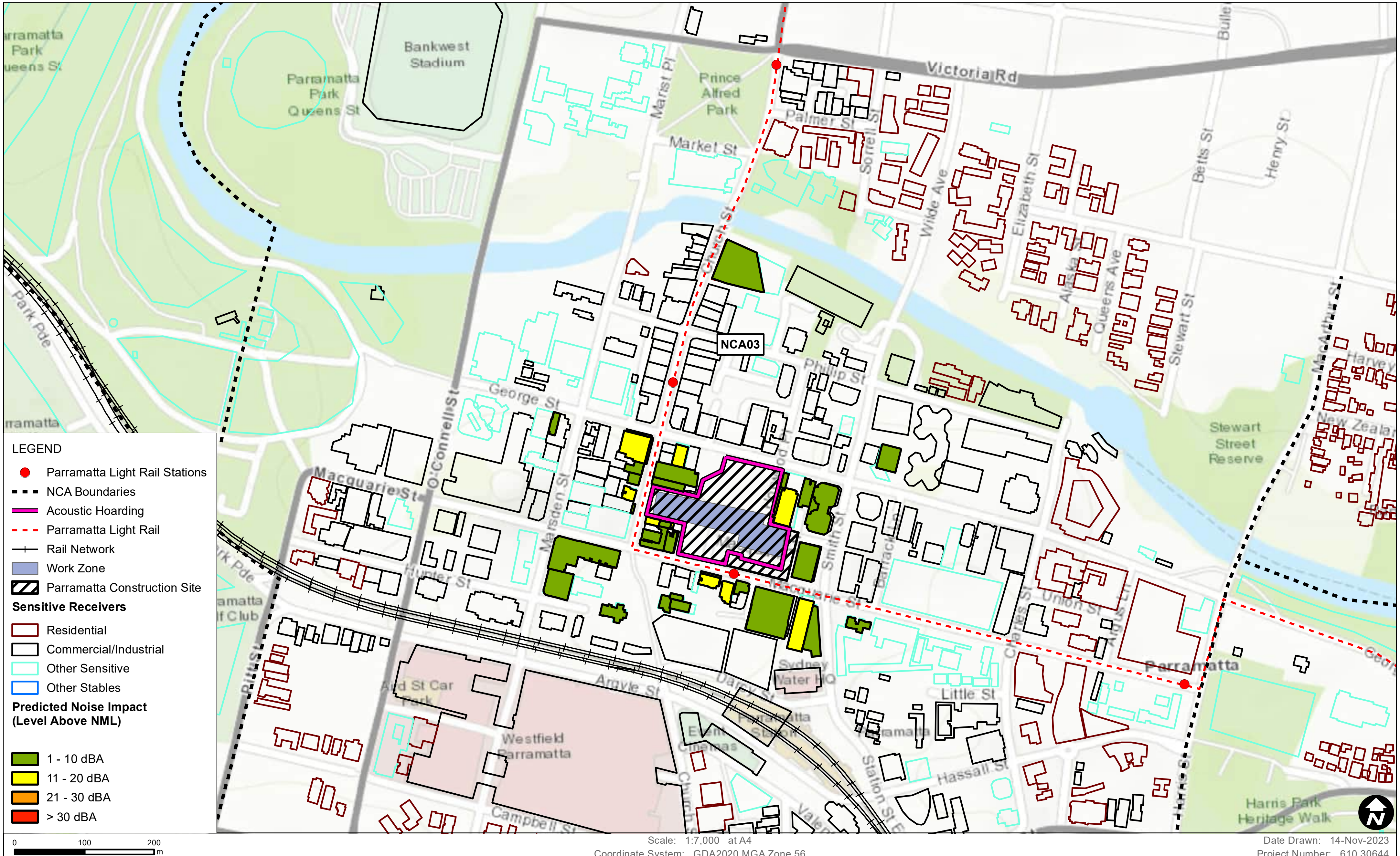
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.15 Box Excavation to -26m
Predicted Noise Impacts
(Approved Hours)

FIGURE C-65

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C60_PM_15_Box Excavation to - 26m_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 14-Nov-2023
Project Number: 610.30644

SLR

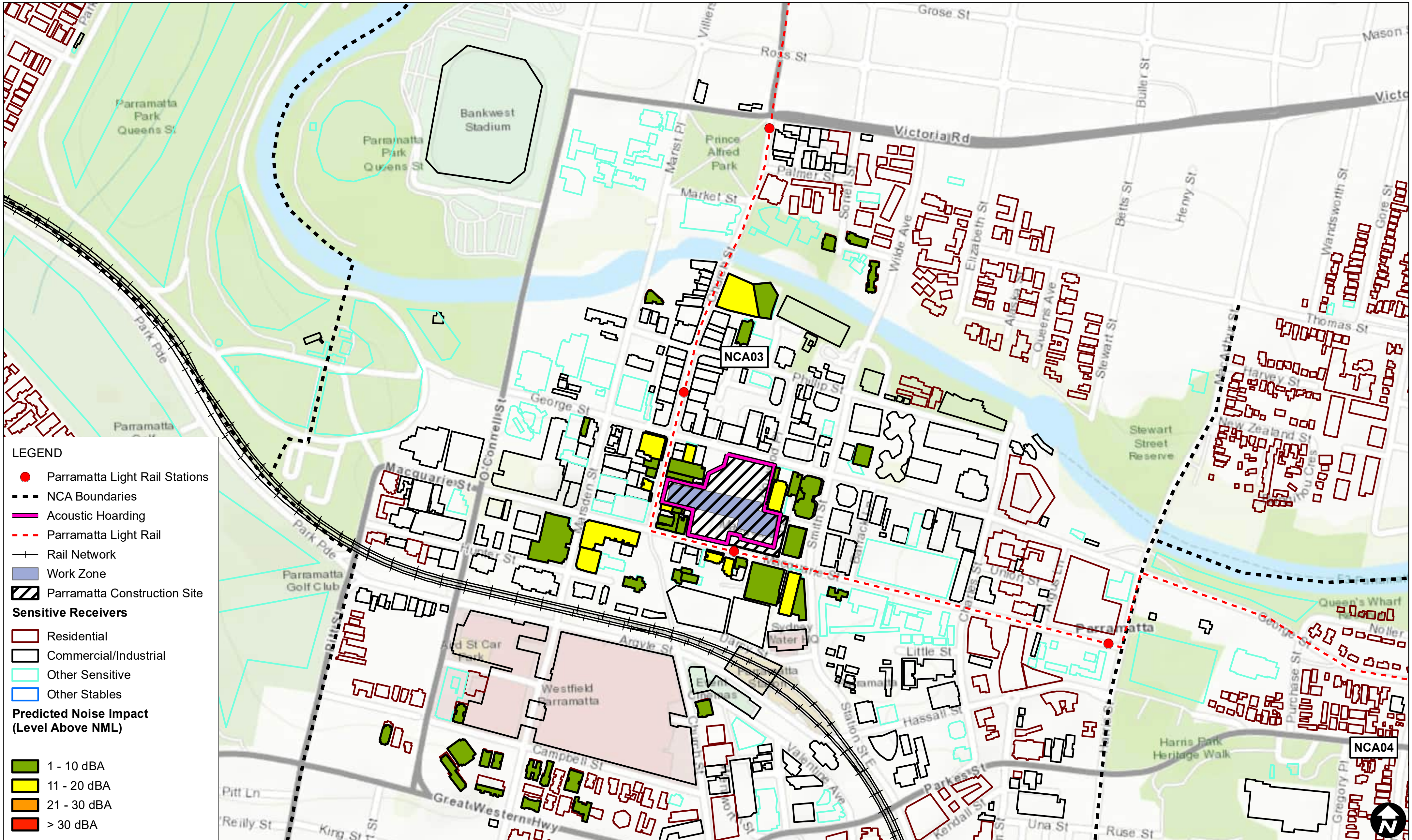
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.15 Box Excavation to -26m
Predicted Noise Impacts
(Evening)

FIGURE C-66

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_PM_15_Box Excavation to - 26m_Evening_04.mxd



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 14-Nov-2023
Project Number: 610.30644

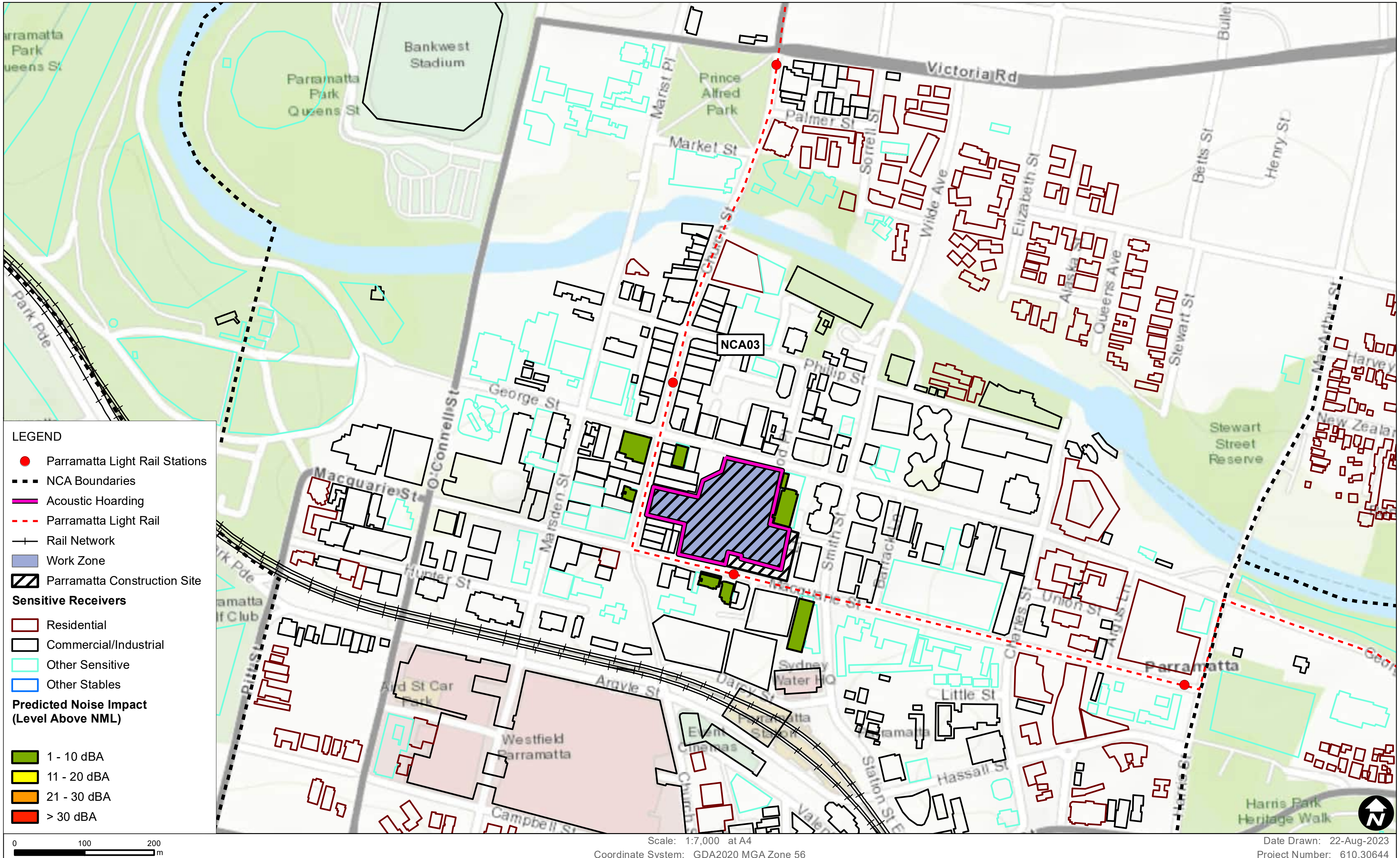
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.15 Box Excavation to -26m
Predicted Noise Impacts
(Night)

FIGURE C-67

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_PM_15_Box Excavation to - 26m_Night_04.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

SLR

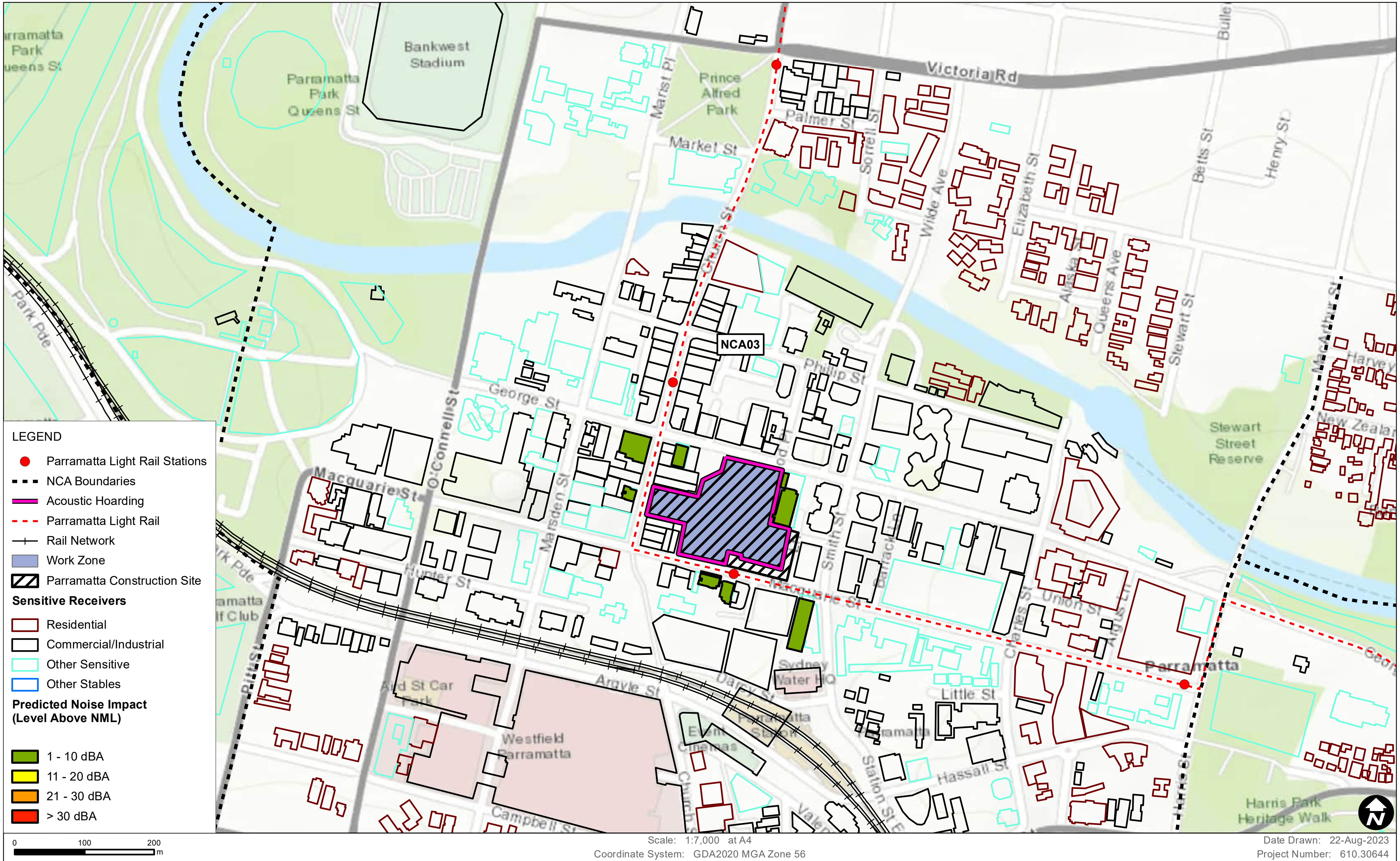
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.16 Delivery of Equipment
Predicted Noise Impacts
(Approved Hours)

FIGURE C-68

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C63_PM_16_Delivery of Equipment_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

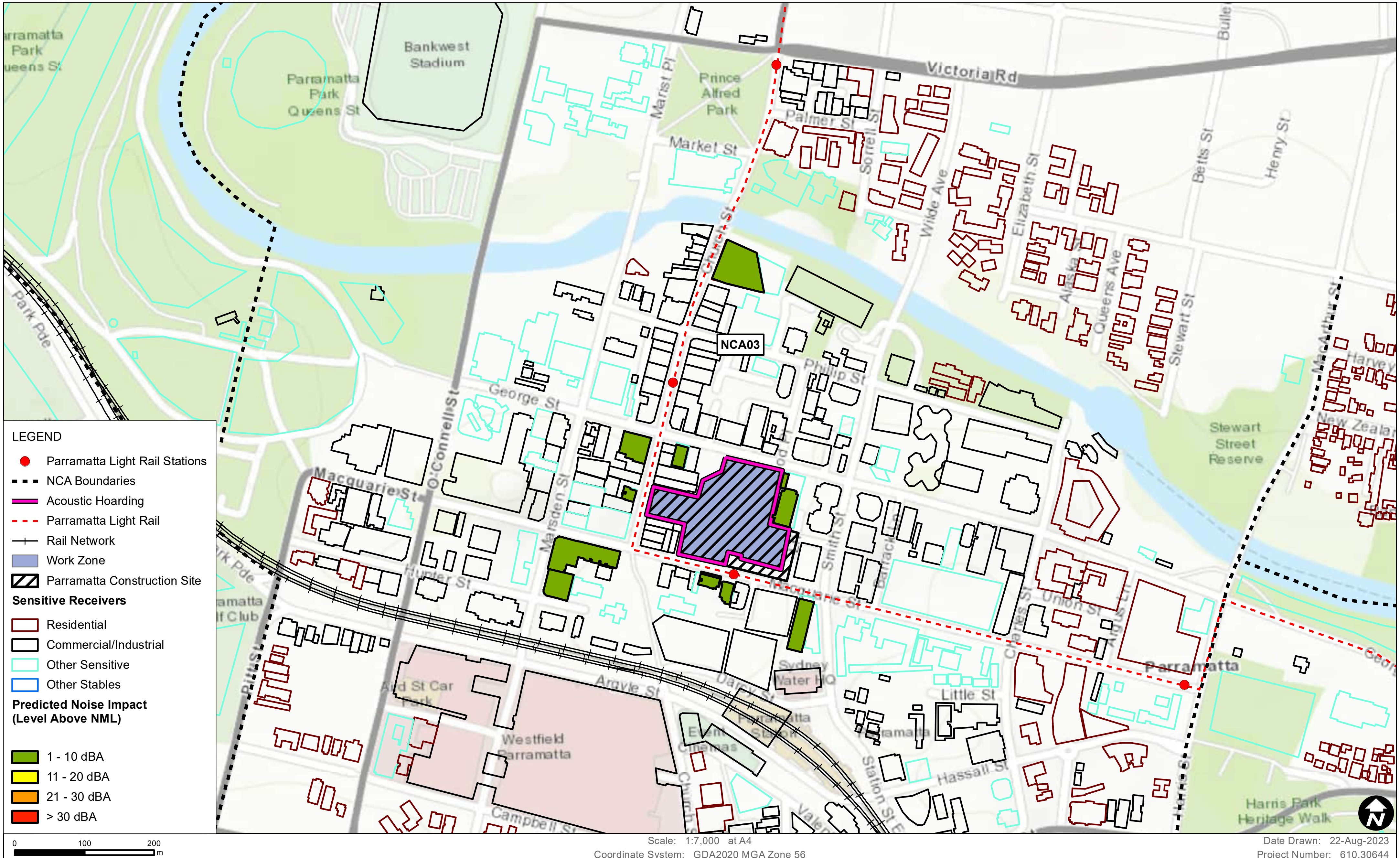
Date Drawn: 22-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.16 Delivery of Equipment Predicted Noise Impacts (Evening)

FIGURE C-69



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

SLR

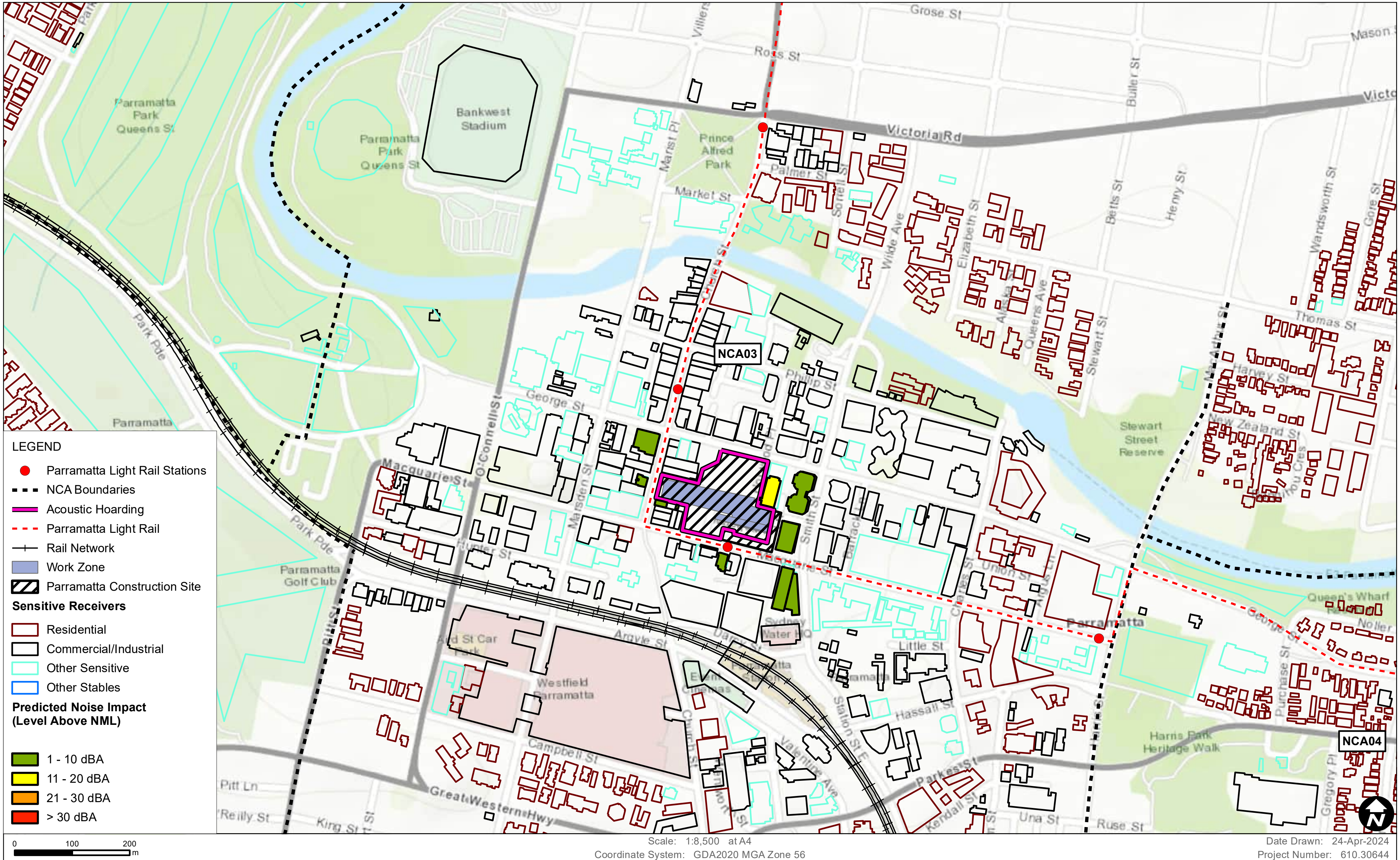
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.16 Delivery of Equipment
Predicted Noise Impacts
(Night)

FIGURE C-70

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C65_PM_16_Delivery of Equipment_Night_03.mxd



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

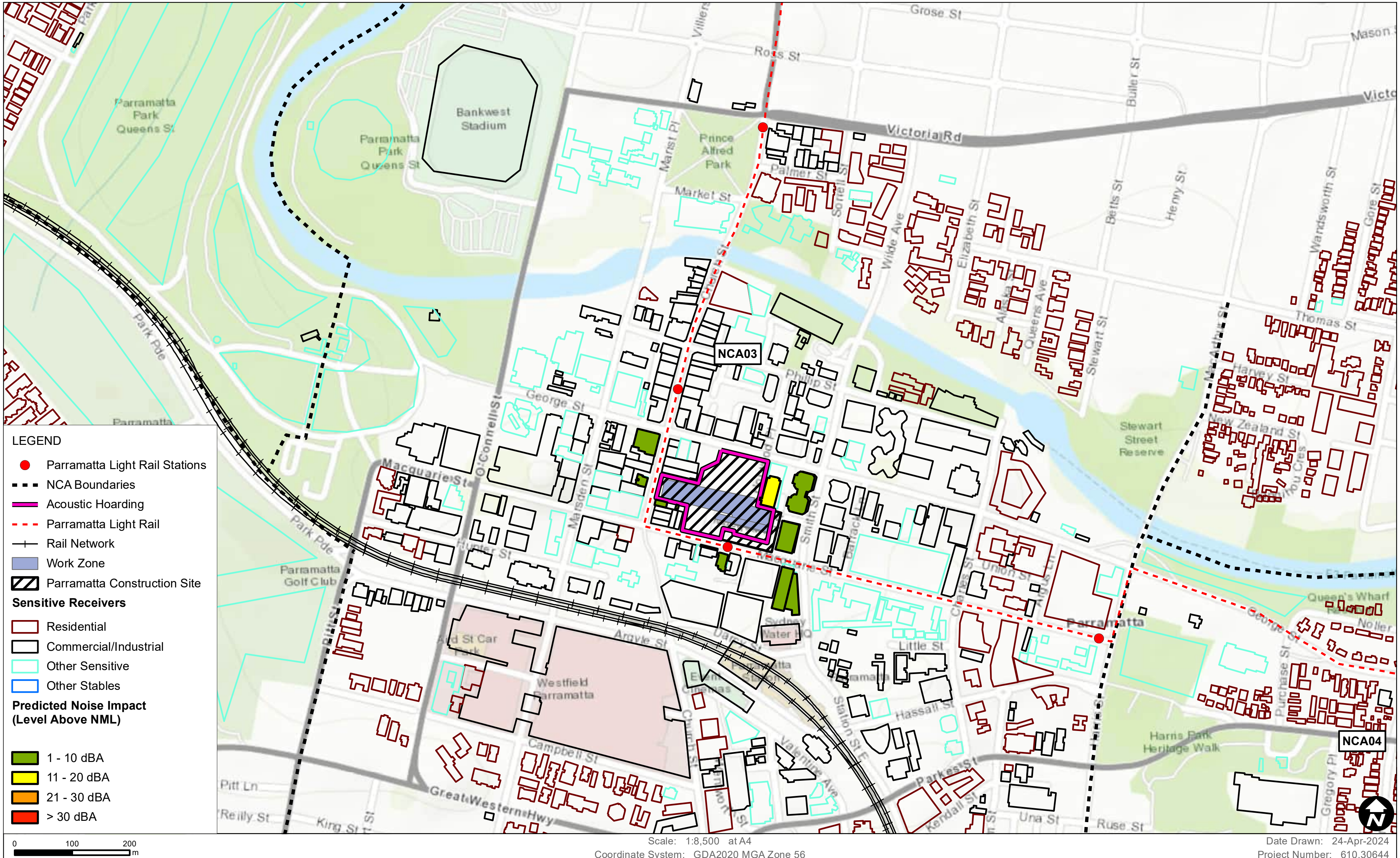
Date Drawn: 24-Apr-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17a Nozzle construction and demobilisation - fissure grouting Predicted Noise Impacts (Approved Hours)

FIGURE C-71



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 24-Apr-2024
Project Number: 610.30644

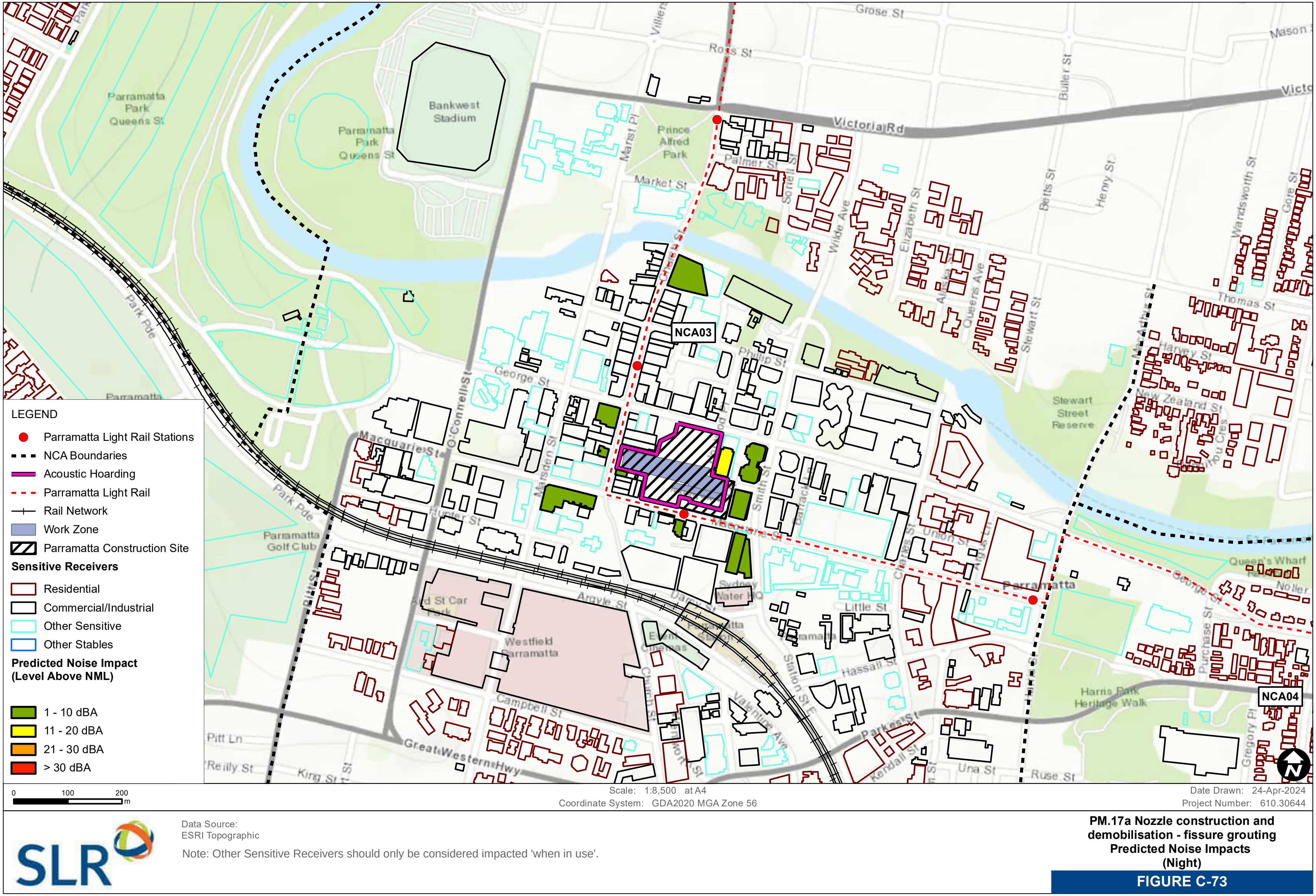
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

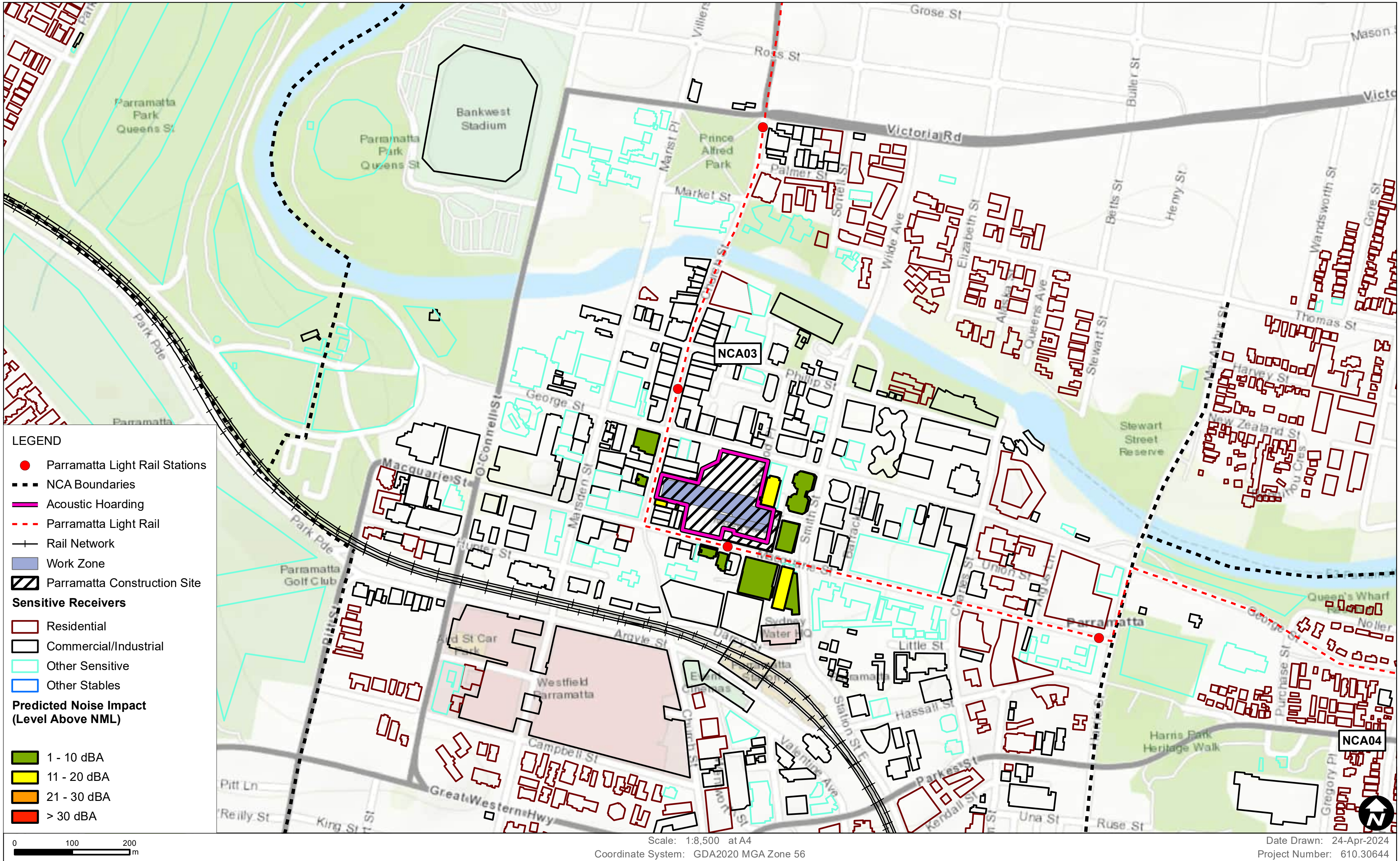
PM.17a Nozzle construction and de-mobilisation - fissure grouting Predicted Noise Impacts (Evening)

FIGURE C-72

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_PM_17a_Nozzle construction and demobilisation fissure grouting_Evening_04.mxd



H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_PM_17a_Nozzle construction and demobilisation fissure grouting_Night_04.mxd



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

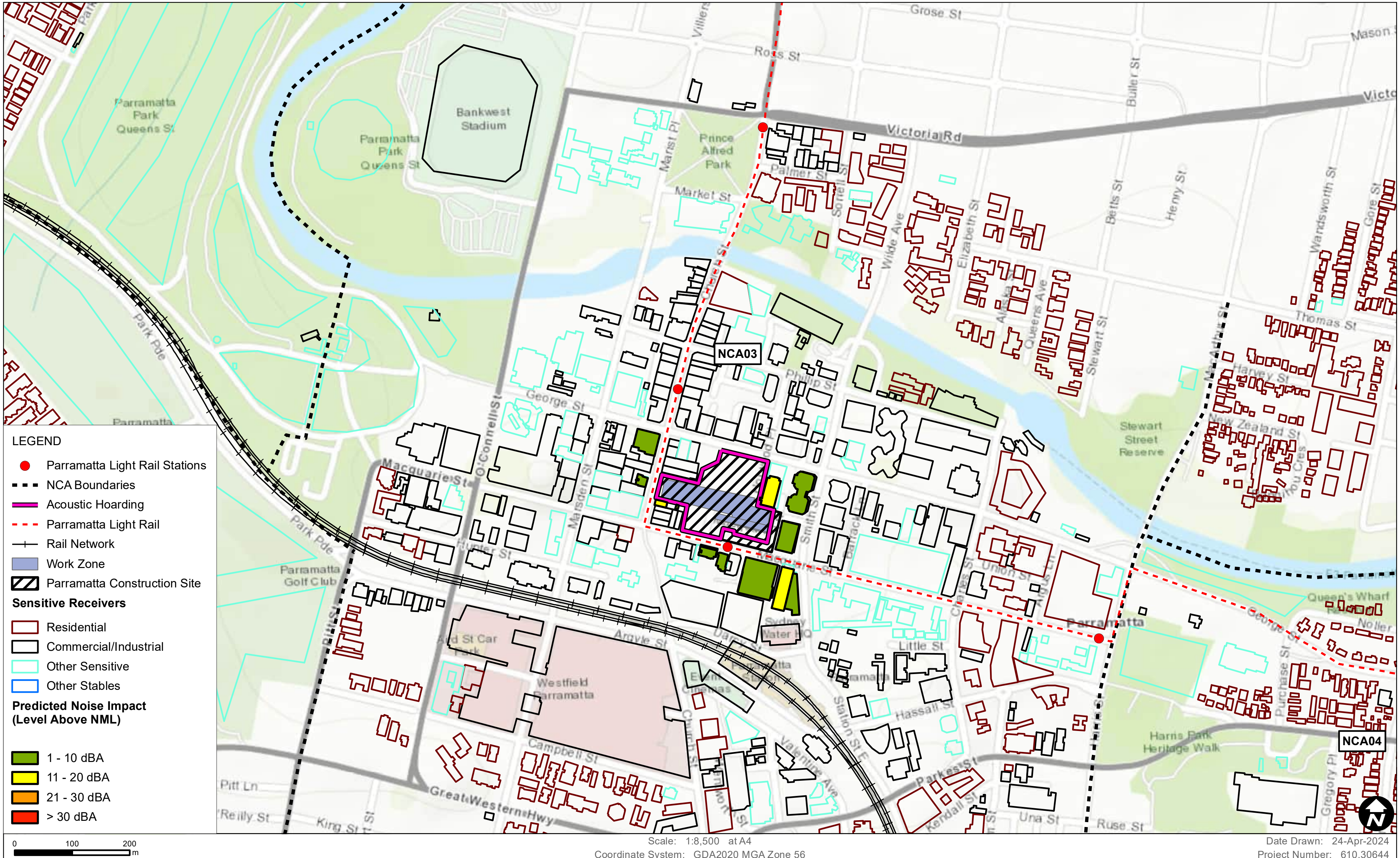
Date Drawn: 24-Apr-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17b Nozzle construction and demobilisation - canopy tube installation Predicted Noise Impacts (Approved Hours)

FIGURE C-74



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

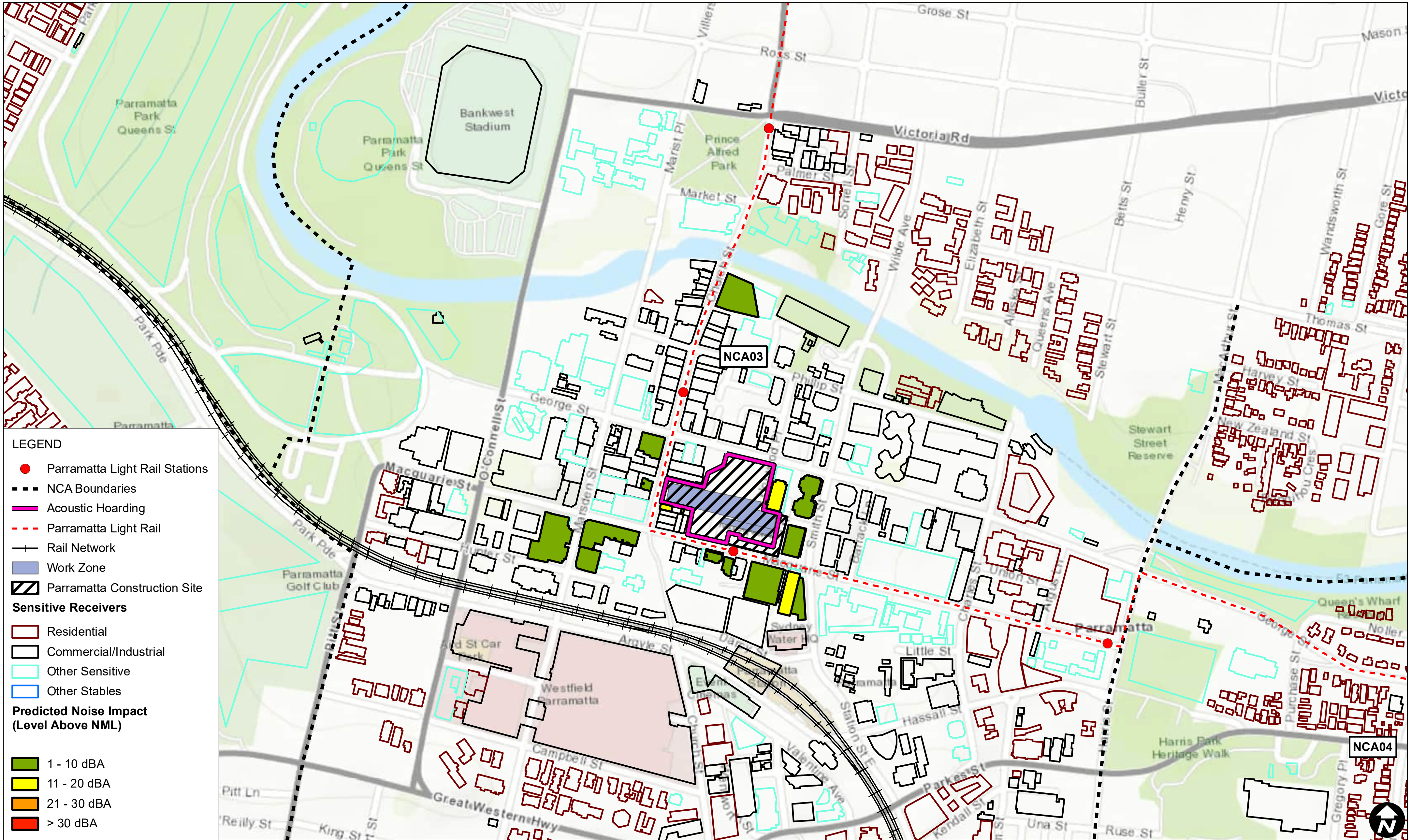
Date Drawn: 24-Apr-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17b Nozzle construction and demobilisation - canopy tube installation Predicted Noise Impacts (Evening)

FIGURE C-75



0 100 200 m

Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

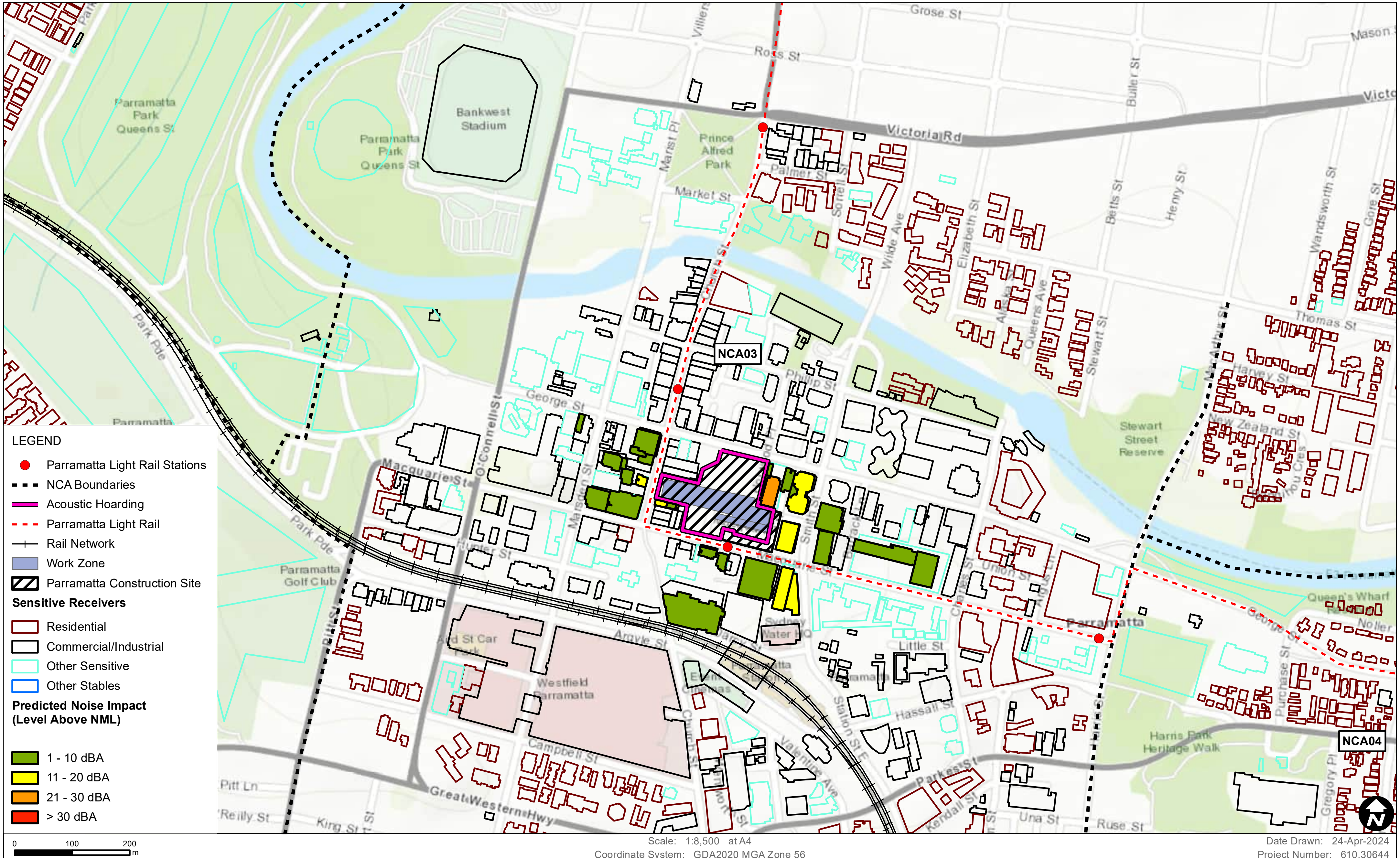
Date Drawn: 24-Apr-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17b Nozzle construction and demobilisation - canopy tube installation Predicted Noise Impacts (Night)

FIGURE C-76



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 24-Apr-2024
Project Number: 610.30644

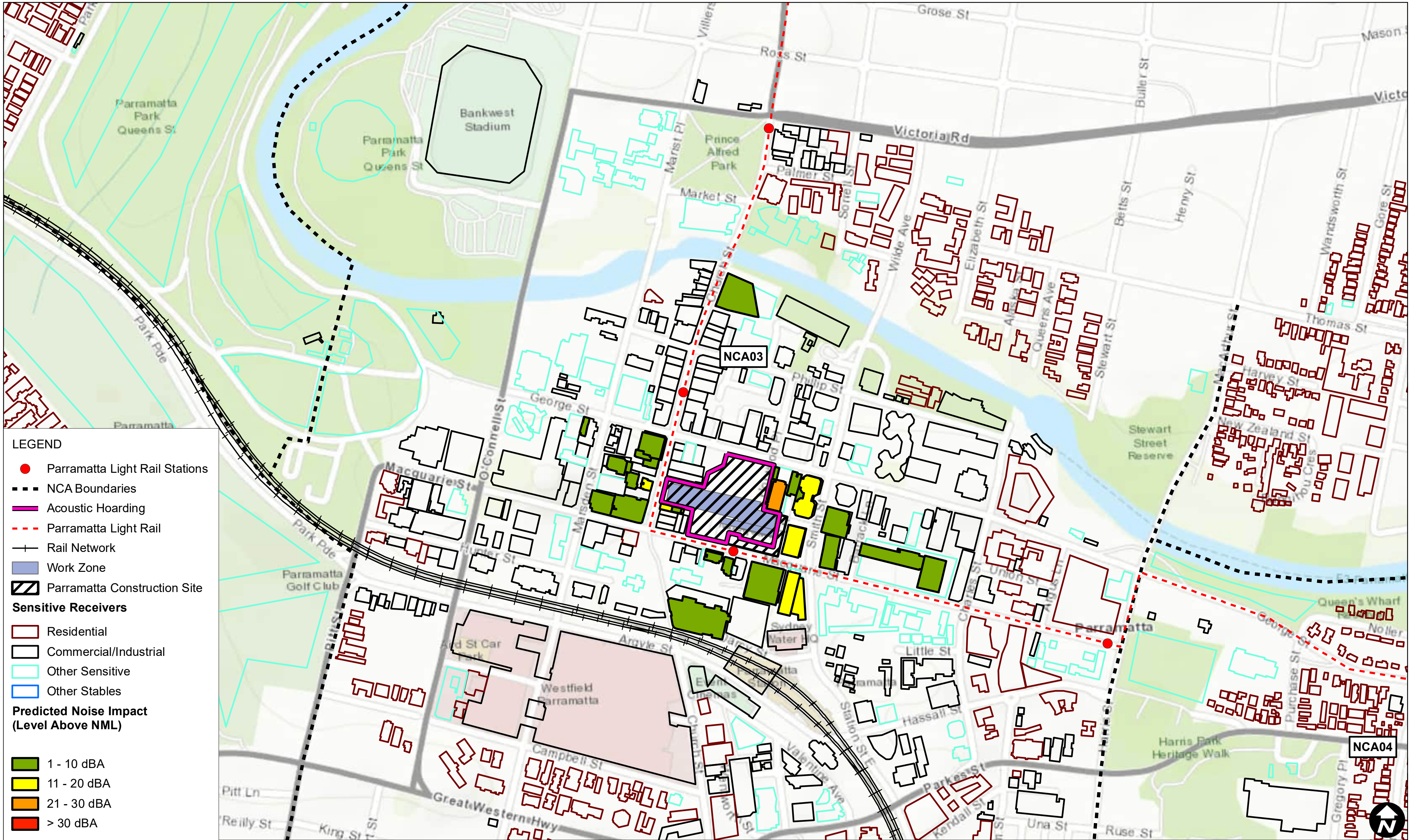
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17c Nozzle construction and demobilisation - concrete D-Wall removal Predicted Noise Impacts (Approved Hours)

FIGURE C-77



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

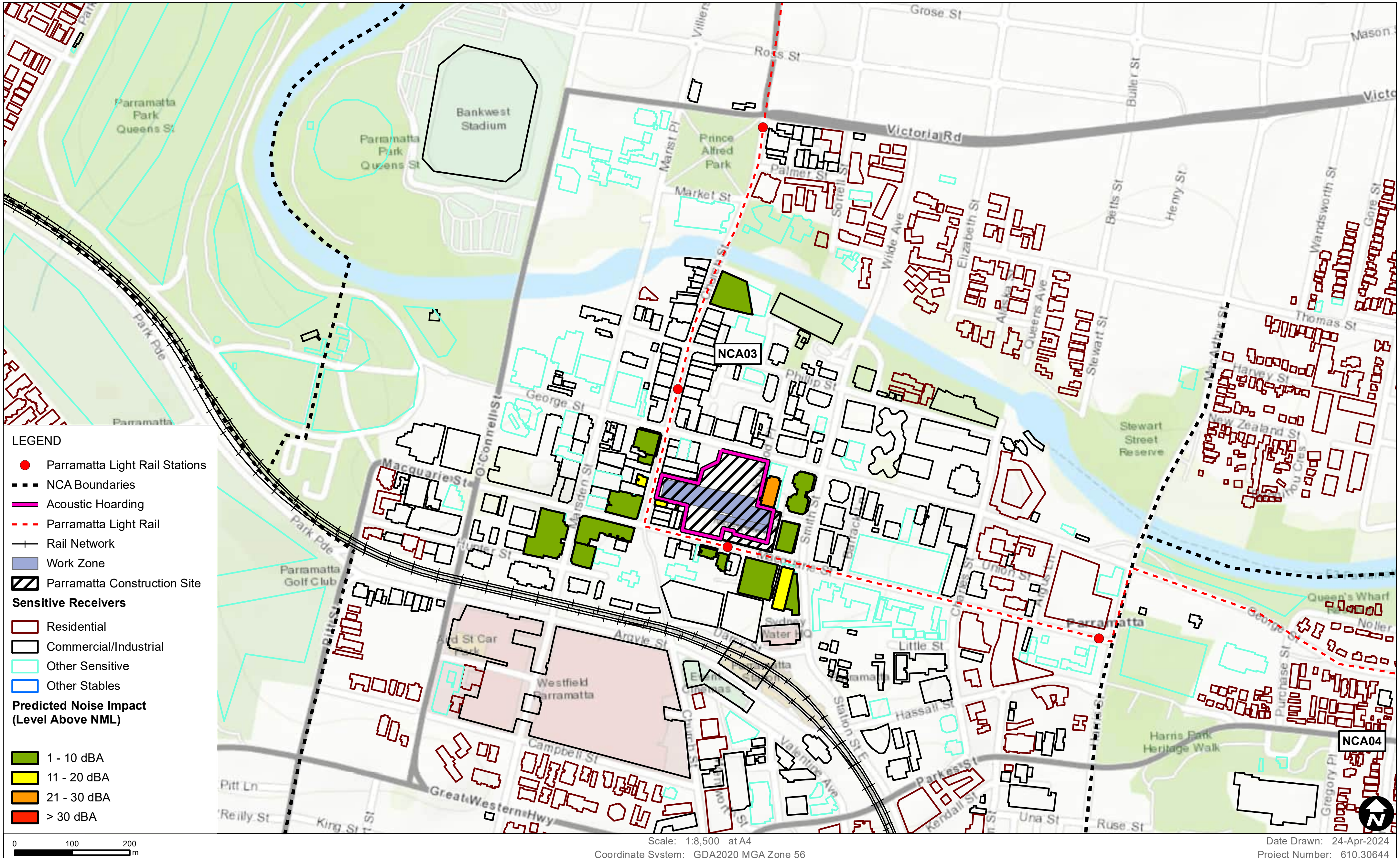
Date Drawn: 24-Apr-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17c Nozzle construction and demobilisation - concrete D-Wall removal Predicted Noise Impacts (Evening)

FIGURE C-78



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

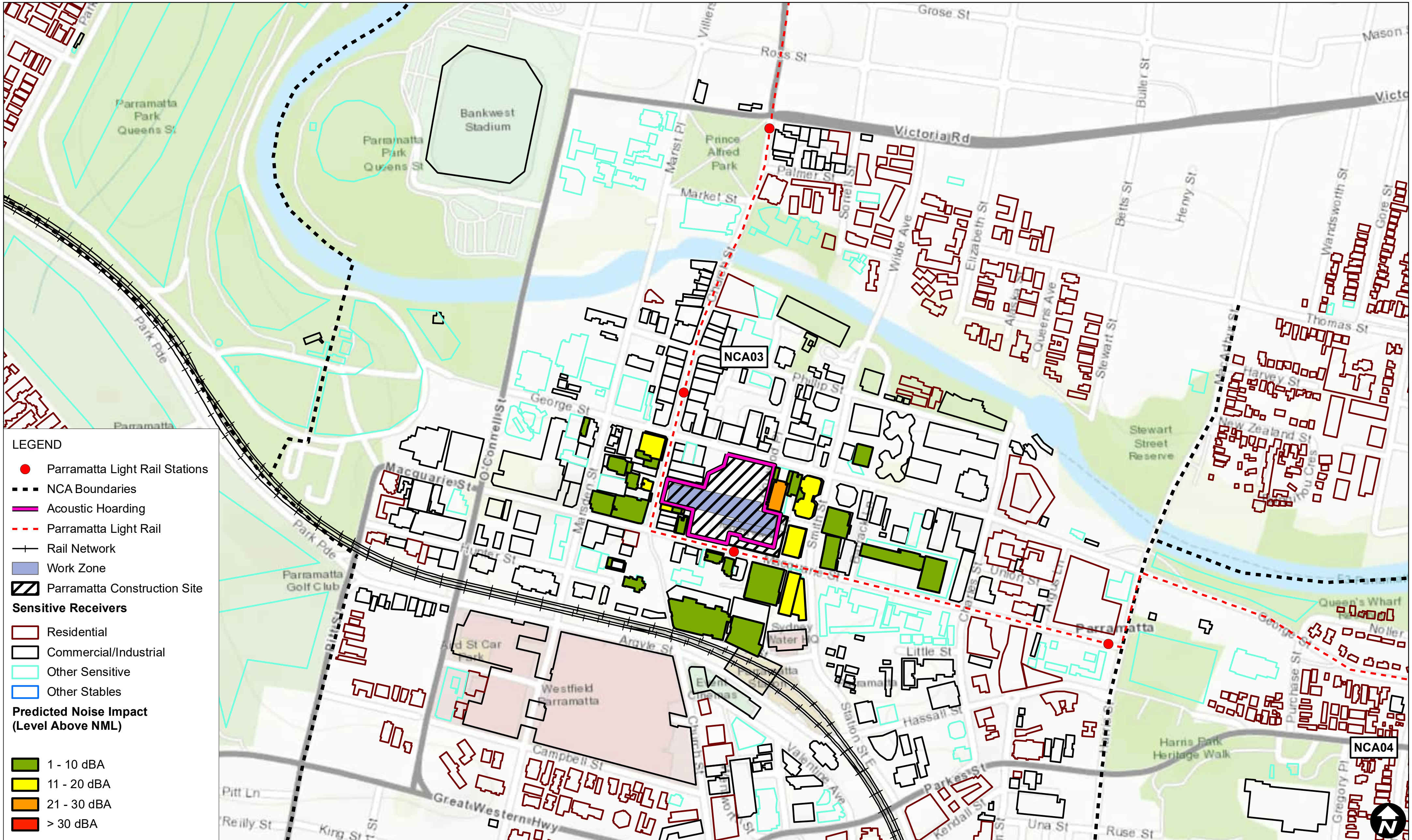
Date Drawn: 24-Apr-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17c Nozzle construction and demobilisation - concrete D-Wall removal Predicted Noise Impacts (Night)

FIGURE C-79



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

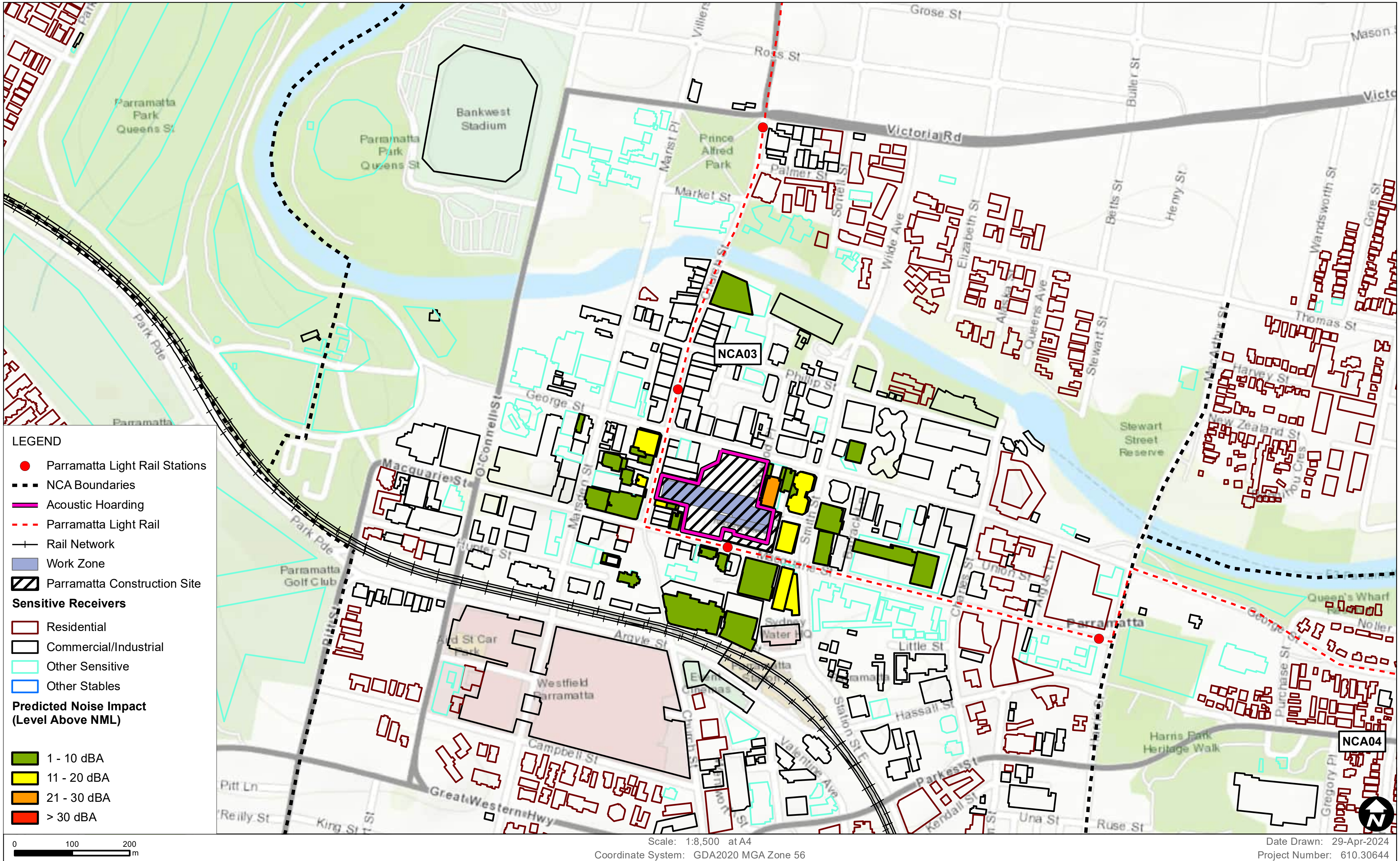
Date Drawn: 24-Apr-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17d Nozzle construction and demobilisation - ground support and excavation Predicted Noise Impacts (Approved Hours)

FIGURE C-80



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 29-Apr-2024
Project Number: 610.30644

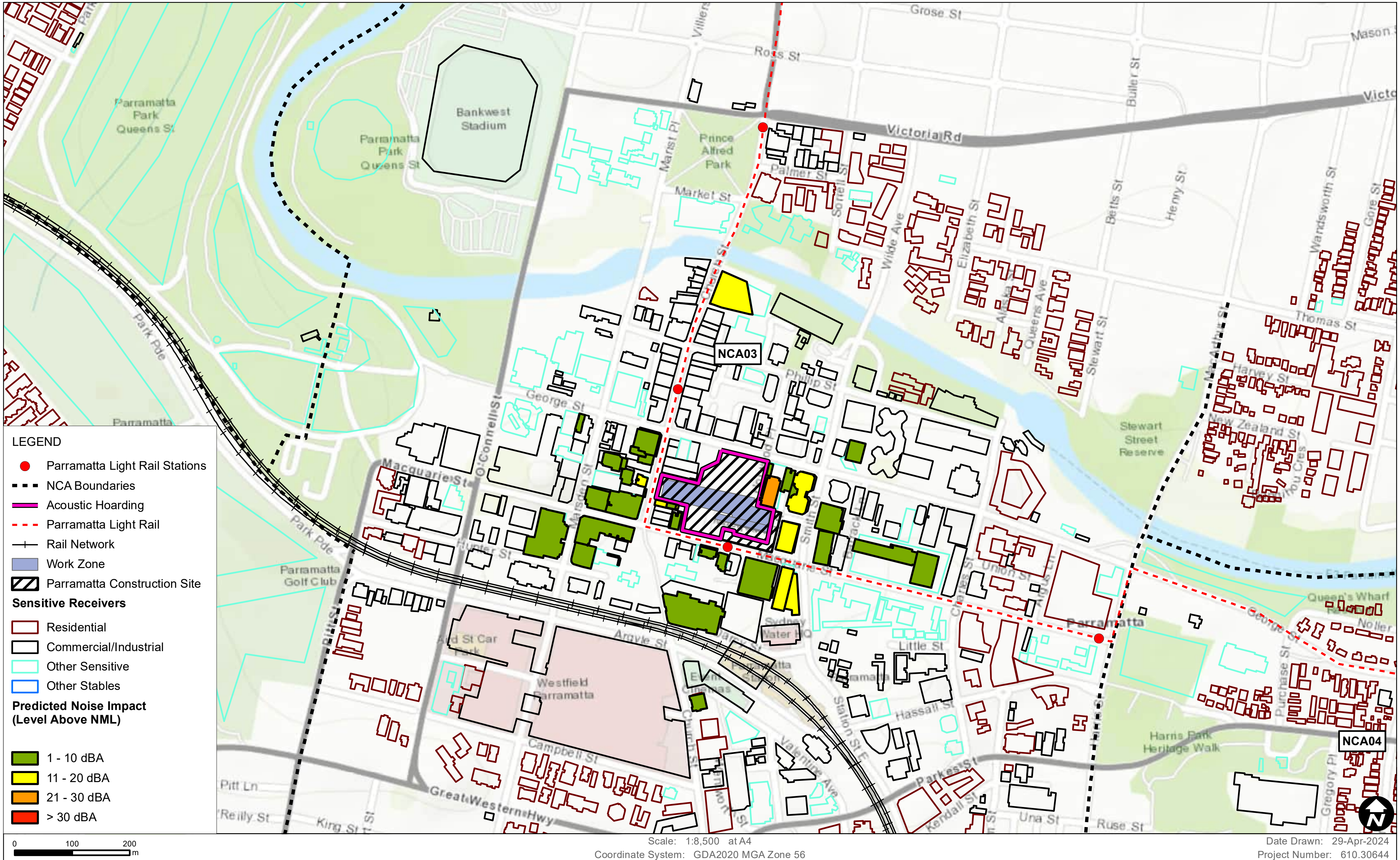
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17d Nozzle construction and demobilisation - ground support and excavation Predicted Noise Impacts (Evening)

FIGURE C-81



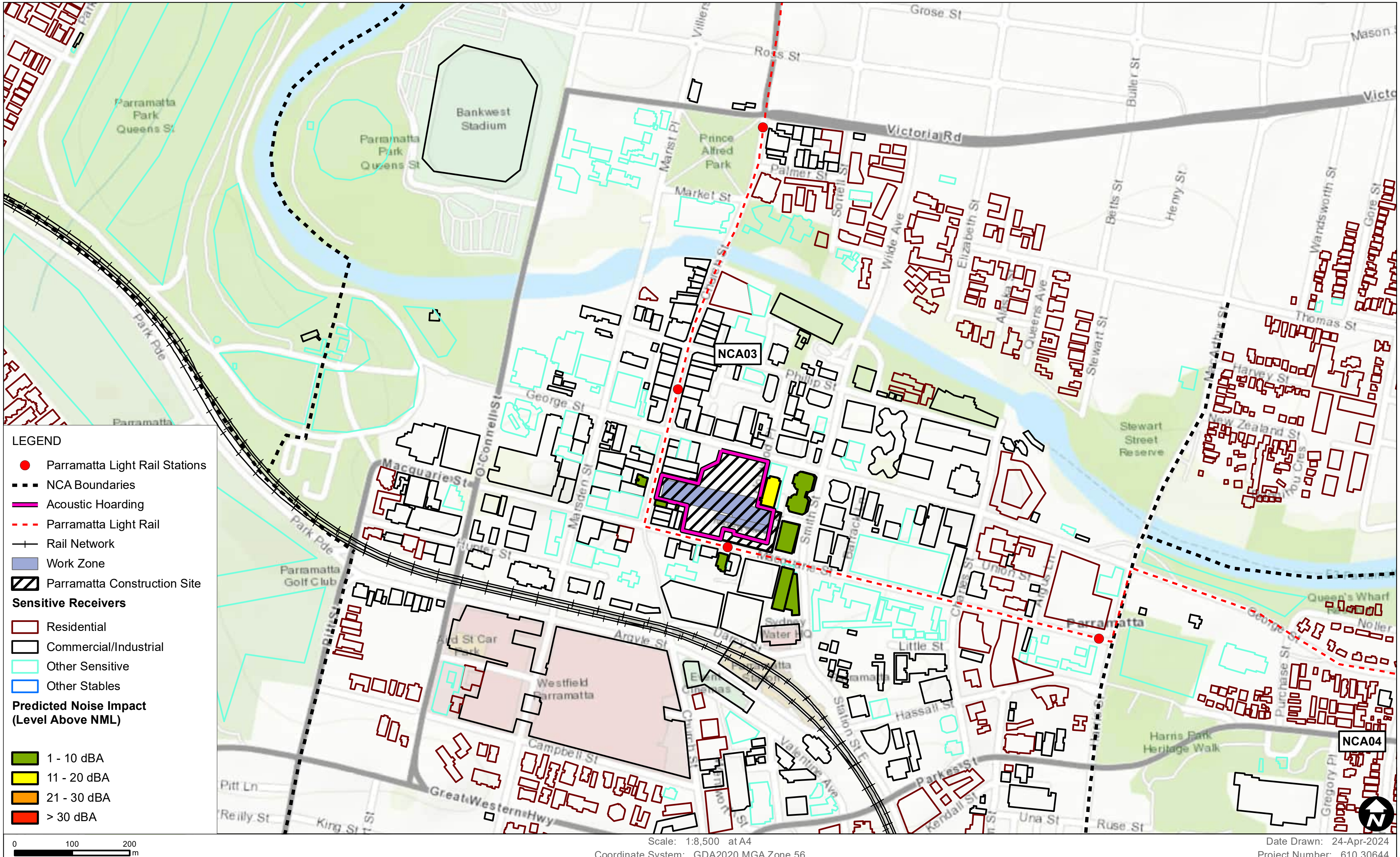
Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 29-Apr-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

PM.17d Nozzle construction and demobilisation - ground support and excavation Predicted Noise Impacts (Night)

FIGURE C-82



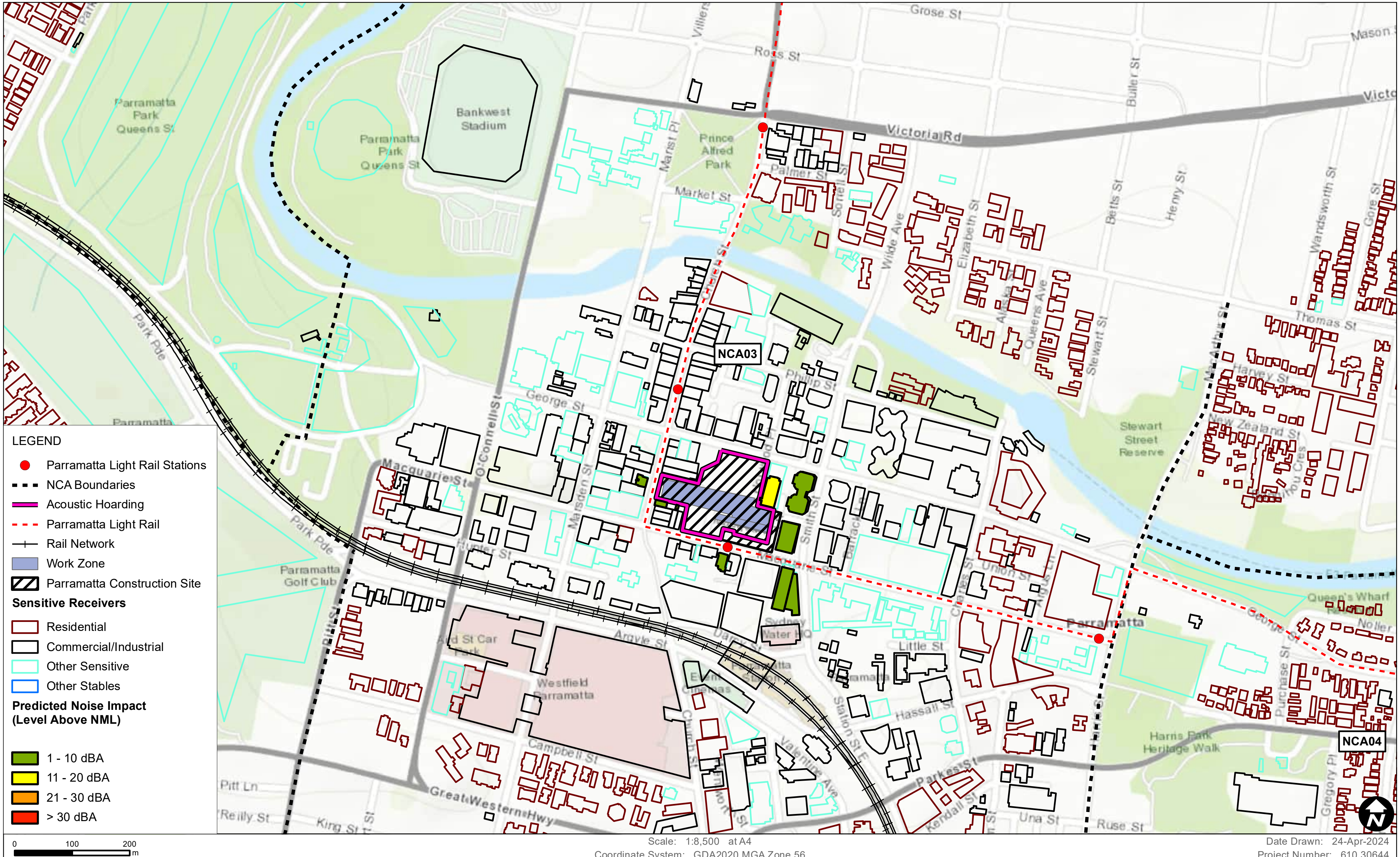
Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 24-Apr-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

PM.17e Nozzle construction and demobilisation - tunnel spoil loadout Predicted Noise Impacts (Approved Hours)

FIGURE C-83



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

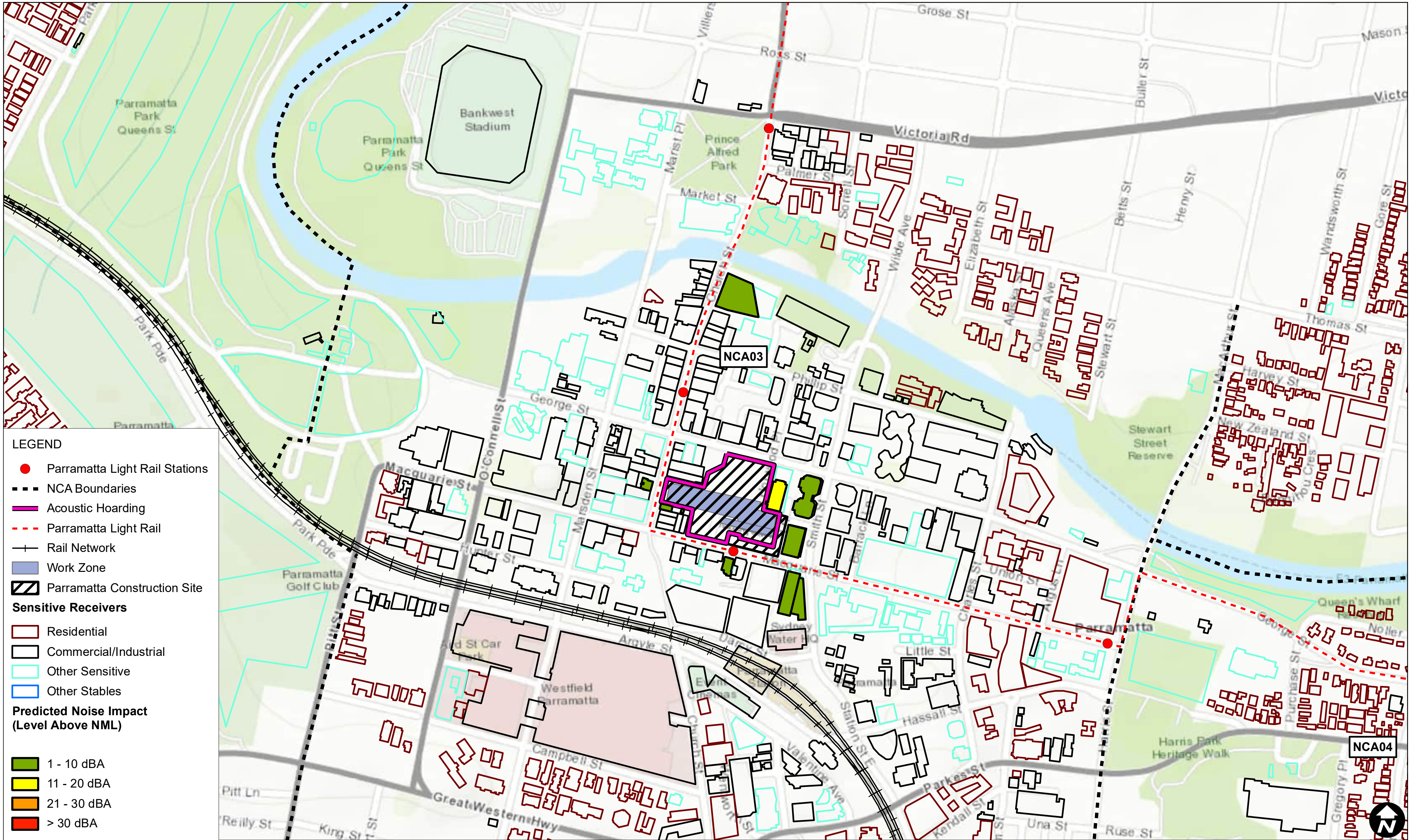
Date Drawn: 24-Apr-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17e Nozzle construction and demobilisation - tunnel spoil loadout Predicted Noise Impacts (Evening)

FIGURE C-84



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

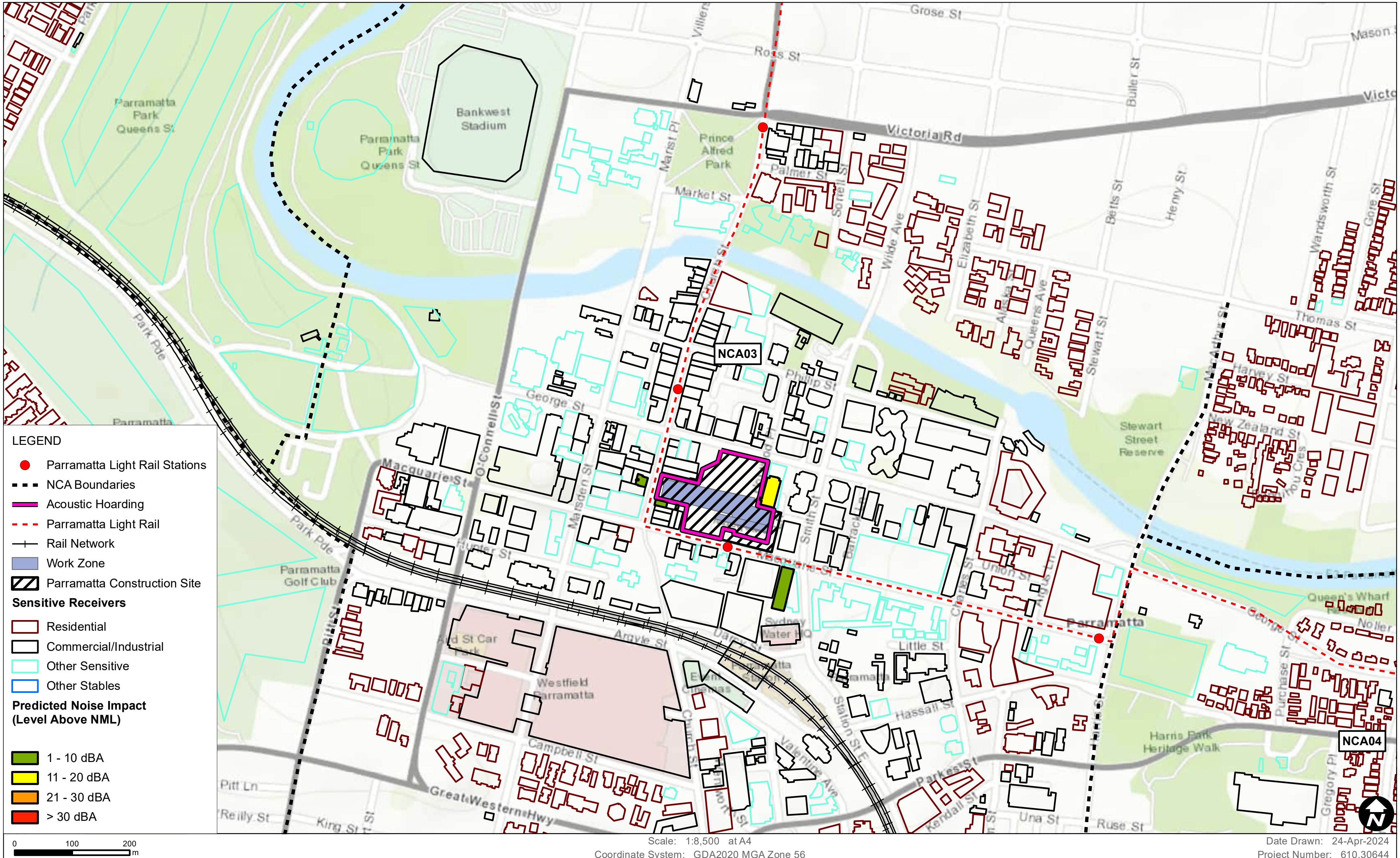
Date Drawn: 24-Apr-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17e Nozzle construction and demobilisation - tunnel spoil loadout Predicted Noise Impacts (Night)

FIGURE C-85



Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 24-Apr-2024
Project Number: 610.30644

SLR

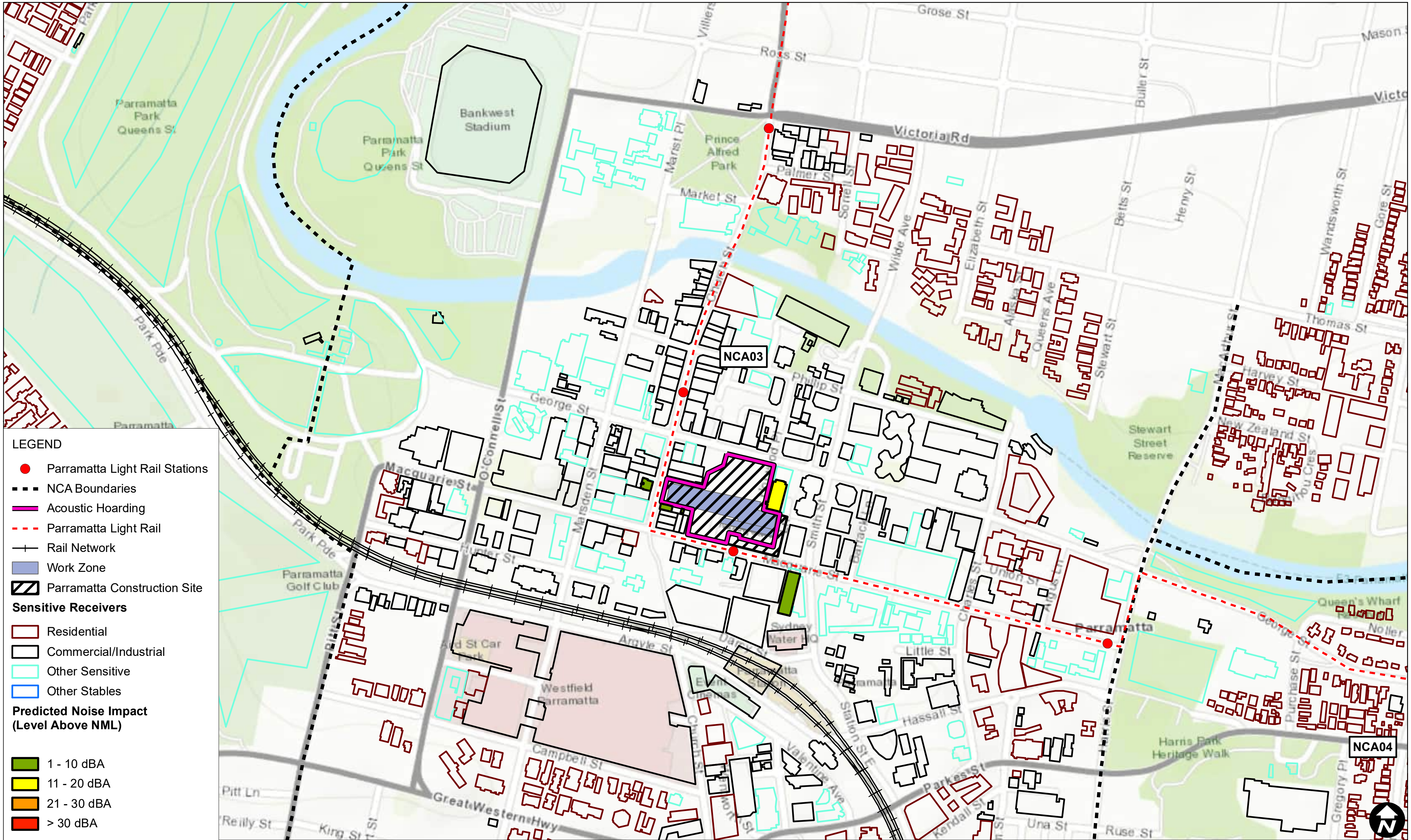
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17f Nozzle construction and demobilisation - Rock bolting Predicted Noise Impacts (Evening)

FIGURE C-86

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_PM_17f_Nozzle construction and demobilisation Rock bolting_Evening_04.mxd



0 100 200 m

Scale: 1:8,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 24-Apr-2024
Project Number: 610.30644

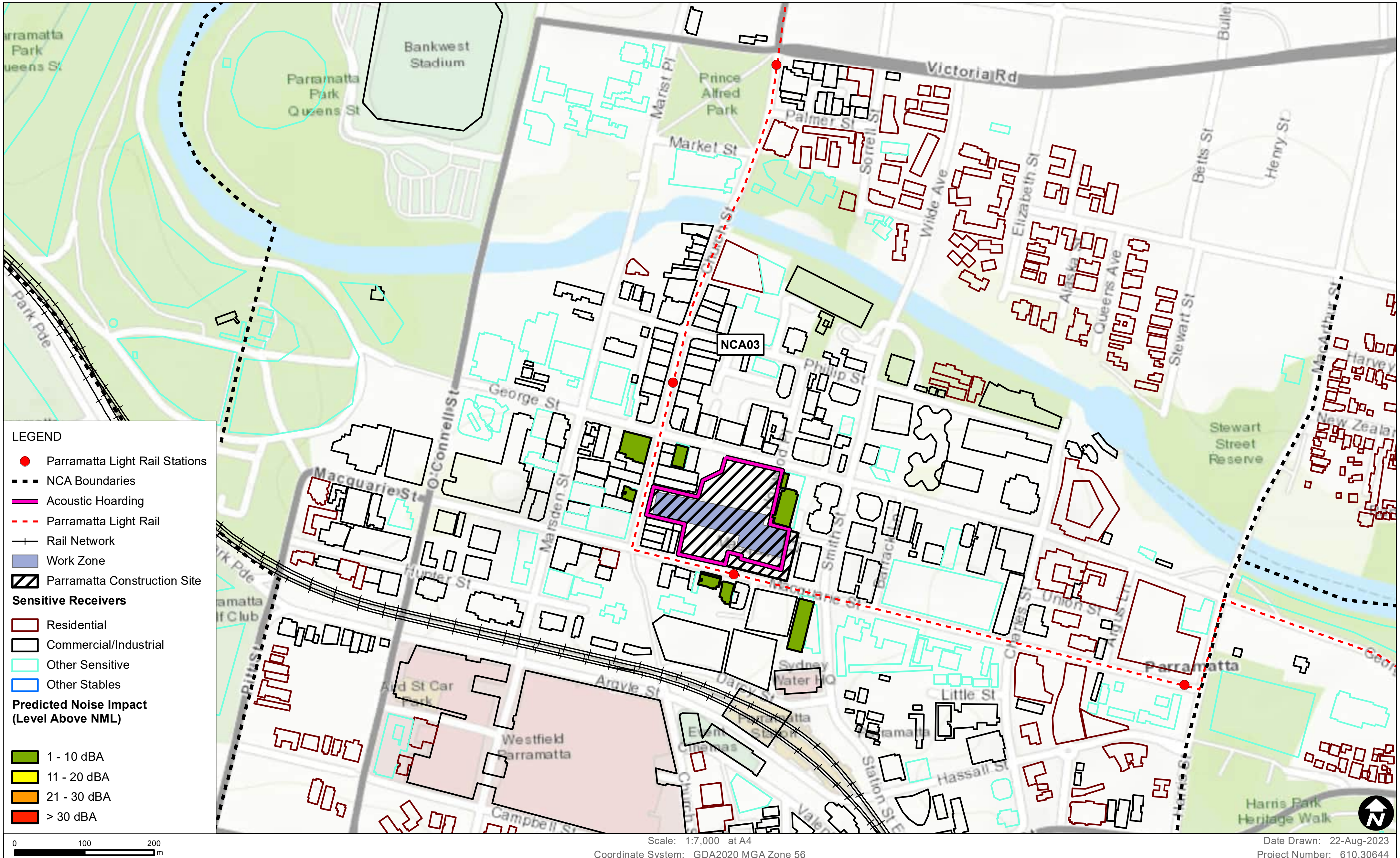
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.17f Nozzle construction and demobilisation - Rock bolting Predicted Noise Impacts (Night)

FIGURE C-87

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_PM_17f_Nozzle construction and demobilisation Rock bolting_Night_04.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

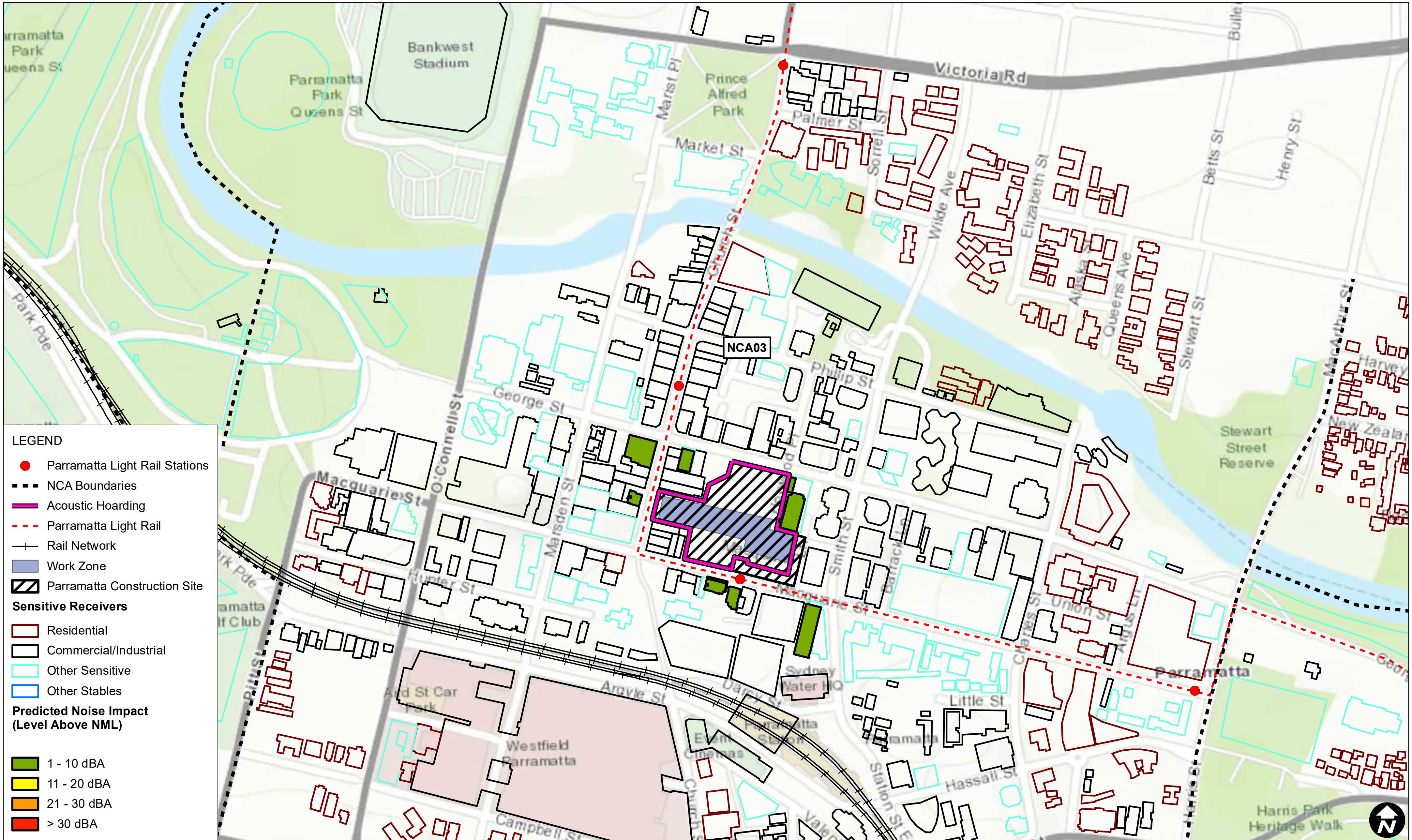
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.18 General operation of ancillary facility
Predicted Noise Impacts
(Approved Hours)

FIGURE C-88



LEGEND

- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Parramatta Light Rail
- Rail Network
- Work Zone
- Parramatta Construction Site

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- > 30 dBA

0 100 200 m

Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

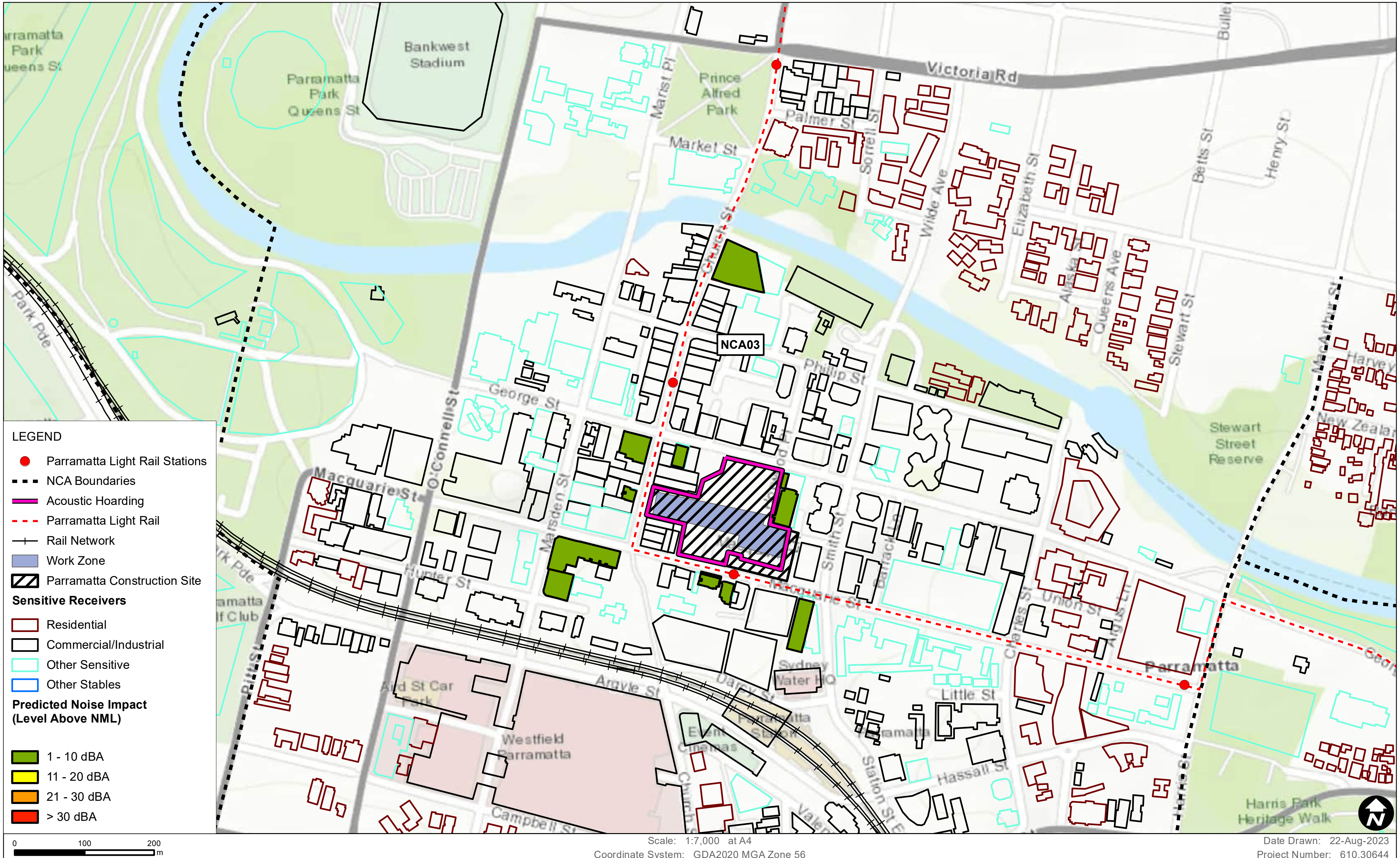
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.18 General operation of ancillary facility
Predicted Noise Impacts
(Evening)

FIGURE C-89



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

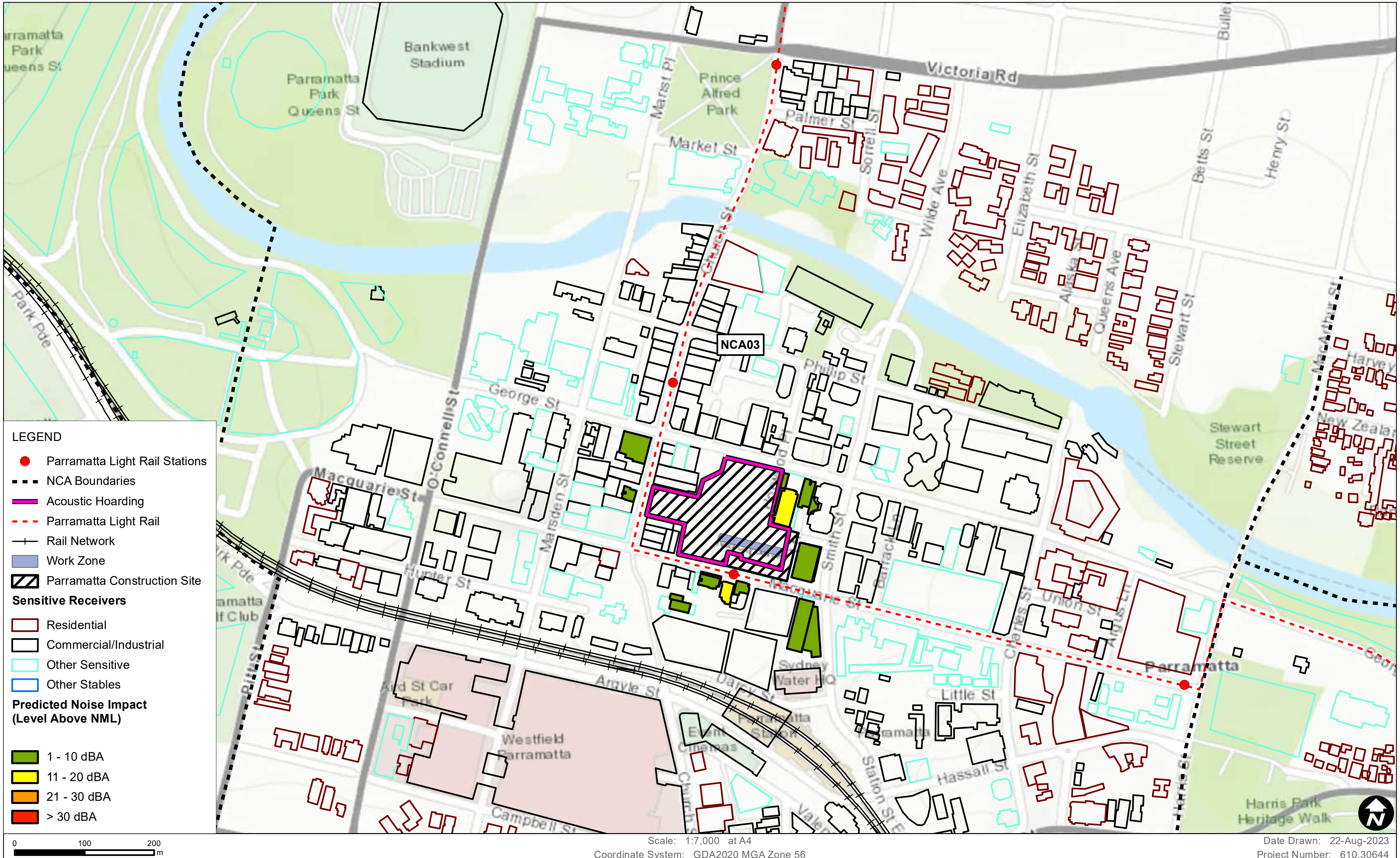
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.18 General operation of ancillary facility
Predicted Noise Impacts
(Night)

FIGURE C-90

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C71_PM_18_General operation of ancillary facility_Night_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

SLR

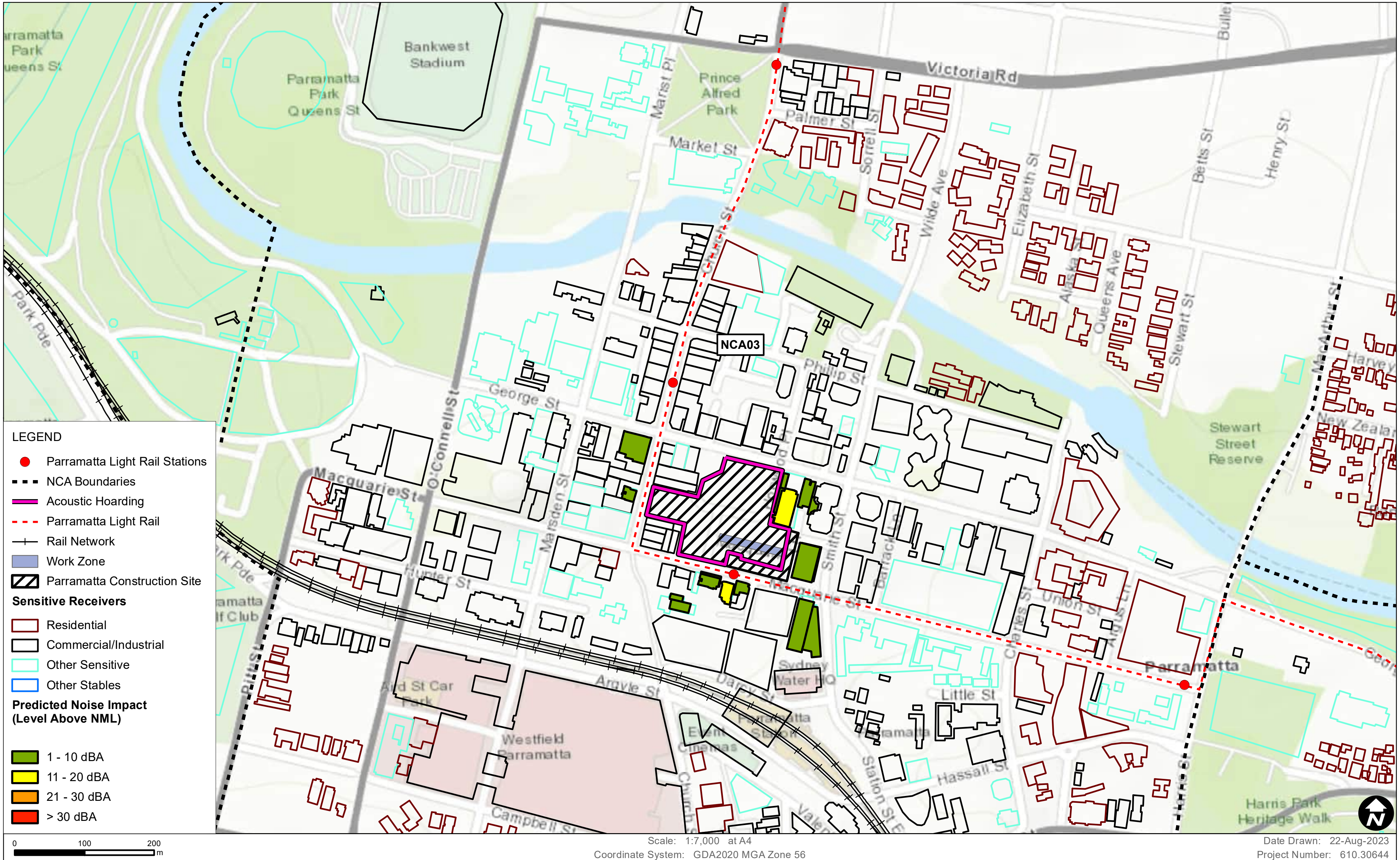
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.19 Tunnel invert concreting works
Predicted Noise Impacts
(Approved Hours)

FIGURE C-91

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C72_PM_19_Tunnel invert concreting works_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

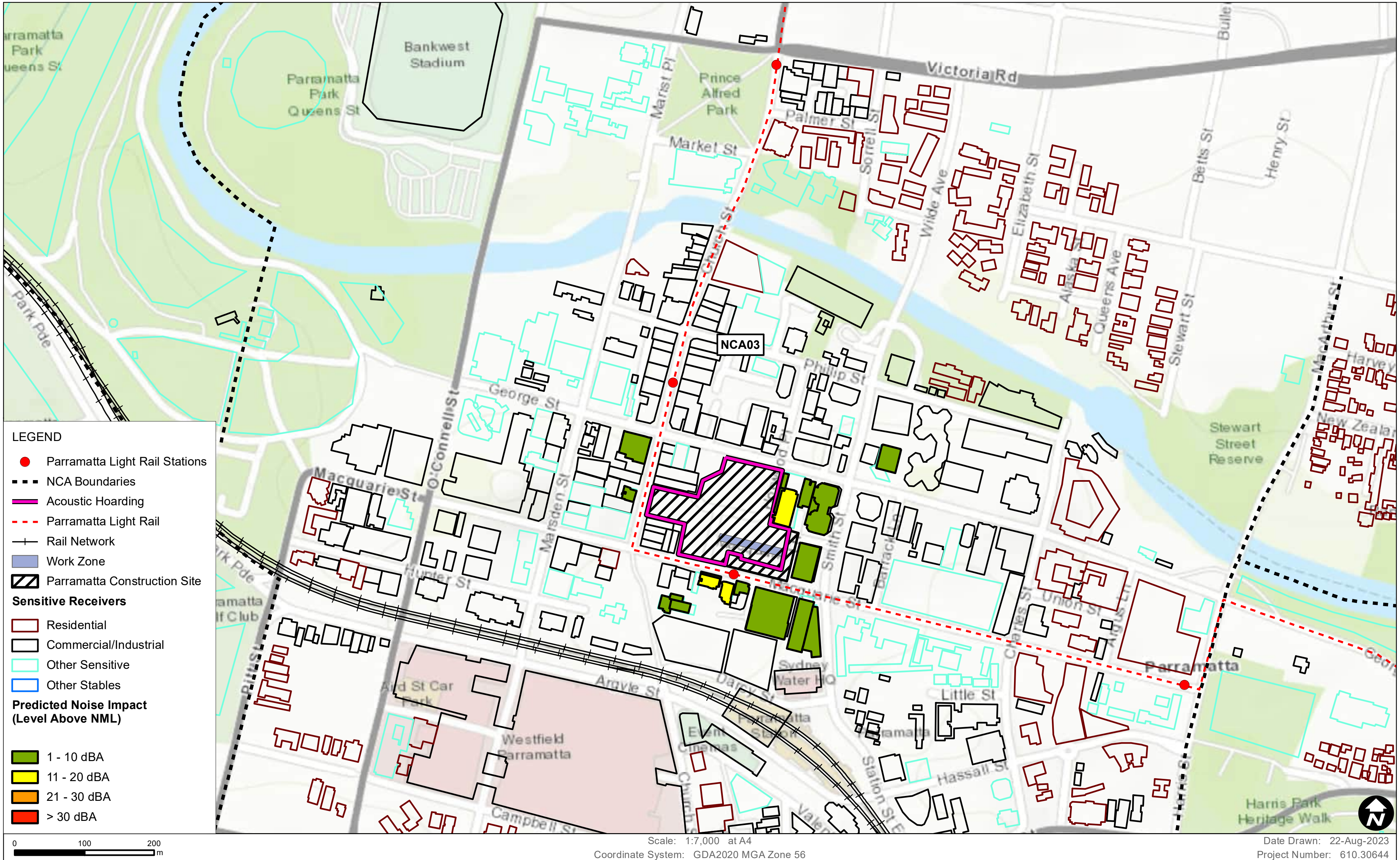
Date Drawn: 22-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.19 Tunnel invert concreting works
Predicted Noise Impacts
(Evening)

FIGURE C-92



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

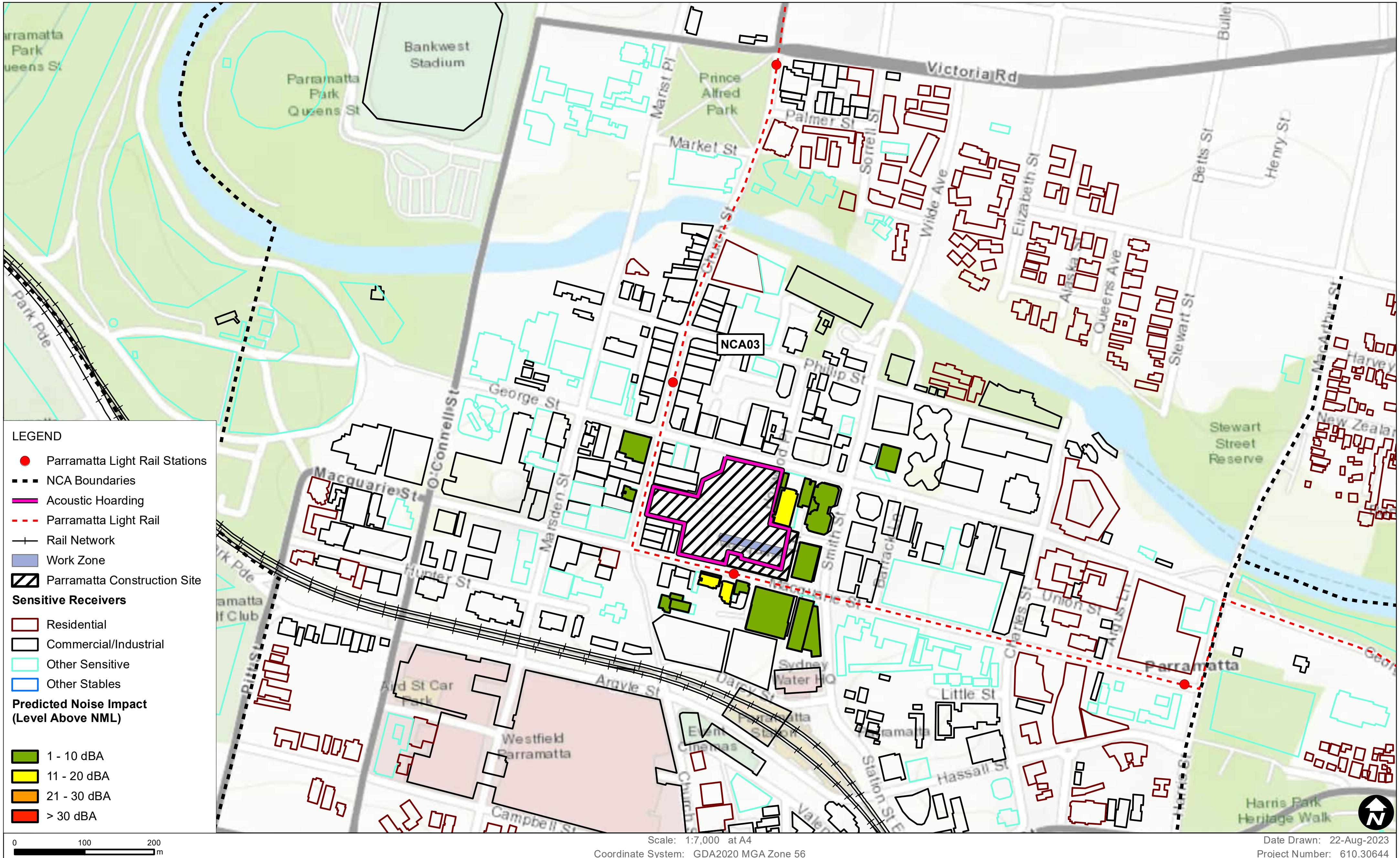
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.20 Cross passage works
Predicted Noise Impacts
(Approved Hours)

FIGURE C-93

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C74_PM_20_Cross passage works_Day_03.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

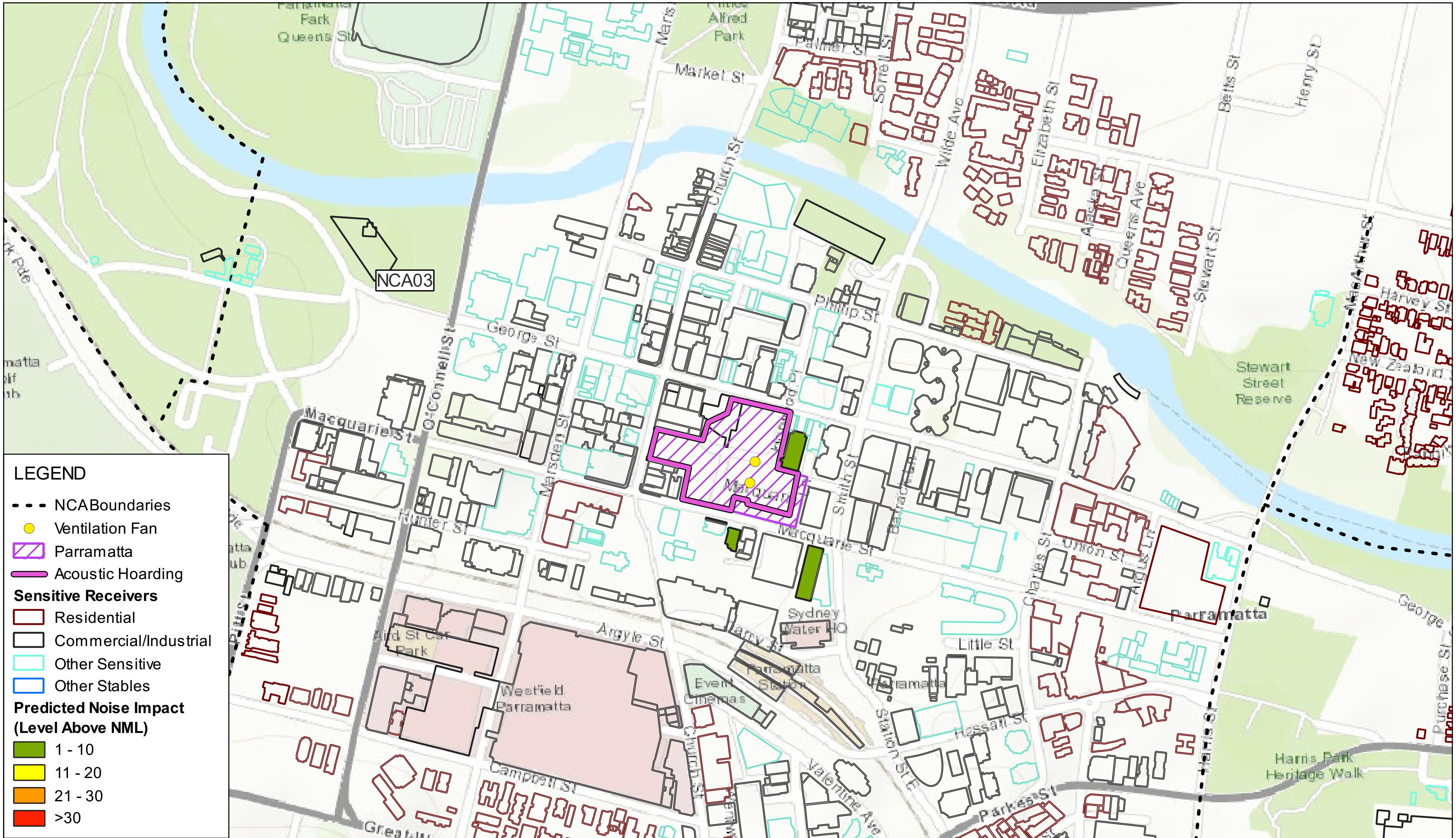
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.20 Cross passage works
Predicted Noise Impacts
(Evening)

FIGURE C-94



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 08-May-2025
Project Number: 610.30644

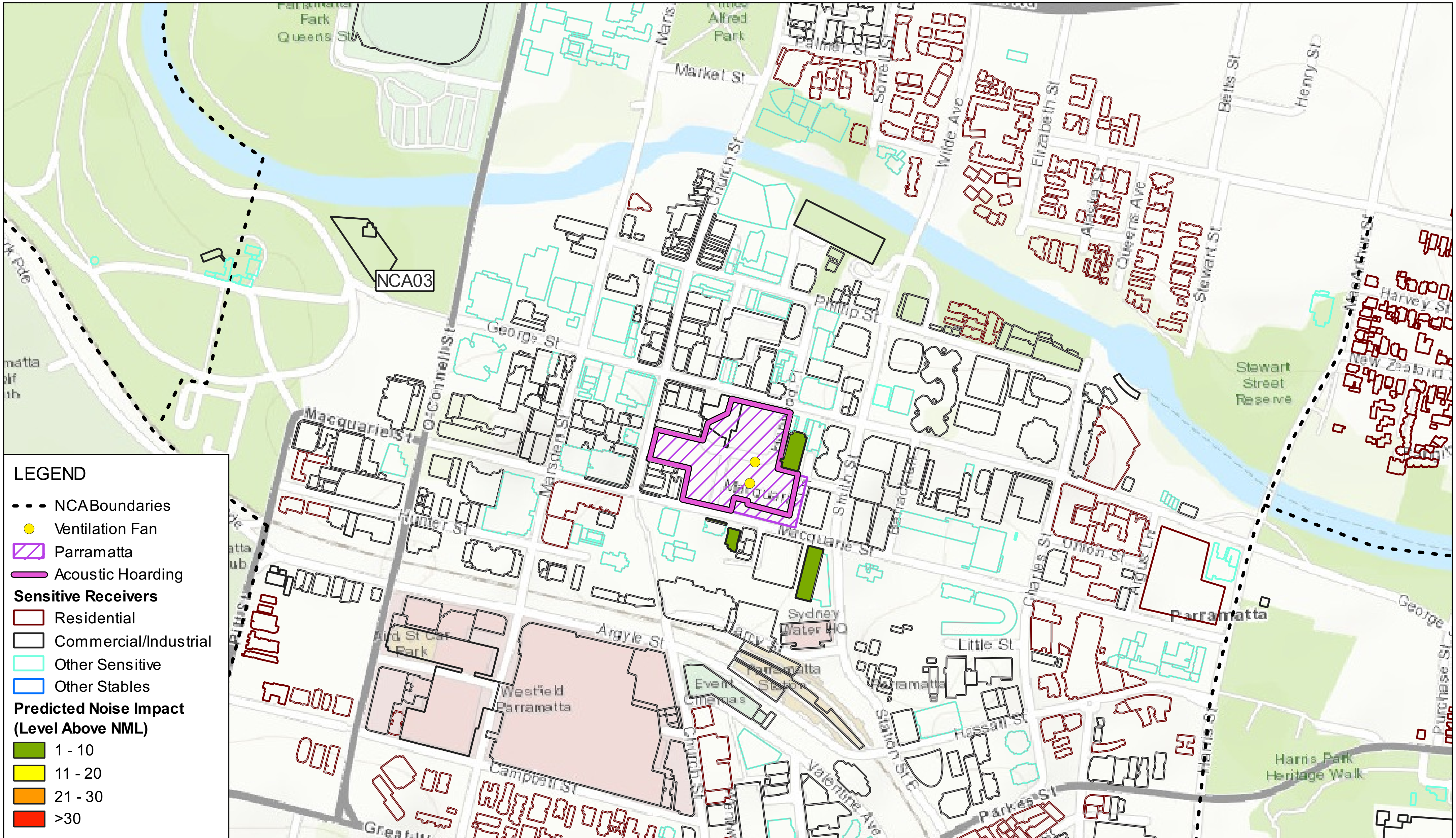
Data Source:
ESRI World Imagery

Note: Other Sensitive Receivers should only be considered impacted 'when in use'

PM.21 Tunnel vent fan operation Predicted Noise Impacts (Approved Hours)

FIGURE C-95

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\05 QGIS\610.30644 WTP - DNVIS\610.30644 WTP - DNVIS.qgz



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 08-May-2025
Project Number: 610.30644

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\05 QGIS\610.30644 WTP - DNVIS\610.30644 WTP - DNVIS.qgz

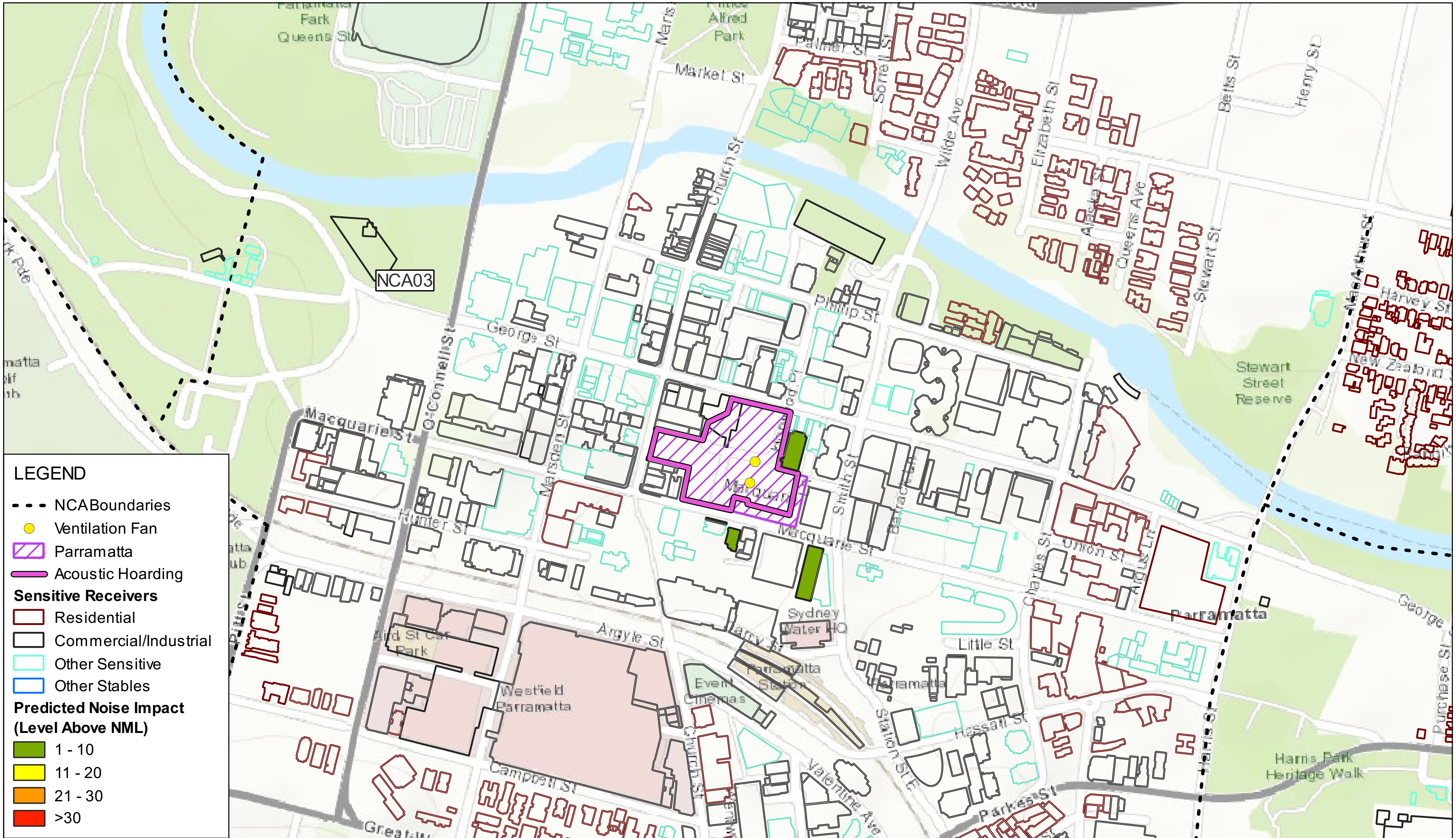
SLR

Data Source:
ESRI World Imagery

Note: Other Sensitive Receivers should only be considered impacted 'when in use'

PM.21 Tunnel vent fan operation Predicted Noise Impacts (Evening)

FIGURE C-96



0 250 500 m

Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 08-May-2025
Project Number: 610.30644

SLR

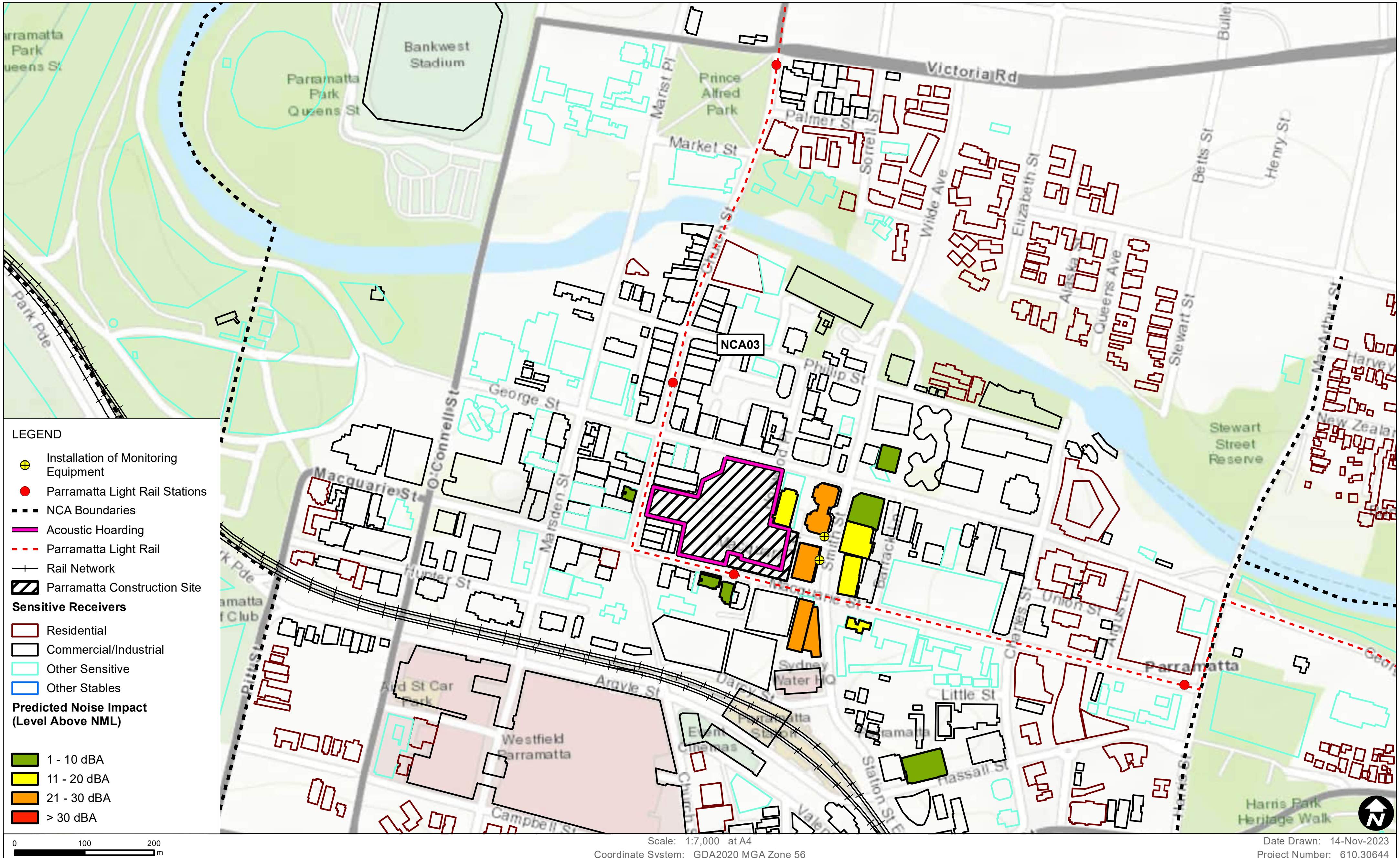
Data Source:
ESRI World Imagery

Note: Other Sensitive Receivers should only be considered impacted 'when in use'

PM.21 Tunnel vent fan operation
Predicted Noise Impacts
(Night)

FIGURE C-97

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\05 QGIS\610.30644 WTP - DNVIS\610.30644 WTP - DNVIS.qgz



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 14-Nov-2023
Project Number: 610.30644

SLR

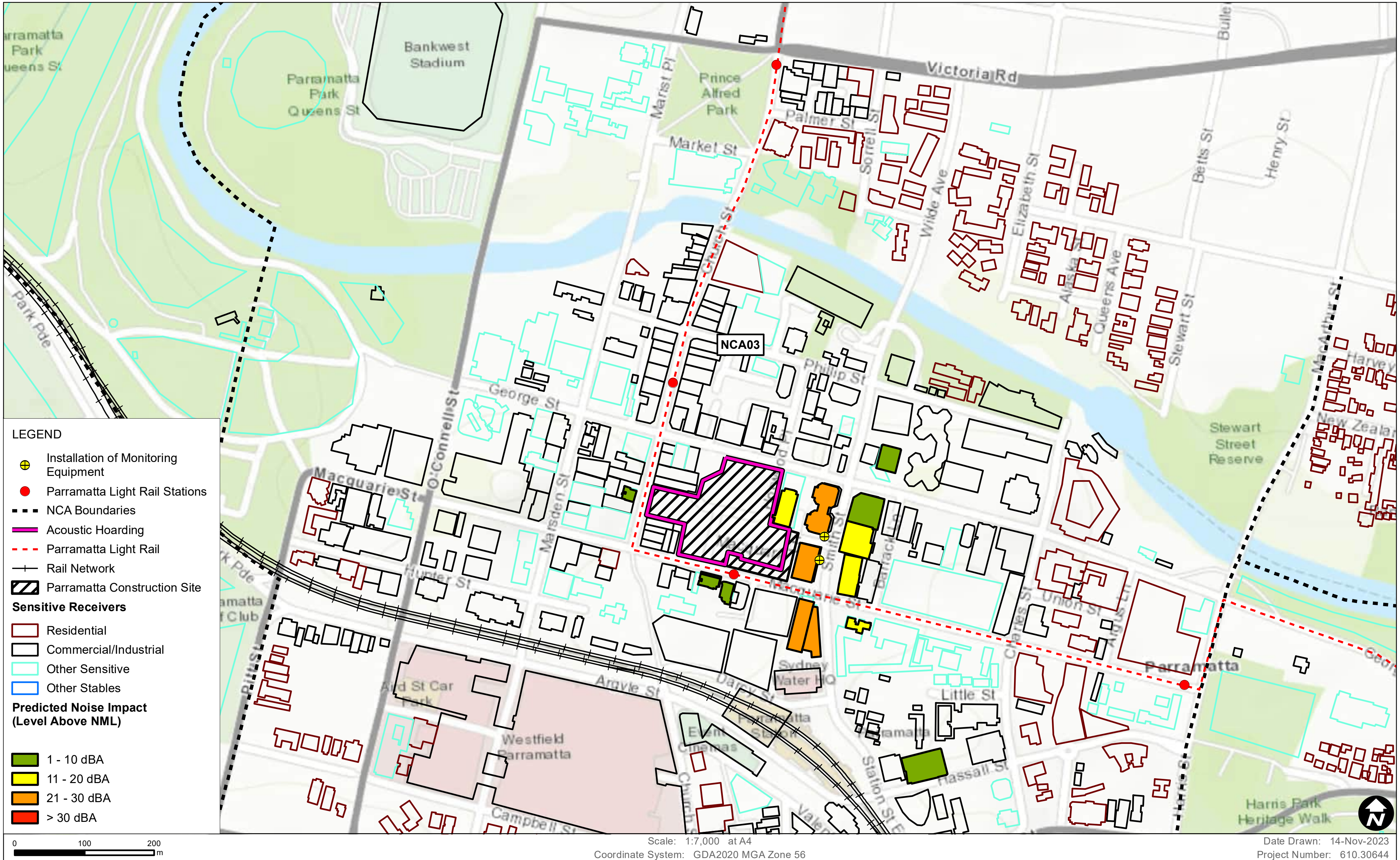
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.22 Installation of Monitoring Equipment
Predicted Noise Impacts
(Approved Hours)

FIGURE C-98

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_PM_22_Installation of Monitoring Equipment_Day_04.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 14-Nov-2023
Project Number: 610.30644

SLR

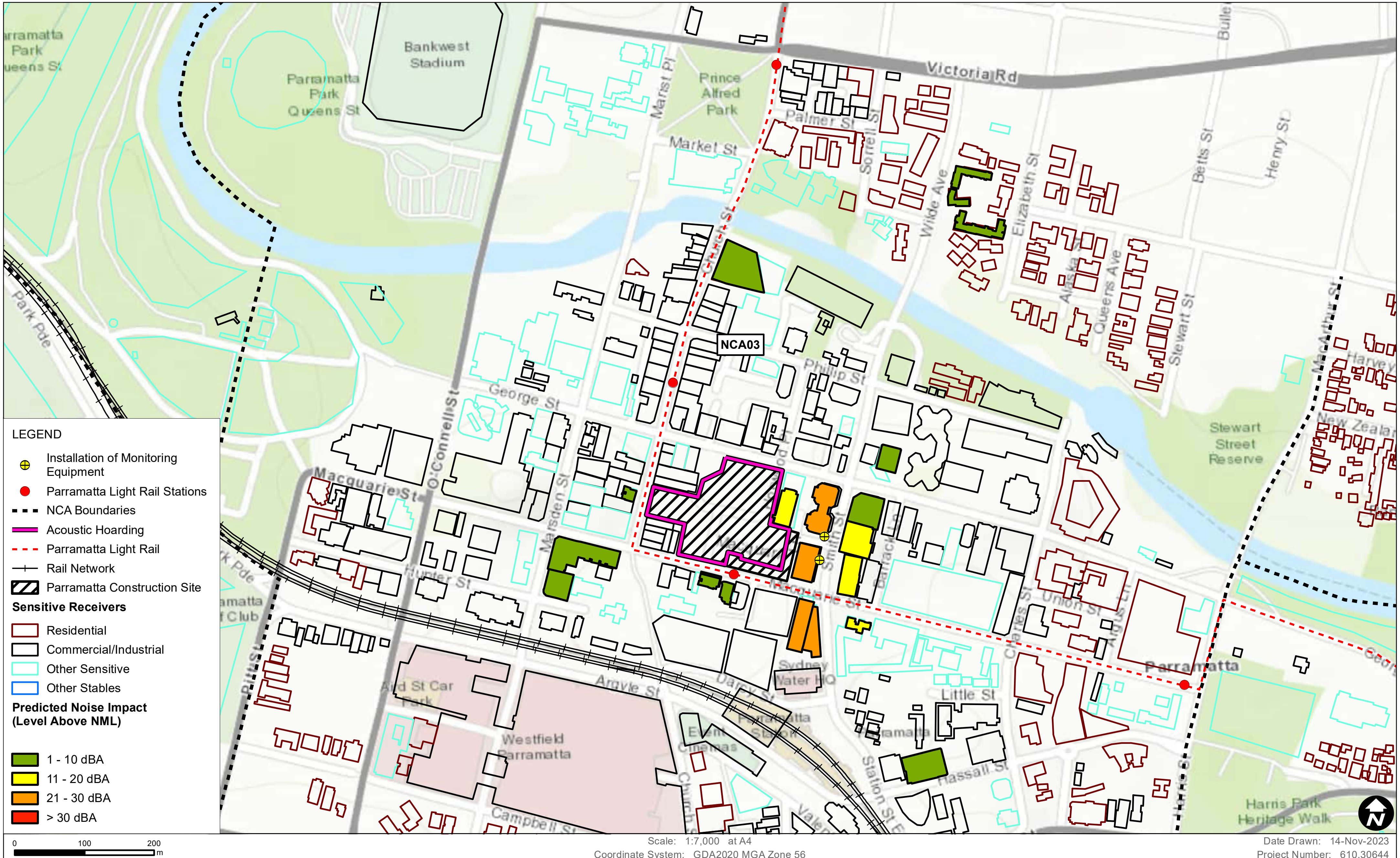
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.22 Installation of Monitoring Equipment
Predicted Noise Impacts
(Evening)

FIGURE C-99

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_PM_22_Installation of Monitoring Equipment_Evening_04.mxd



Scale: 1:7,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 14-Nov-2023
Project Number: 610.30644

SLR

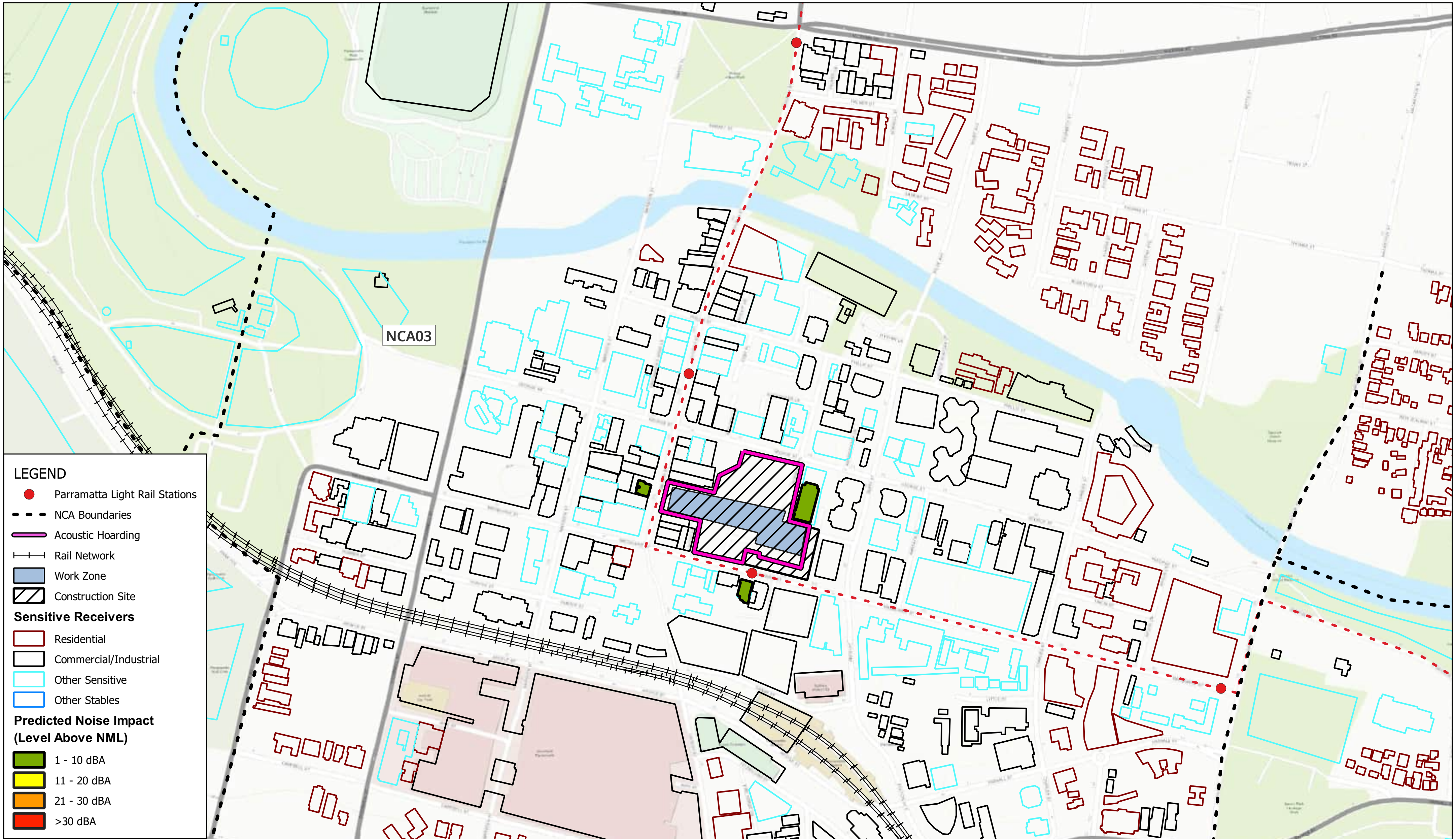
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.22 Installation of Monitoring Equipment
Predicted Noise Impacts
(Night)

FIGURE C-100

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_PM_22_Installation of Monitoring Equipment_Night_04.mxd



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

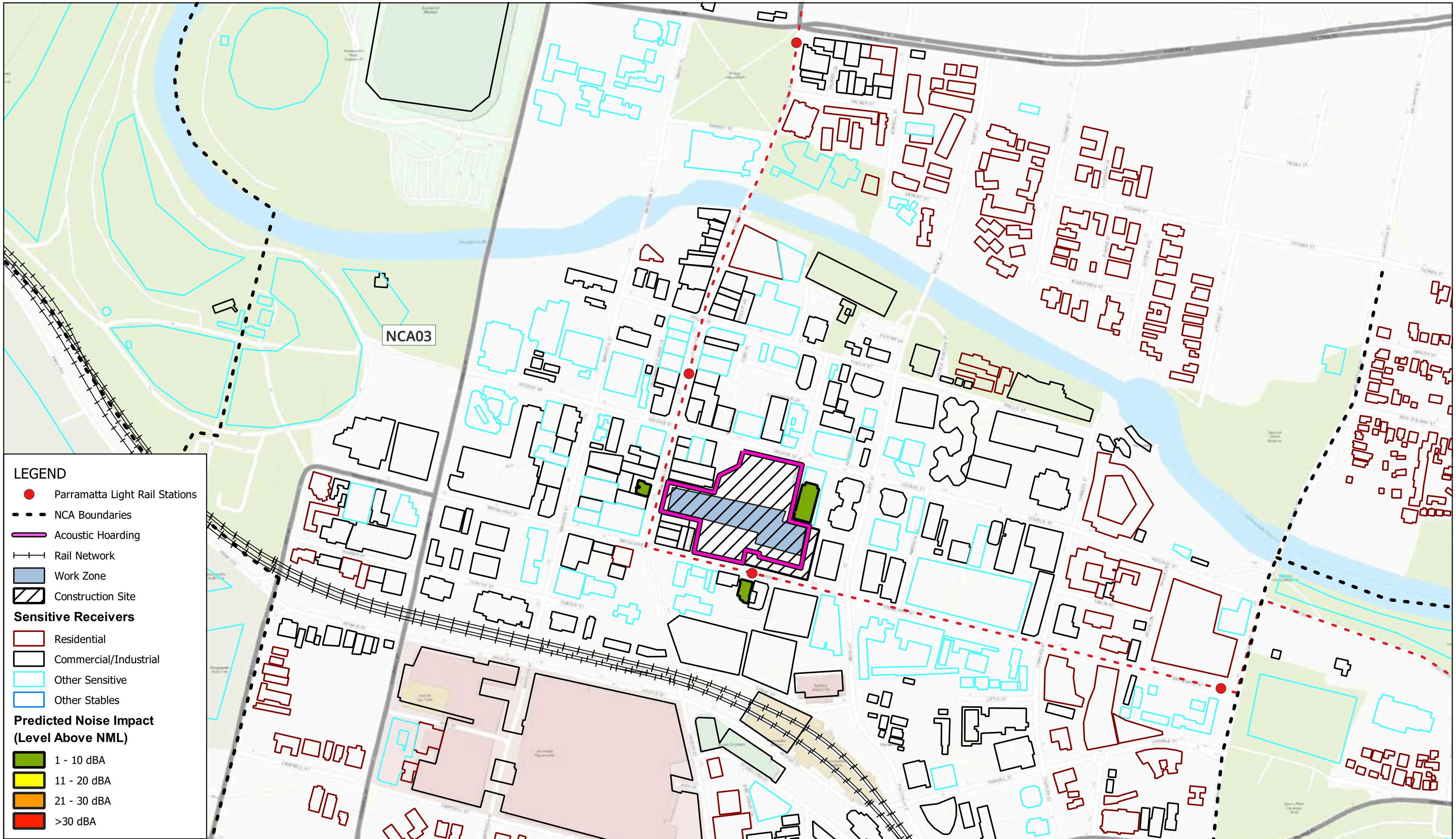
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.23a Nozzle Tunnel Secondary Lining FRP Works - Form & Reo Predicted Noise Impacts (Approved Hours)

FIGURE C-102

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_PM.qgz



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

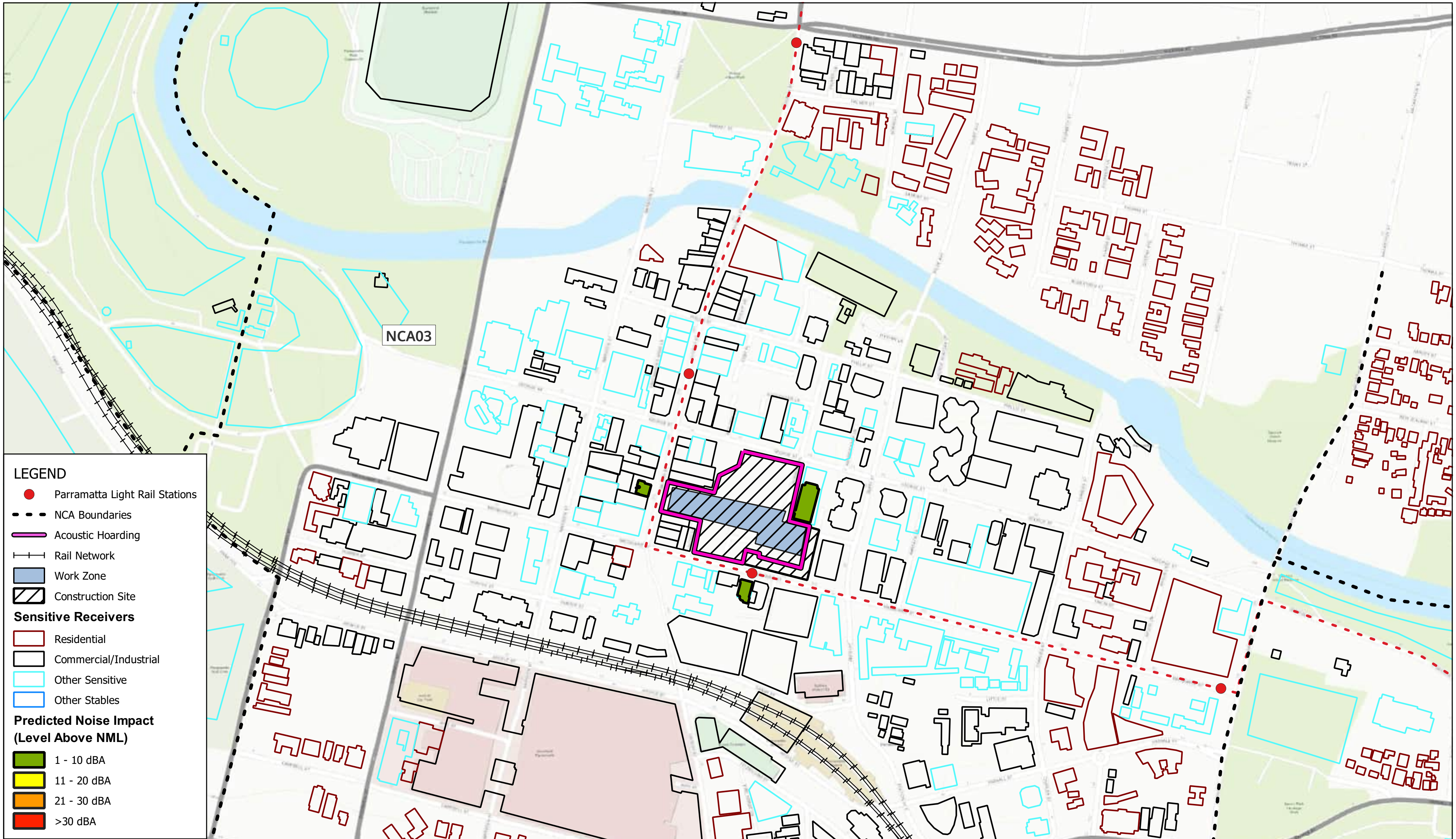
Drawn Date: 16-Jul-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.23a Nozzle Tunnel Secondary Lining FRP Works - Form & Reo Predicted Noise Impacts (Evening)

FIGURE C-107



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

SLR

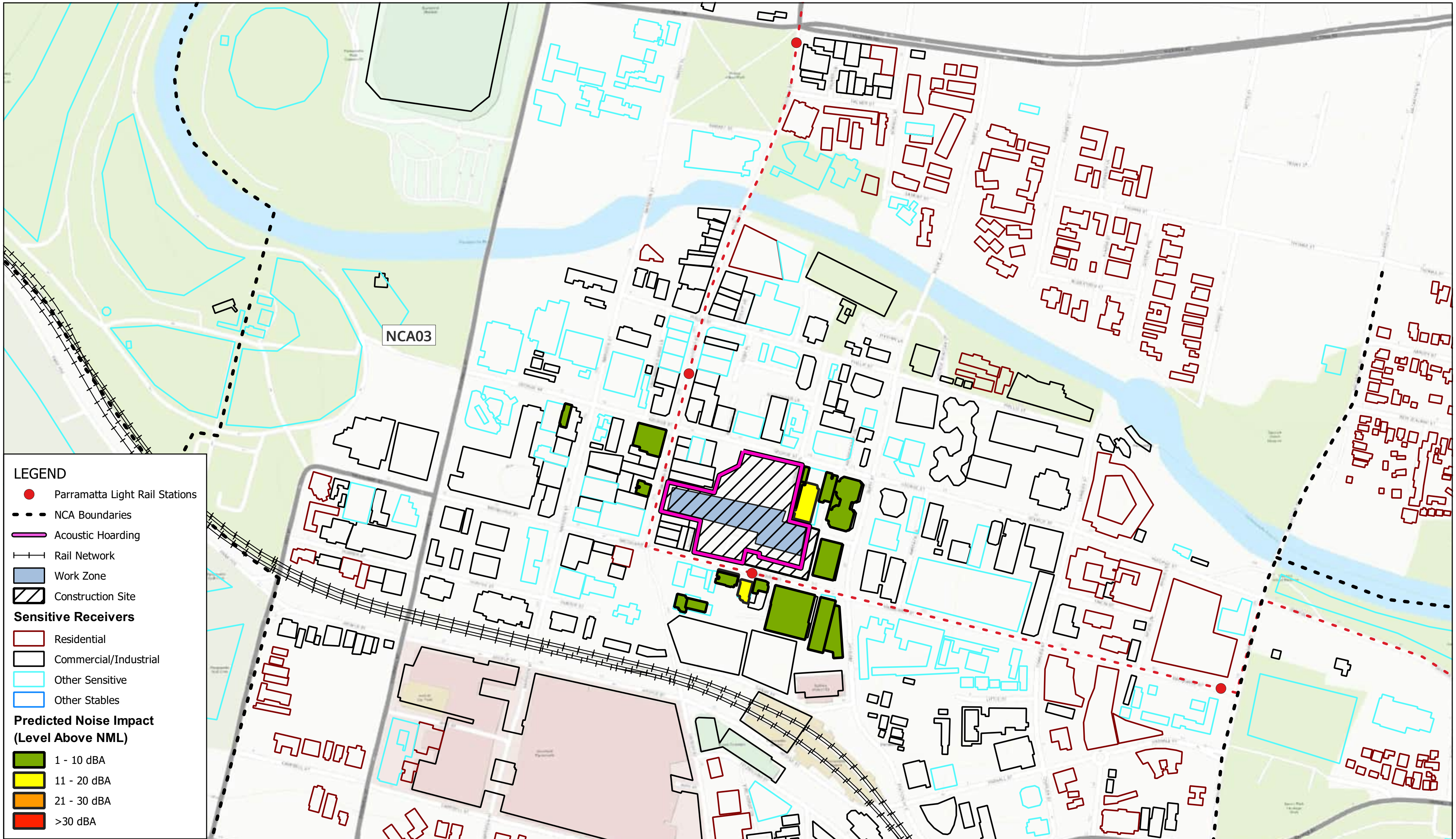
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.23a Nozzle Tunnel Secondary Lining FRP Works - Form & Reo Predicted Noise Impacts (Night)

FIGURE C-103

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_PM.qgz



LEGEND

- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Rail Network
- Work Zone
- Construction Site

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- >30 dBA

0 150 300 m

Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

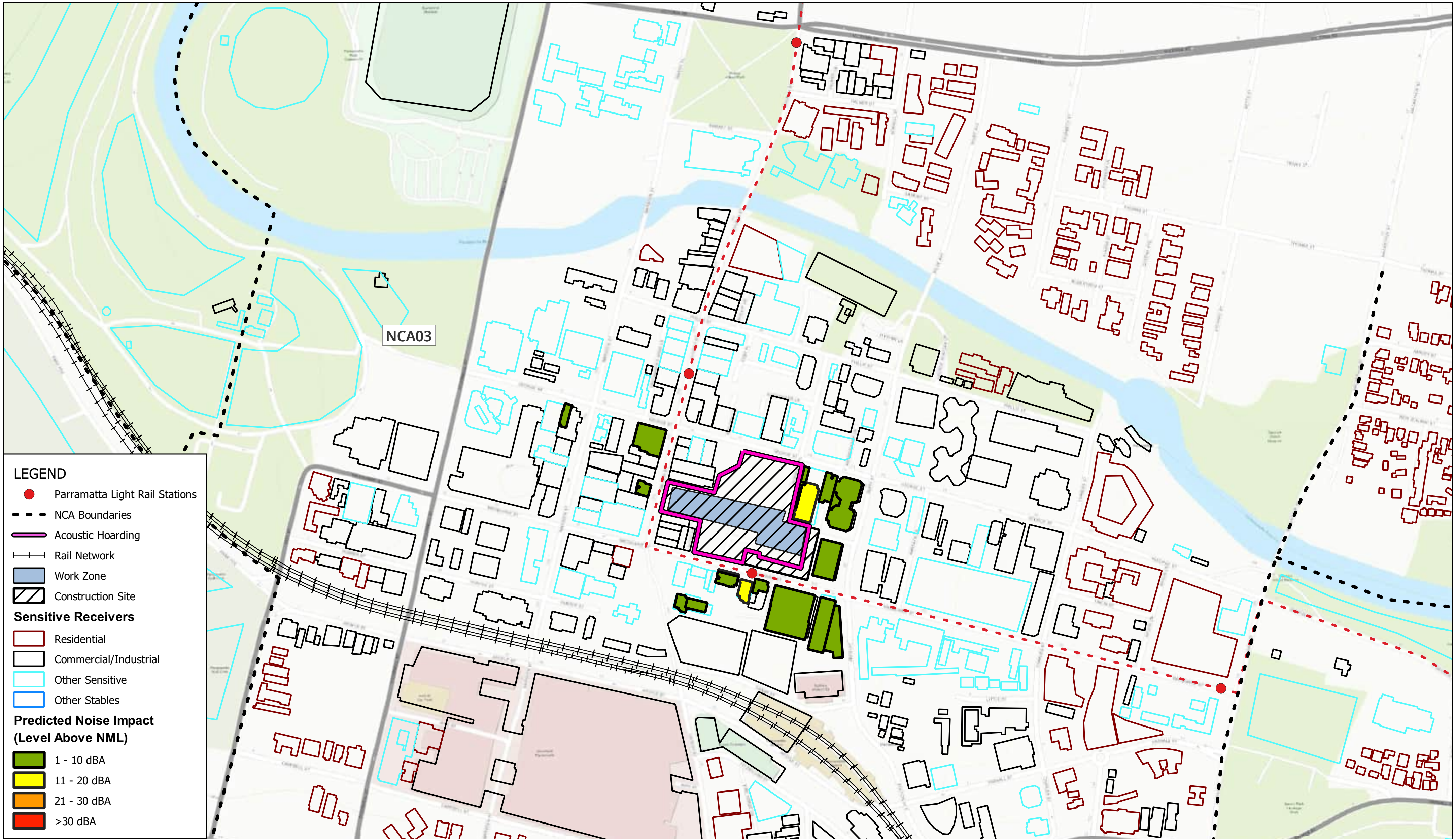
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.23b Nozzle Tunnel Secondary Lining FRP Works - Concrete Pours Predicted Noise Impacts (Approved Hours)

FIGURE C-104

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_PM.qgz



0 150 300 m

Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

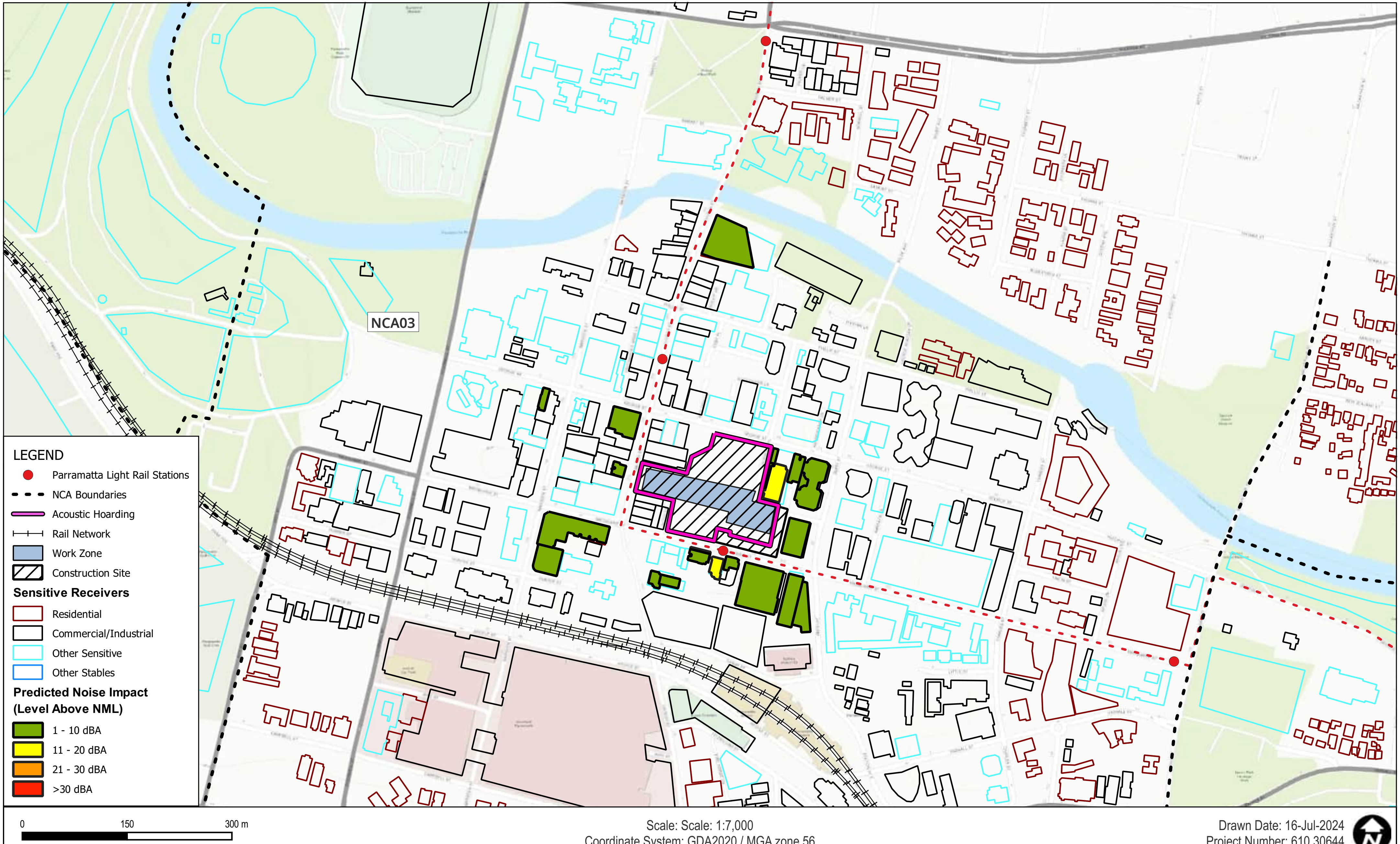
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.23b Nozzle Tunnel Secondary Lining FRP Works - Concrete Pours Predicted Noise Impacts (Evening)

FIGURE C-105



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

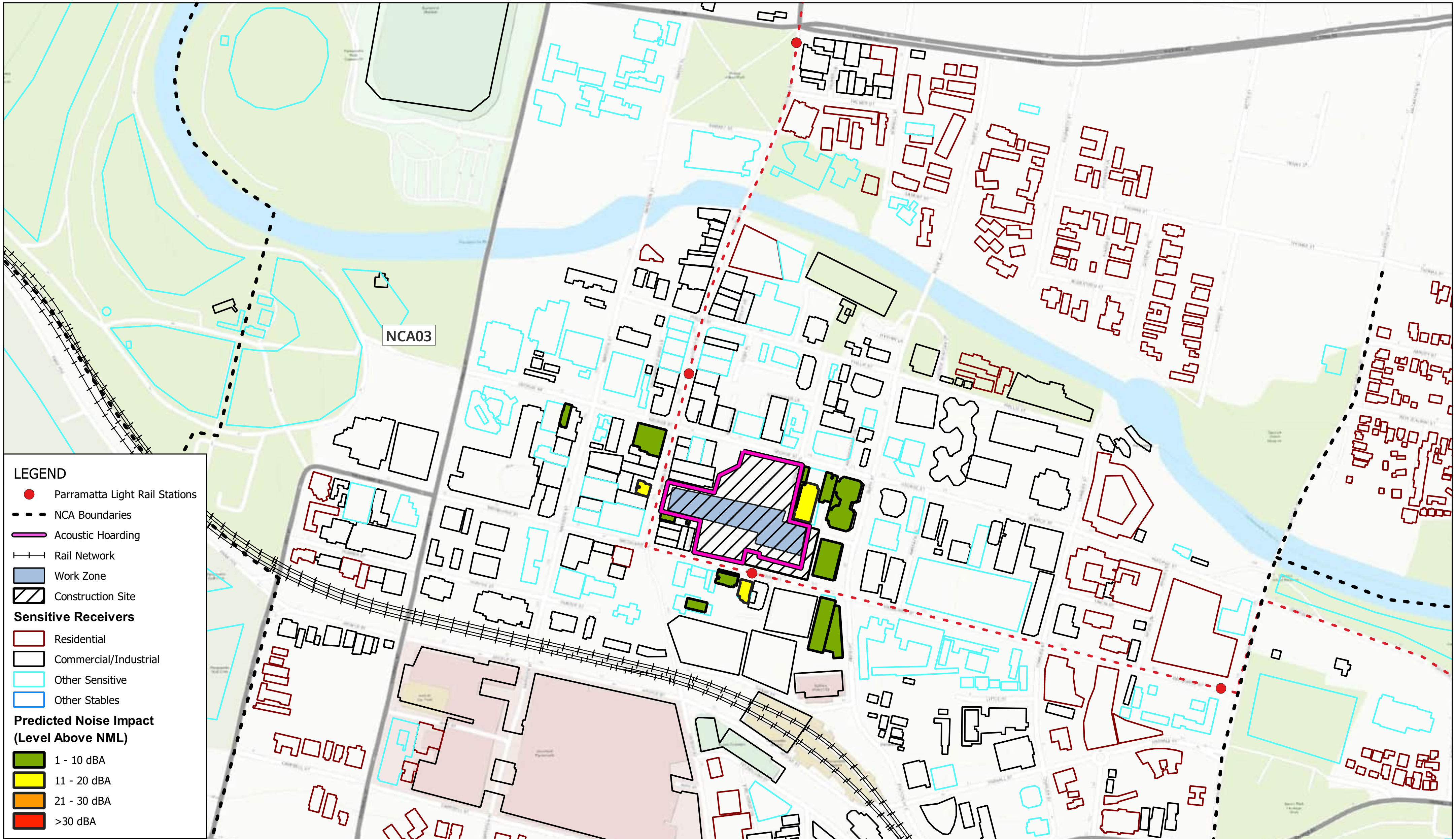
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.23b Nozzle Tunnel Secondary Lining FRP Works - Concrete Pours Predicted Noise Impacts (Night)

FIGURE C-106



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

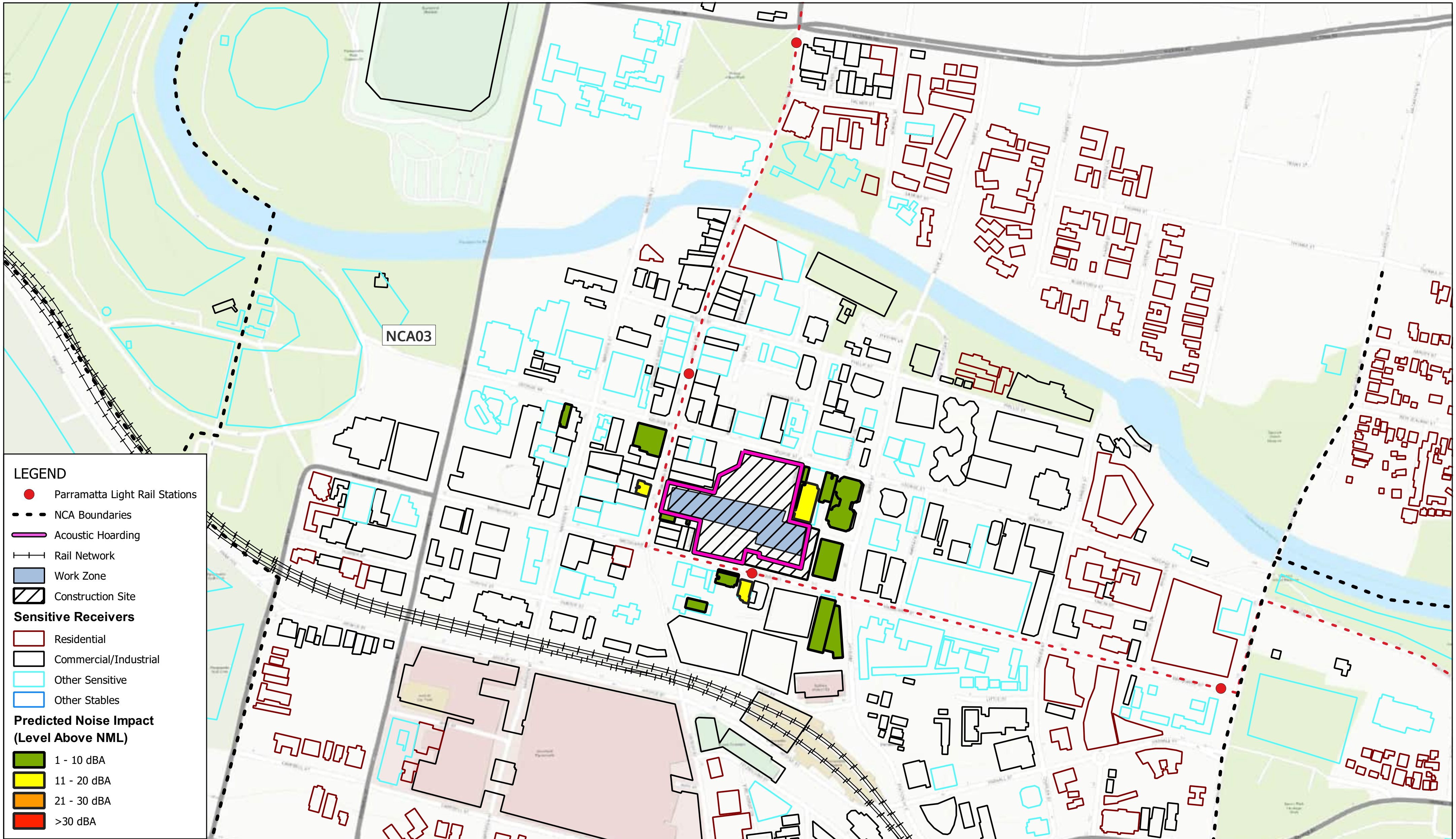
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.24 TBM traverse through Parramatta Station box (incl. prep/support works Predicted Noise Impacts (Approved Hours)

FIGURE C-107



0 150 300 m

Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 16-Jul-2024
Project Number: 610.30644

SLR

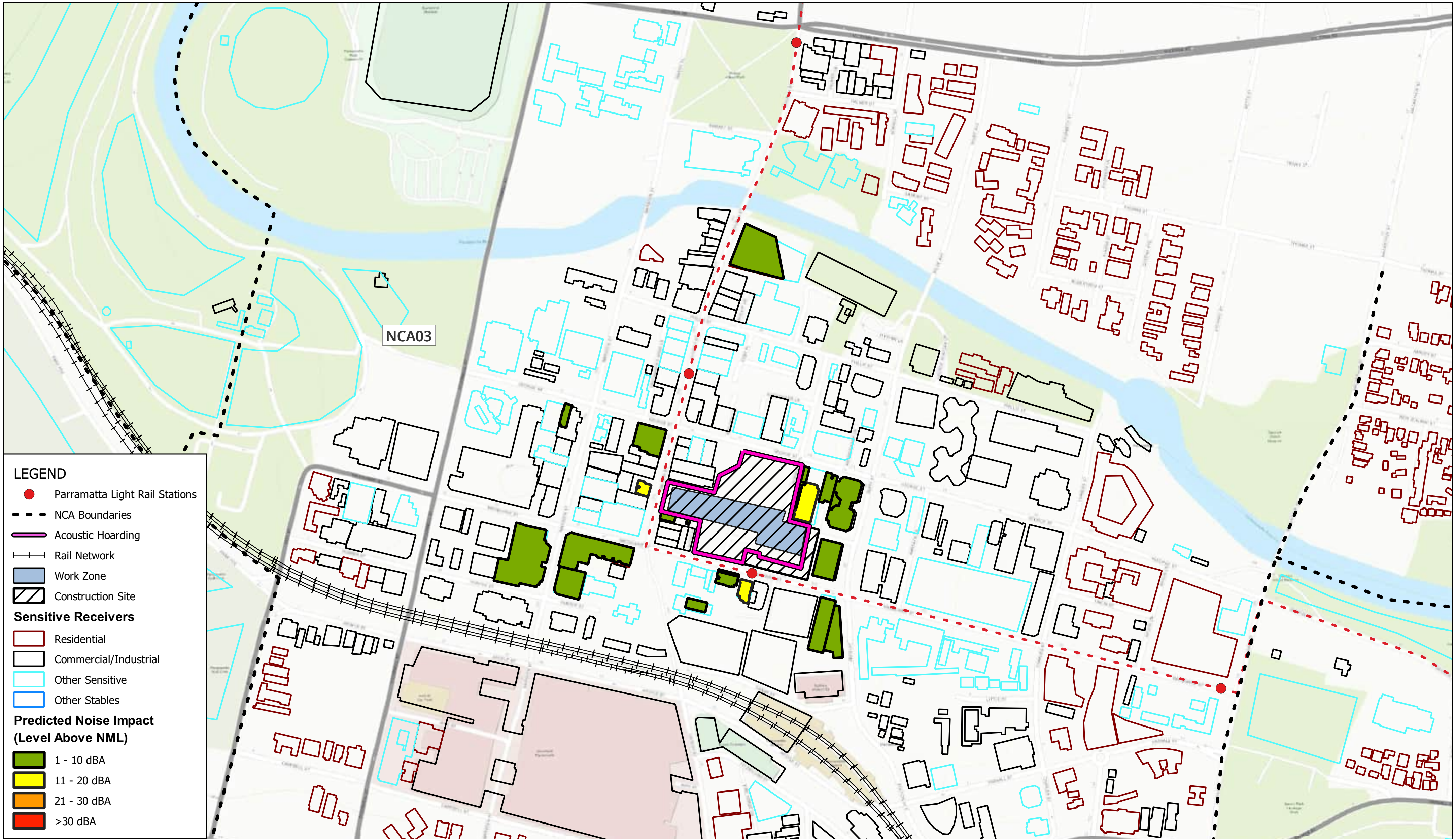
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.24 TBM traverse through Parramatta Station box (incl. prep/support works Predicted Noise Impacts (Evening)

FIGURE C-108

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_PM.qgz



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

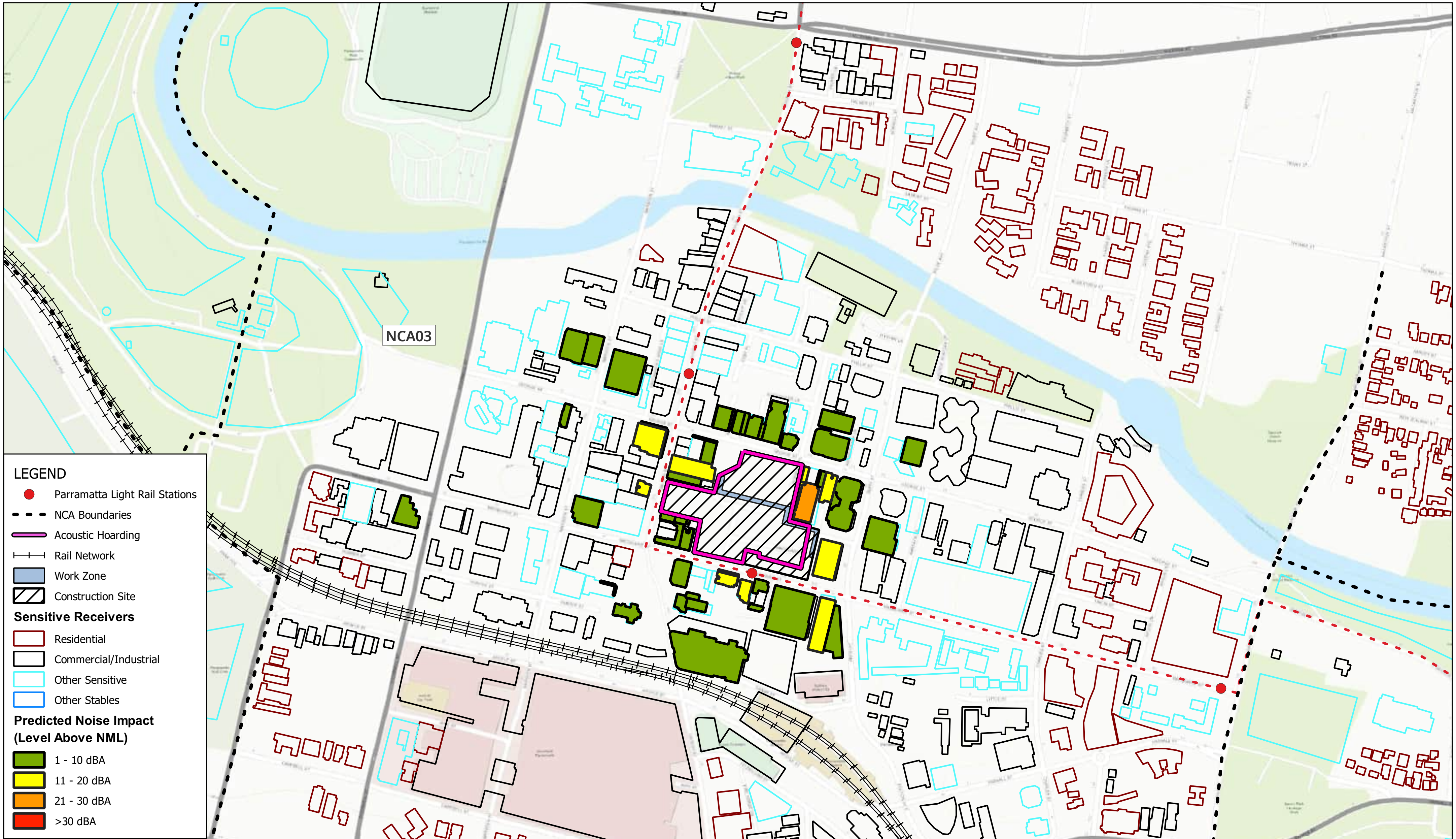
Drawn Date: 16-Jul-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.24 TBM traverse through Parramatta Station box (incl. prep/support works Predicted Noise Impacts (Night)

FIGURE C-109



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

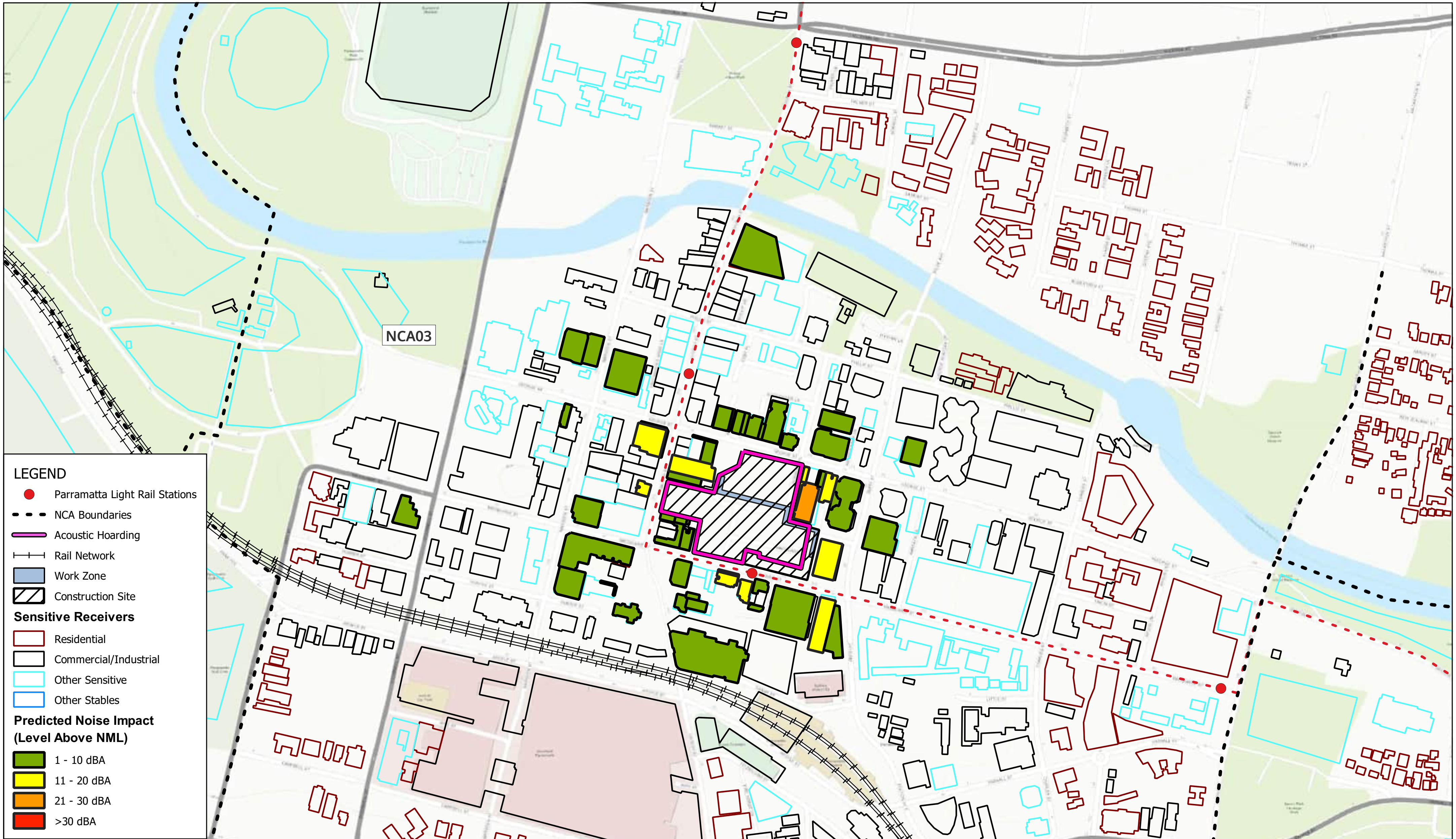
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.25 Sydney Water SEA Works
Predicted Noise Impacts
(Approved Hours)

FIGURE C-110



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

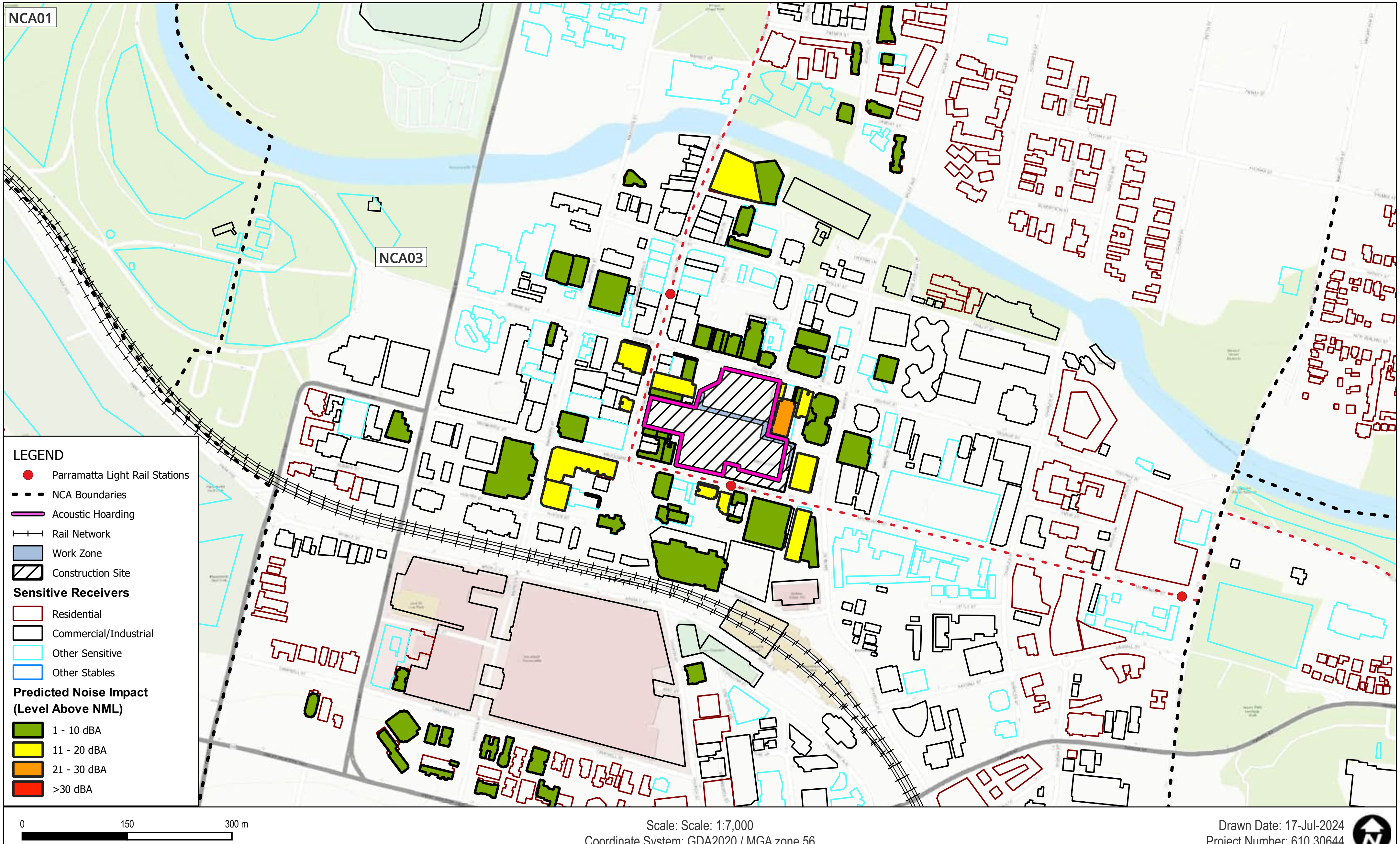
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.25 Sydney Water SEA Works
Predicted Noise Impacts
(Evening)

FIGURE C-111



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

SLR

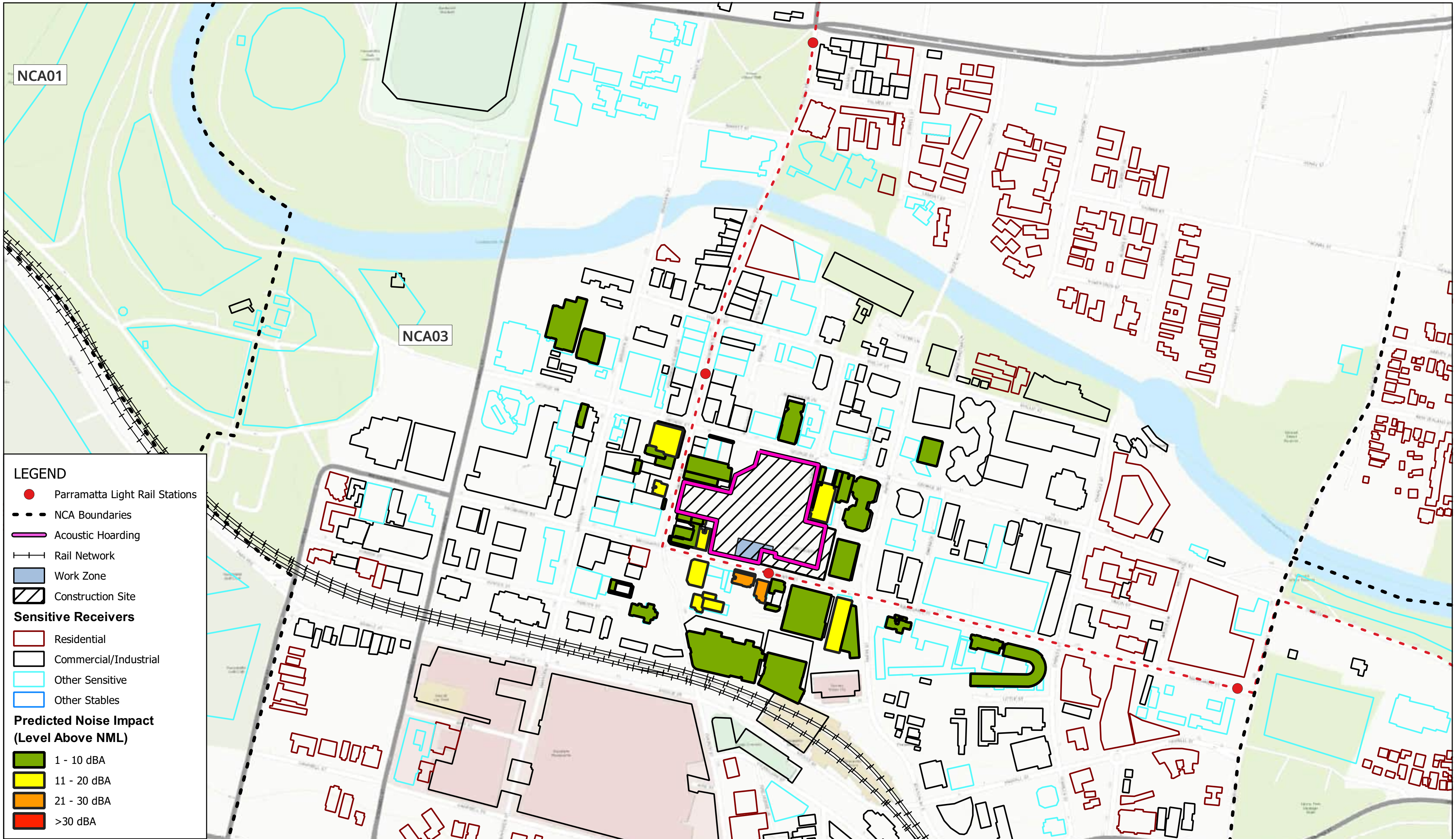
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.25 Sydney Water SEA Works
Predicted Noise Impacts
(Night)

FIGURE C-112

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_PM.qgz



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

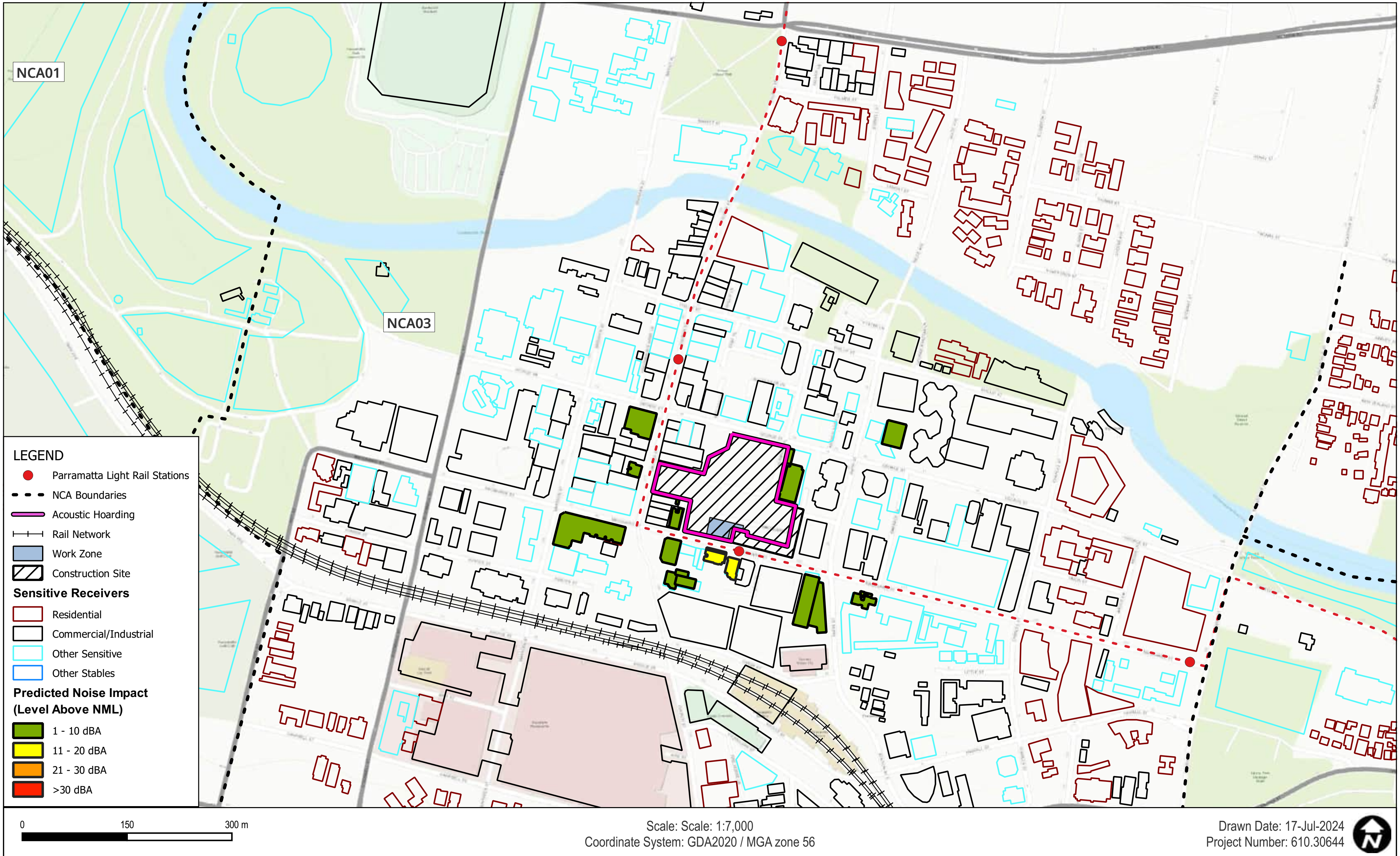
Drawn Date: 17-Jul-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.26 Macquarie Street/Horwood Place Local Area Works Predicted Noise Impacts (Approved Hours)

FIGURE C-113



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

SLR

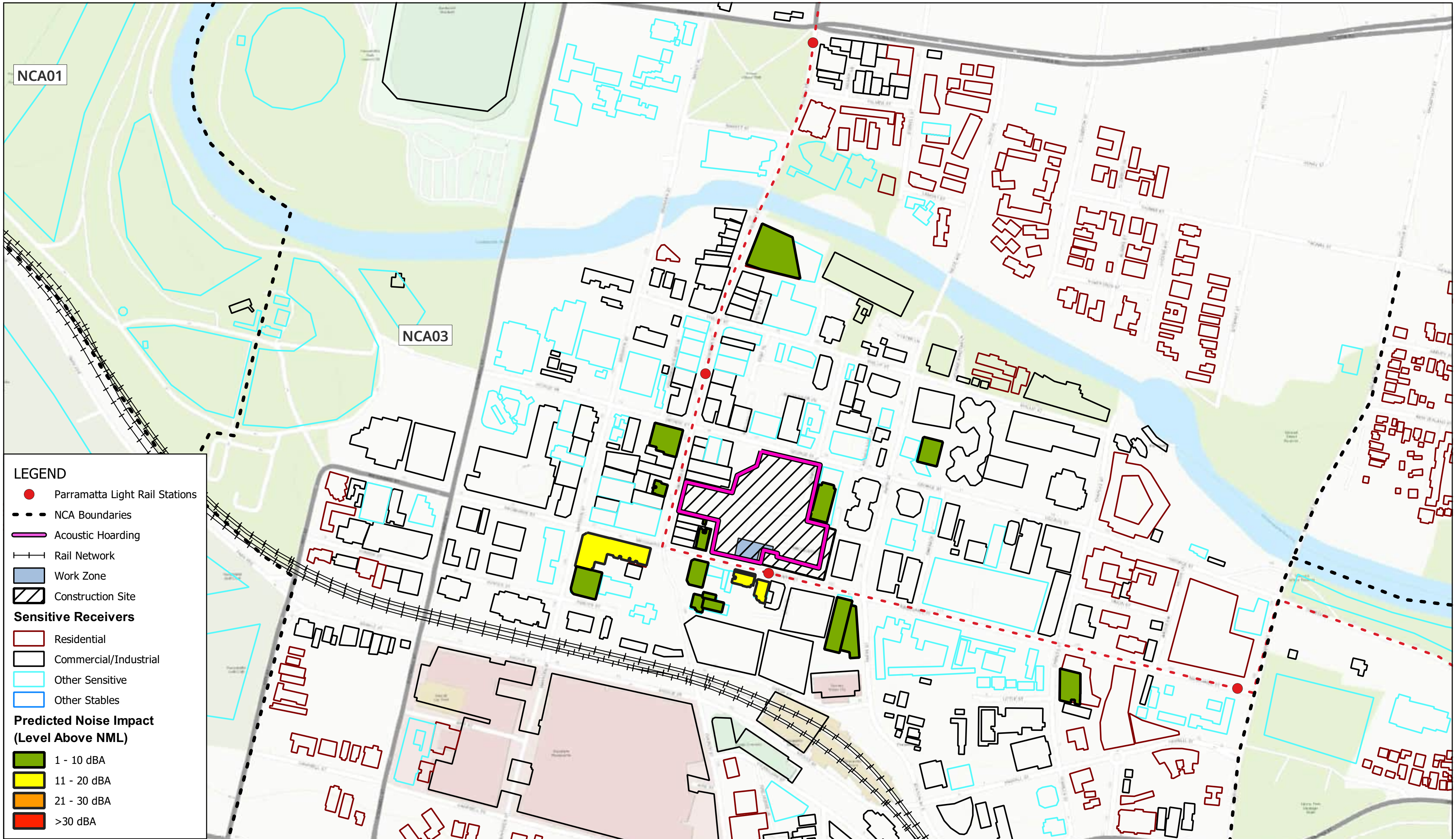
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.26 Macquarie Street/Horwood Place Local Area Works Predicted Noise Impacts (Evening)

FIGURE C-114

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_PM.qgz



0 150 300 m

Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

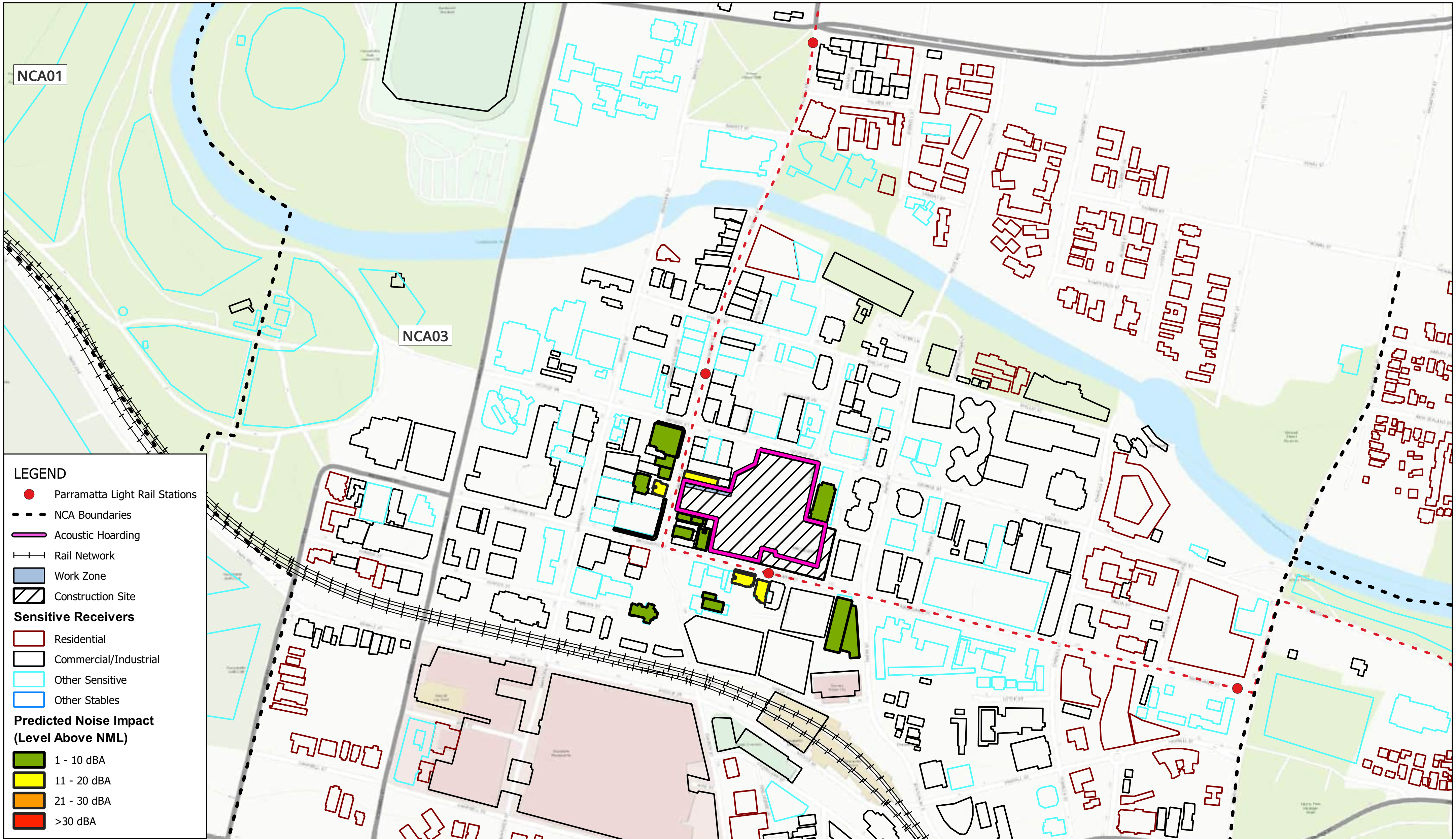
Drawn Date: 17-Jul-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.26 Macquarie Street/Horwood Place Local Area Works Predicted Noise Impacts (Night)

FIGURE C-115



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

SLR

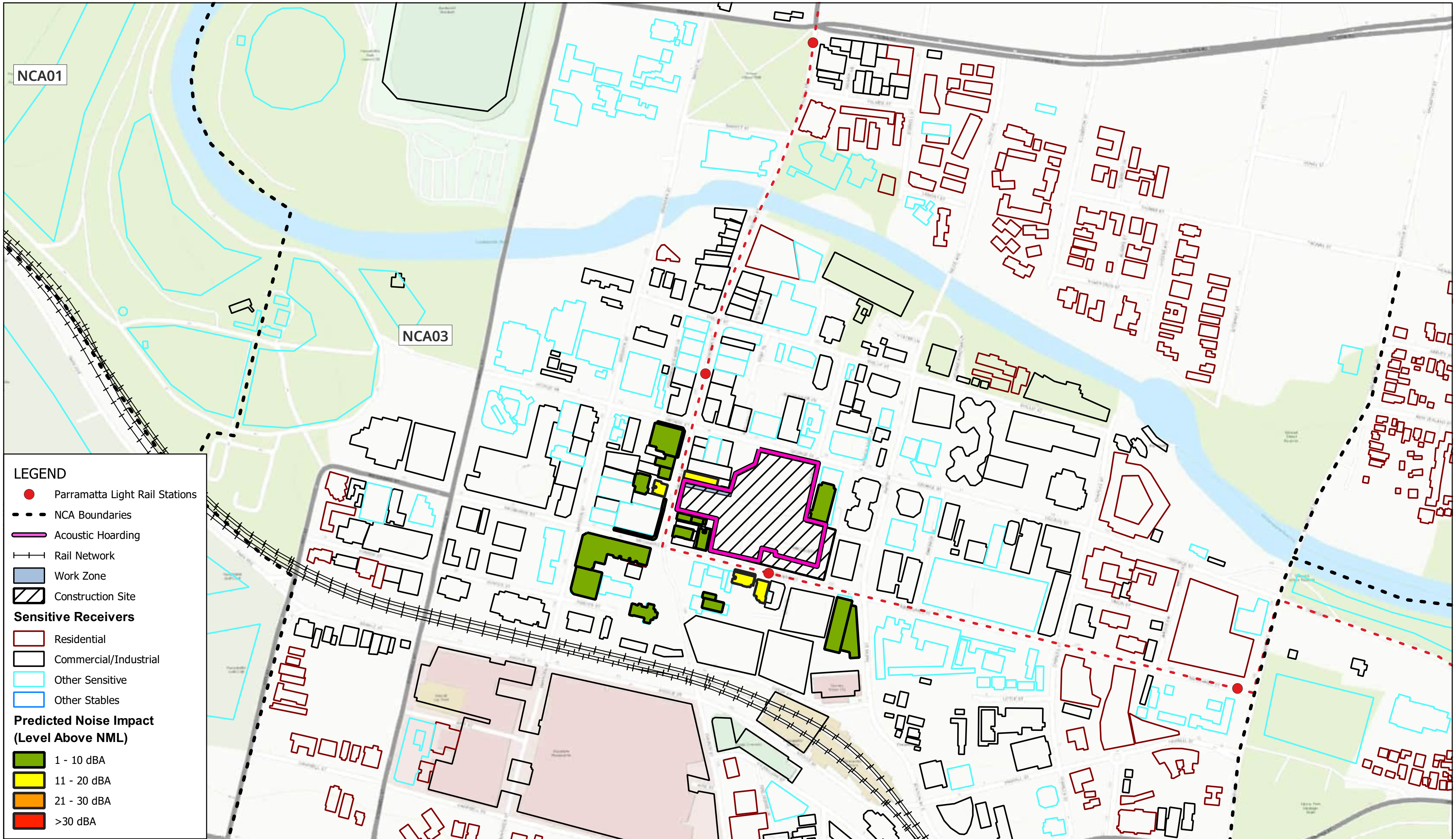
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.27 240 Church Street Works
Predicted Noise Impacts
(Approved Hours)

FIGURE C-116

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_PM.qgz



0 150 300 m

Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

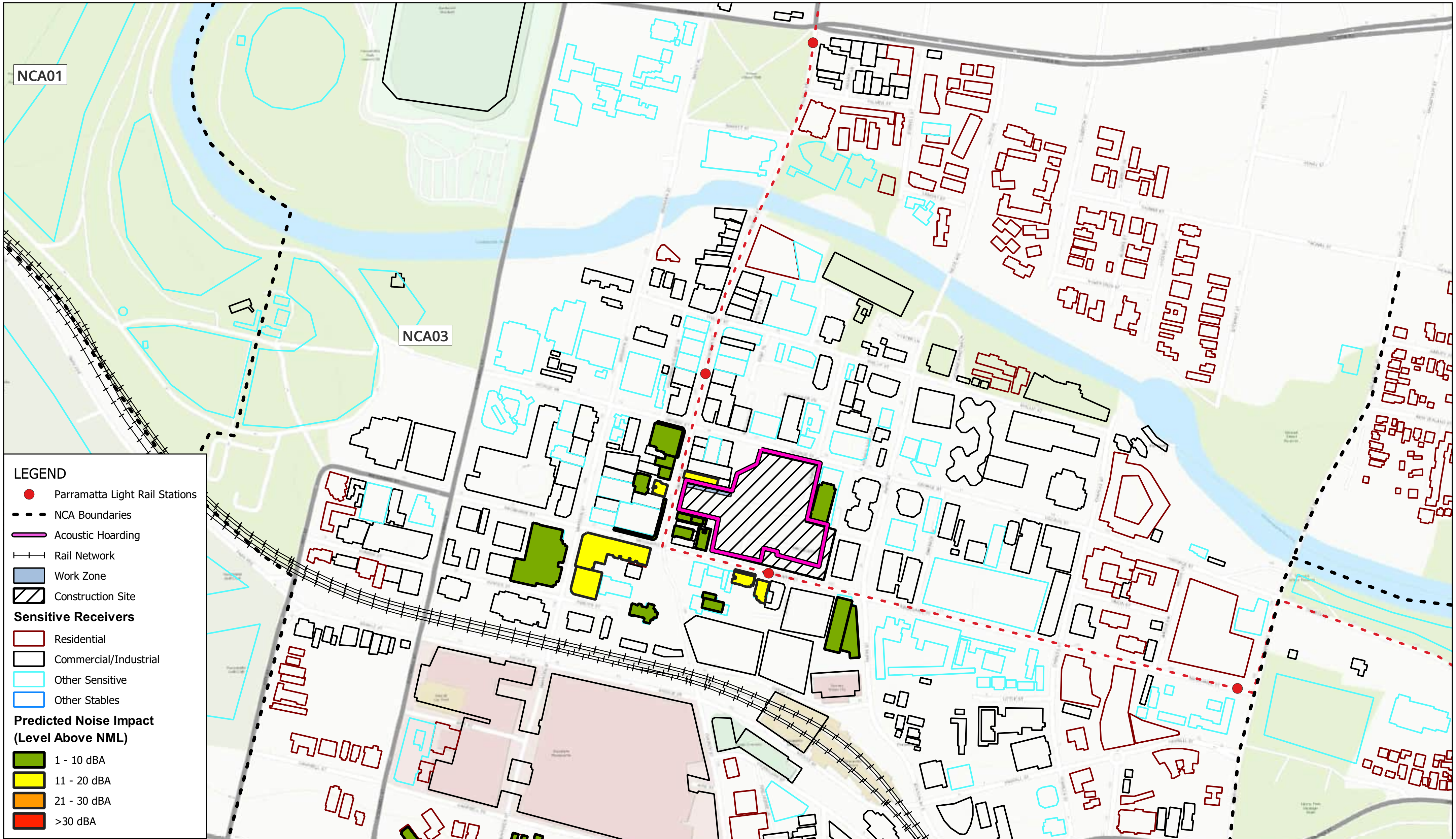
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.27 240 Church Street Works
Predicted Noise Impacts
(Evening)

FIGURE C-117



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

SLR

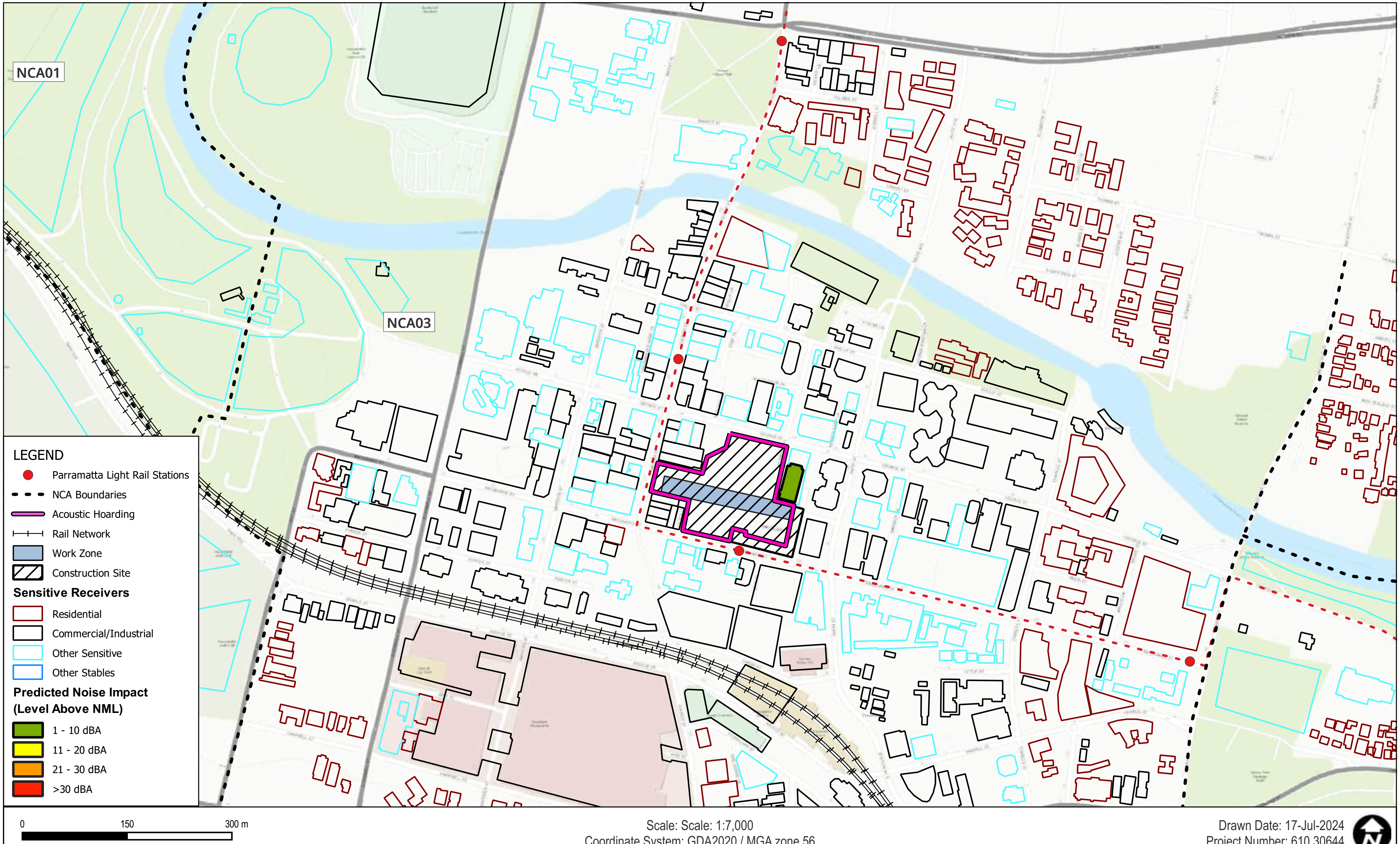
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.27 240 Church Street Works
Predicted Noise Impacts
(Night)

FIGURE C-118

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_PM.qgz



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

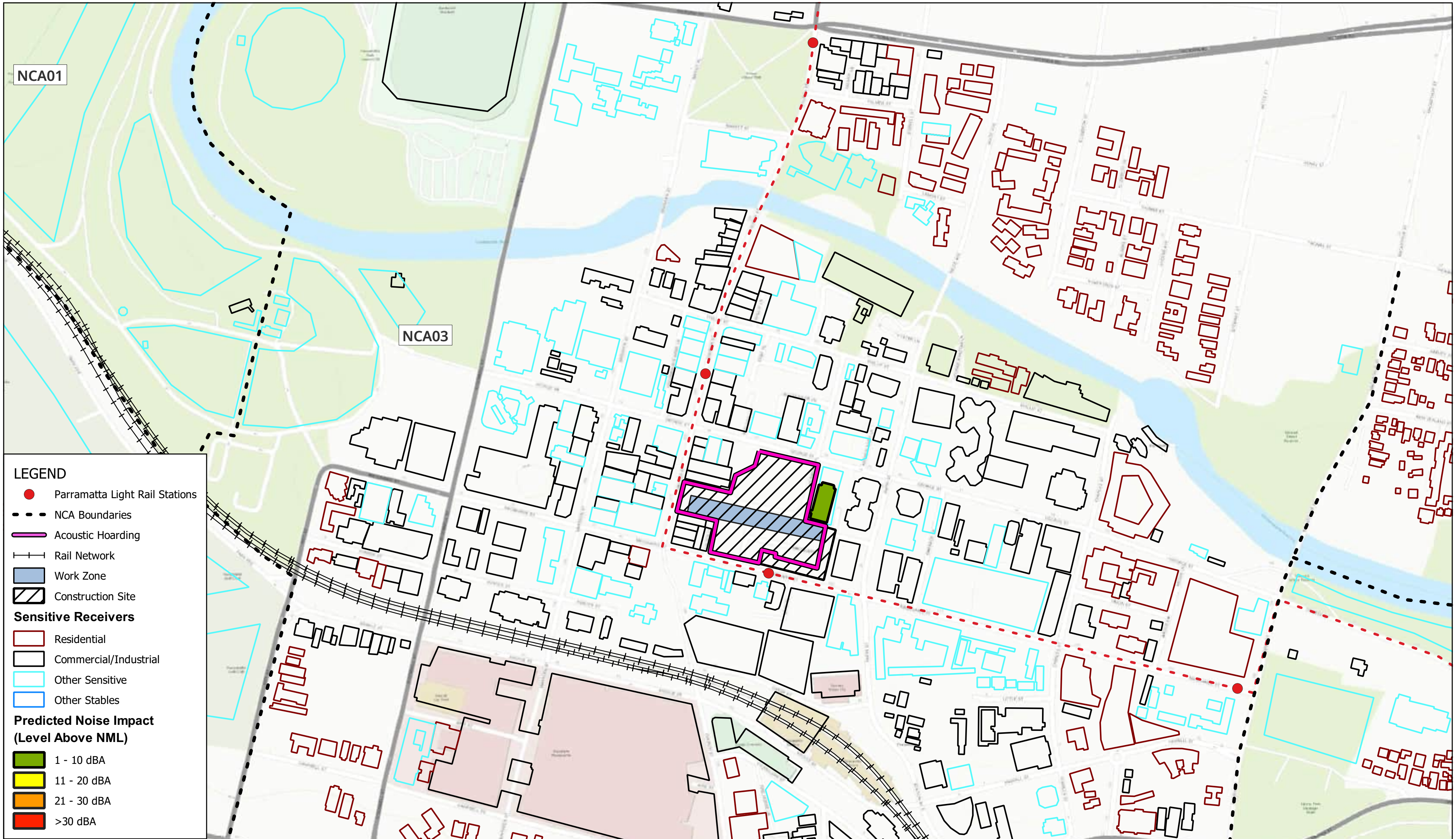
Drawn Date: 17-Jul-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.28 Station box maintenance works
Predicted Noise Impacts
(Approved Hours)

FIGURE C-119



0 150 300 m

Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

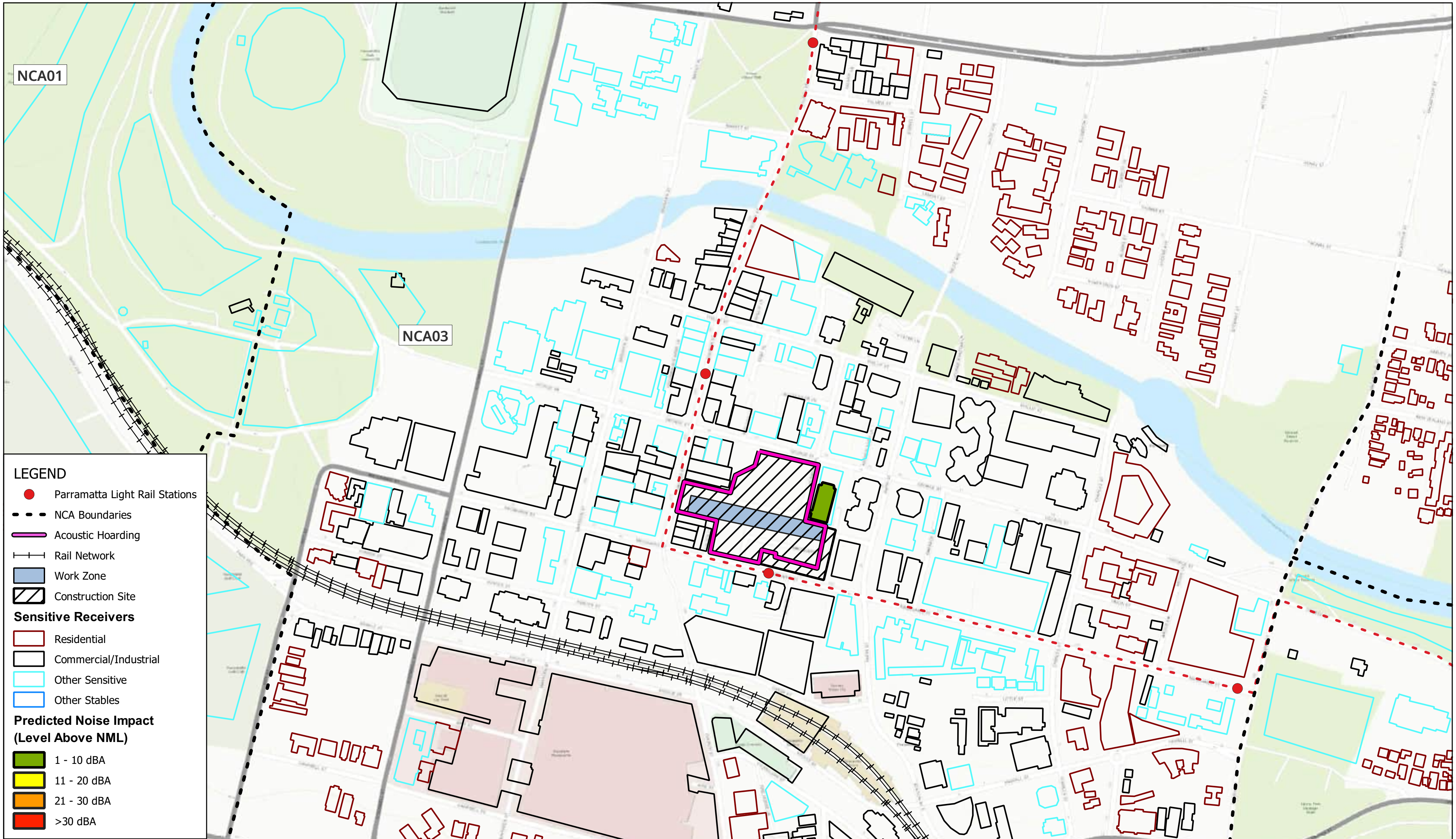
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.28 Station box maintenance works
Predicted Noise Impacts
(Evening)

FIGURE C-120



0 150 300 m

Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

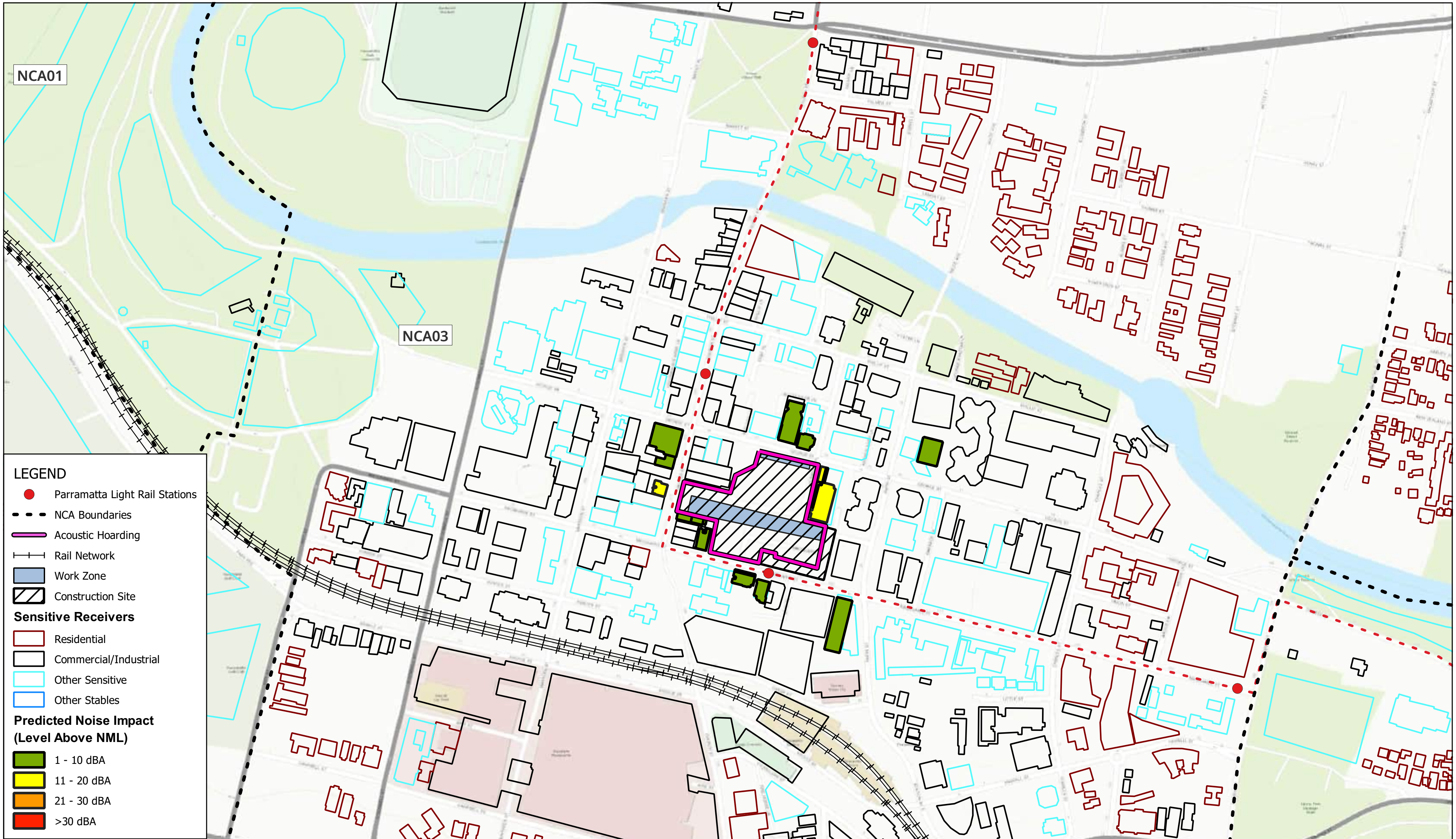
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.28 Station box maintenance works
Predicted Noise Impacts
(Night)

FIGURE C-121



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

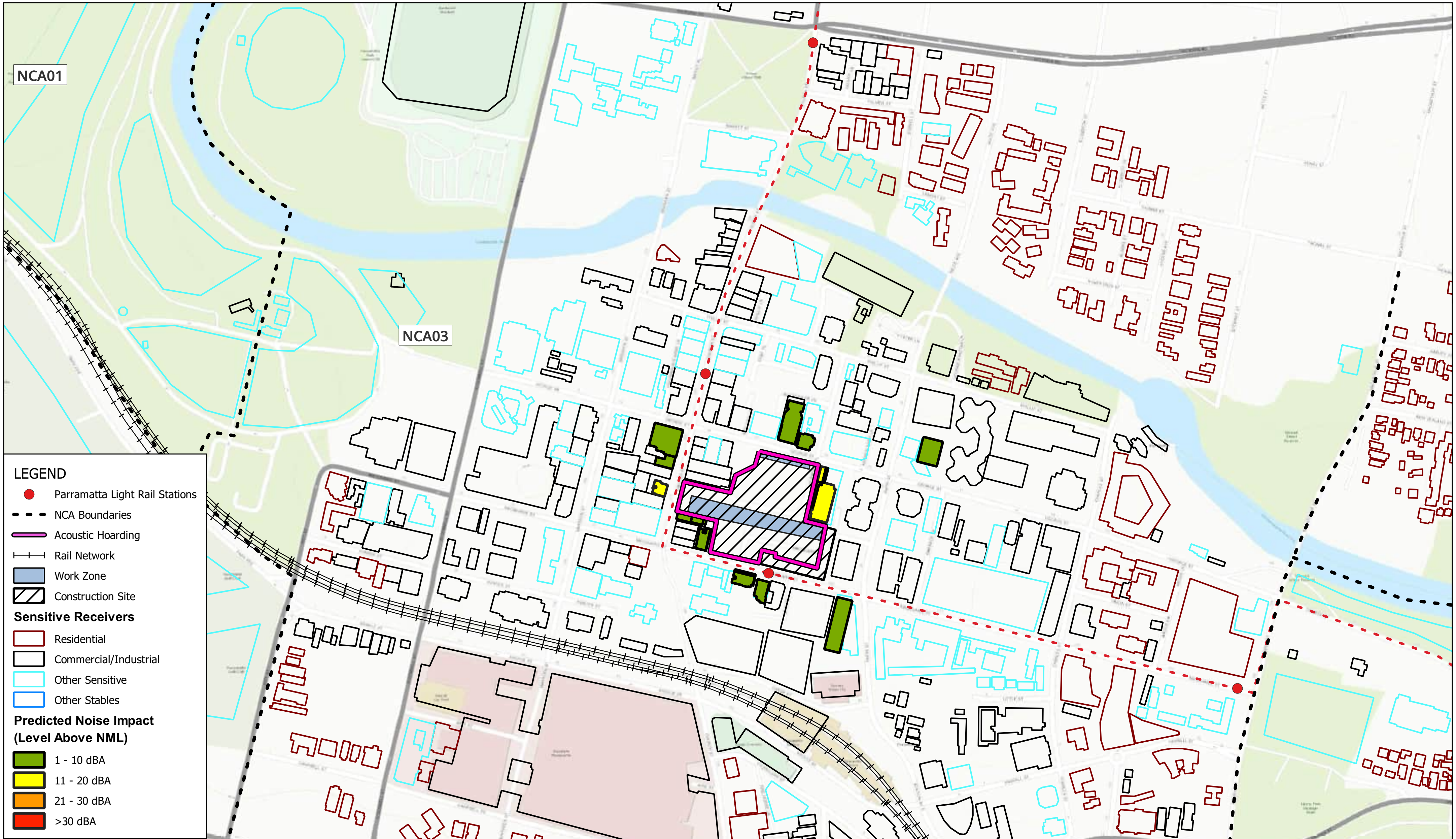
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.29 Water management/dewatering
Predicted Noise Impacts
(Approved Hours)

FIGURE C-122



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

SLR

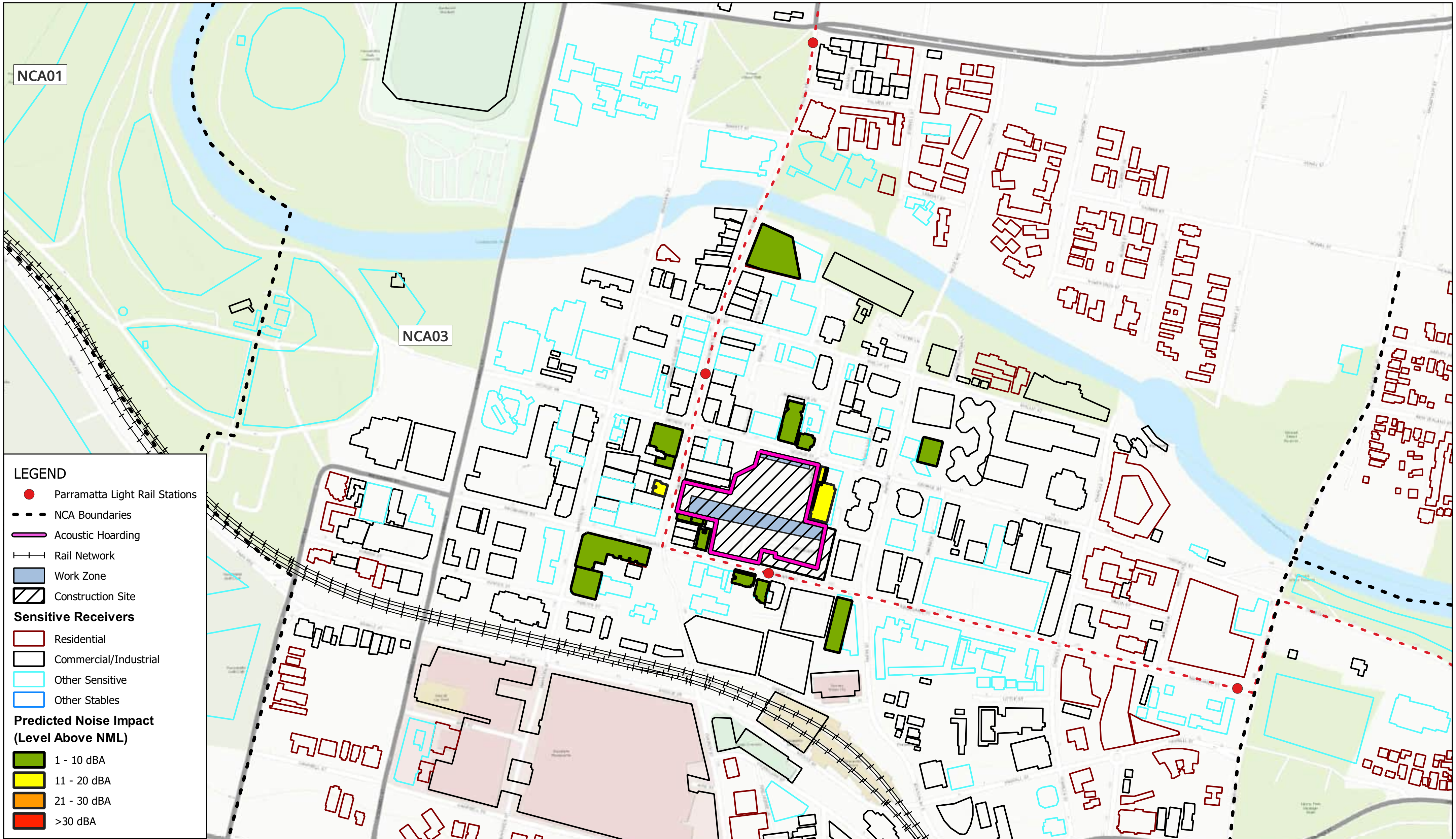
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.29 Water management/dewatering
Predicted Noise Impacts
(Evening)

FIGURE C-123

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_PM.qgz



Scale: Scale: 1:7,000
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

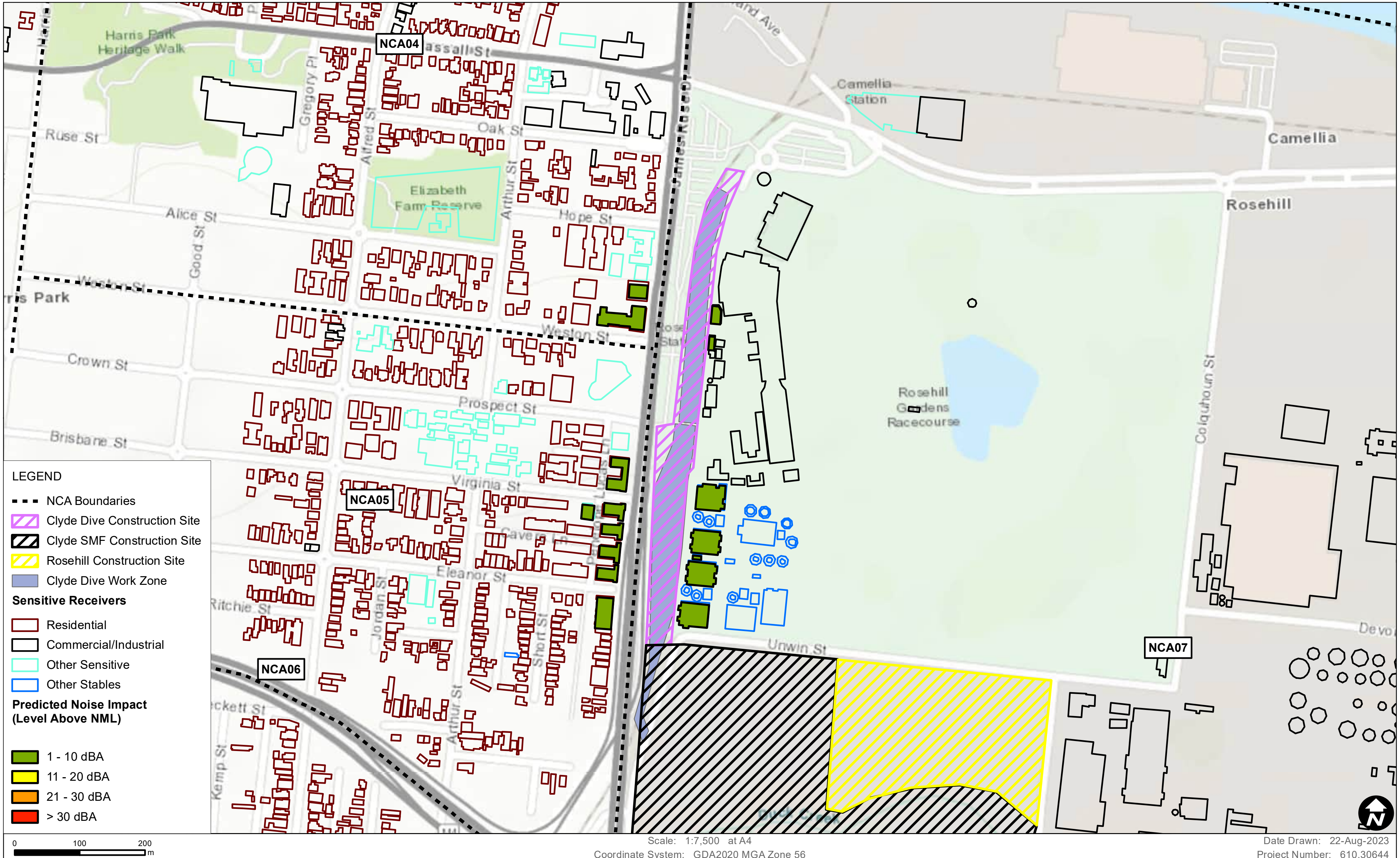
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

PM.29 Water management/dewatering
Predicted Noise Impacts
(Night)

FIGURE C-124



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

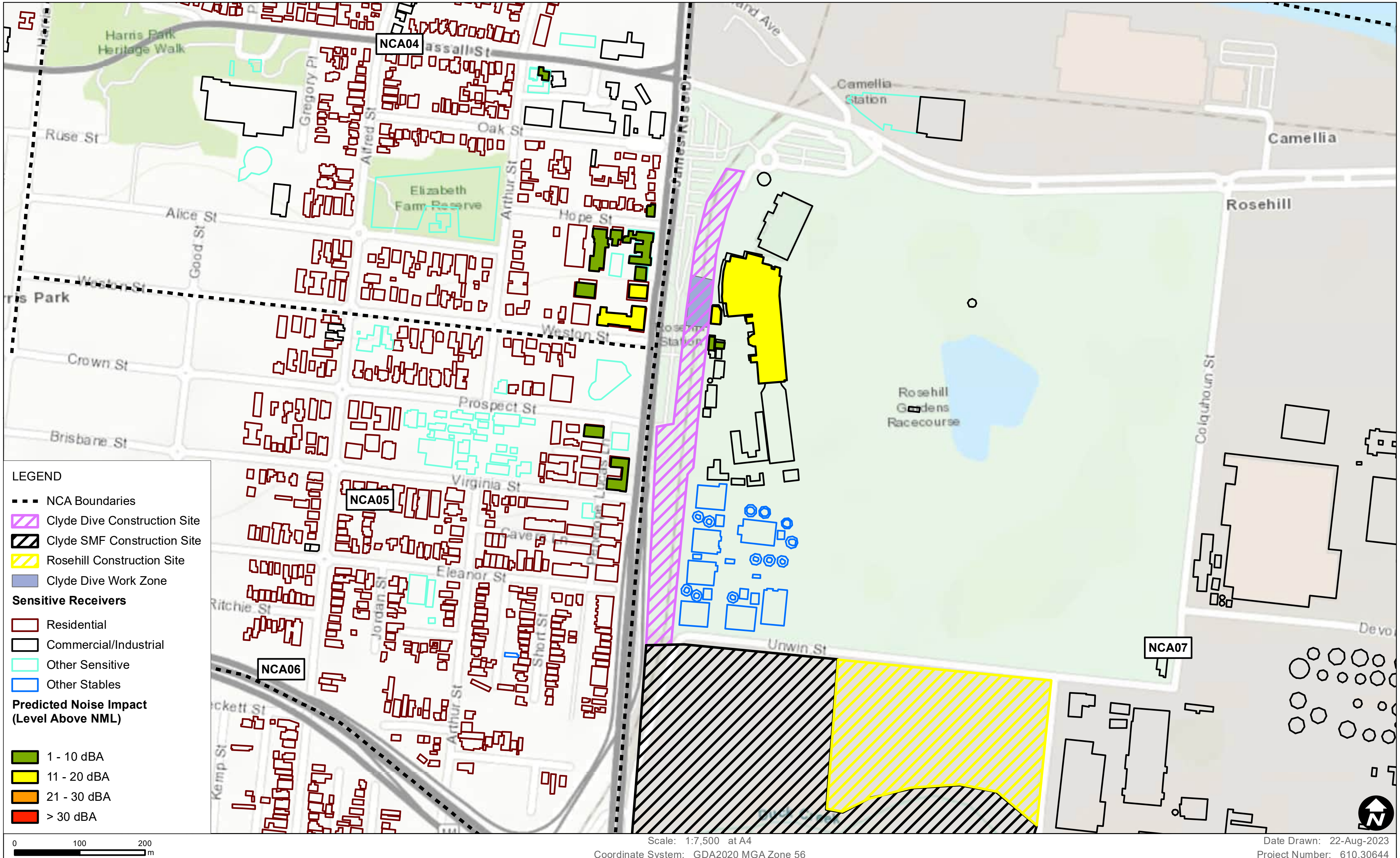
Date Drawn: 22-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.01a Construction site Establishment / Haul Roads Predicted Noise Impacts (Approved Hours)

FIGURE C-125



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 22-Aug-2023
Project Number: 610.30644

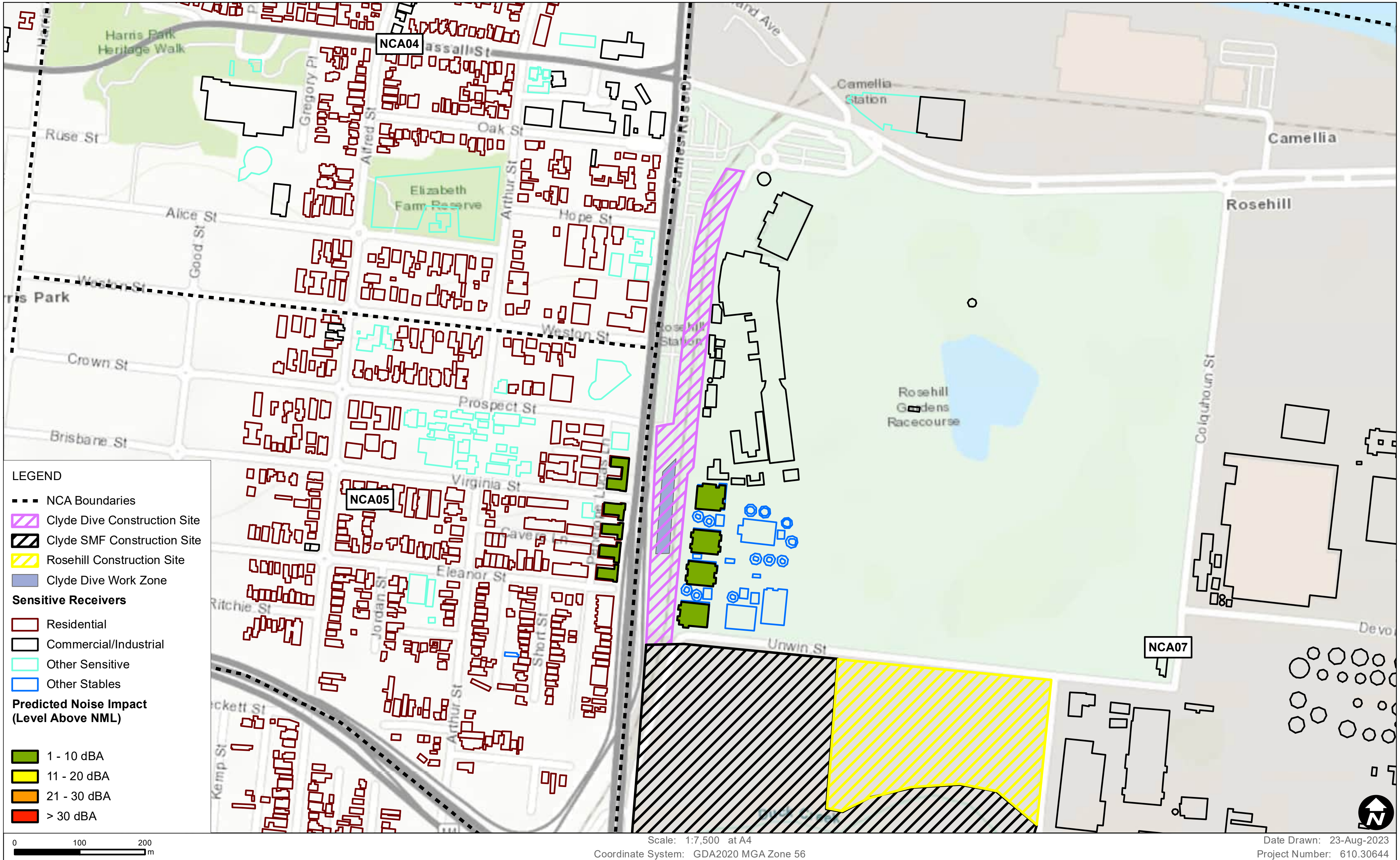
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.01b Demolition of former Rosehill Station
Predicted Noise Impacts
(Approved Hours)

FIGURE C-126

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C83_CD_01b_Demolition of former Rosehill Station_Day_03.mxd



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.02 Establishing piling platforms
Predicted Noise Impacts
(Approved Hours)

FIGURE C-127

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\05 QGIS\610.30644 WTP - DNVIS\610.30644 WTP - DNVIS.qgz

Scale: Scale: 1:7,500
Coordinate System: GDA2020 / MGA zone 56

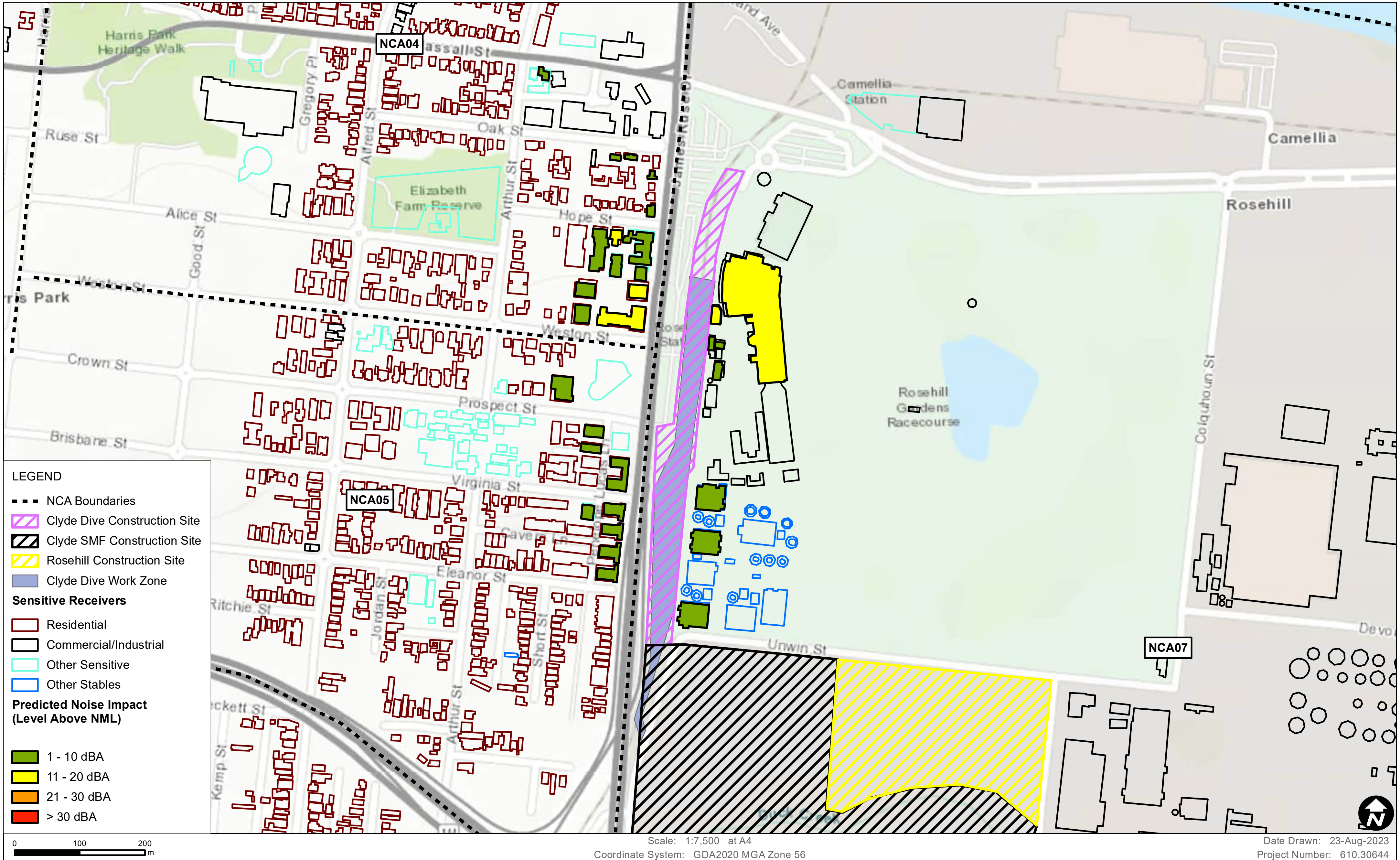
Drawn Date: 22-May-2025
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'

CD.03 Tree Clearing
Predicted Noise Impacts
(Approved Hours)

FIGURE C-128



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

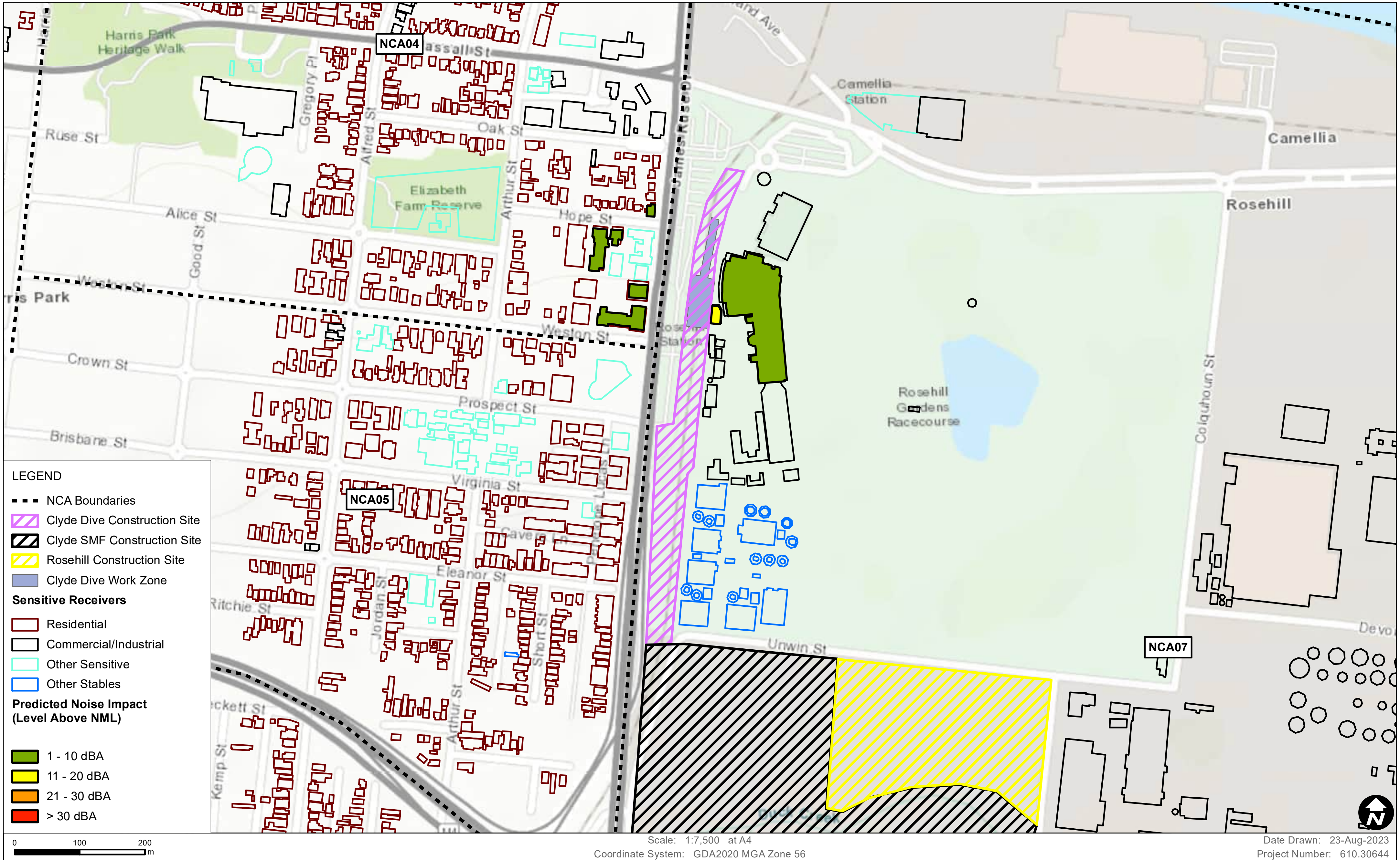
Date Drawn: 23-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.04 Shaft construction (evacuation and piling) Predicted Noise Impacts (Approved Hours)

FIGURE C-129



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.05 Establishing concrete slabs / acoustic shed Predicted Noise Impacts (Approved Hours)

FIGURE C-130

Scale: Scale: 1:7,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 08-May-2025
Project Number: 610.30644

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\05 QGIS\610.30644 WTP - DNVIS\610.30644 WTP - DNVIS.qgz

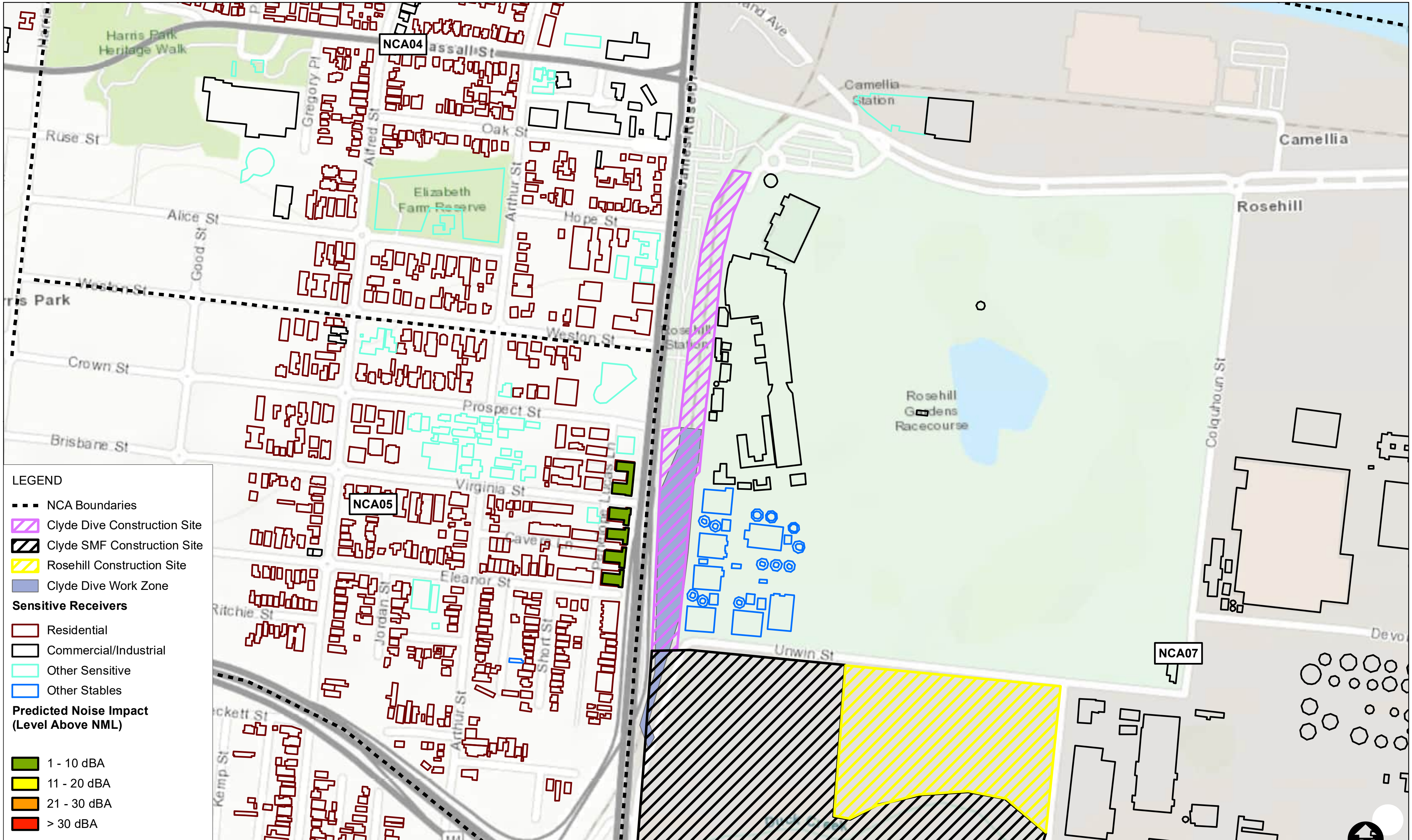
SLR

Data Source:
ESRI World Imagery

Note: Other Sensitive Receivers should only be considered impacted 'when in use'

CD.06 Bulk Earthworks
Predicted Noise Impacts
(Approved Hours)

FIGURE C-131



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

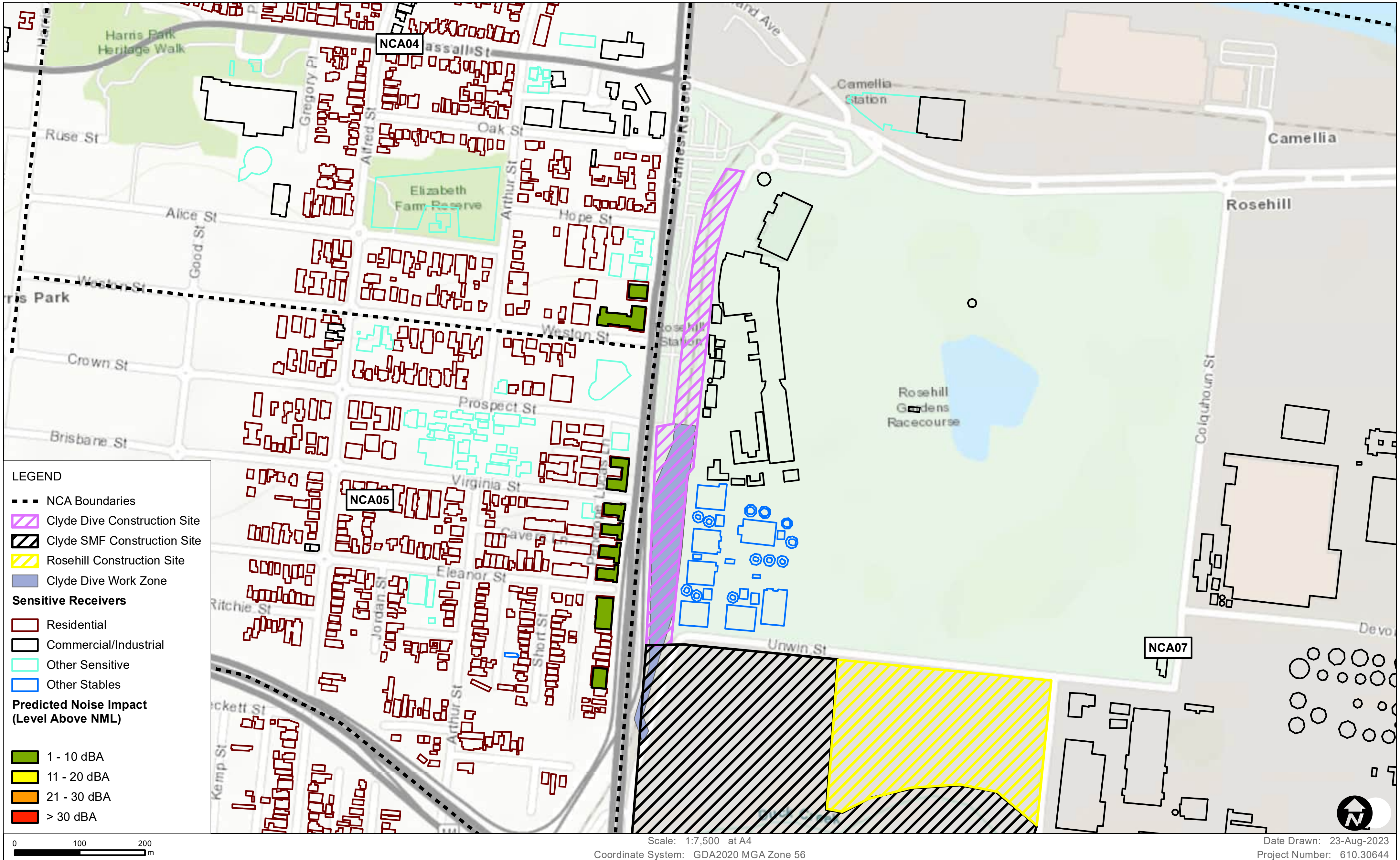
Date Drawn: 23-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.07 Haul road FRP (form reo pour) and hoarding install
Predicted Noise Impacts
(Approved Hours)

FIGURE C-132



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

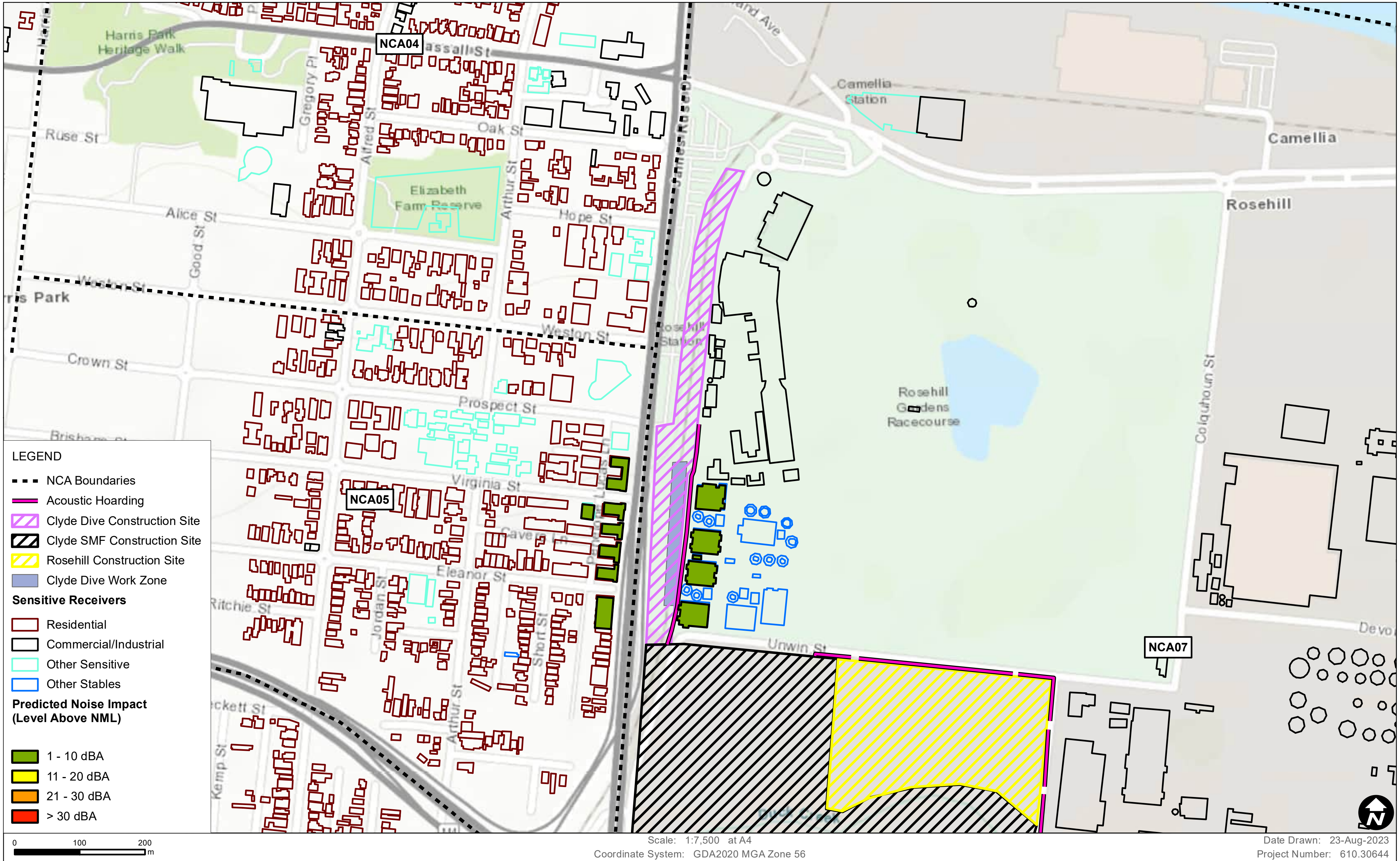
Date Drawn: 23-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.07 Haul road FRP (form reo pour) and hoarding install
Predicted Noise Impacts
(Evening)

FIGURE C-133



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

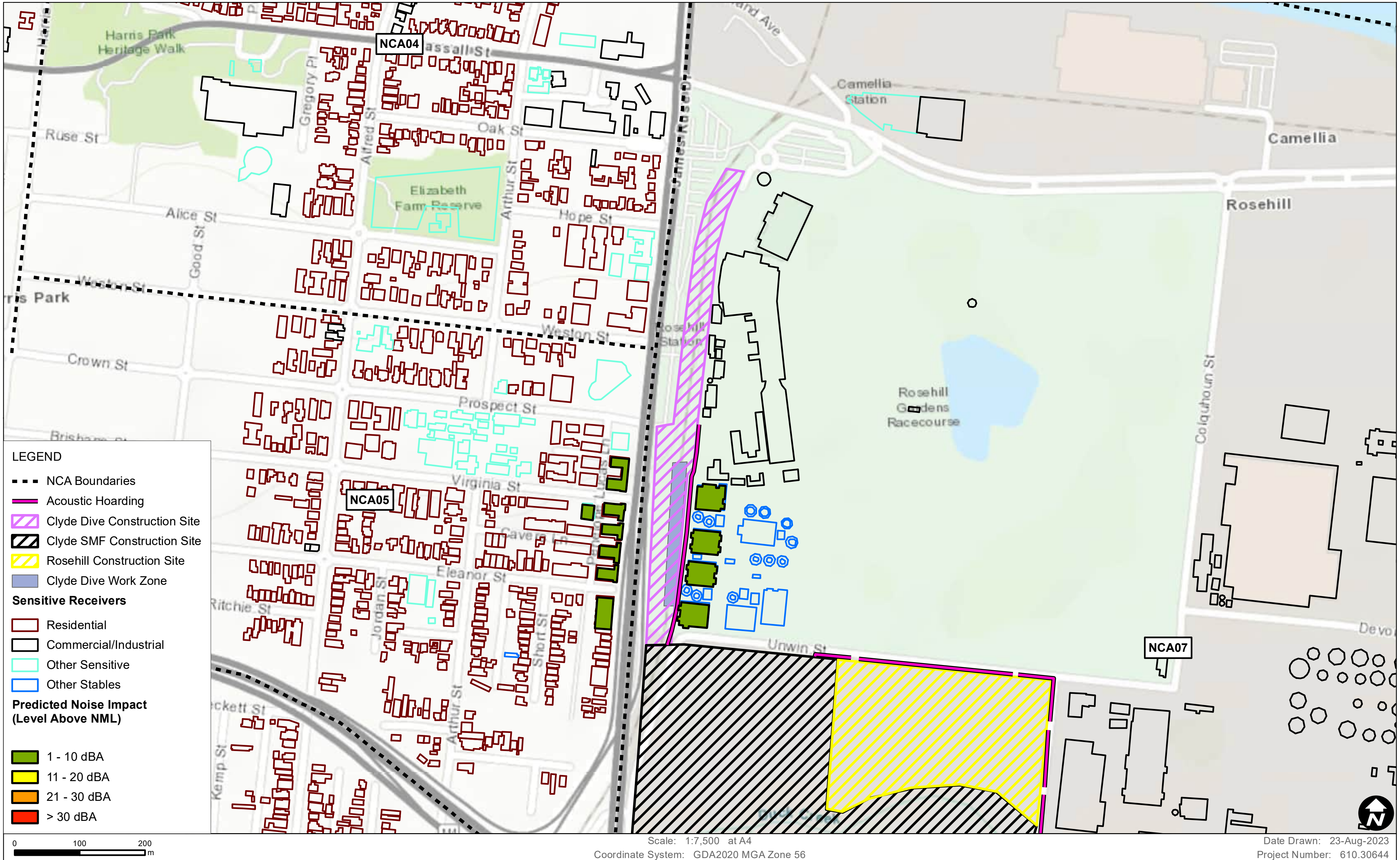
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.08a Decline structure construction (piling) Predicted Noise Impacts (Approved Hours)

FIGURE C-134



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

SLR

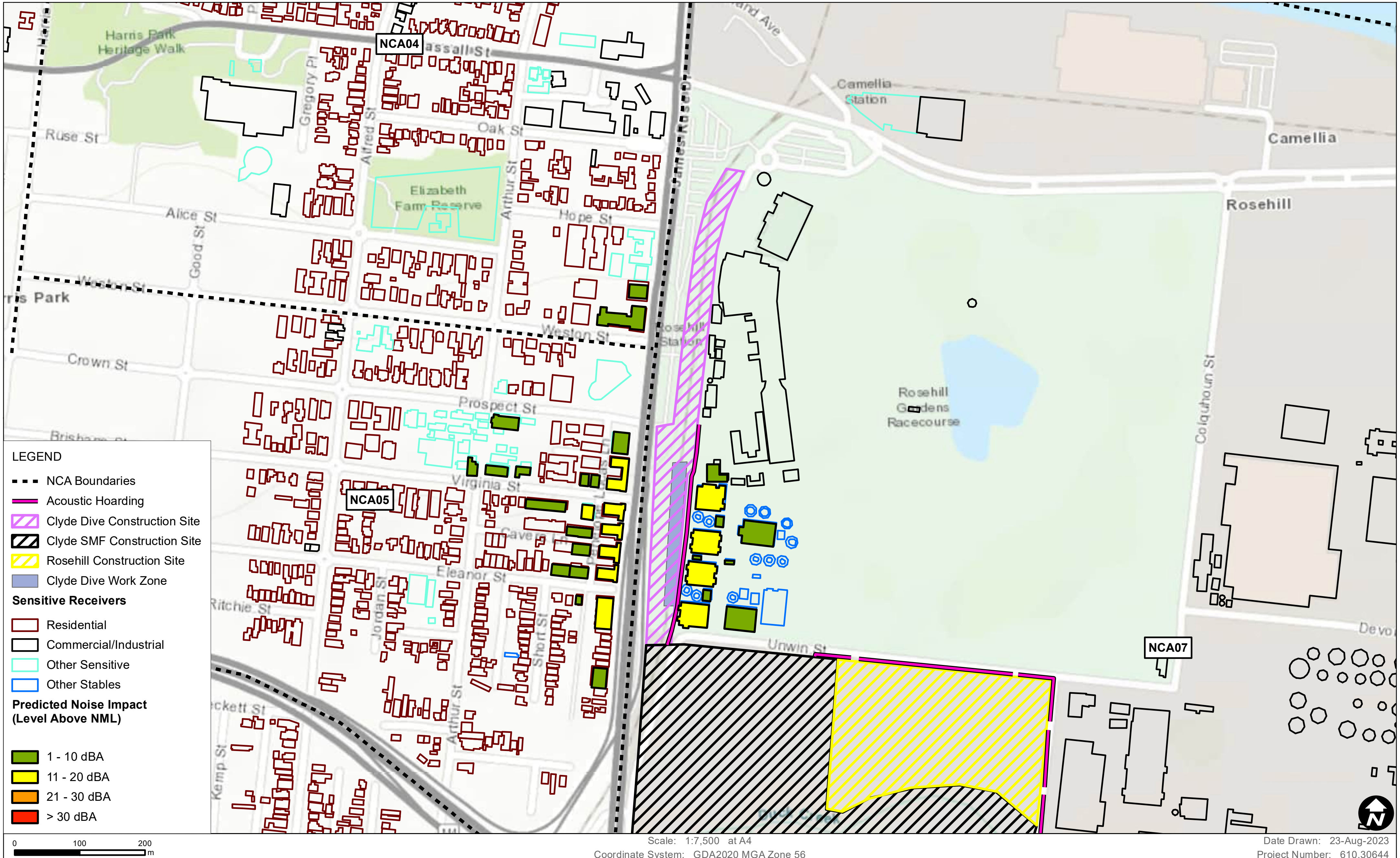
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.08b Decline structure construction (capping beam - 50% overlap with piling) Predicted Noise Impacts (Approved Hours)

FIGURE C-135

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C92_CD_08b_Decline structure construction (capping beam - 50% overlap with piling)_Day_03.mxd



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

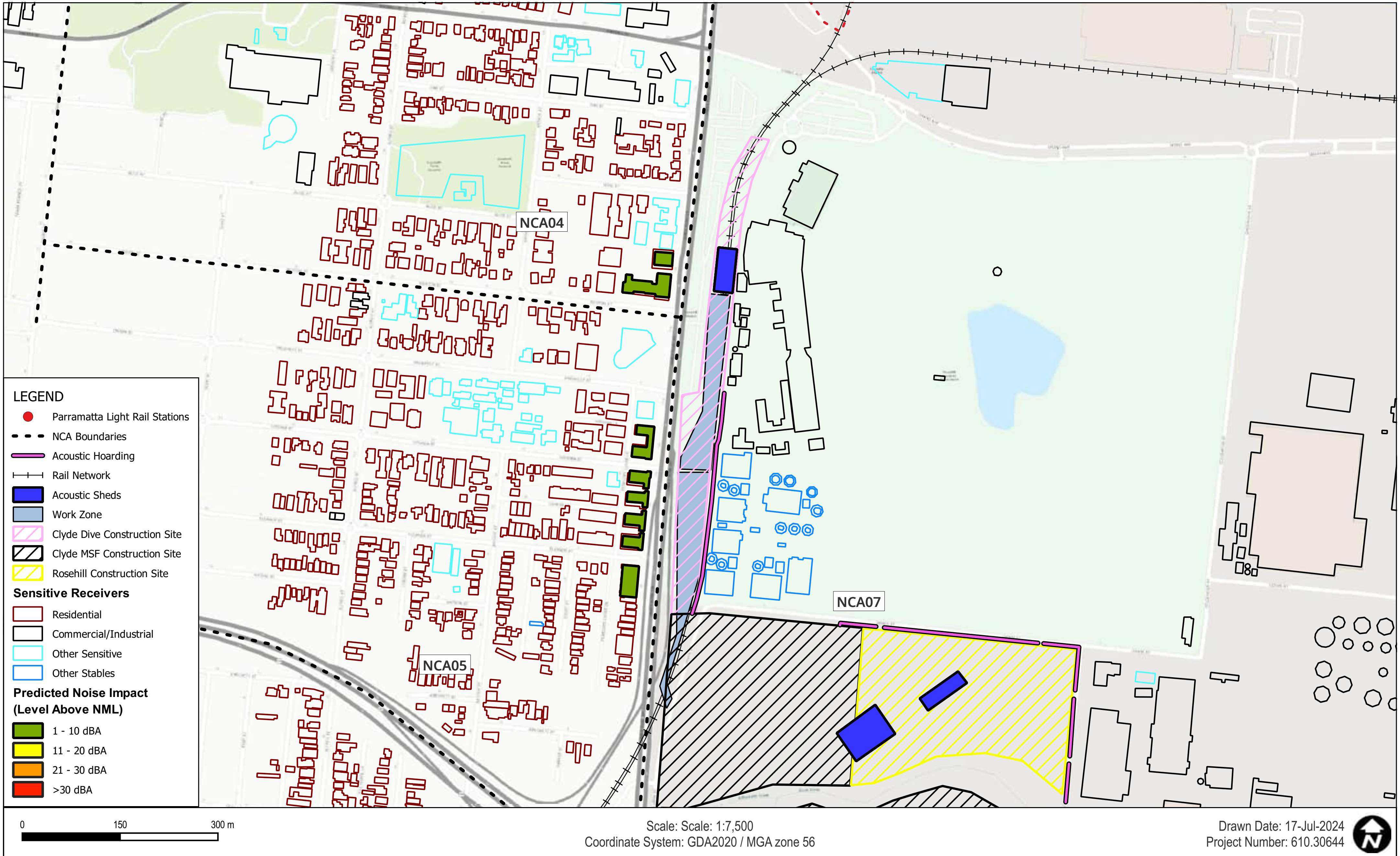
Date Drawn: 23-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.08c Decline structure construction (10% overlap with capping beam) Predicted Noise Impacts (Approved Hours)

FIGURE C-136



Scale: Scale: 1:7,500
Coordinate System: GDA2020 / MGA zone 56

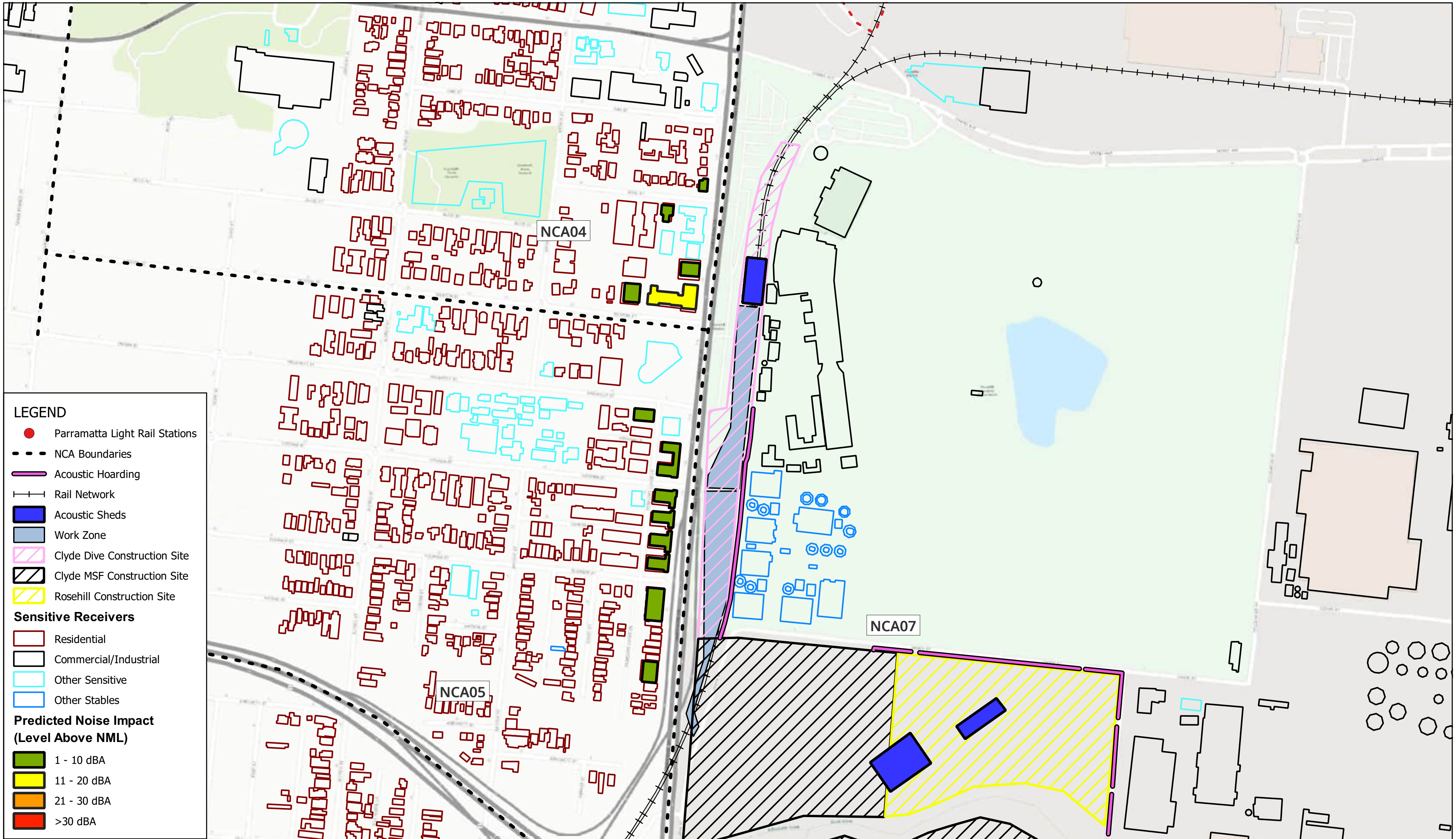
Drawn Date: 17-Jul-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.09 Spur line excavation
Predicted Noise Impacts
(Evening)

FIGURE C-137



Scale: Scale: 1:7,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

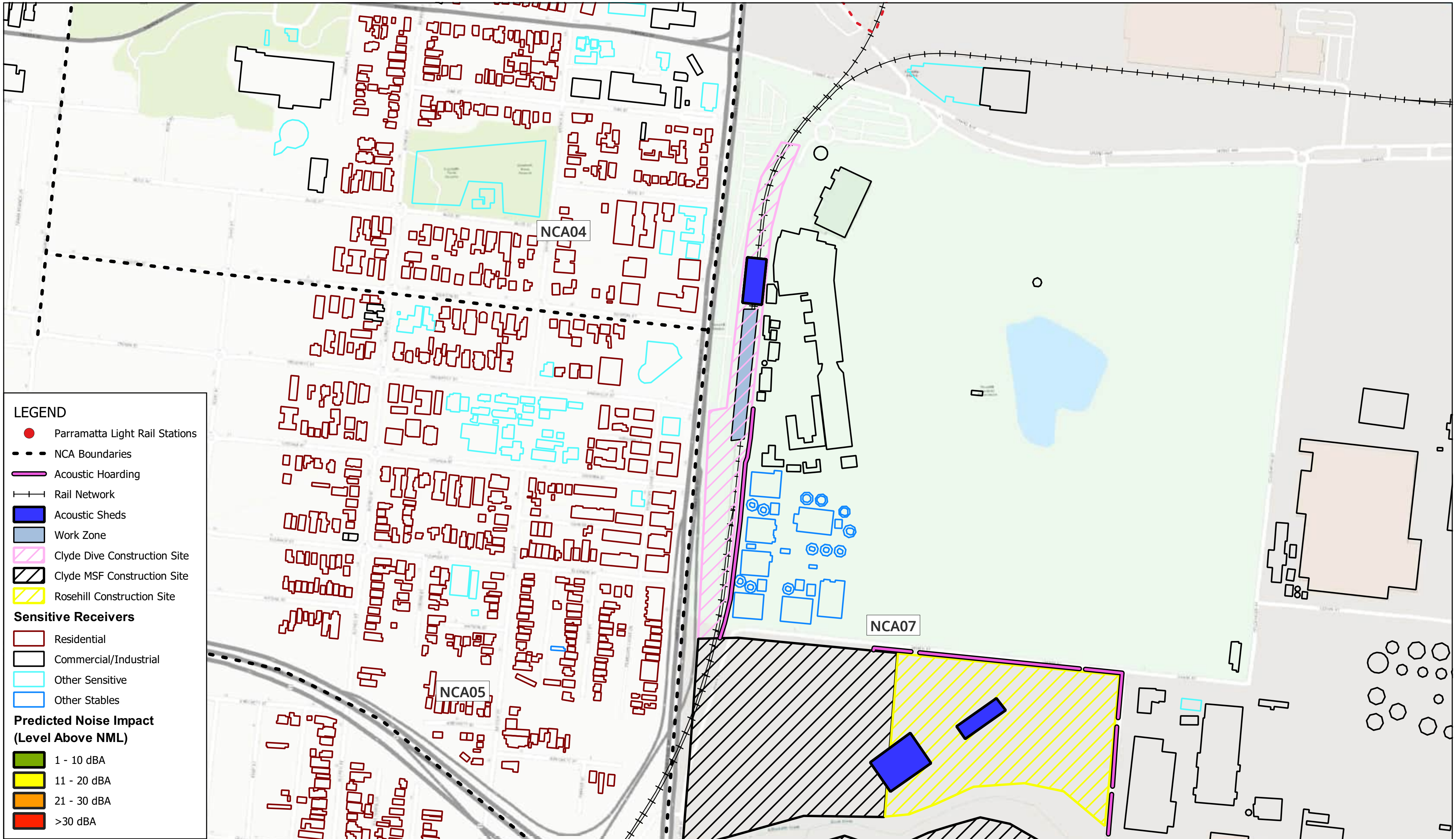
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.09 Spur line excavation
Predicted Noise Impacts
(Night)

FIGURE C-138



Scale: Scale: 1:7,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 23-Jul-2024
Project Number: 610.30644

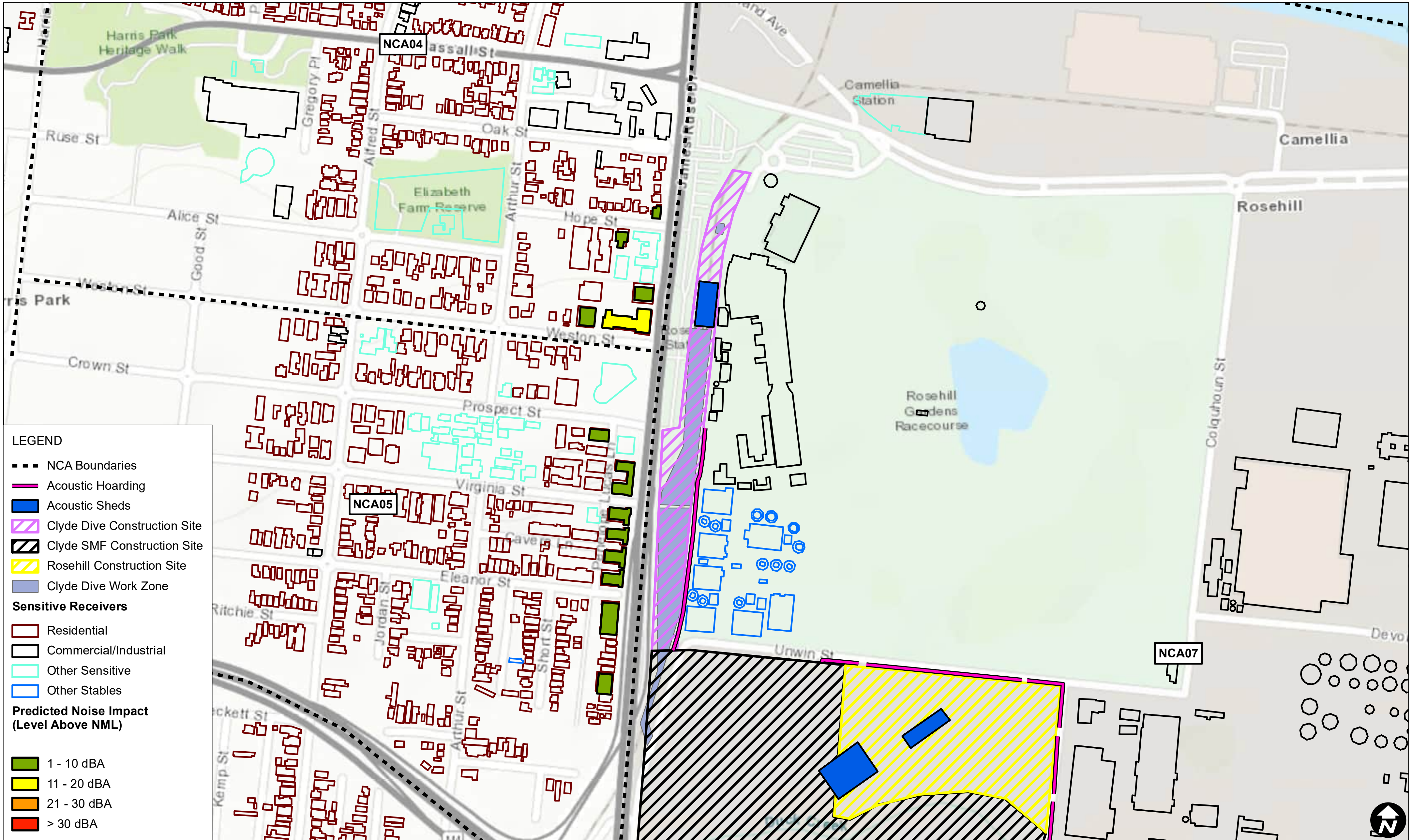
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.10 Spur line lining
Predicted Noise Impacts
(Night)

FIGURE C-139



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

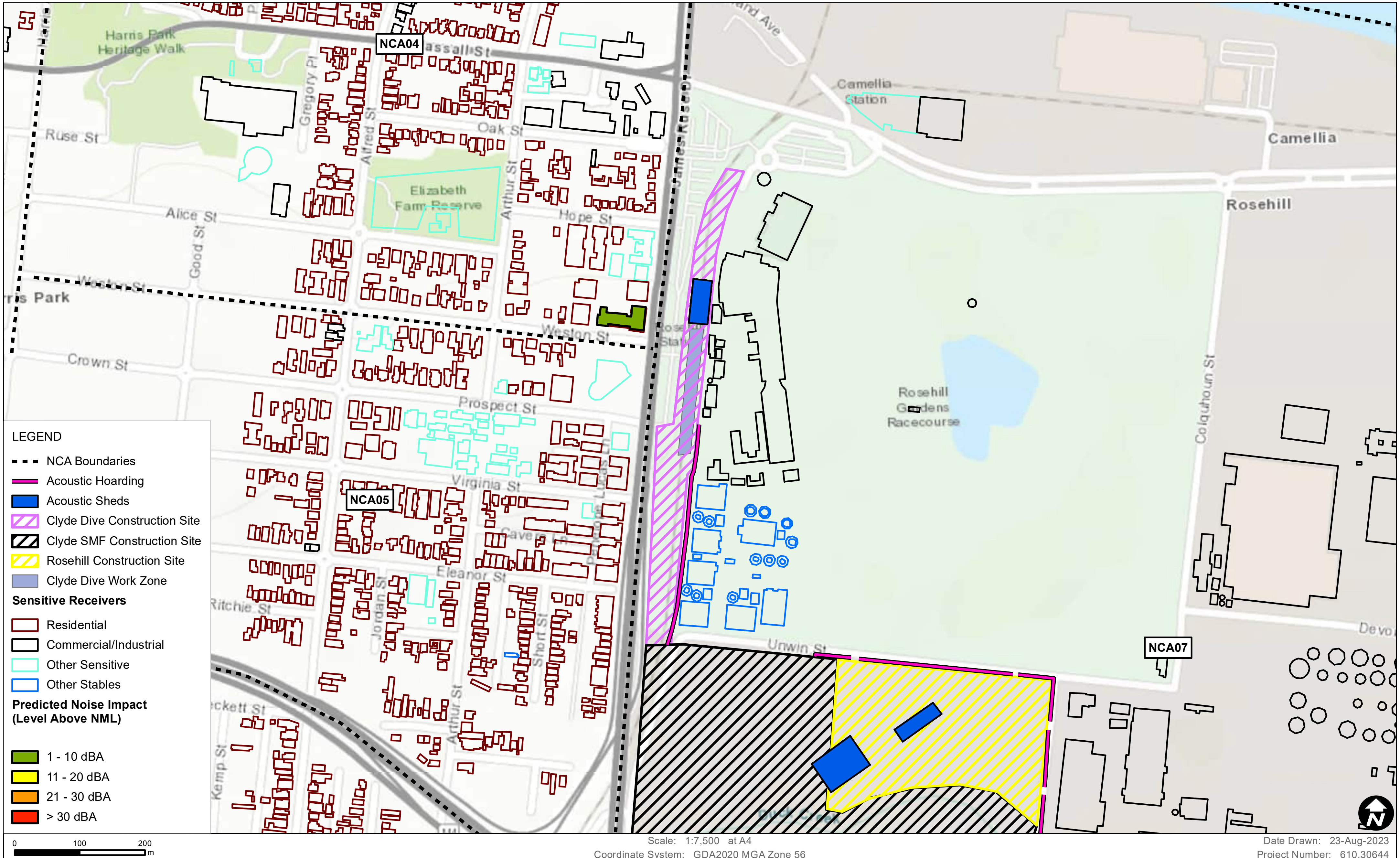
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.11 Junction excavation Predicted Noise Impacts (Night)

FIGURE C-140



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

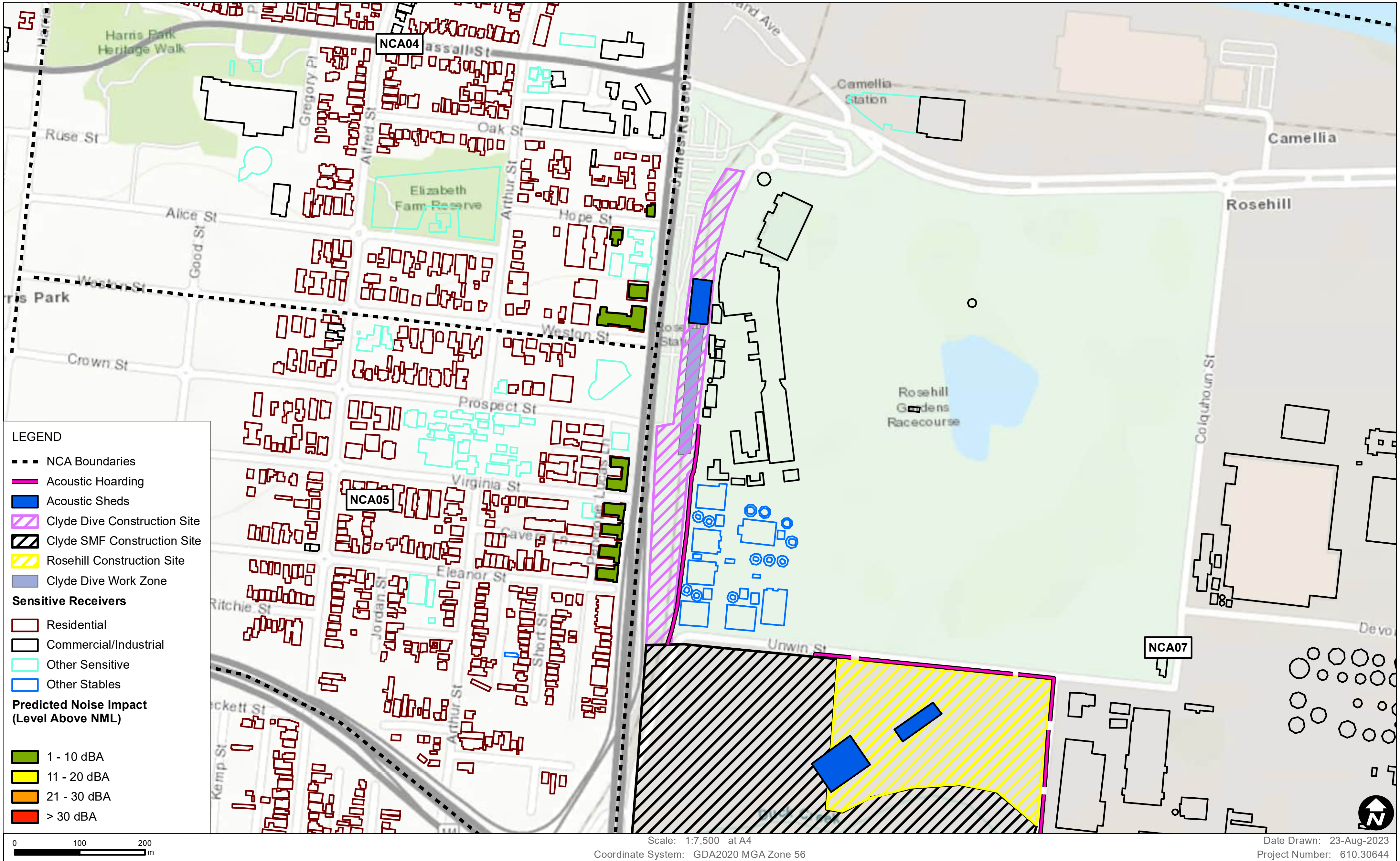
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.12 Junction lining
Predicted Noise Impacts
(Evening)

FIGURE C-141



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.12 Junction lining Predicted Noise Impacts (Night)

FIGURE C-142

Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

SLR

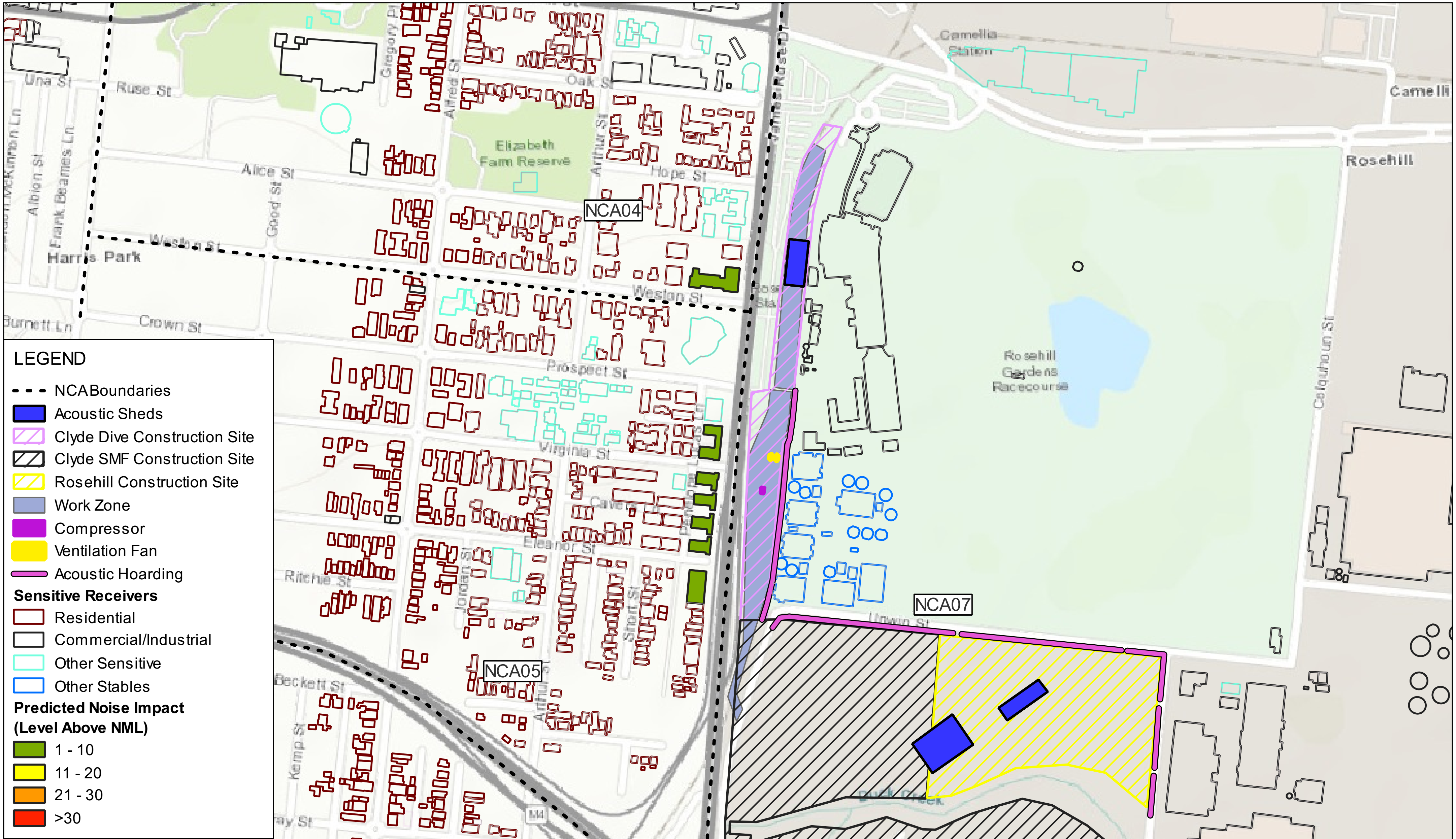
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.13 Demobilisation Predicted Noise Impacts (Approved Hours)

FIGURE C-143

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C106_CD_13_Demobilisation_Day_03.mxd



0 250 500 m

Scale: Scale: 1:7,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 08-May-2025
Project Number: 610.30644

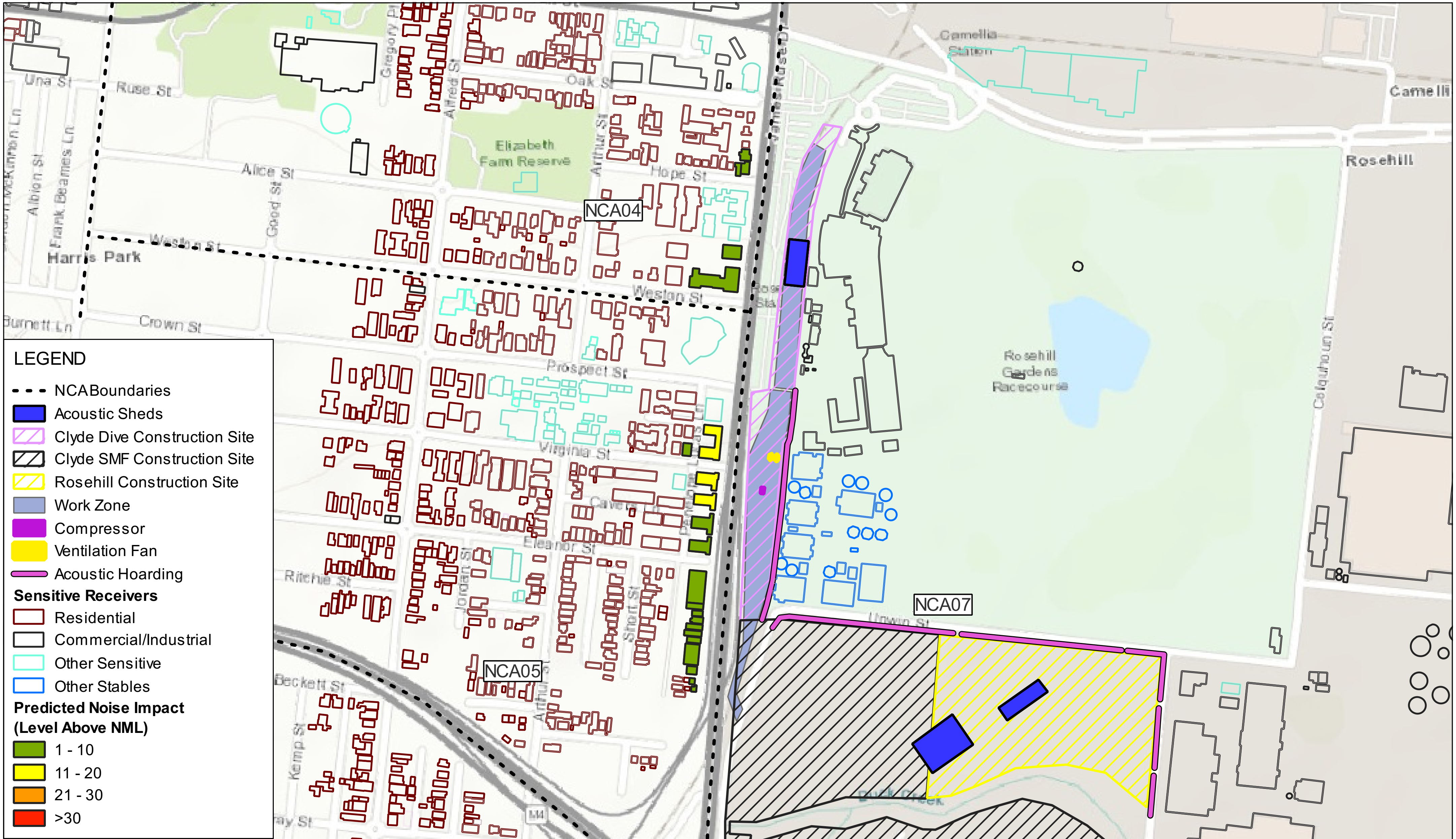
Data Source:
ESRI World Imagery

Note: Other Sensitive Receivers should only be considered impacted 'when in use'

CD.14 General operation of ancillary facility Predicted Noise Impacts (Evening)

FIGURE C-144

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\05 QGIS\610.30644 WTP - DNVIS\610.30644 WTP - DNVIS.qgz



0 250 500 m

Scale: Scale: 1:7,500
Coordinate System: GDA2020 / MGA zone 56

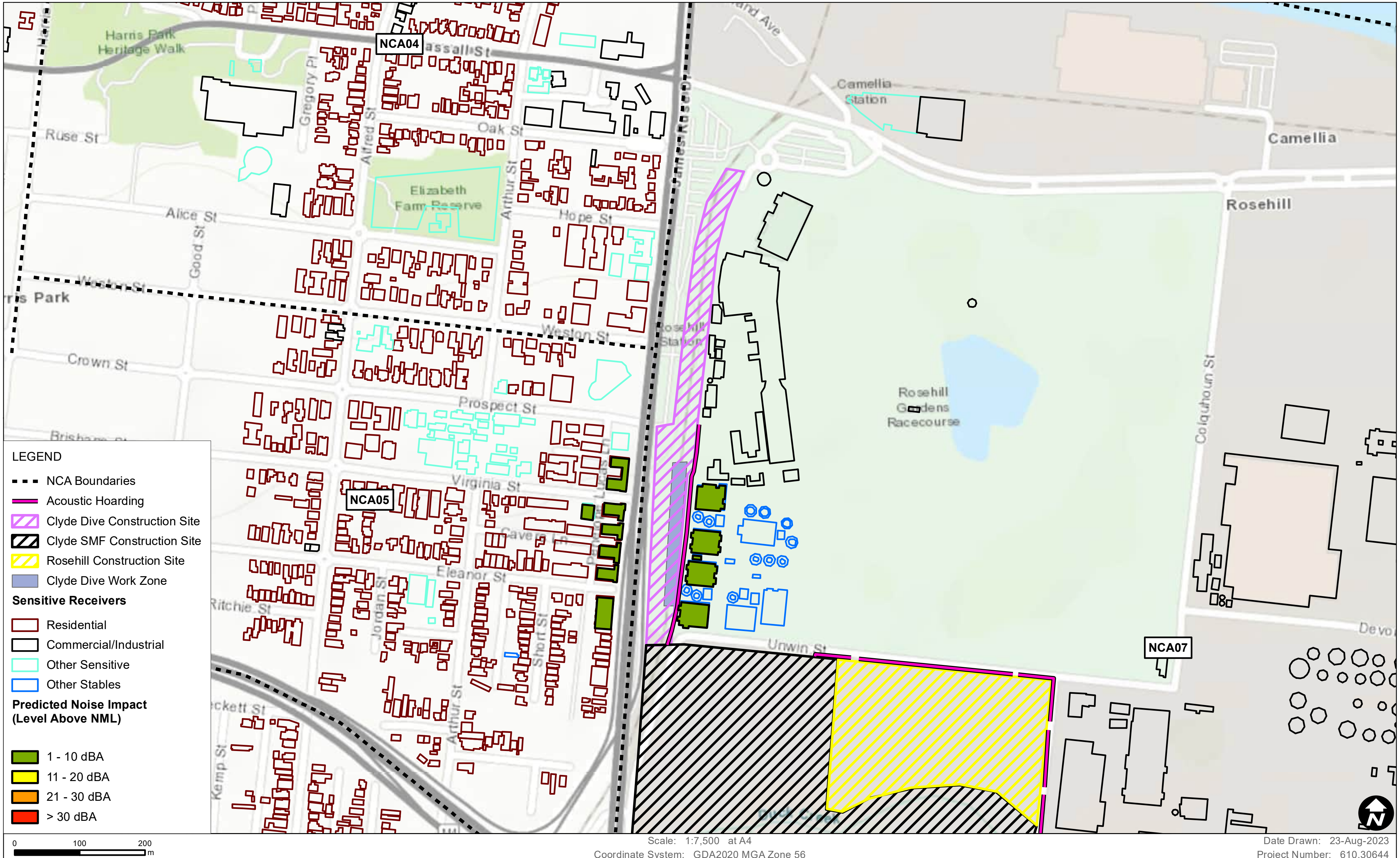
Drawn Date: 08-May-2025
Project Number: 610.30644

Data Source:
ESRI World Imagery

Note: Other Sensitive Receivers should only be considered impacted 'when in use'

CD.14 General operation of ancillary facility
Predicted Noise Impacts
(Night)

FIGURE C-145



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

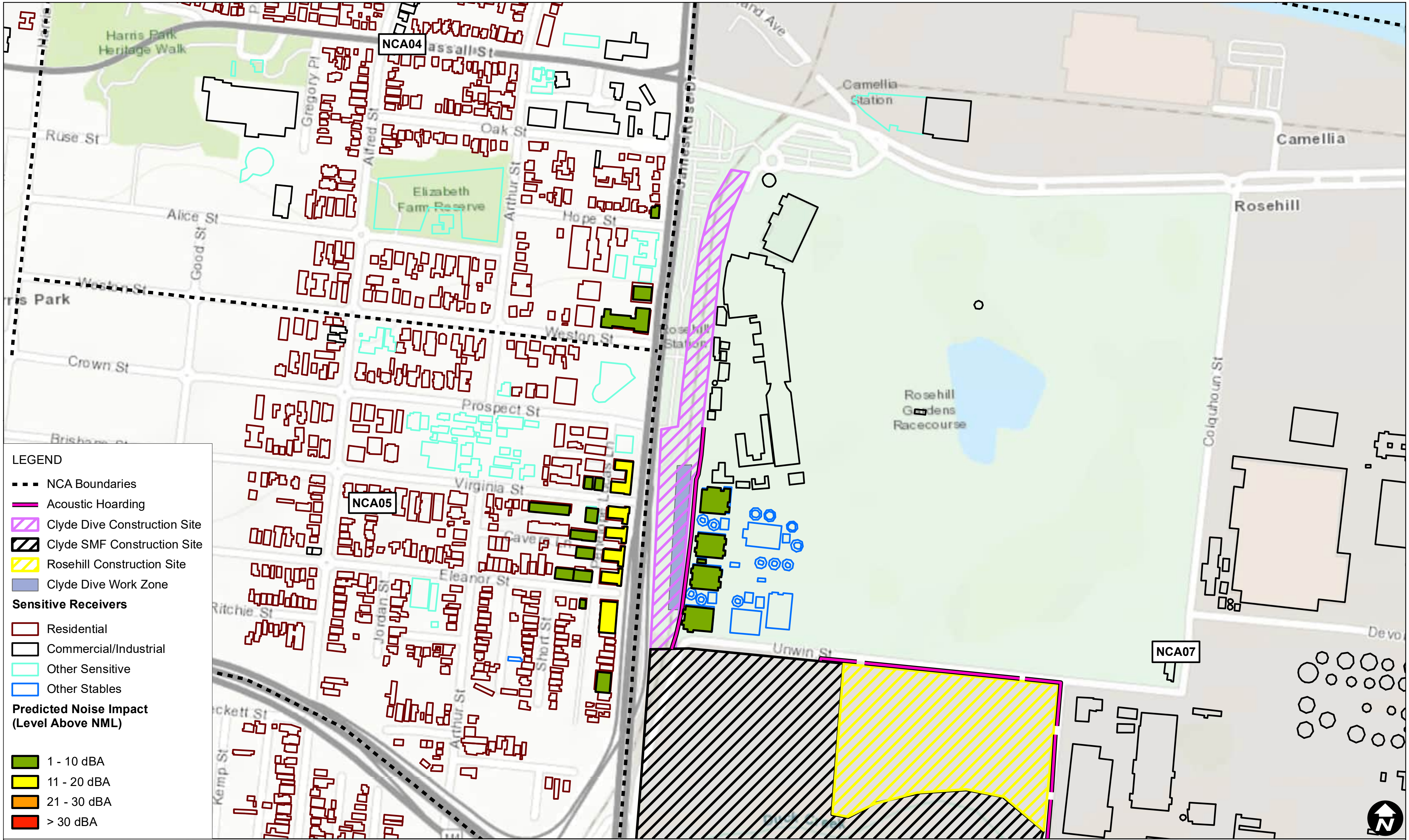
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.15 Watermain diversion
Predicted Noise Impacts
(Approved Hours)

FIGURE C-146



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

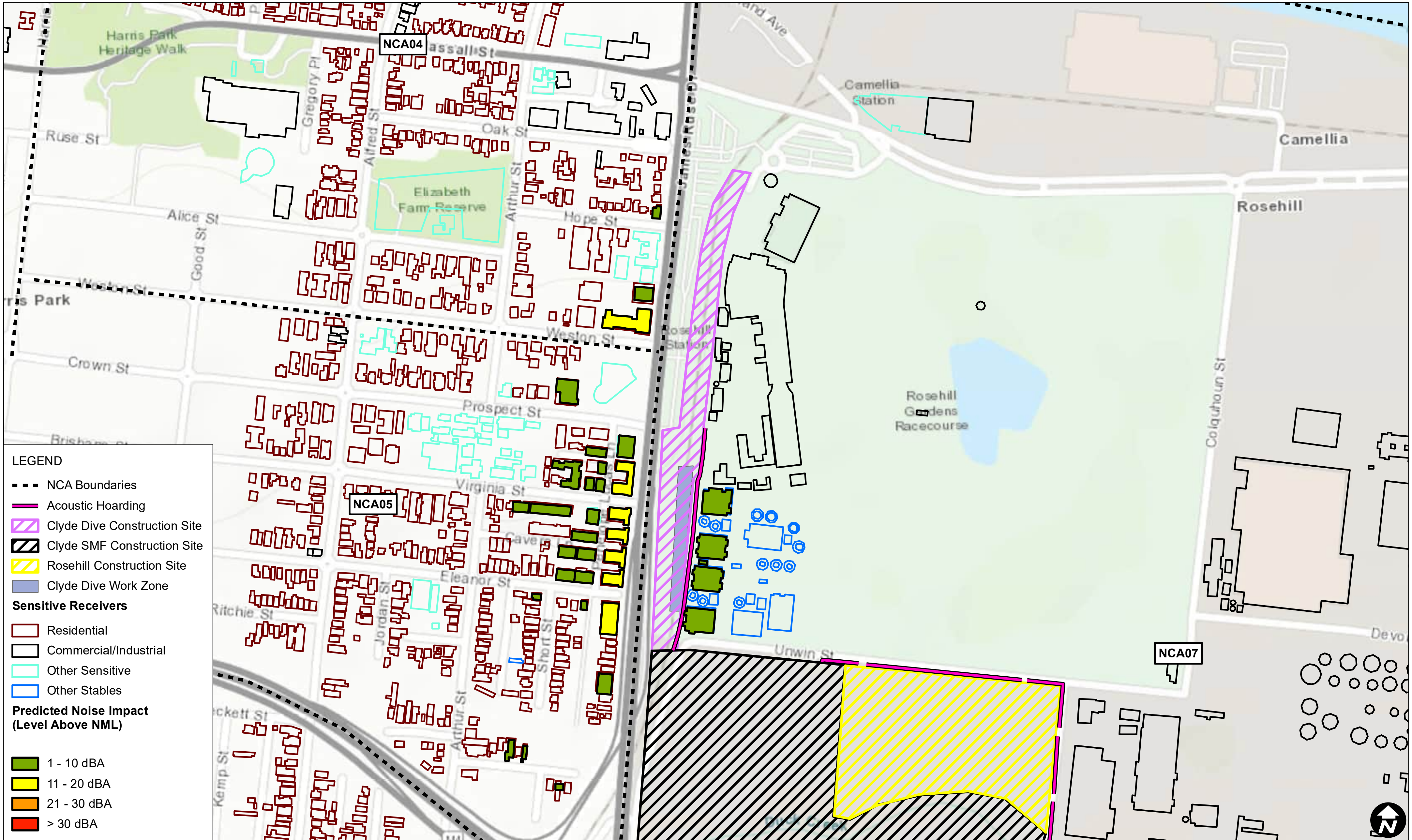
Date Drawn: 23-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.15 Watermain diversion
Predicted Noise Impacts
(Evening)

FIGURE C-147



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

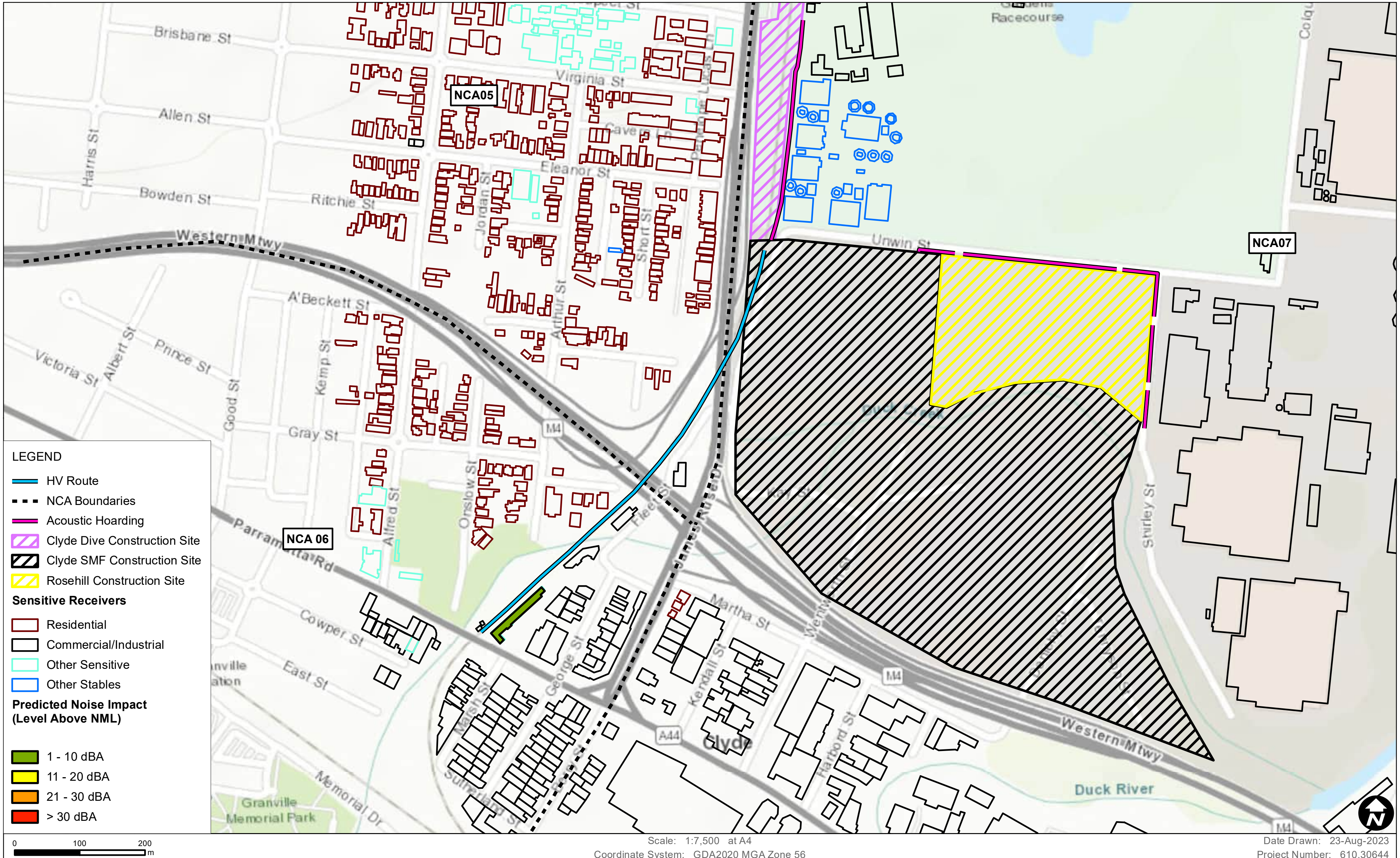
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.15 Watermain diversion
Predicted Noise Impacts
(Night)

FIGURE C-148



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

SLR

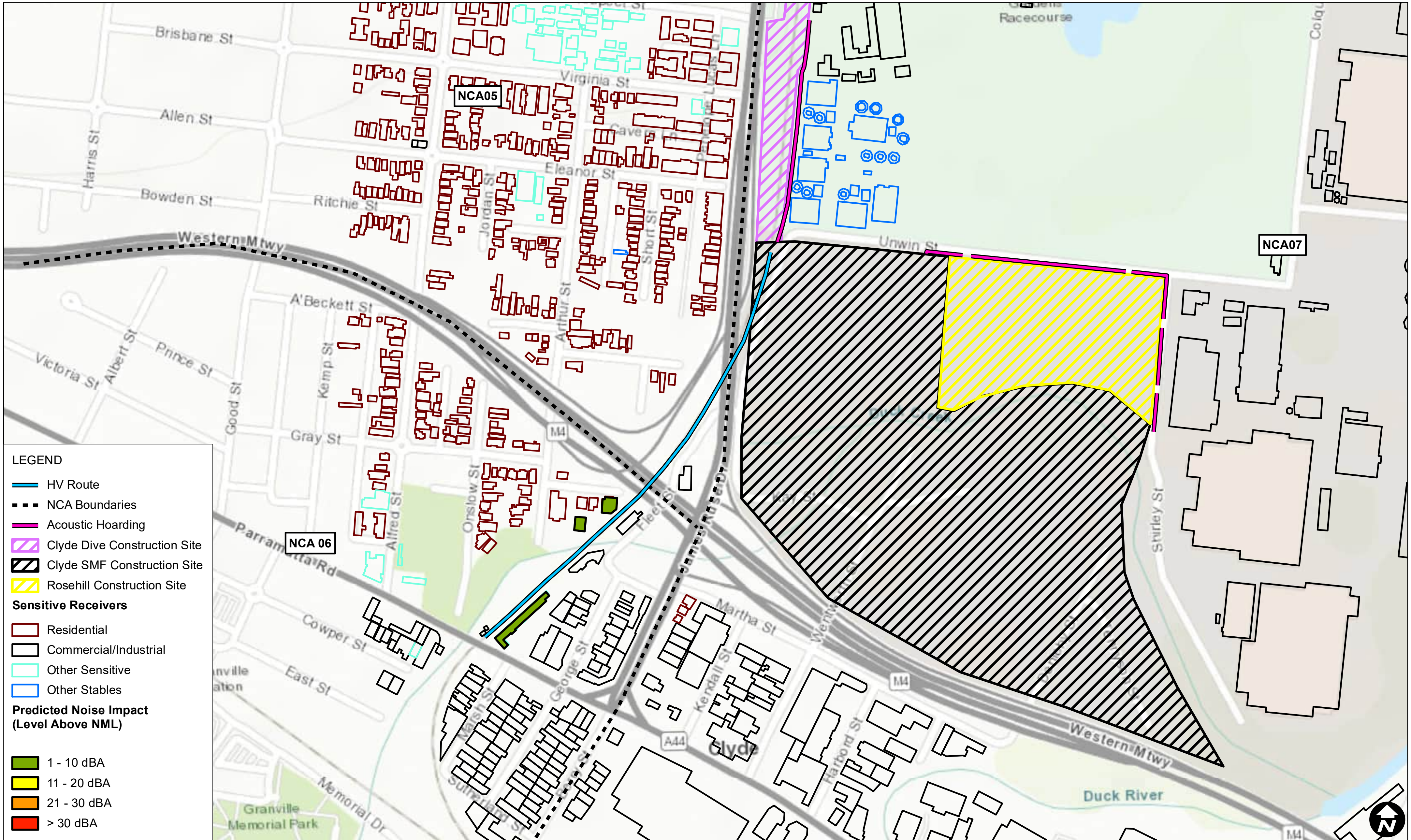
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.16 Carlingford Rail Line
Oversized Deliveries
Predicted Noise Impacts
(Approved Hours)

FIGURE C-149

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C112_CD_16_Carlinford Rail Line Oversised Deliveries_Day_03.mxd



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

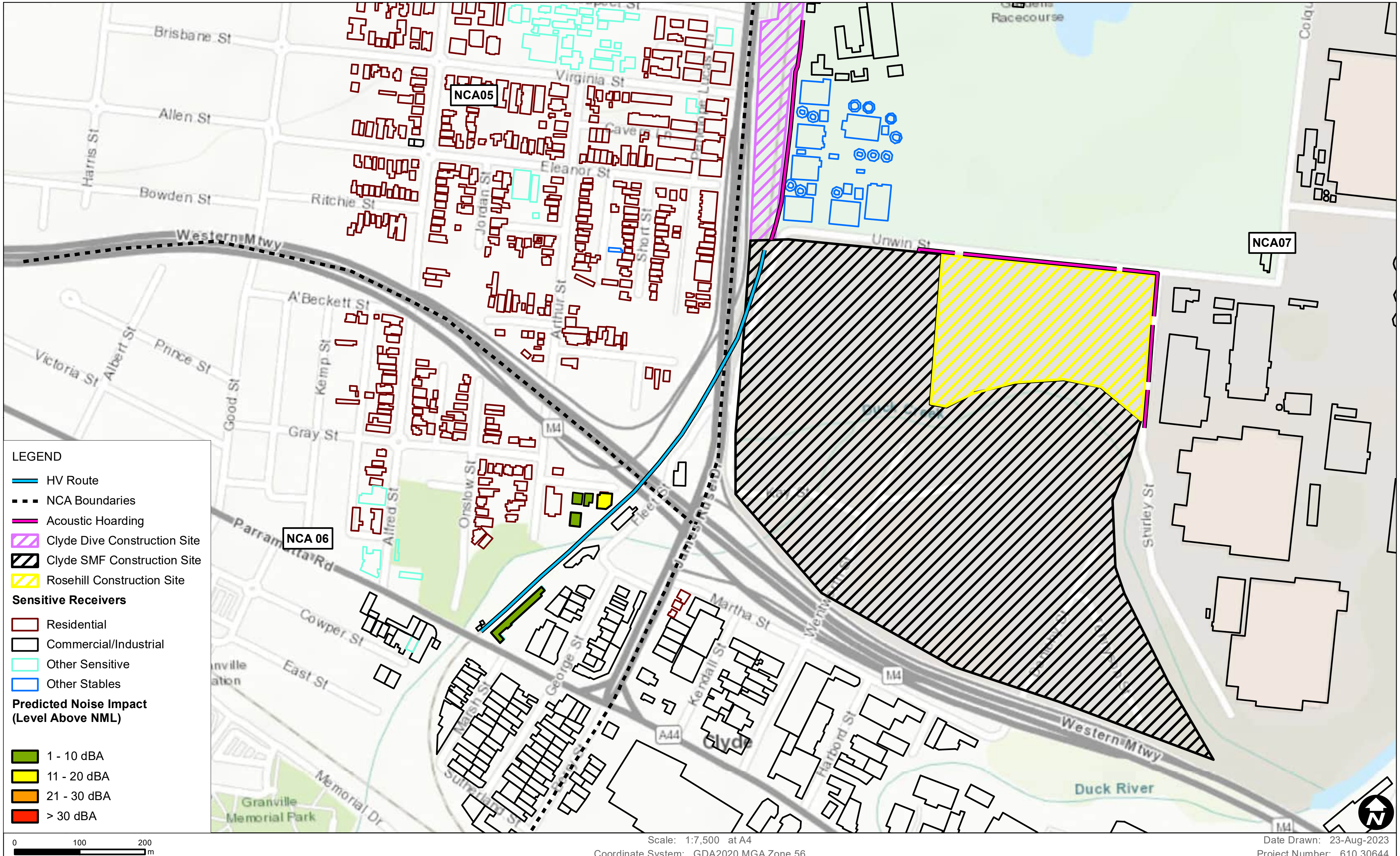
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.16 Carlingford Rail Line
Oversized Deliveries
Predicted Noise Impacts
(Evening)

FIGURE C-150

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C113_CD_16_Carlinford Rail Line Oversised Deliveries_Evening_03.mxd



Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

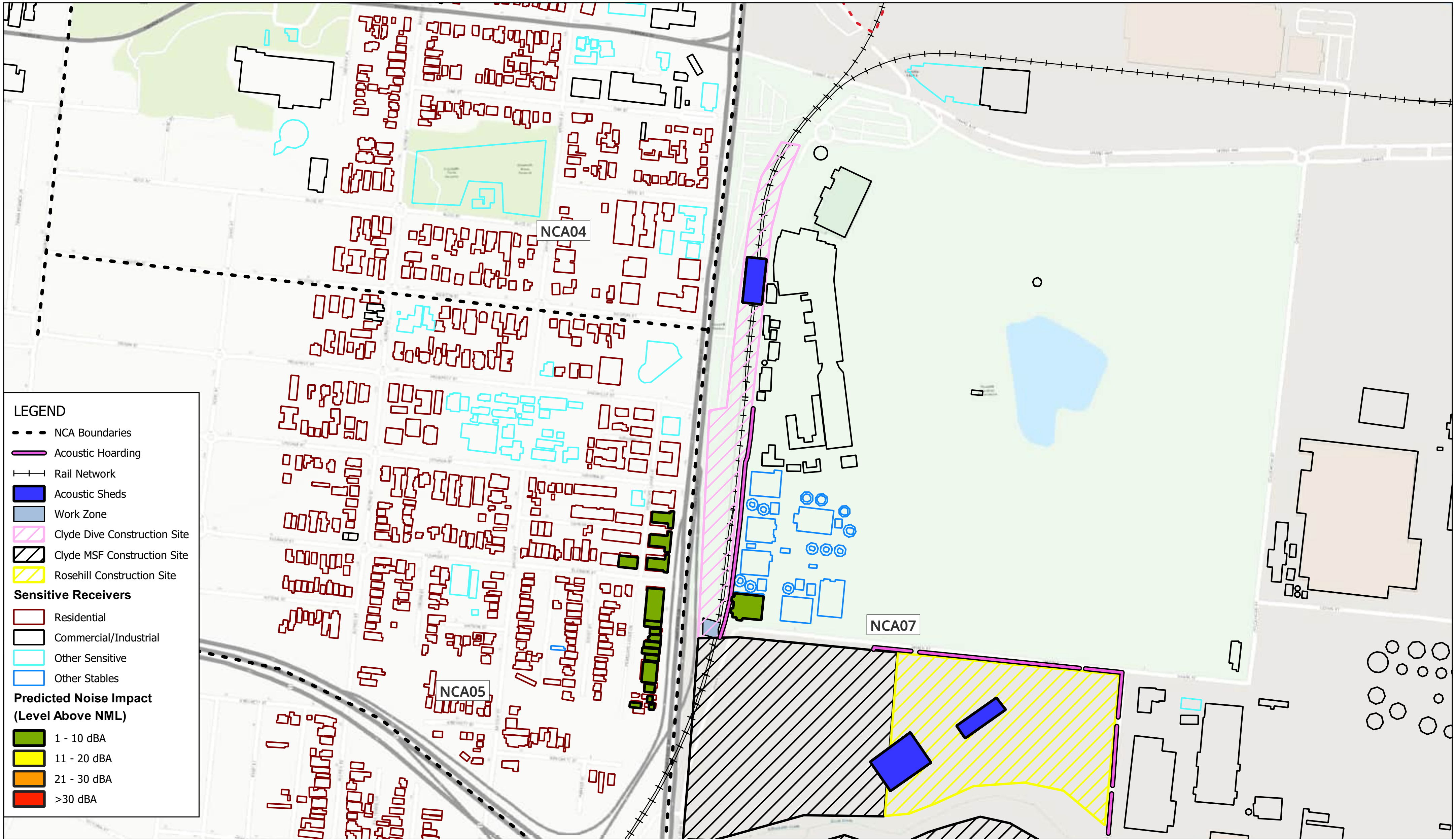
Date Drawn: 23-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.16 Carlingford Rail Line Over-sized Deliveries Predicted Noise Impacts (Night)

FIGURE C-151



Scale: Scale: 1:7,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 19-Aug-2024
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

CD.17 Utility Protection Slab
Predicted Noise Impacts
(Approved Hours)

FIGURE C-152

Scale: Scale: 1:7,500
Coordinate System: GDA2020 / MGA zone 56

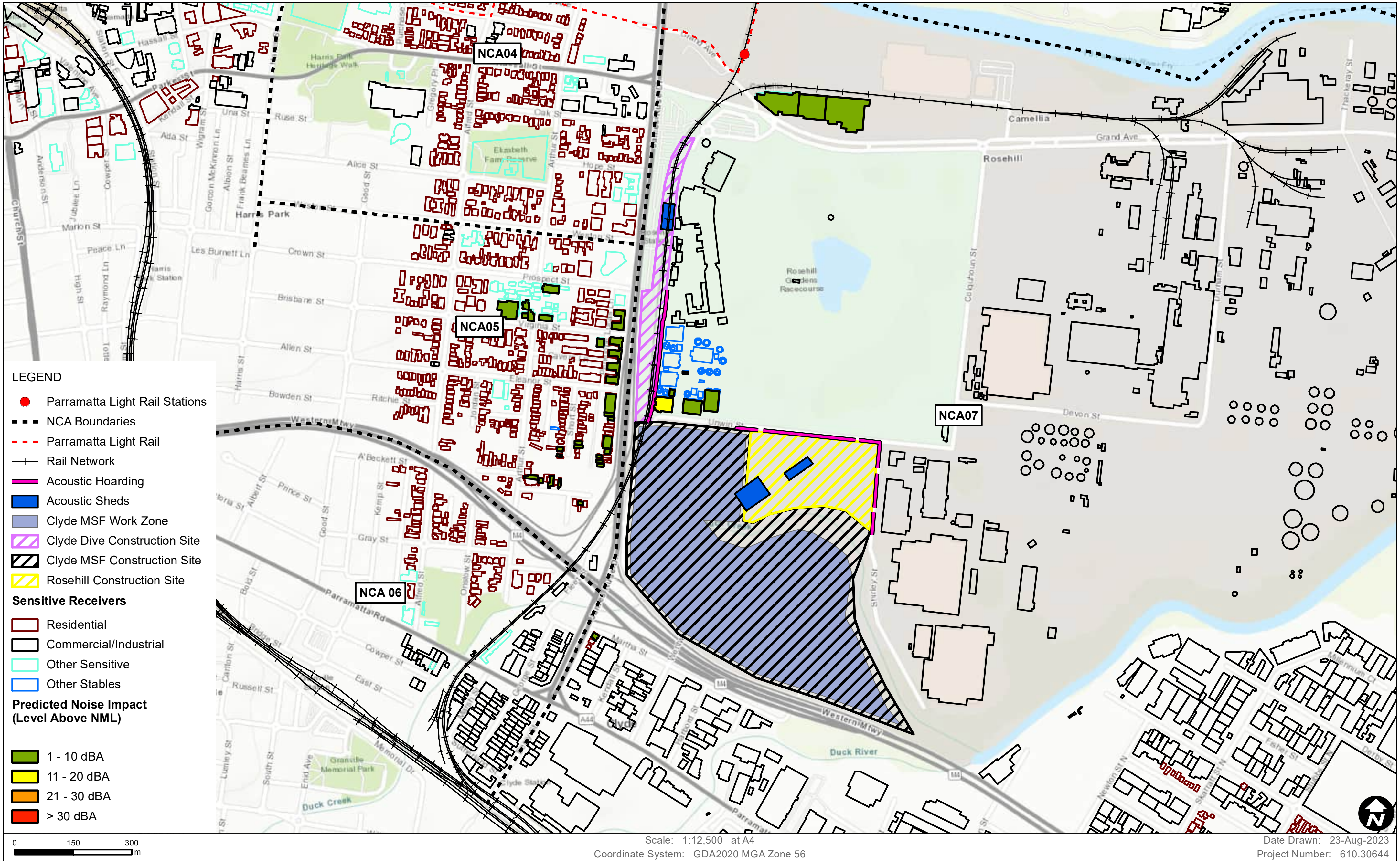
Drawn Date: 08-May-2025
Project Number: 610.30644

Data Source:
ESRI World Imagery

Note: Other Sensitive Receivers should only be considered impacted 'when in use'

CD.18 ATC Boundary Installation
Predicted Noise Impacts
(Approved Hours)

FIGURE C-152.1



Scale: 1:12,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.01a Construction site establishment/ demolition of structures Predicted Noise Impacts (Approved Hours)

FIGURE C-153

Scale: 1:12,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

SLR

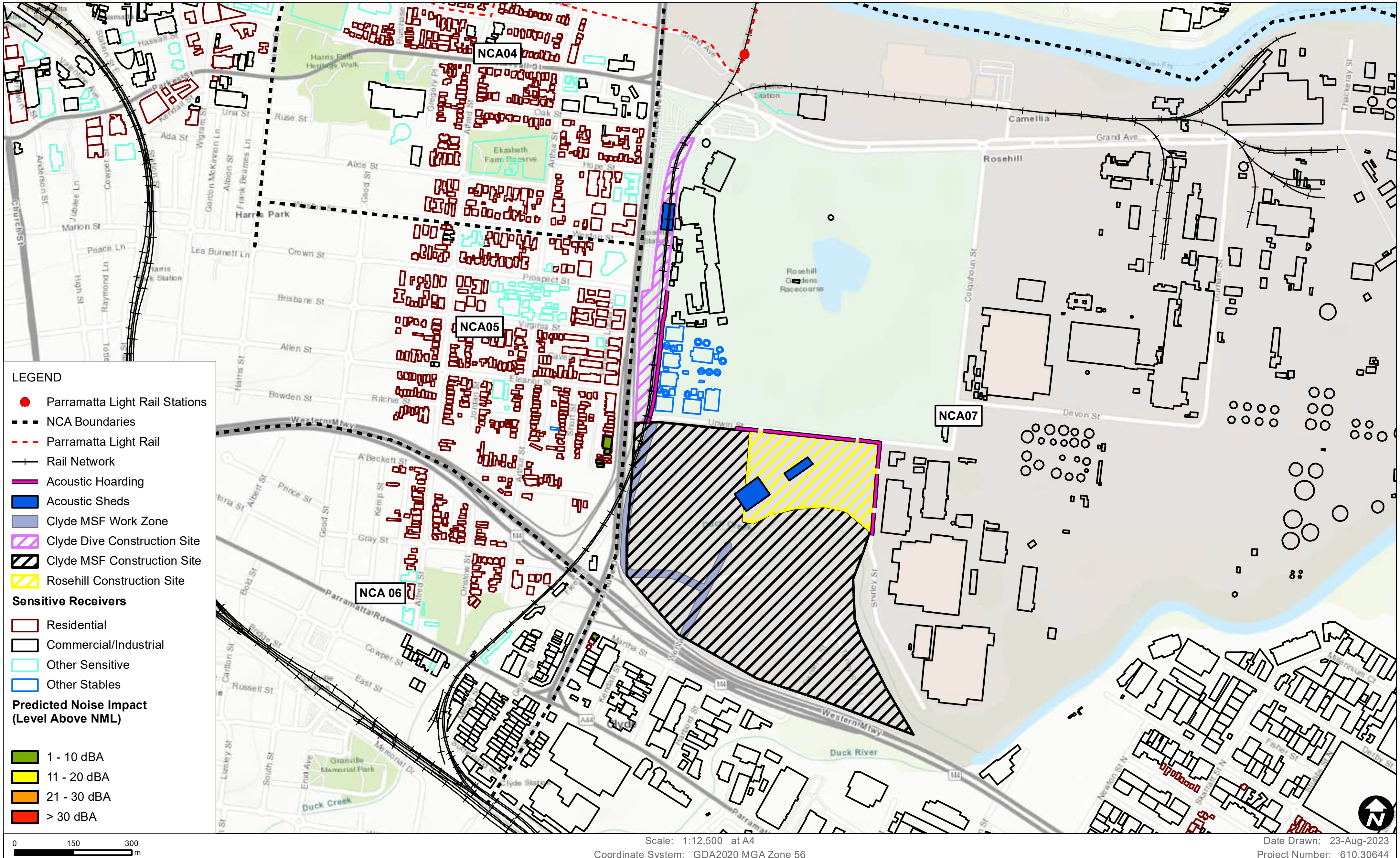
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.01a Construction site establishment/ demolition of structures Predicted Noise Impacts (Evening)

FIGURE C-154

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C119_MSF_01a_Construction_site_establishment_demolition_of_structures_Evening_03.mxd



Scale: 1:12,500 at A4
Coordinate System: GDA2020 MGA Zone 56

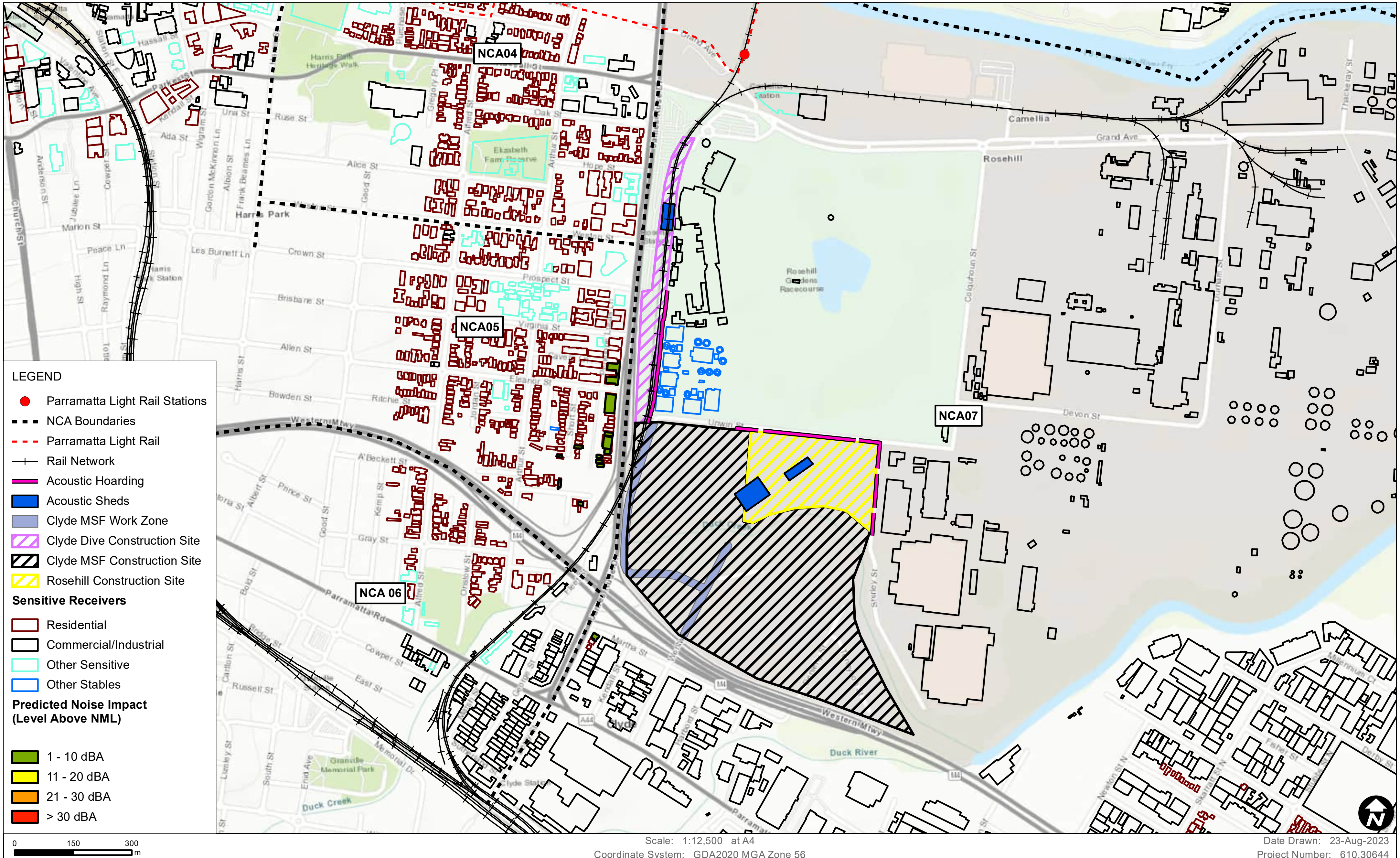
Date Drawn: 23-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.01b Traffic adjustments Predicted Noise Impacts (Evening)

FIGURE C-155



Scale: 1:12,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

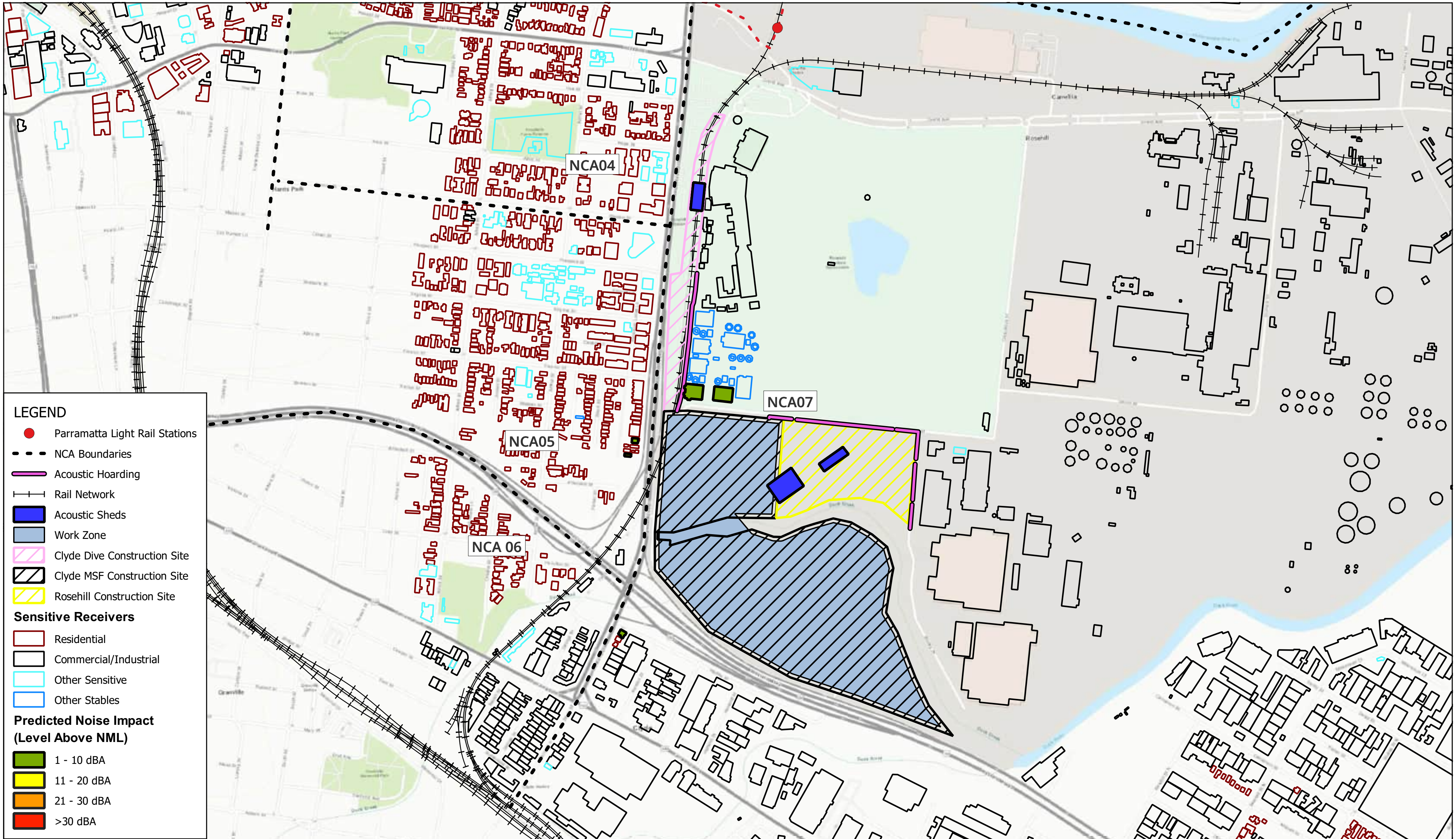
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.01b Traffic adjustments
Predicted Noise Impacts
(Night)

FIGURE C-156

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C121_MSF_01b_Traffic adjustments_Night_03.mxd



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

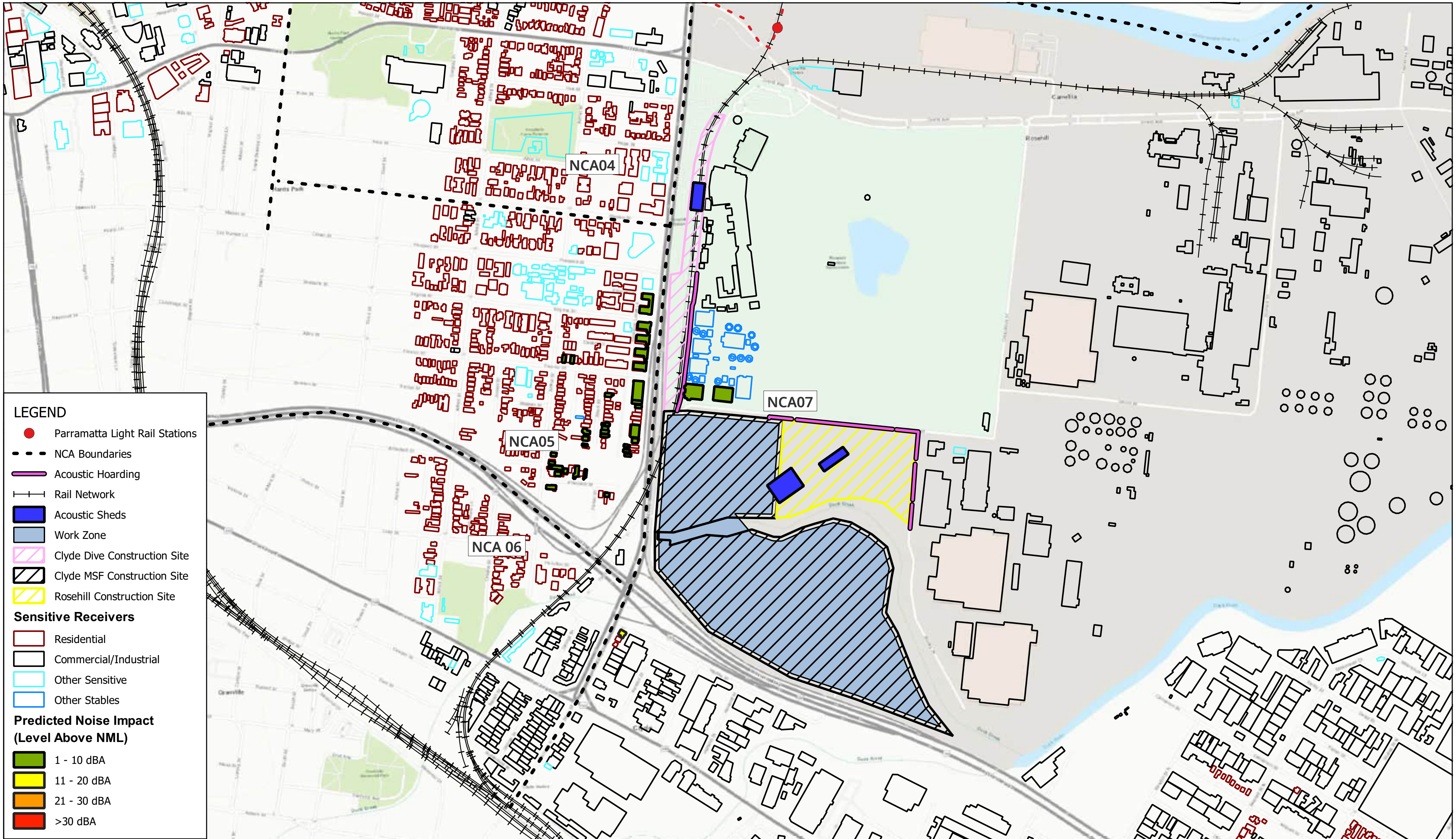
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.02 Haul roads and site amenities
Predicted Noise Impacts
(Approved Hours)

FIGURE C-157

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

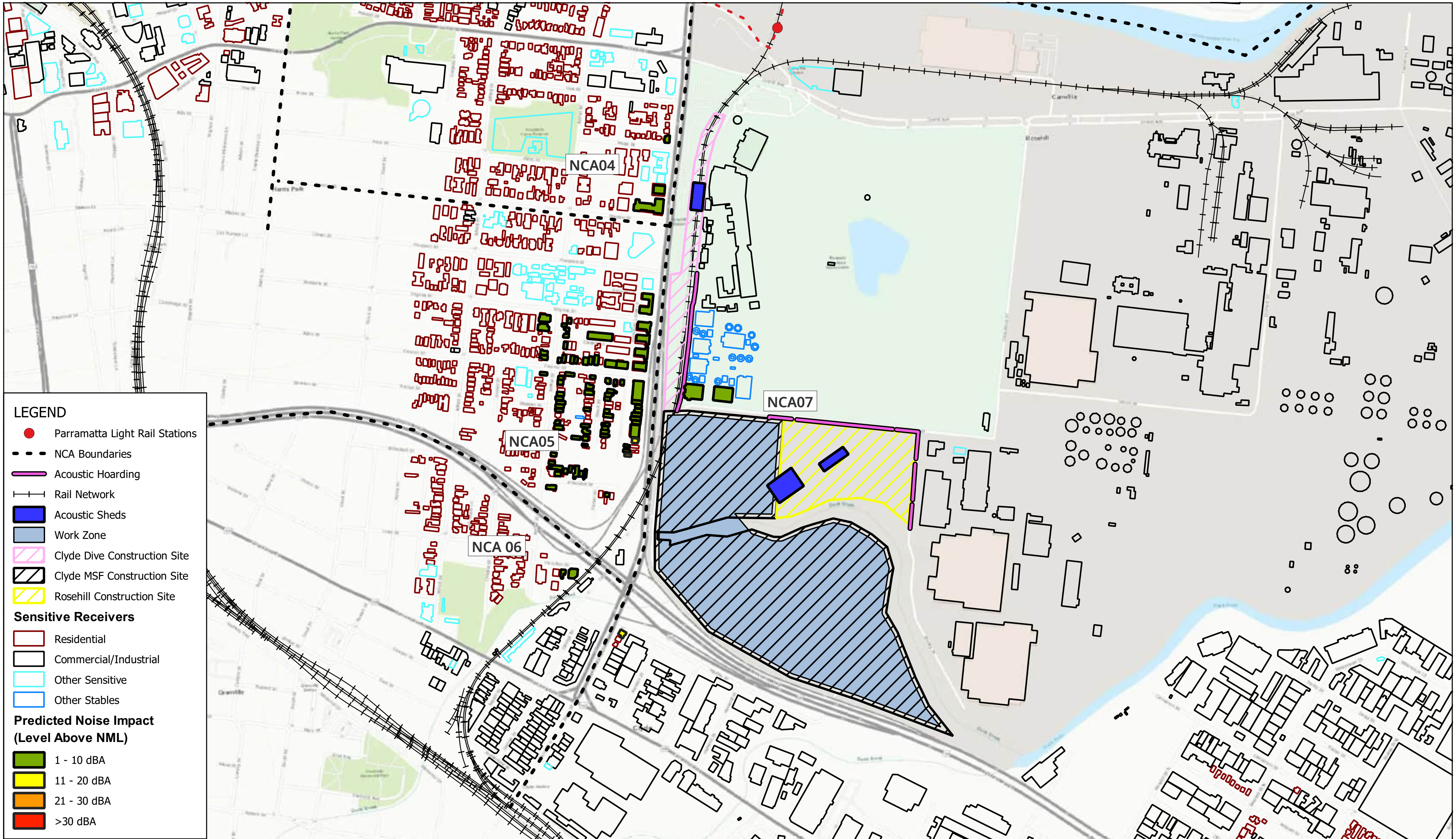
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.02 Haul roads and site amenities
Predicted Noise Impacts
(Evening)

FIGURE C-158

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

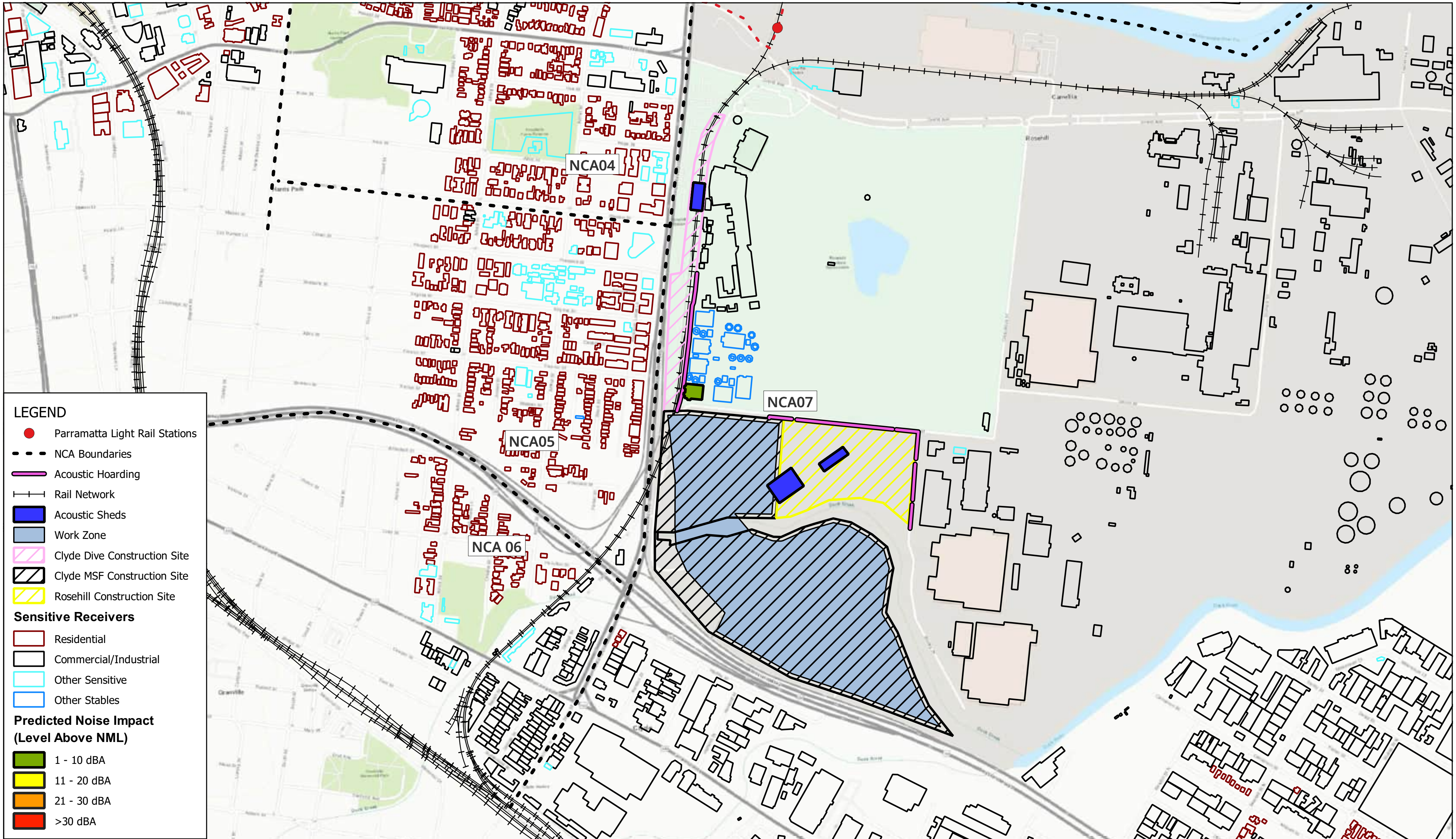
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.02 Haul roads and site amenities
Predicted Noise Impacts
(Night)

FIGURE C-159

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

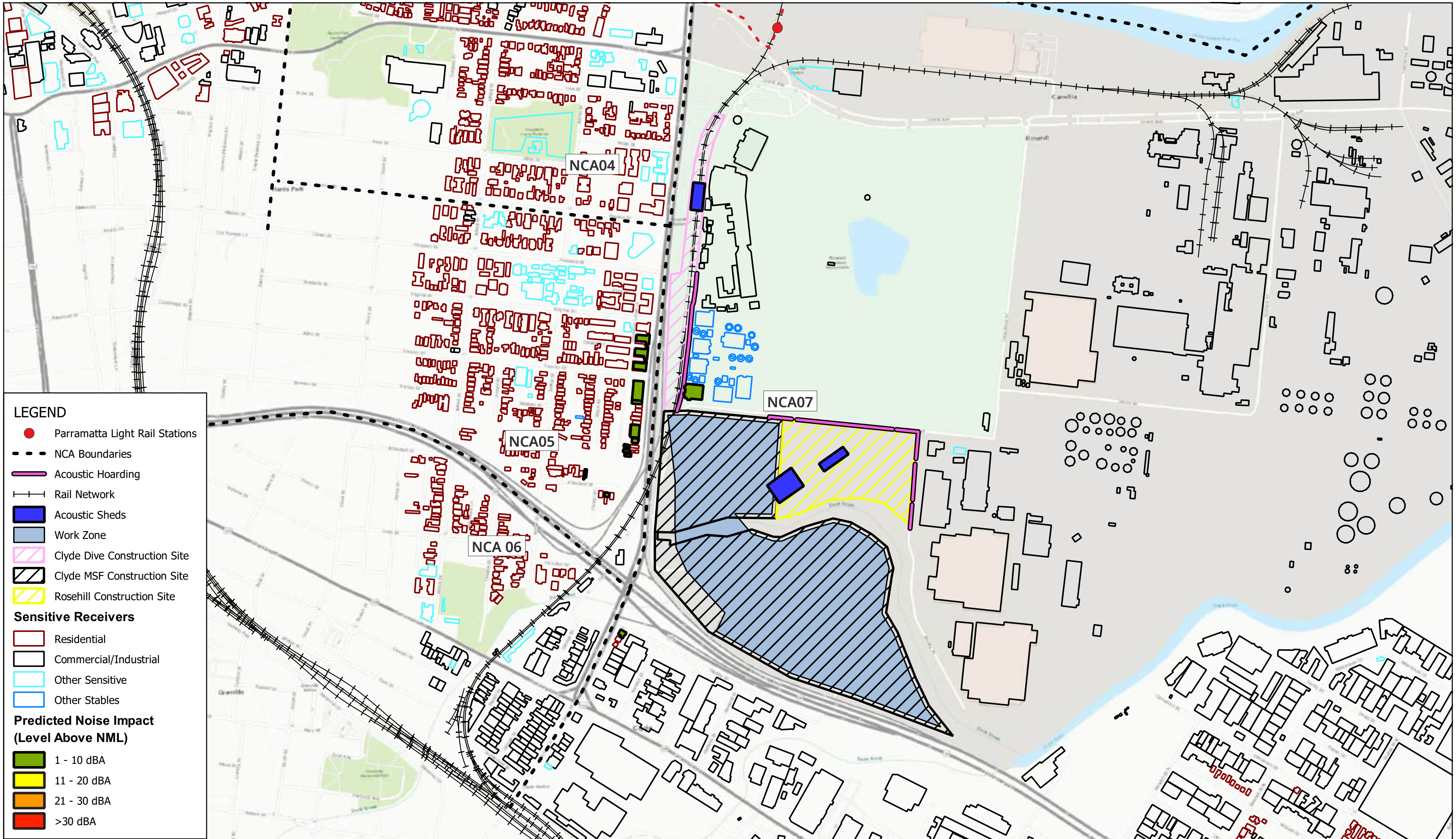
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.03 Earthworks
Predicted Noise Impacts
(Approved Hours)

FIGURE C-160



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

SLR

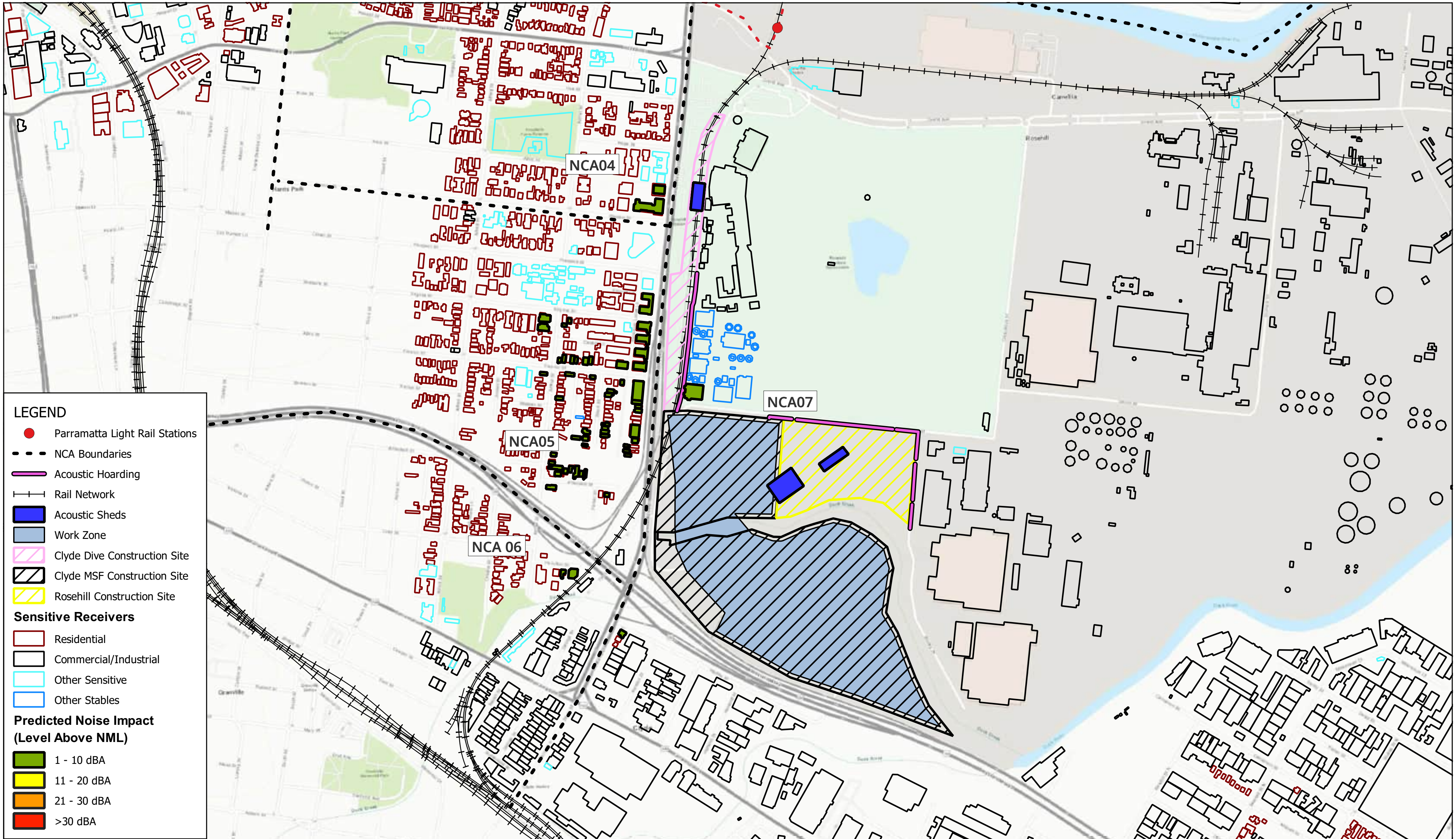
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.03 Earthworks
Predicted Noise Impacts
(Evening)

FIGURE C-161

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



0 150 300 m

Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

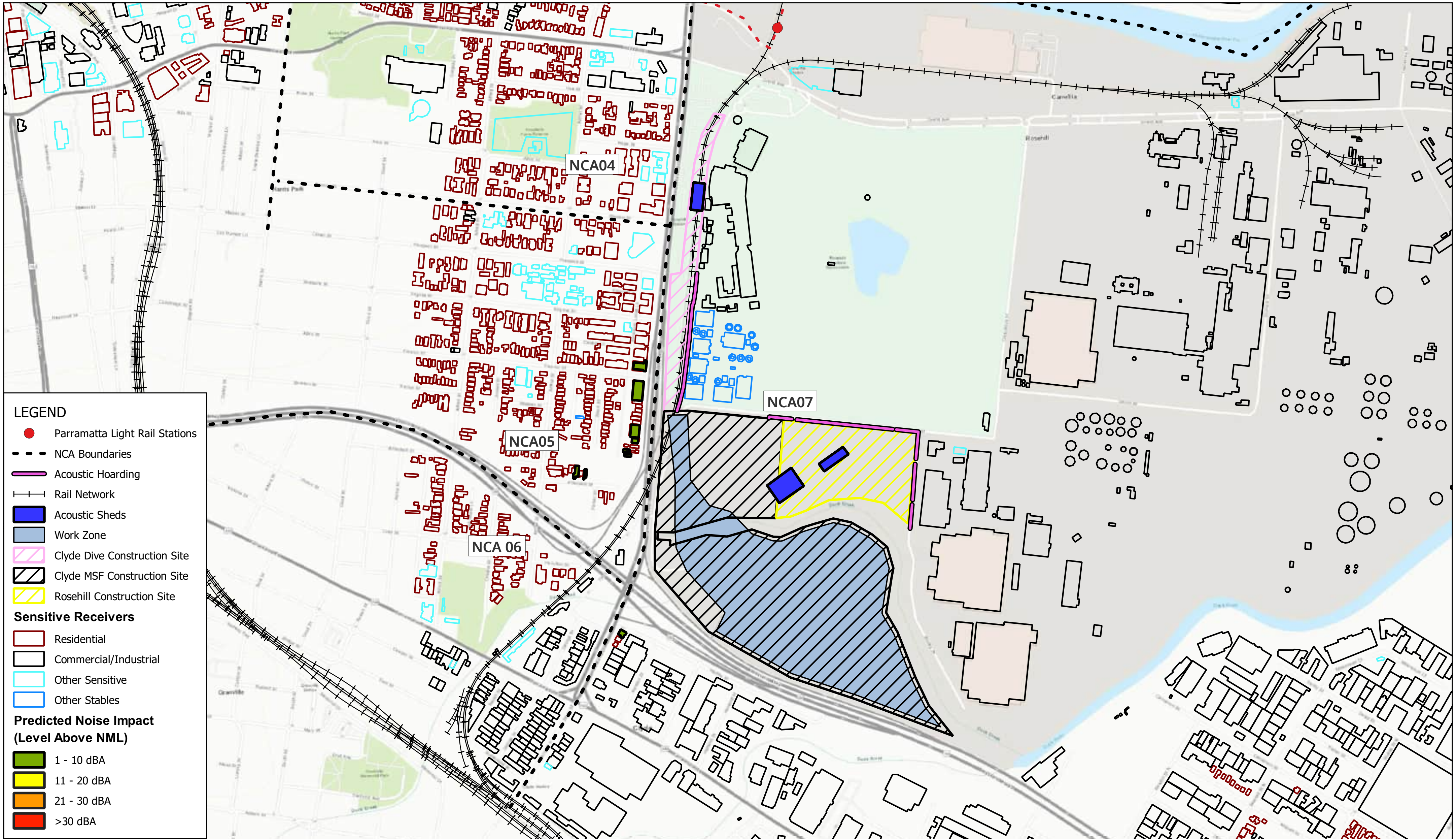
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.03 Earthworks
Predicted Noise Impacts
(Night)

FIGURE C-162



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

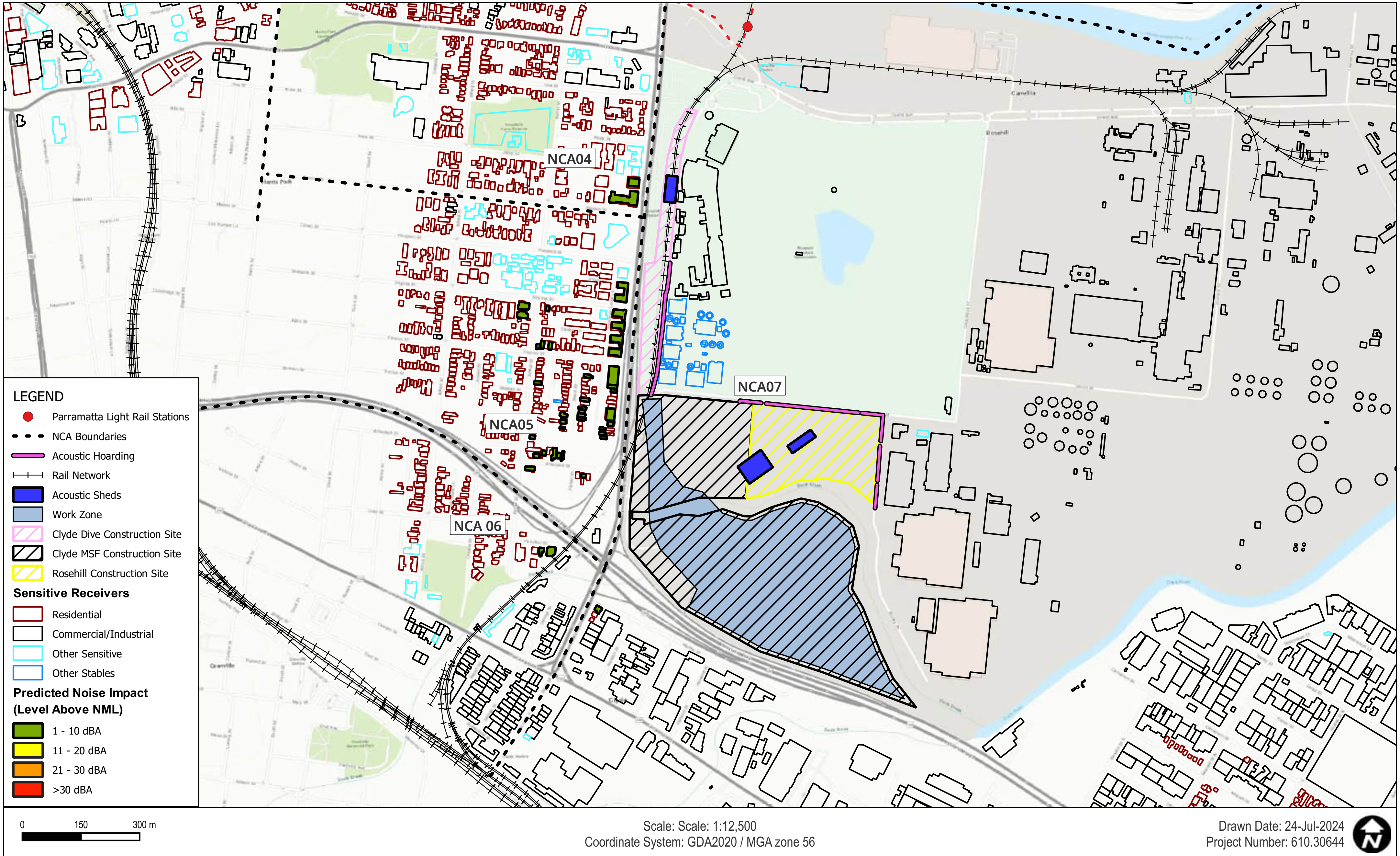
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.04 Drainage installation & combined services route Predicted Noise Impacts (Evening)

FIGURE C-163



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

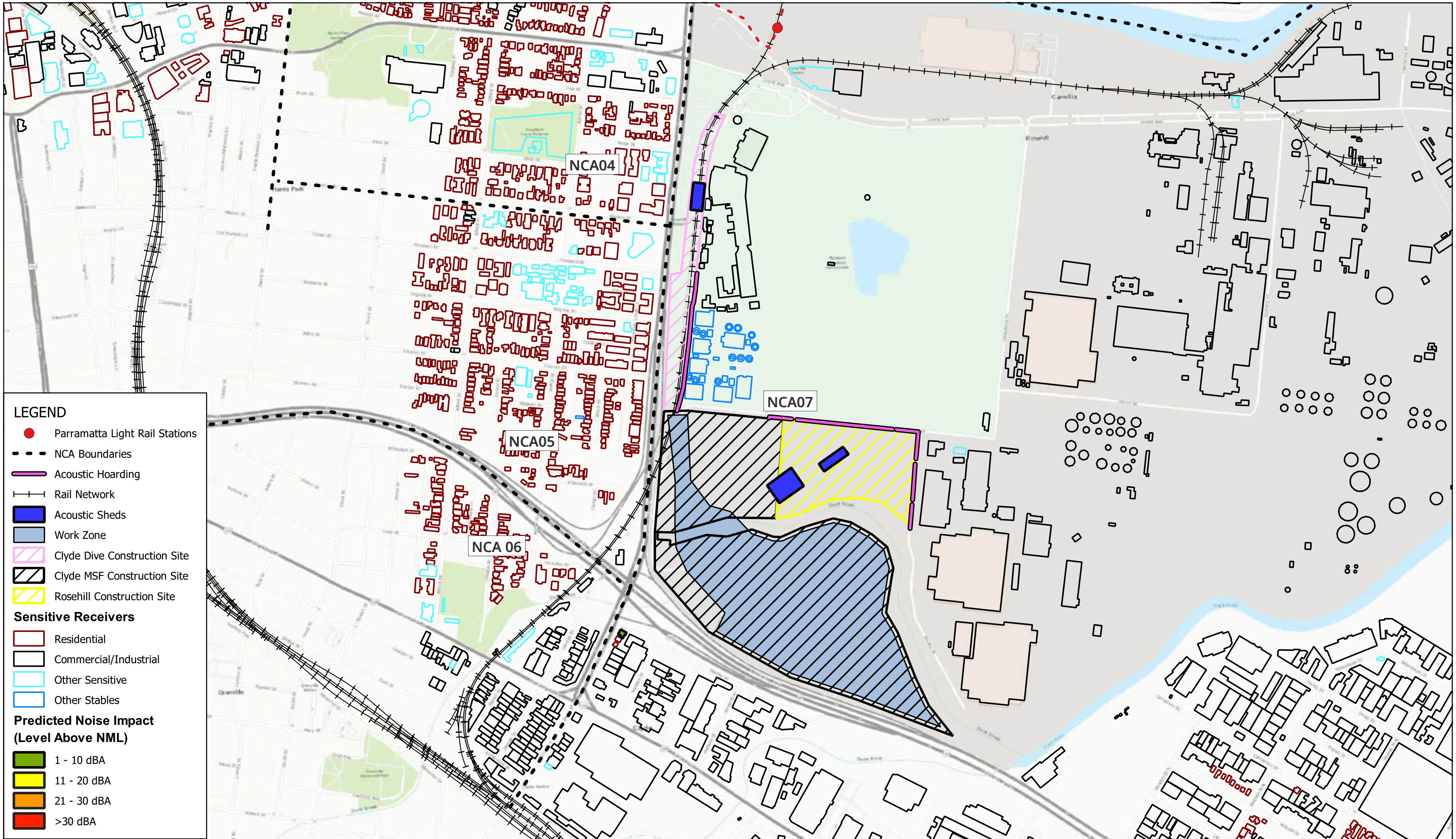
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.04 Drainage installation & combined services route Predicted Noise Impacts (Night)

FIGURE C-164



0 150 300 m

Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

SLR

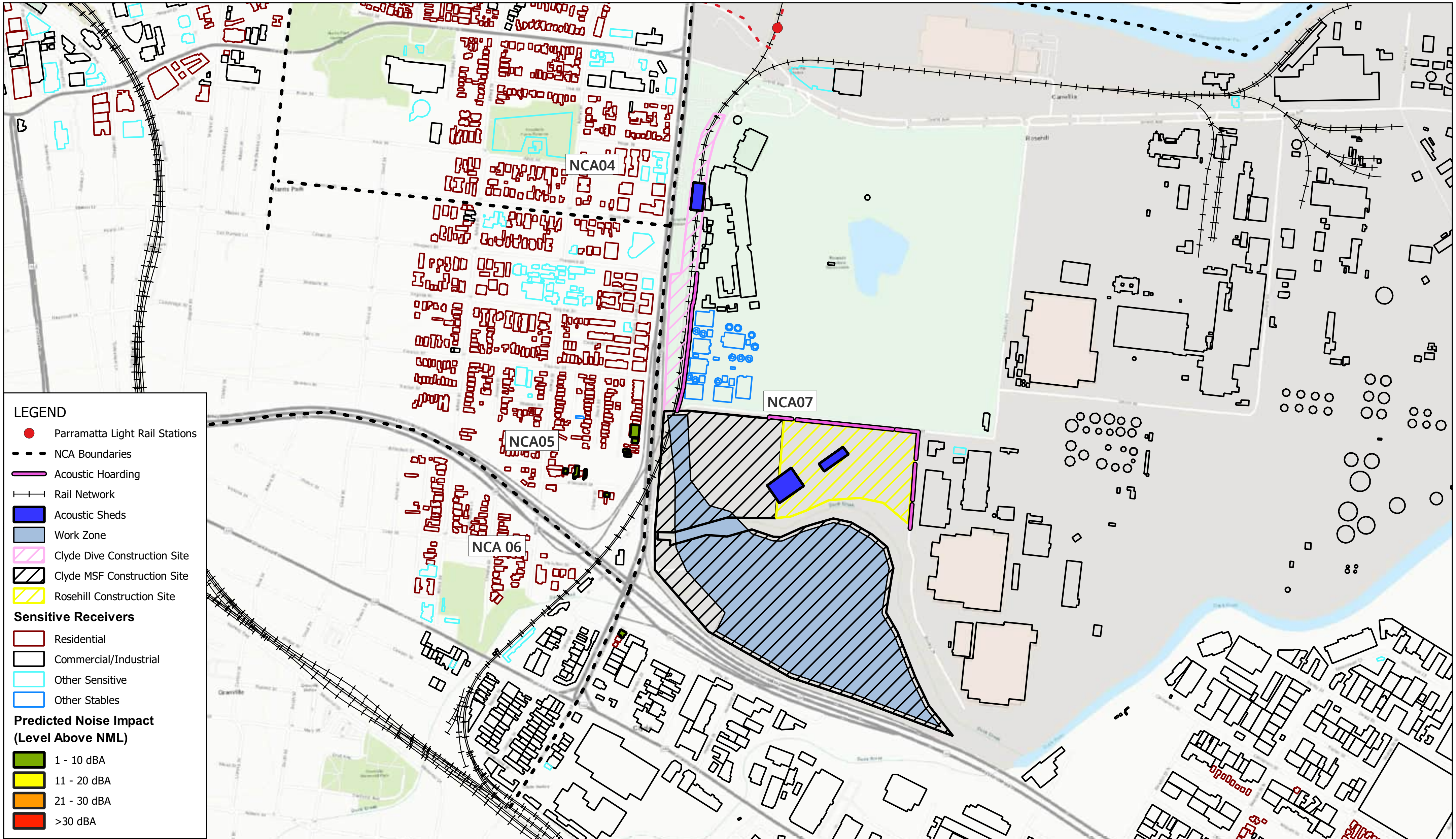
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.05 Utility trench and services corridor
Predicted Noise Impacts
(Evening)

FIGURE C-165

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

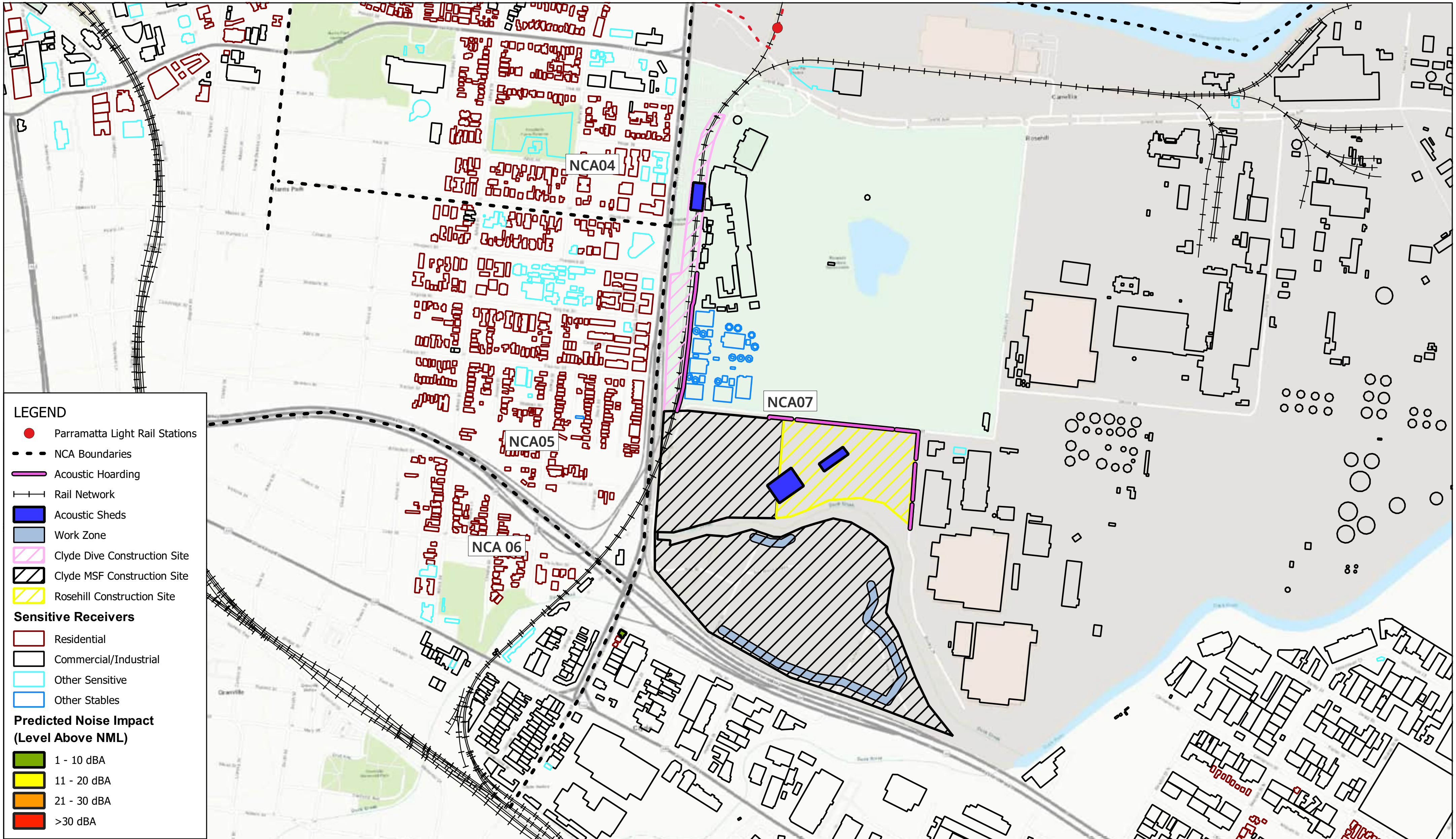
Drawn Date: 17-Jul-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.05 Utility trench and services corridor
Predicted Noise Impacts
(Night)

FIGURE C-166



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

SLR

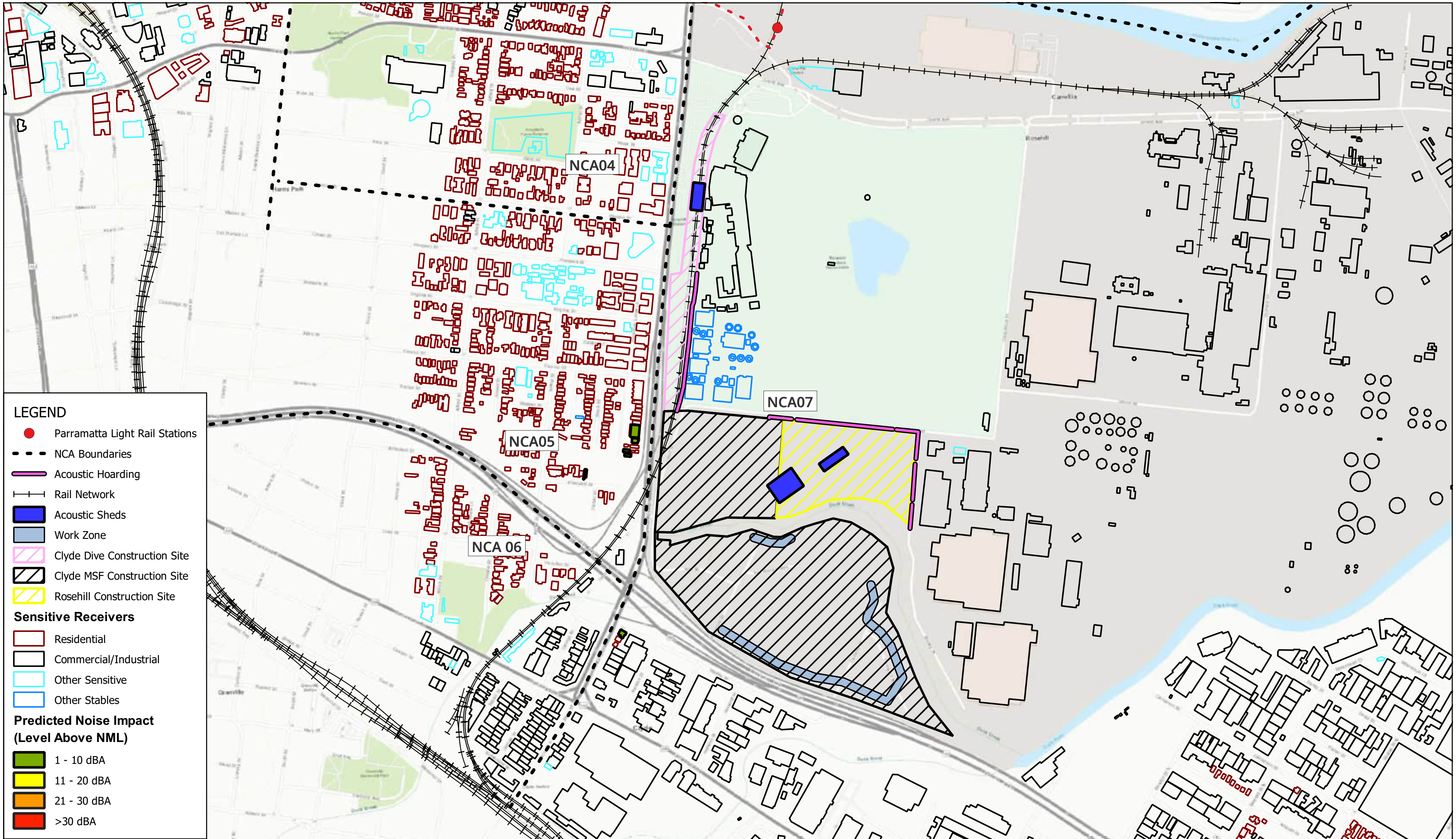
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.06 FRP works, concrete works and retaining walls
Predicted Noise Impacts
(Evening)

FIGURE C-167

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

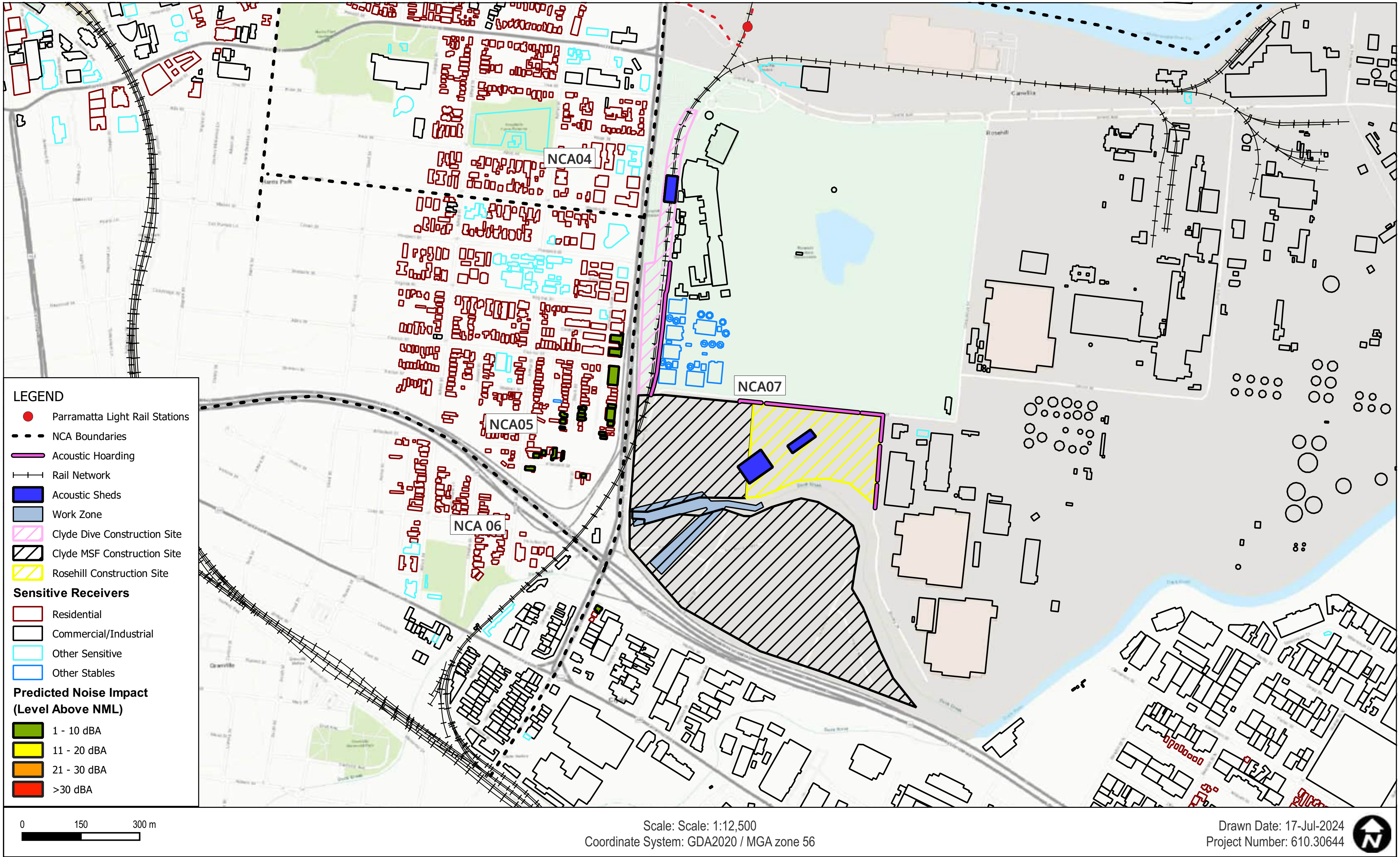
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.06 FRP works, concrete works and retaining walls Predicted Noise Impacts (Night)

FIGURE C-168



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

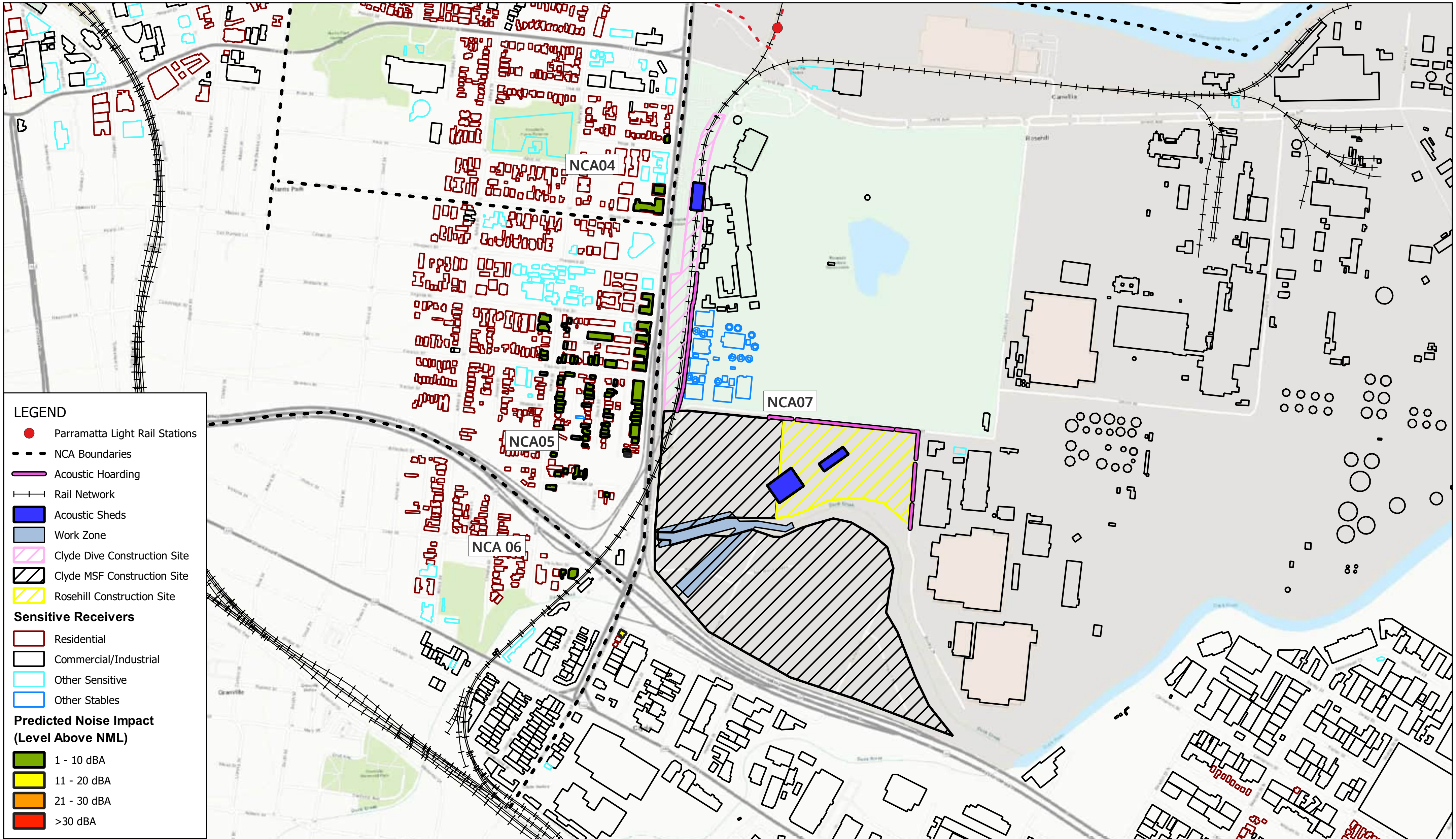
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.07a Water Conveyancing Structure - Construction Predicted Noise Impacts (Evening)

FIGURE C-169

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

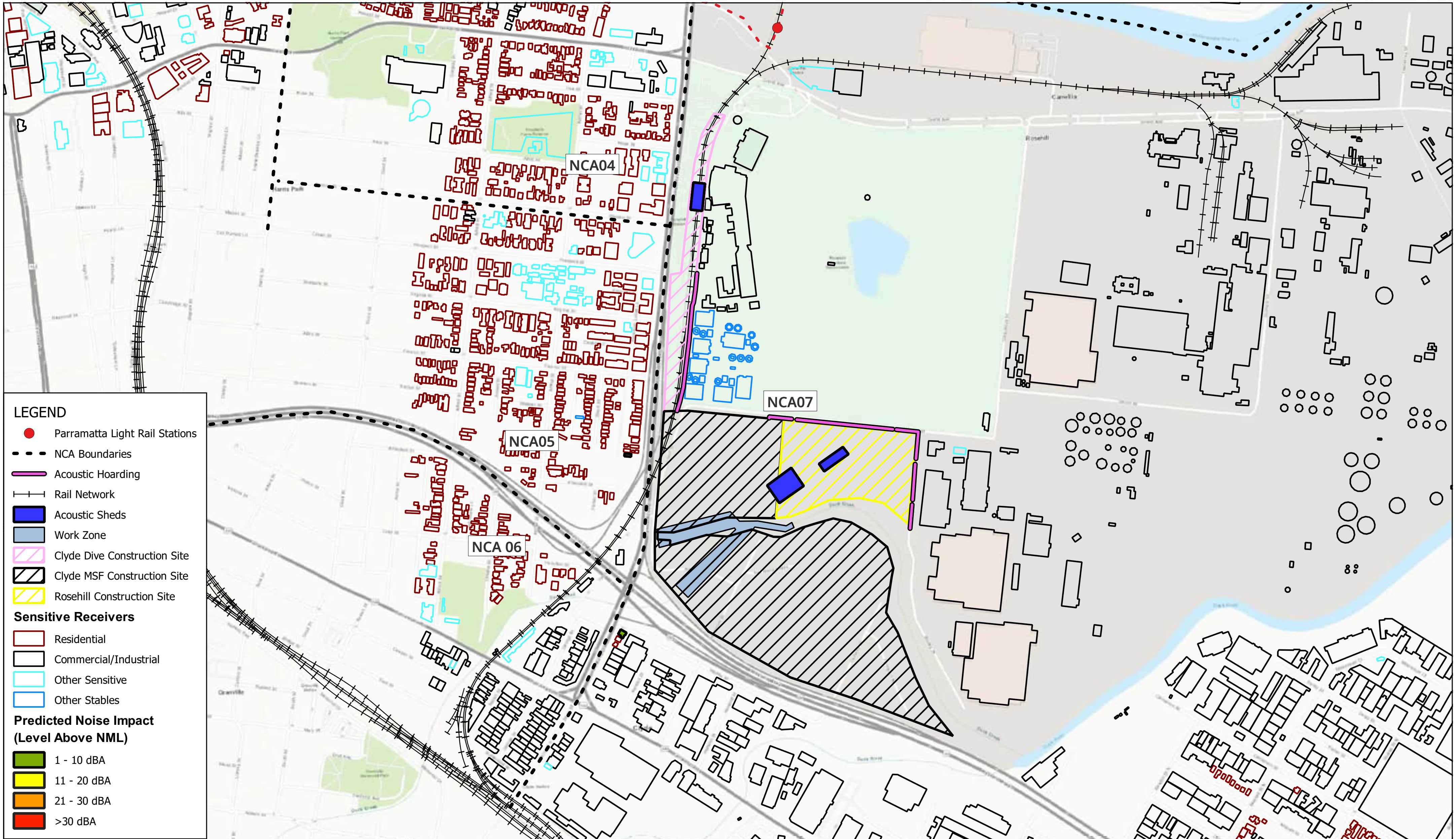
Drawn Date: 17-Jul-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.07a Water Conveyancing Structure - Construction Predicted Noise Impacts (Night)

FIGURE C-170



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

SLR

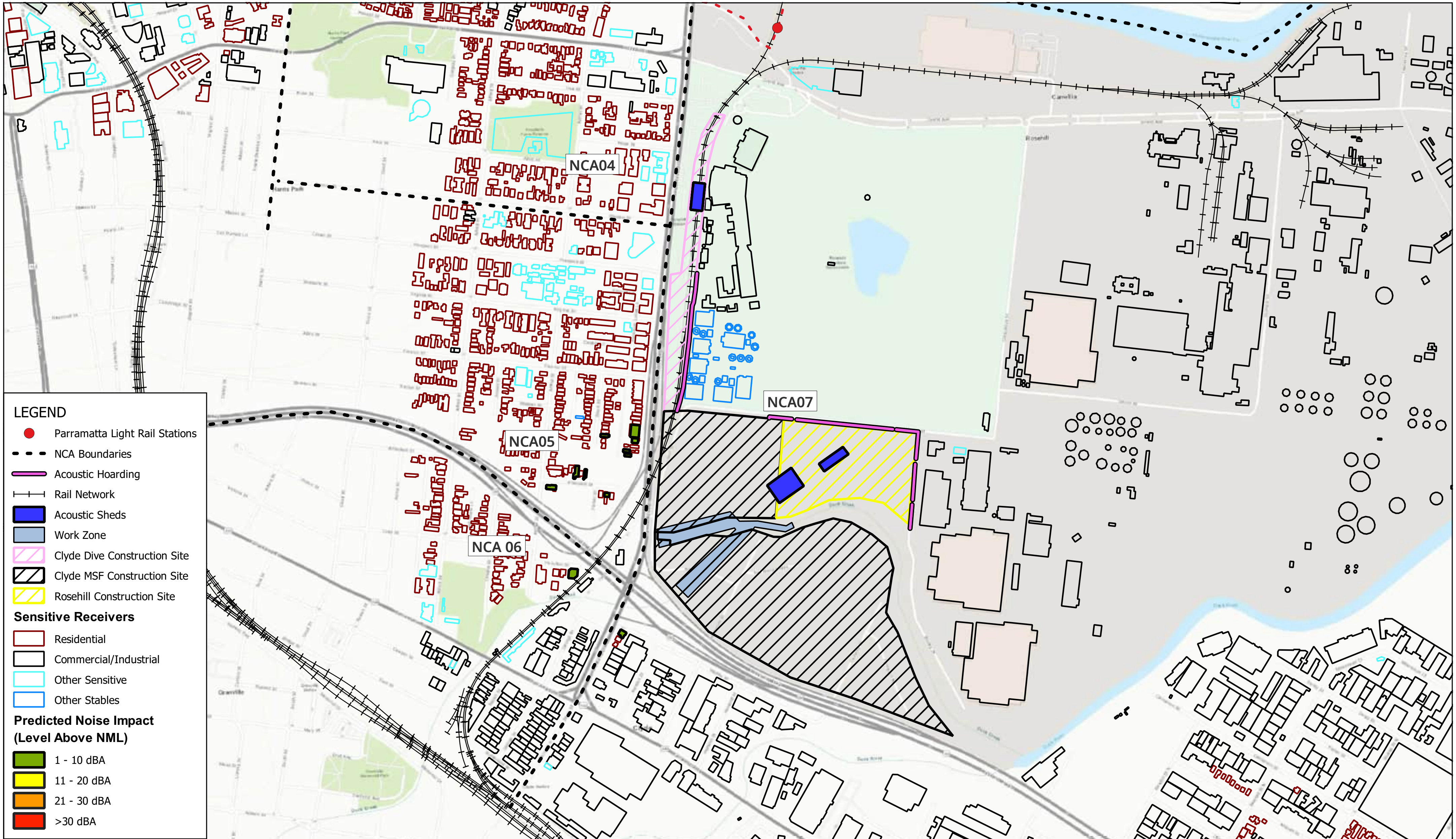
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.07b Water Conveyancing Structure - Construction Predicted Noise Impacts (Evening)

FIGURE C-171

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

SLR

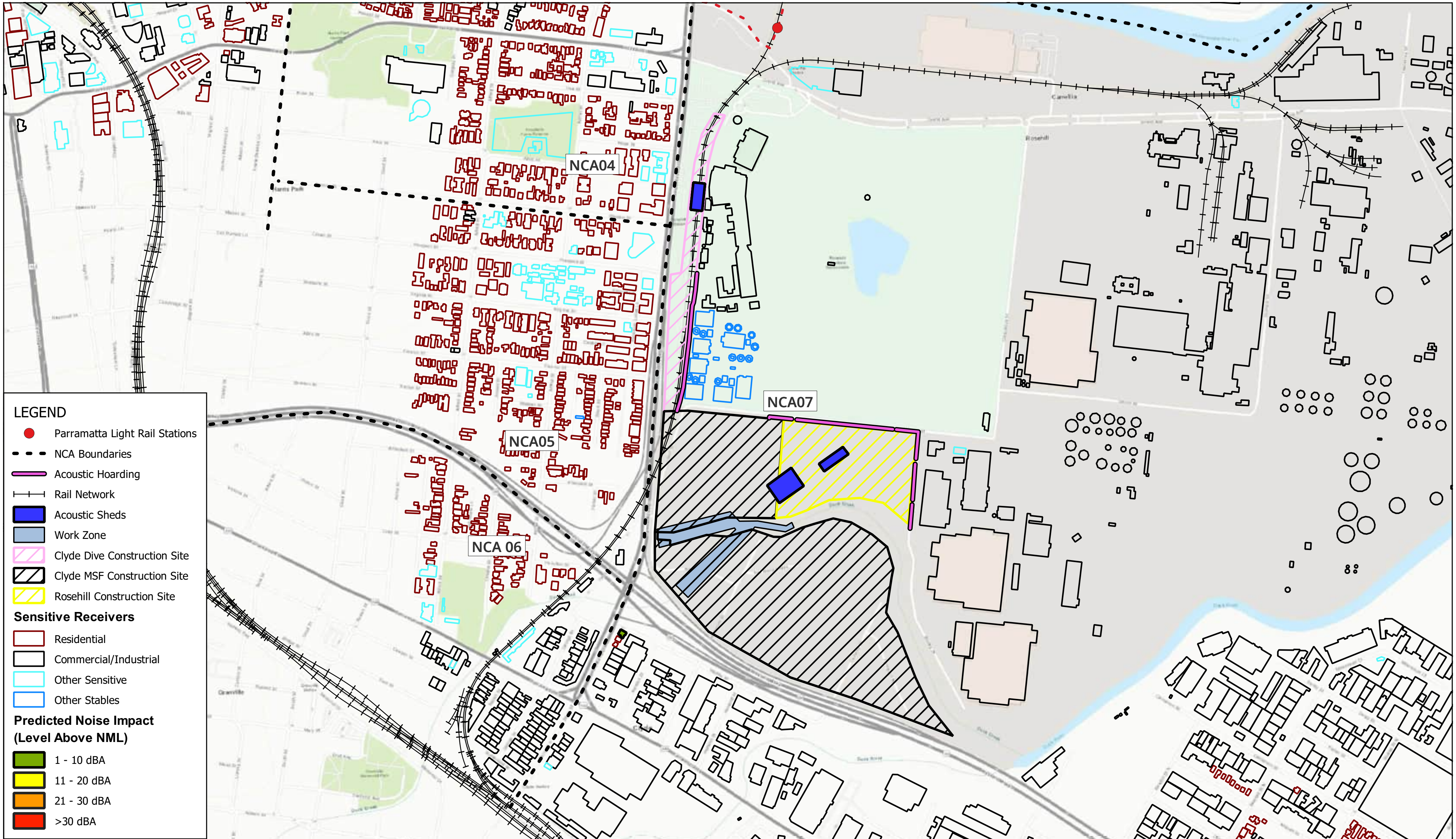
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.07b Water Conveyancing Structure - Construction Predicted Noise Impacts (Night)

FIGURE C-172

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

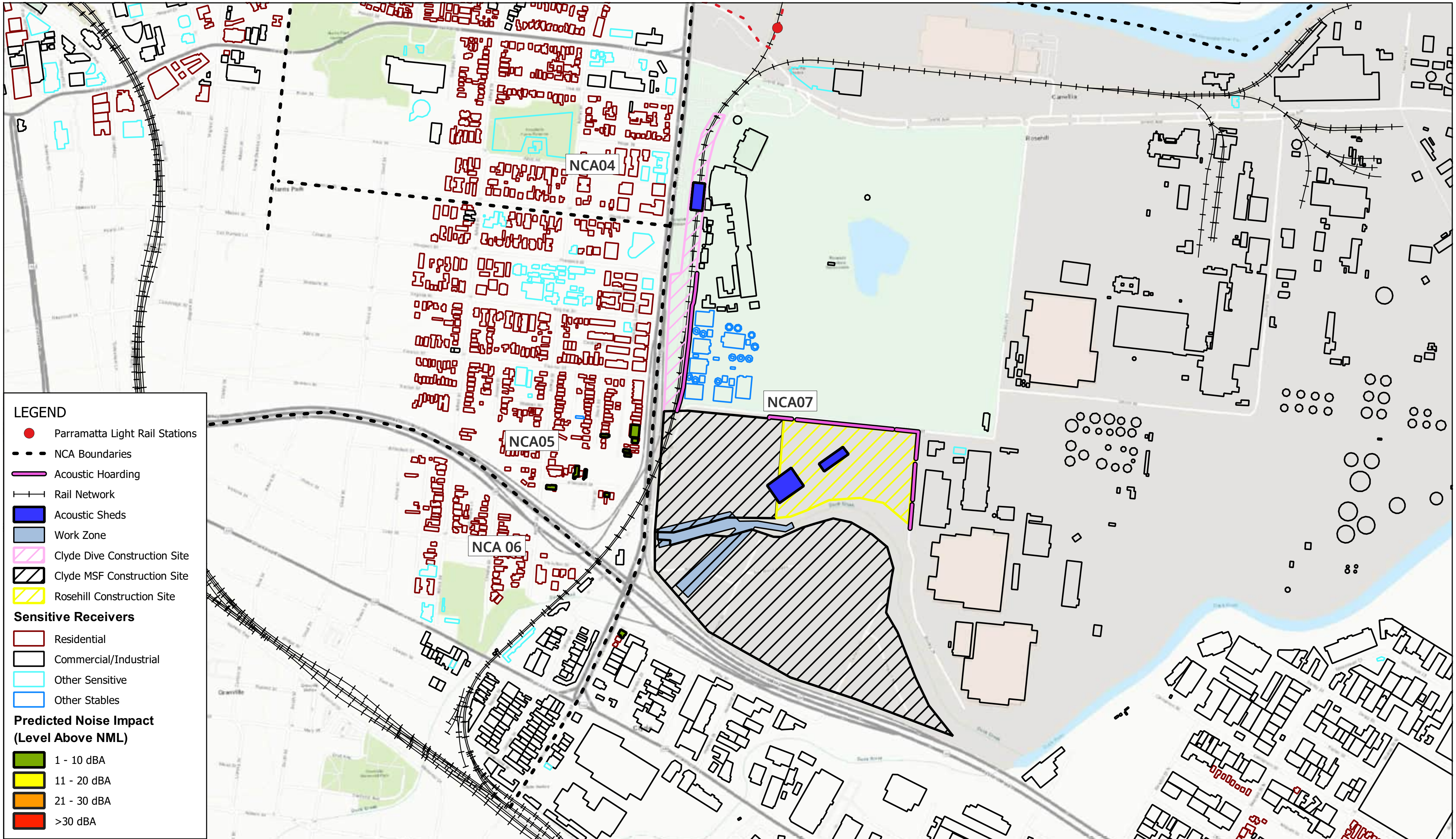
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.08 Water Conveyancing Structure - Finishing Works
Predicted Noise Impacts
(Approved Hours)

FIGURE C-173

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

SLR

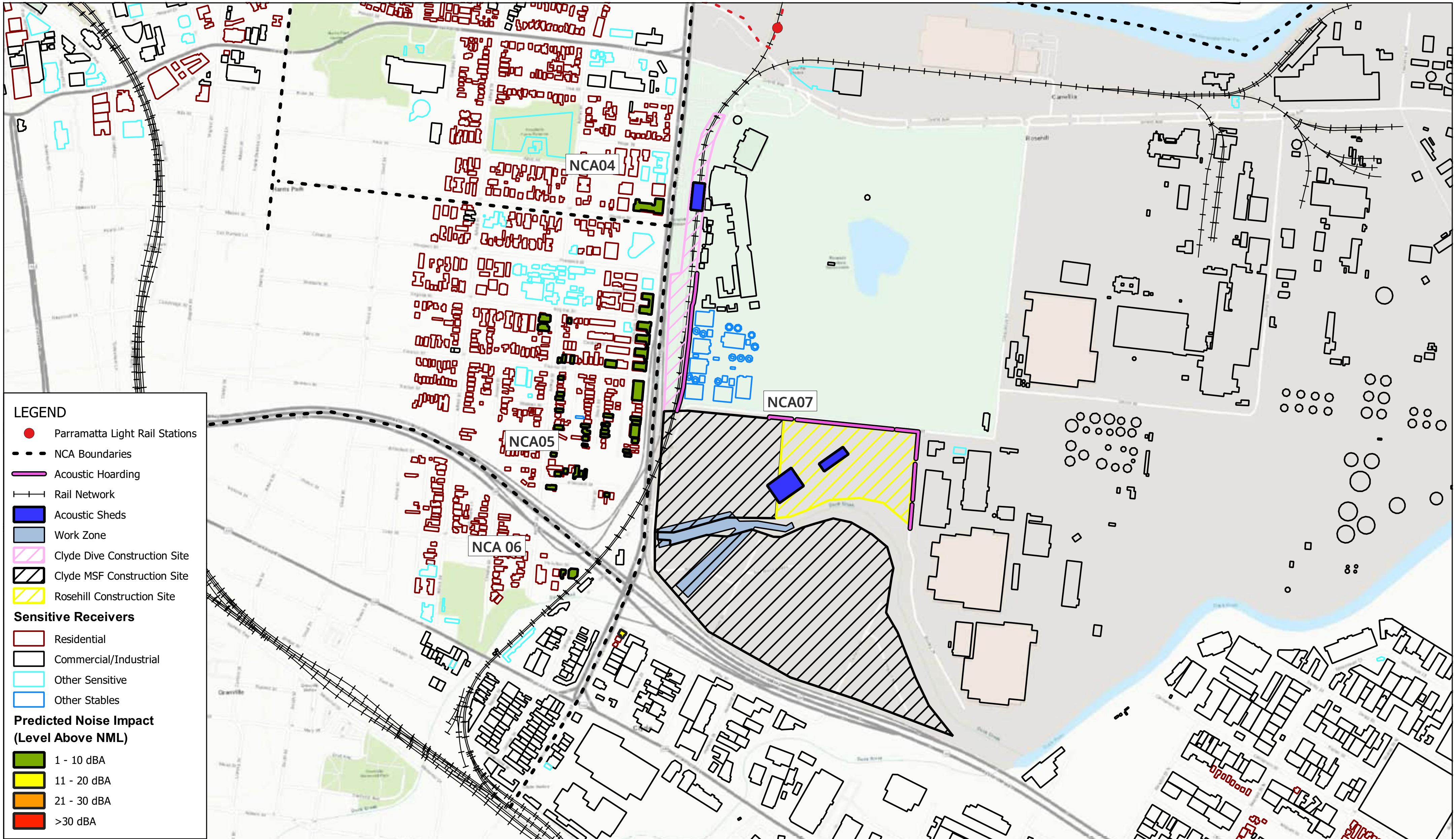
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.08 Water Conveyancing Structure - Finishing Works
Predicted Noise Impacts
(Evening)

FIGURE C-174

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

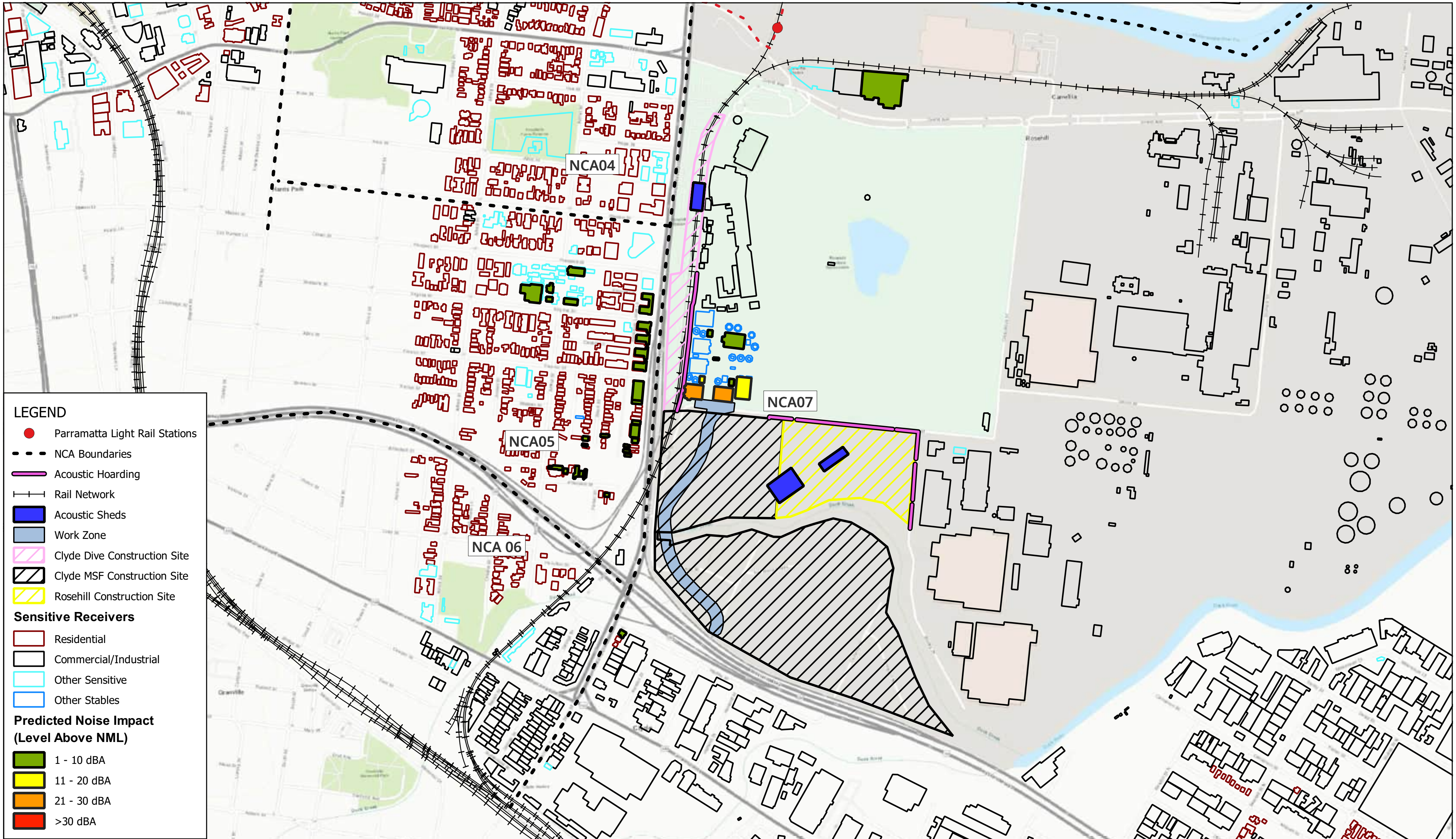
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.08 Water Conveyancing Structure - Finishing Works
Predicted Noise Impacts
(Night)

FIGURE C-175



0 150 300 m

Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

SLR

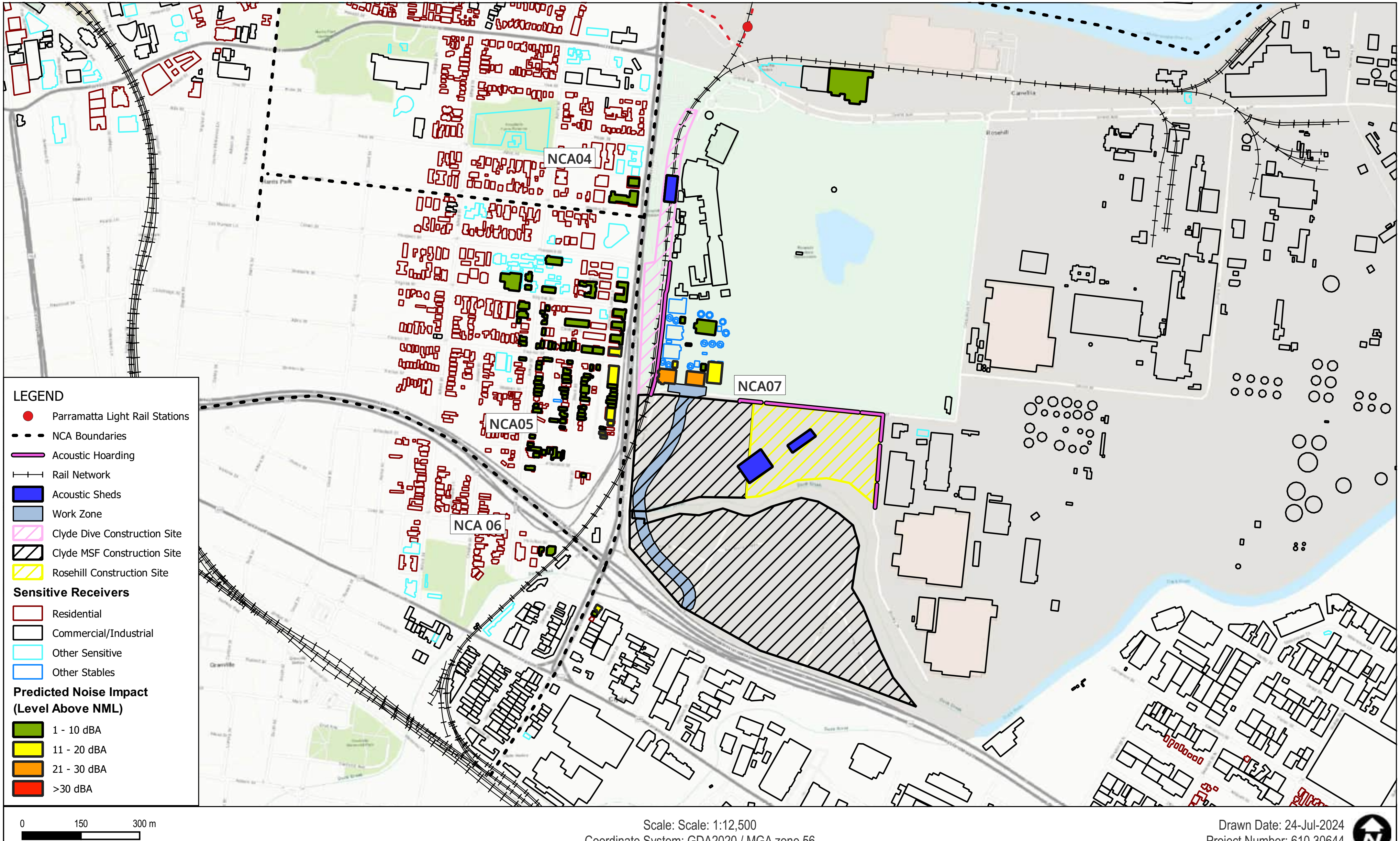
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.09 Unwin Street Diversion - Construction Predicted Noise Impacts (Approved Hours)

FIGURE C-176

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

SLR

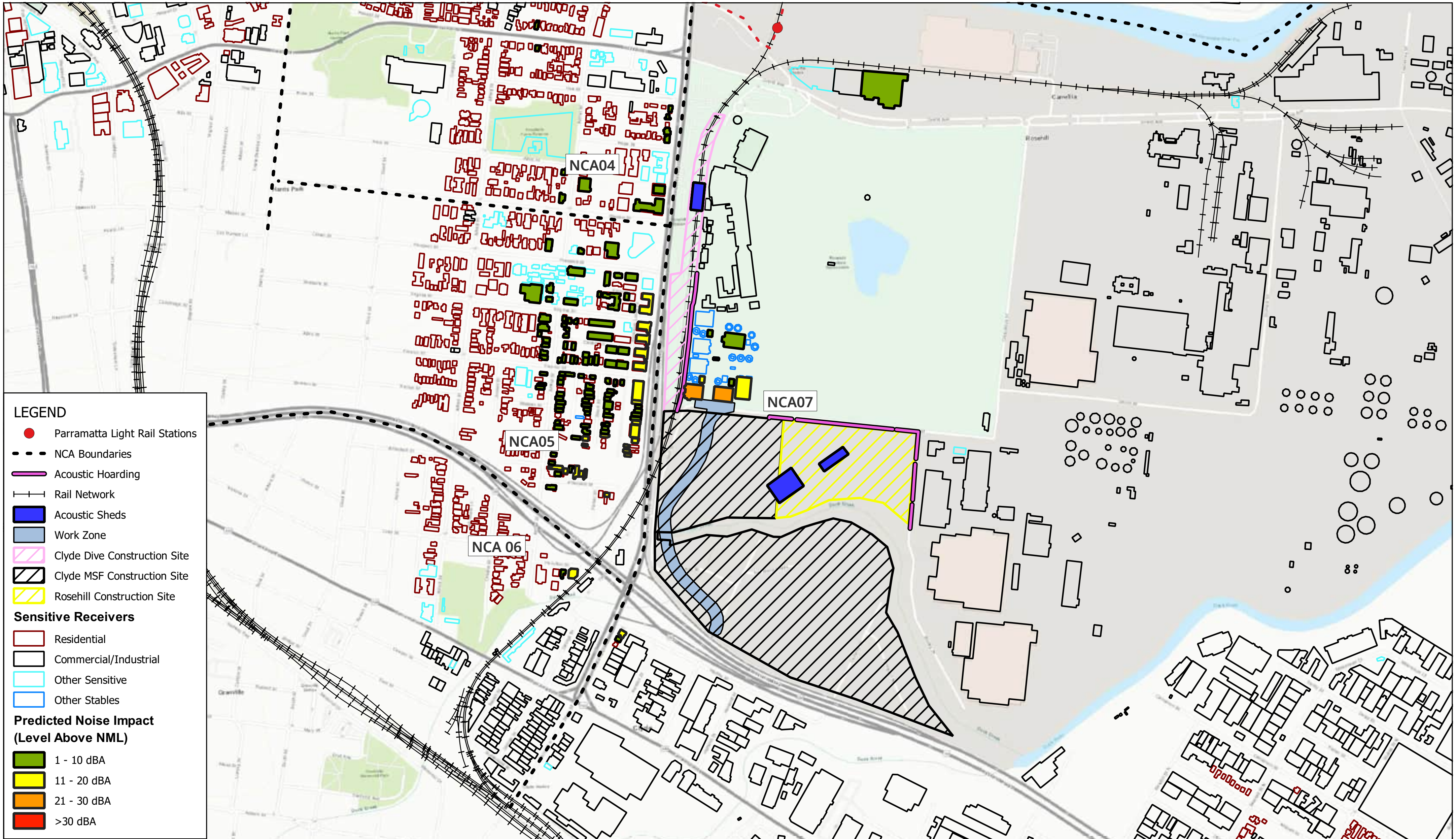
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.09 Unwin Street Diversion - Construction Predicted Noise Impacts (Evening)

FIGURE C-177

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

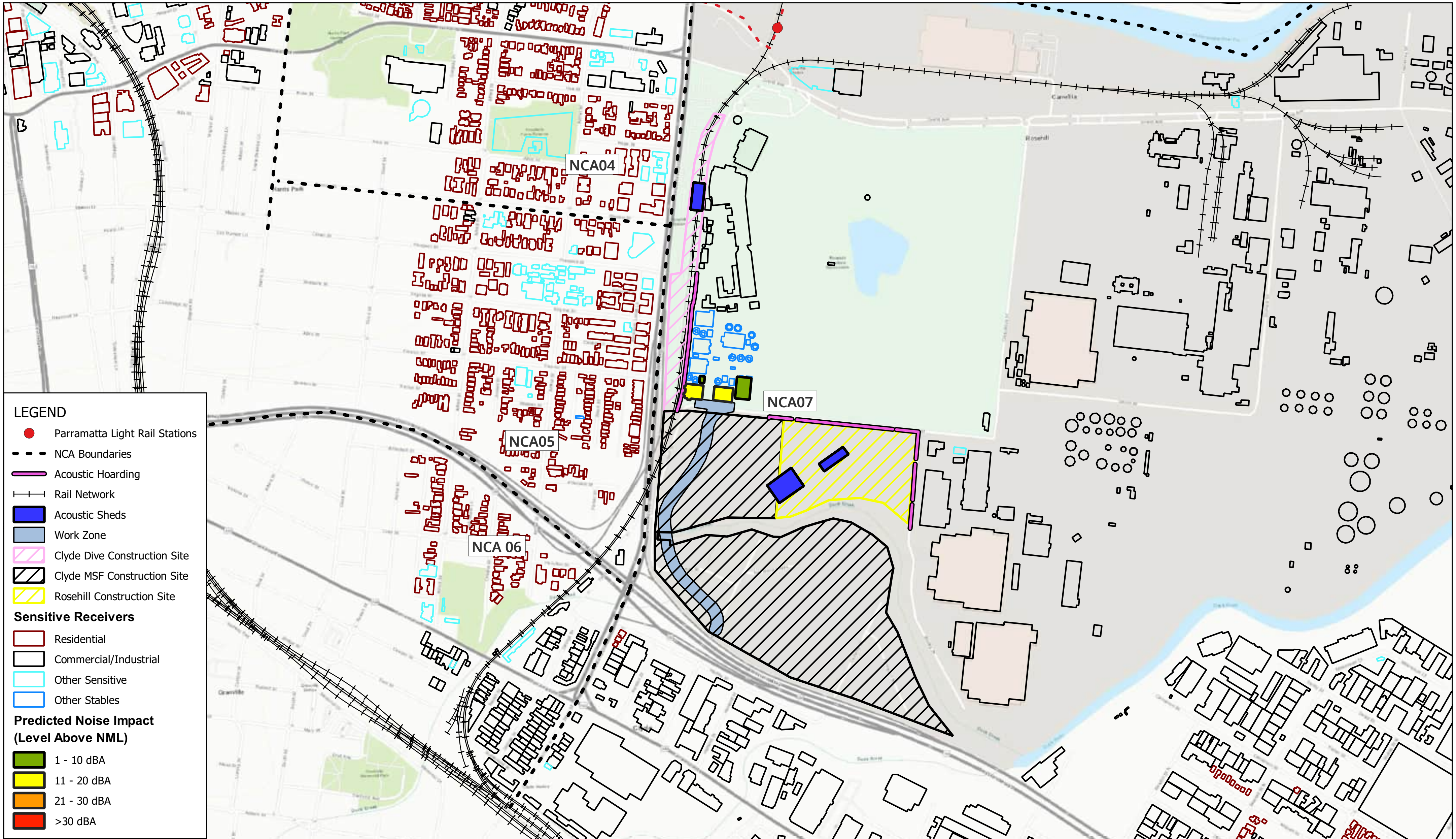
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.09 Unwin Street Diversion - Construction Predicted Noise Impacts (Night)

FIGURE C-178



0 150 300 m

Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

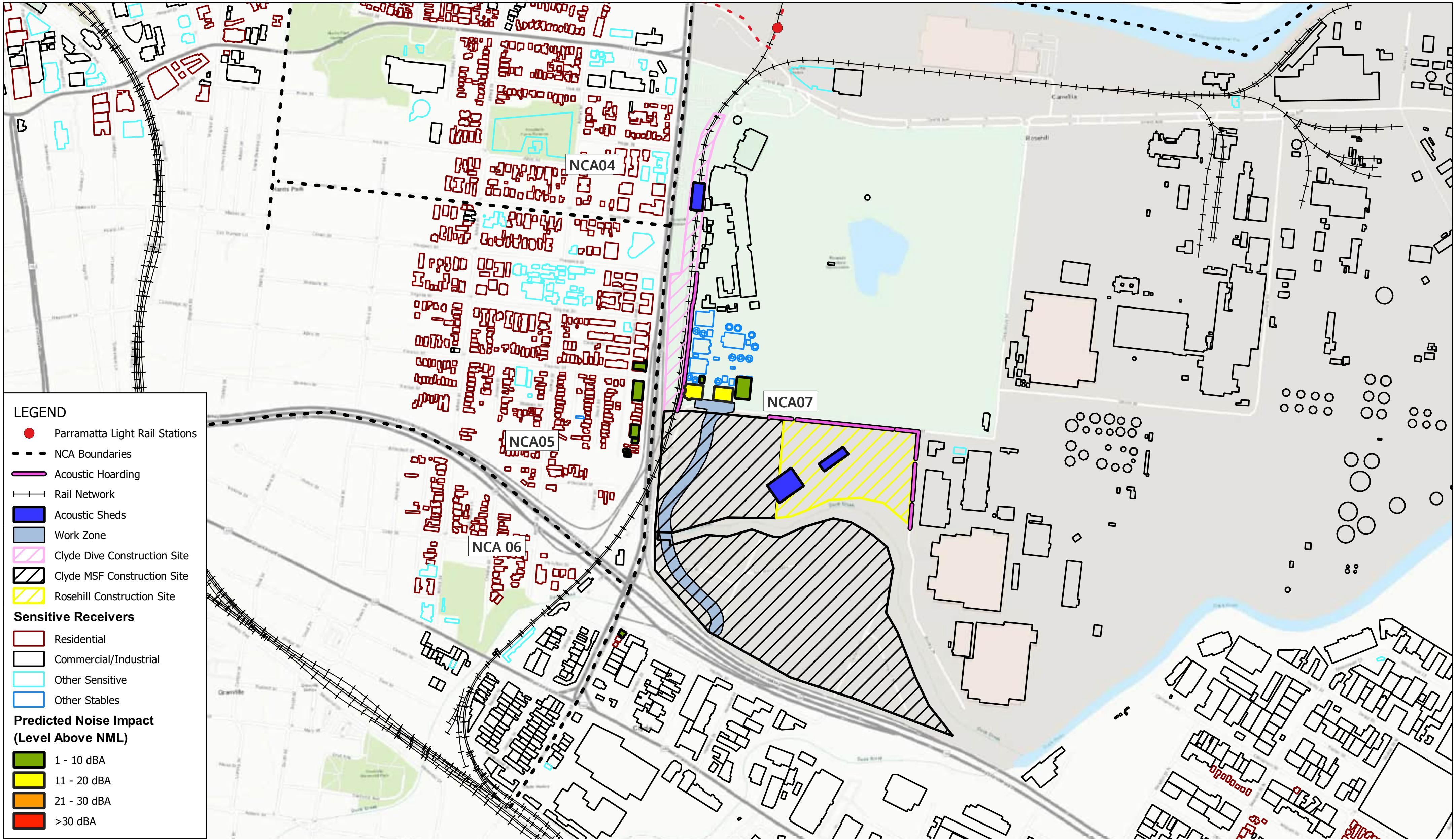
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.10 Unwin Street Diversion - Finishing Works Predicted Noise Impacts (Approved Hours)

FIGURE C-179



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

SLR

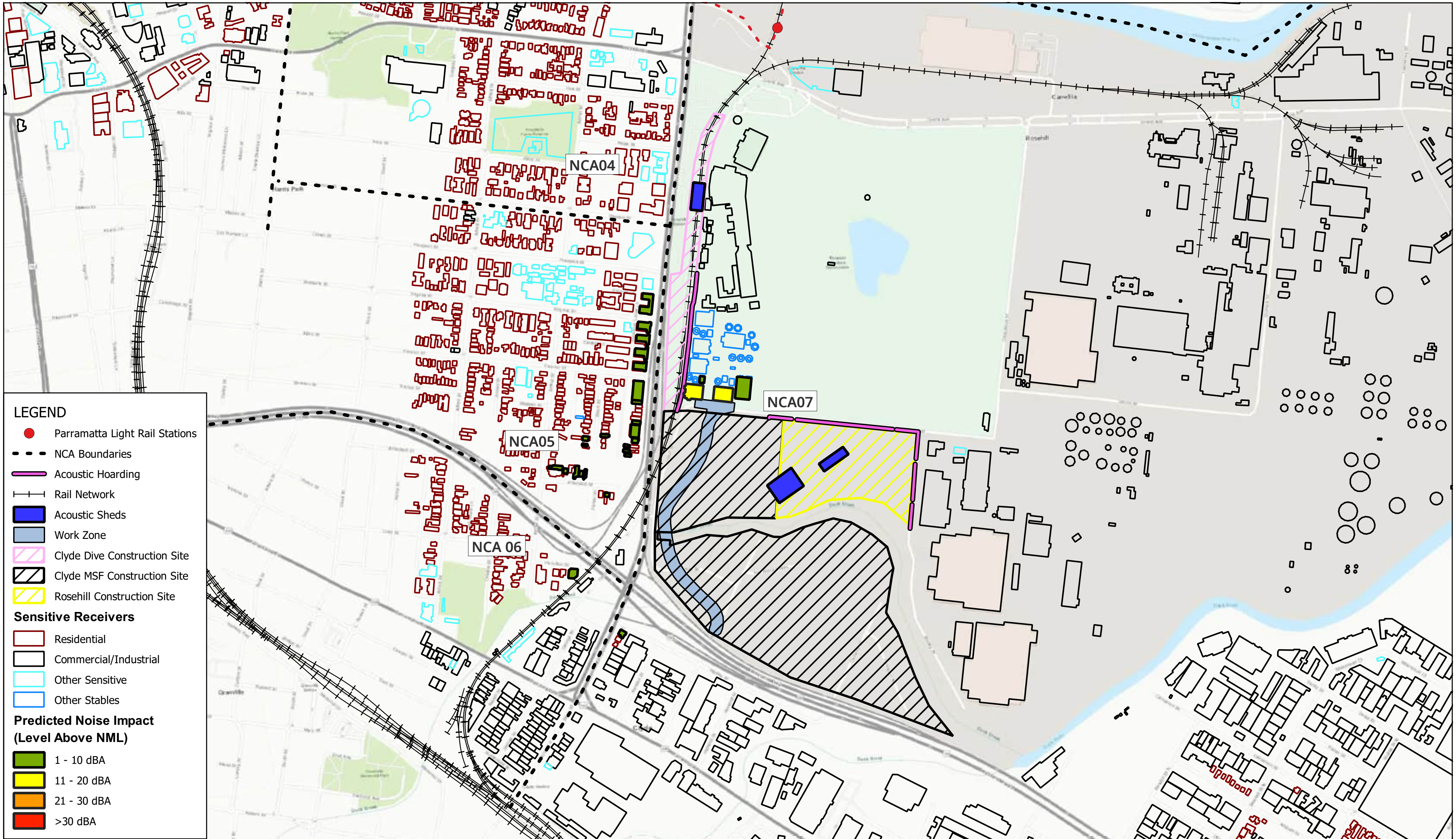
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.10 Unwin Street Diversion - Finishing Works
Predicted Noise Impacts
(Evening)

FIGURE C-180

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

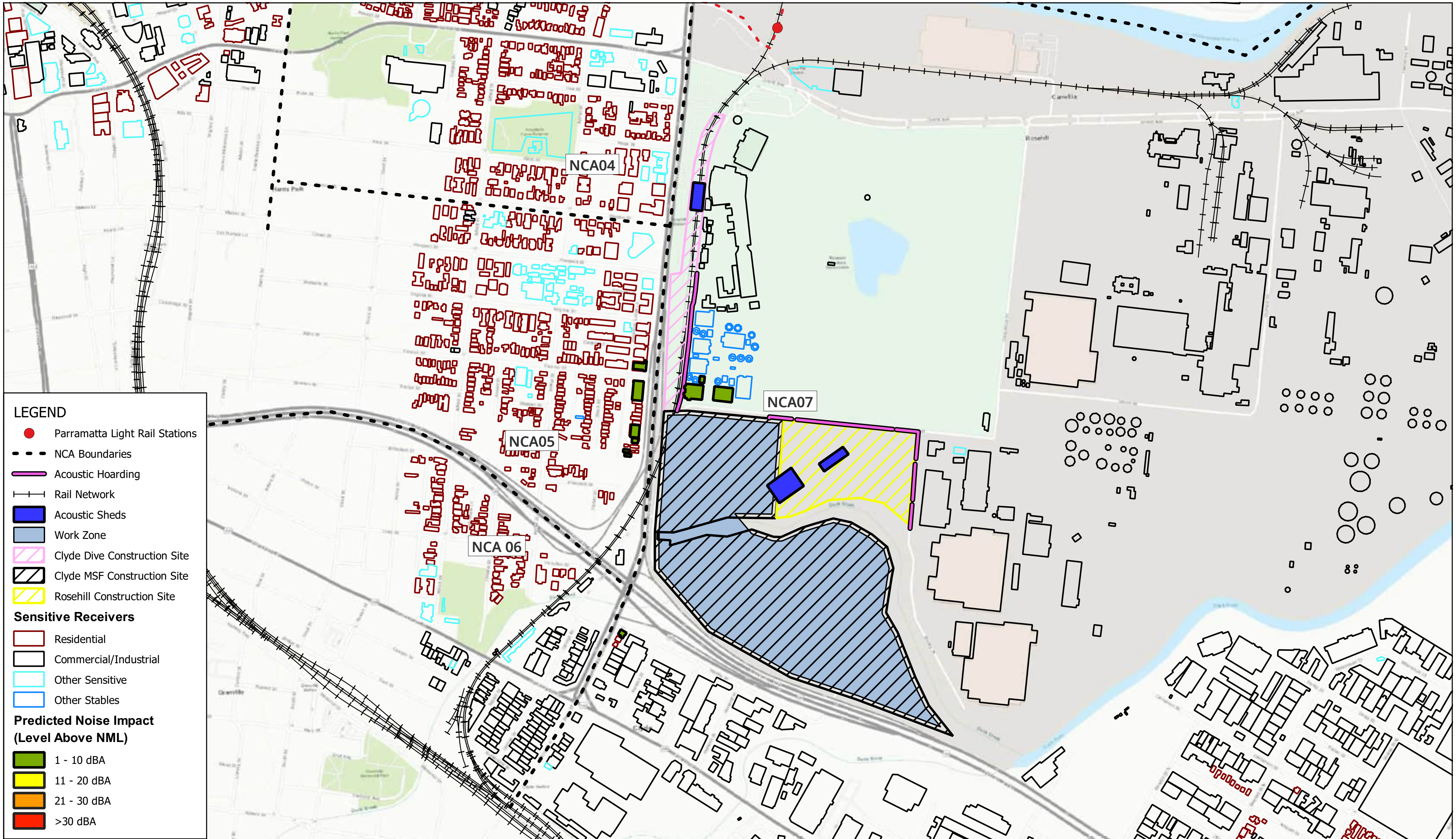
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.10 Unwin Street Diversion - Finishing Works Predicted Noise Impacts (Night)

FIGURE C-181

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

SLR

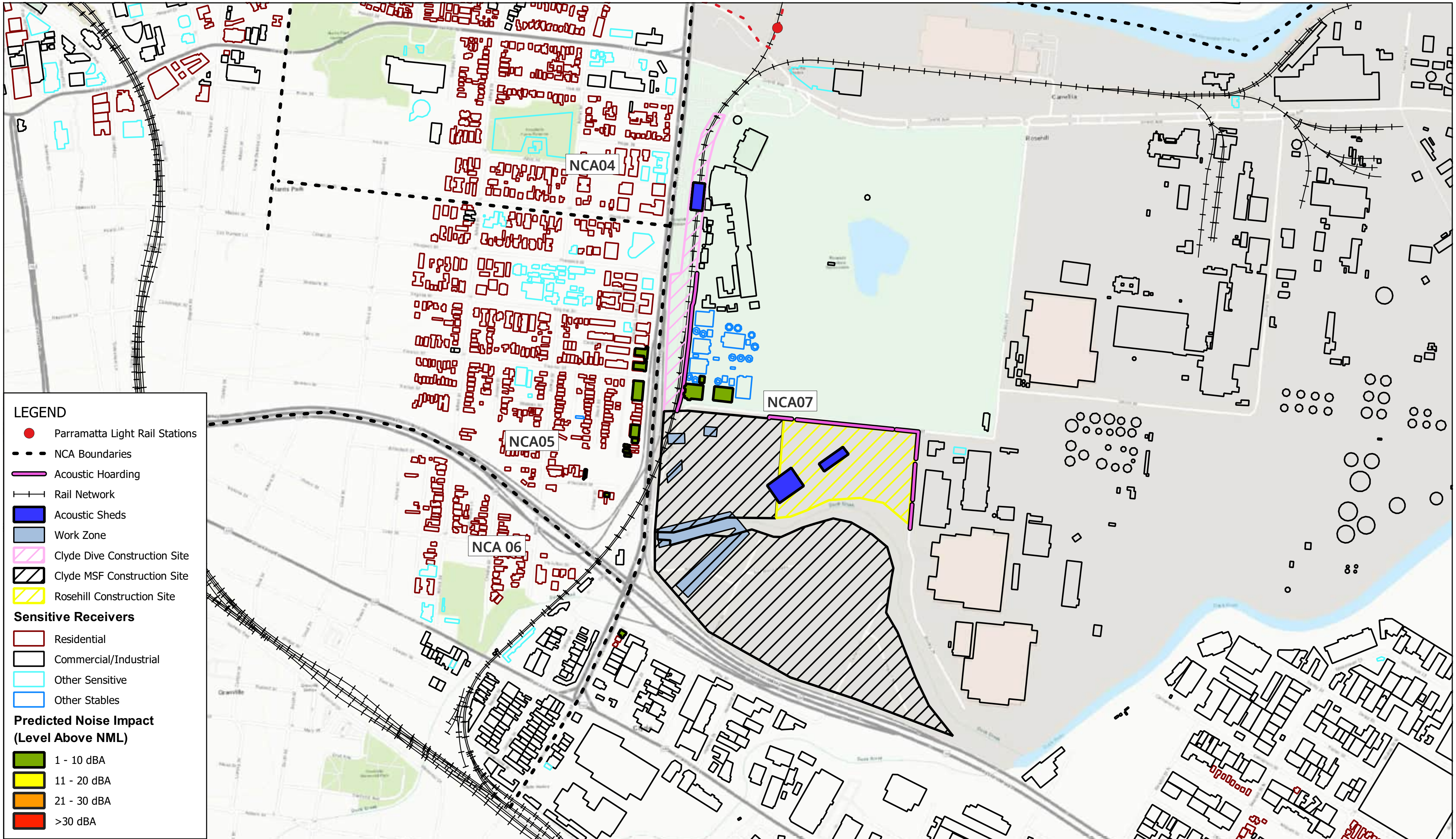
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.11 Demobilisation
Predicted Noise Impacts
(Approved Hours)

FIGURE C-182

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

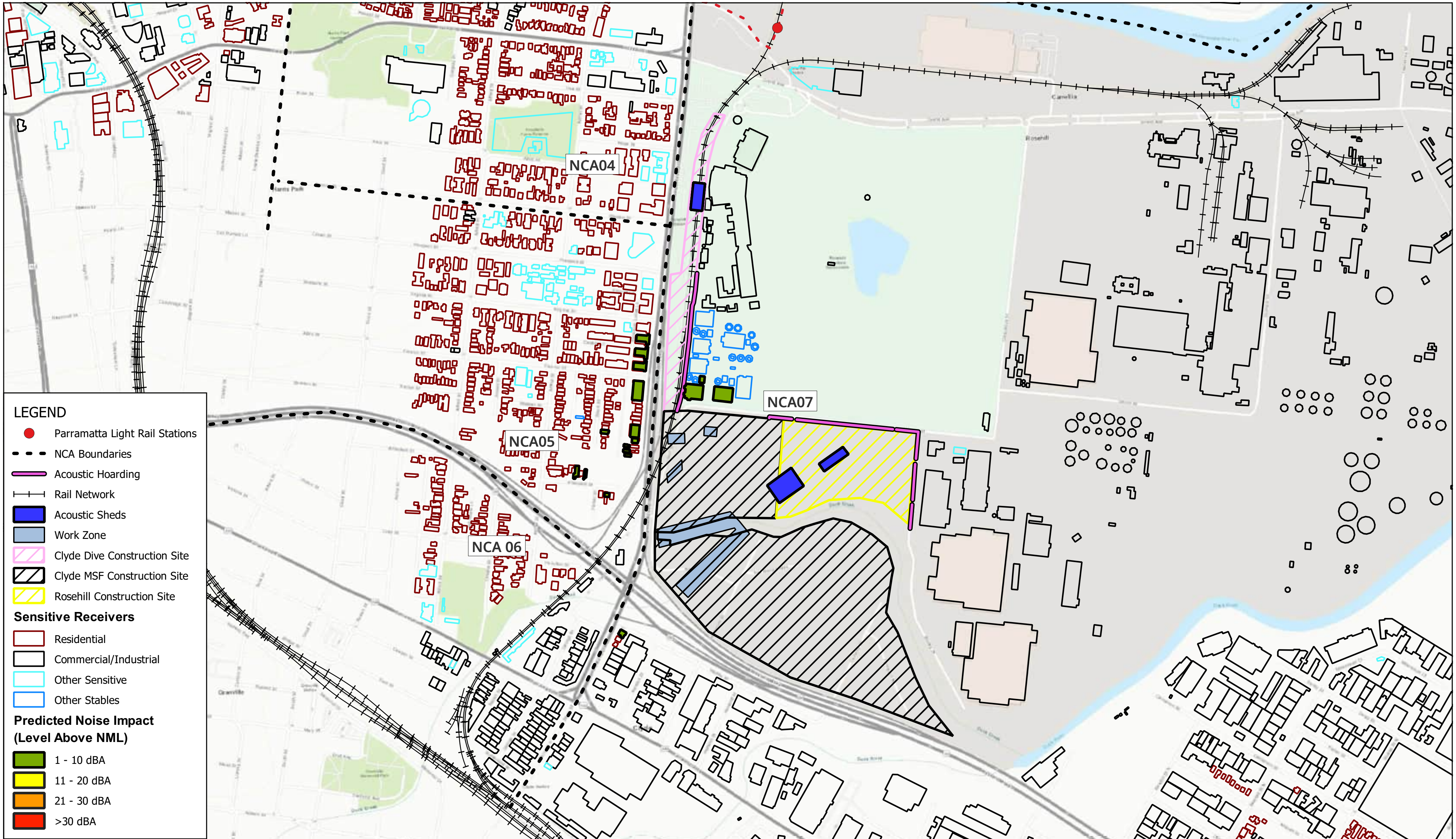
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.12a Unwin Street Overpass (Piling, FRP, Earthworks, Heavy Lifting) Predicted Noise Impacts (Approved Hours)

FIGURE C-183



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

SLR

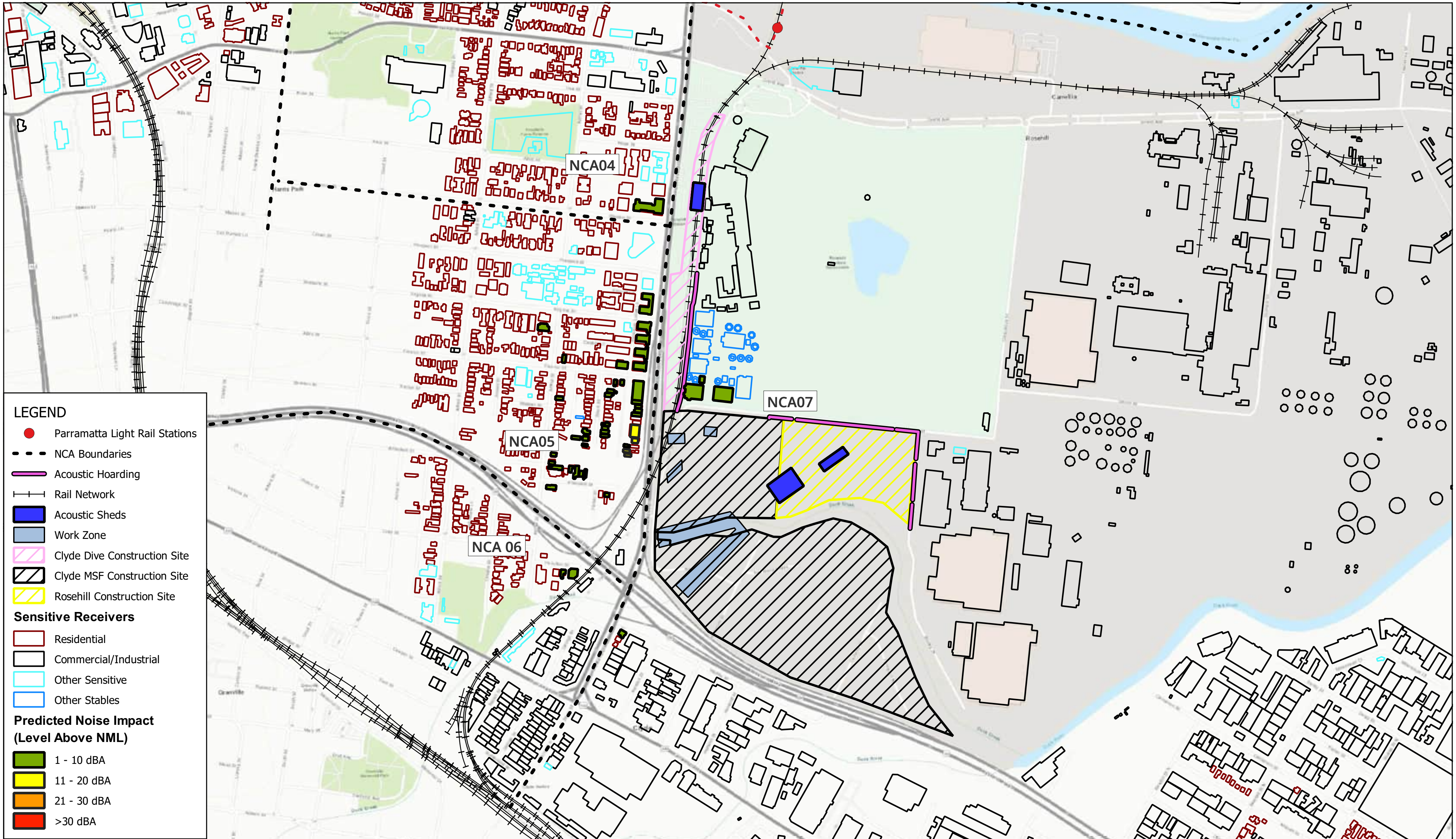
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.12b Unwin Street Overpass - Delivery
Predicted Noise Impacts
(Evening)

FIGURE C-184

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



0 150 300 m

Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 17-Jul-2024
Project Number: 610.30644

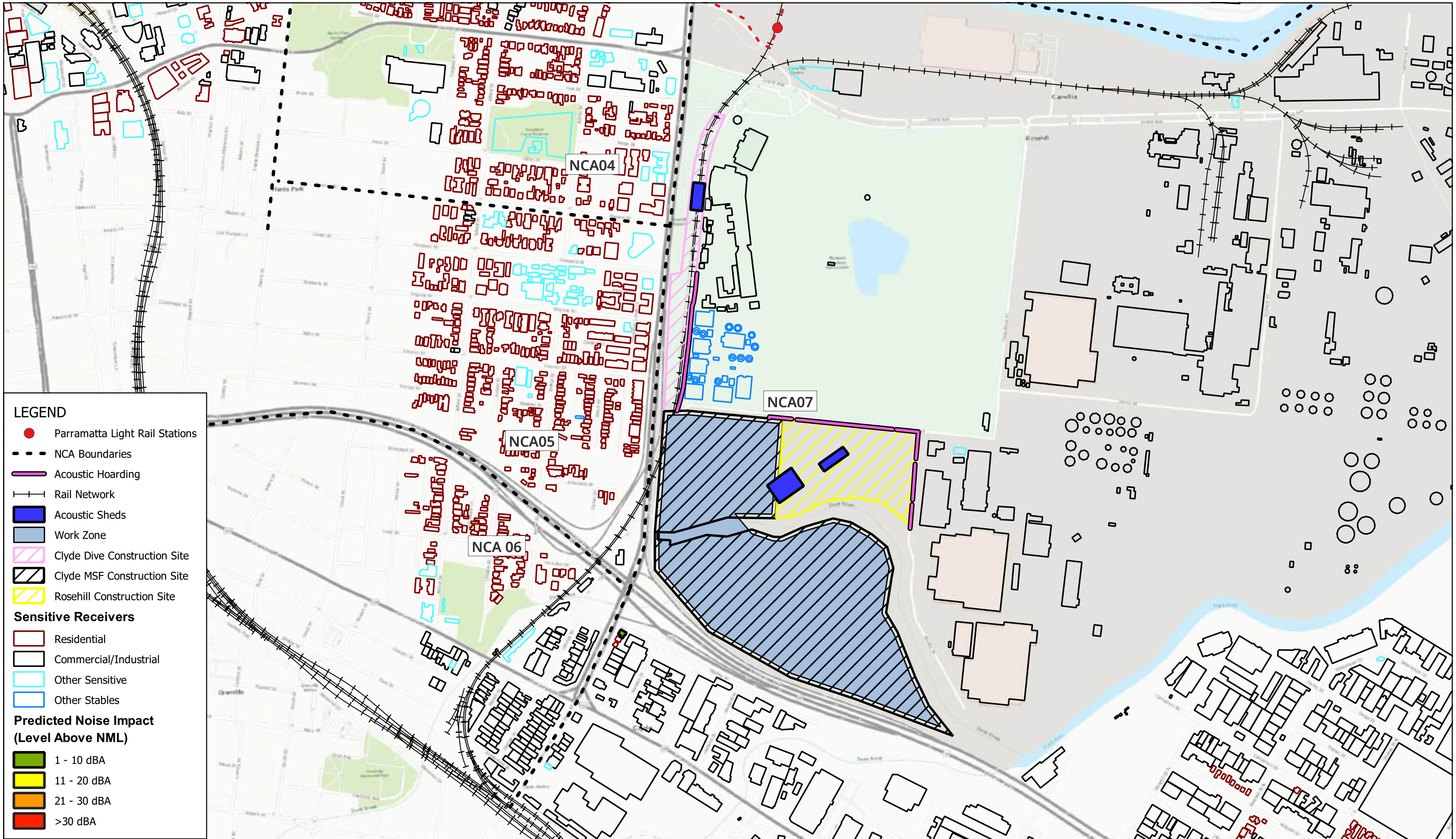
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.12b Unwin Street Overpass - Delivery
Predicted Noise Impacts
(Night)

FIGURE C-185



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

SLR

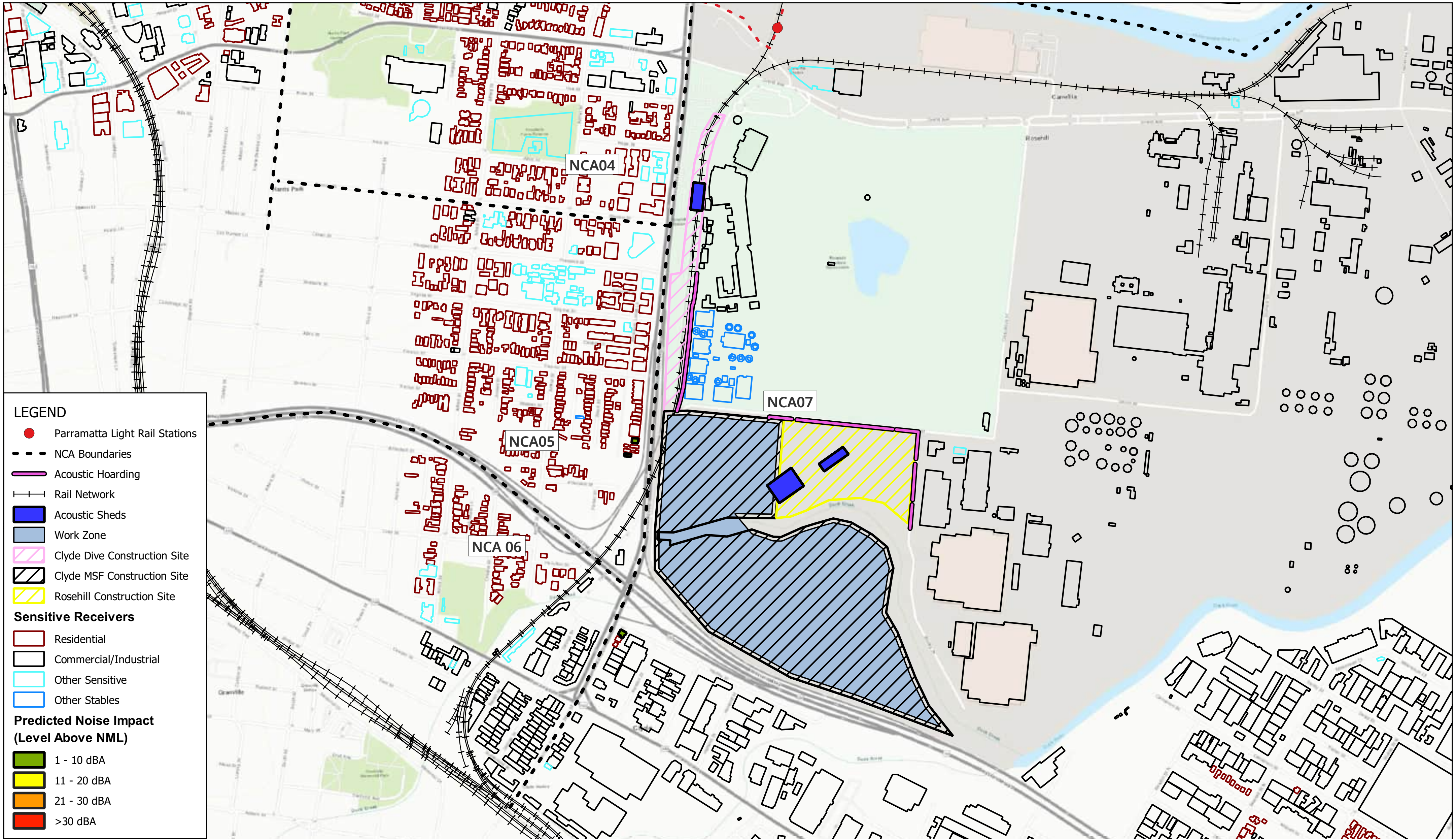
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.13 General operation of ancillary facility
Predicted Noise Impacts
(Evening)

FIGURE C-186

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

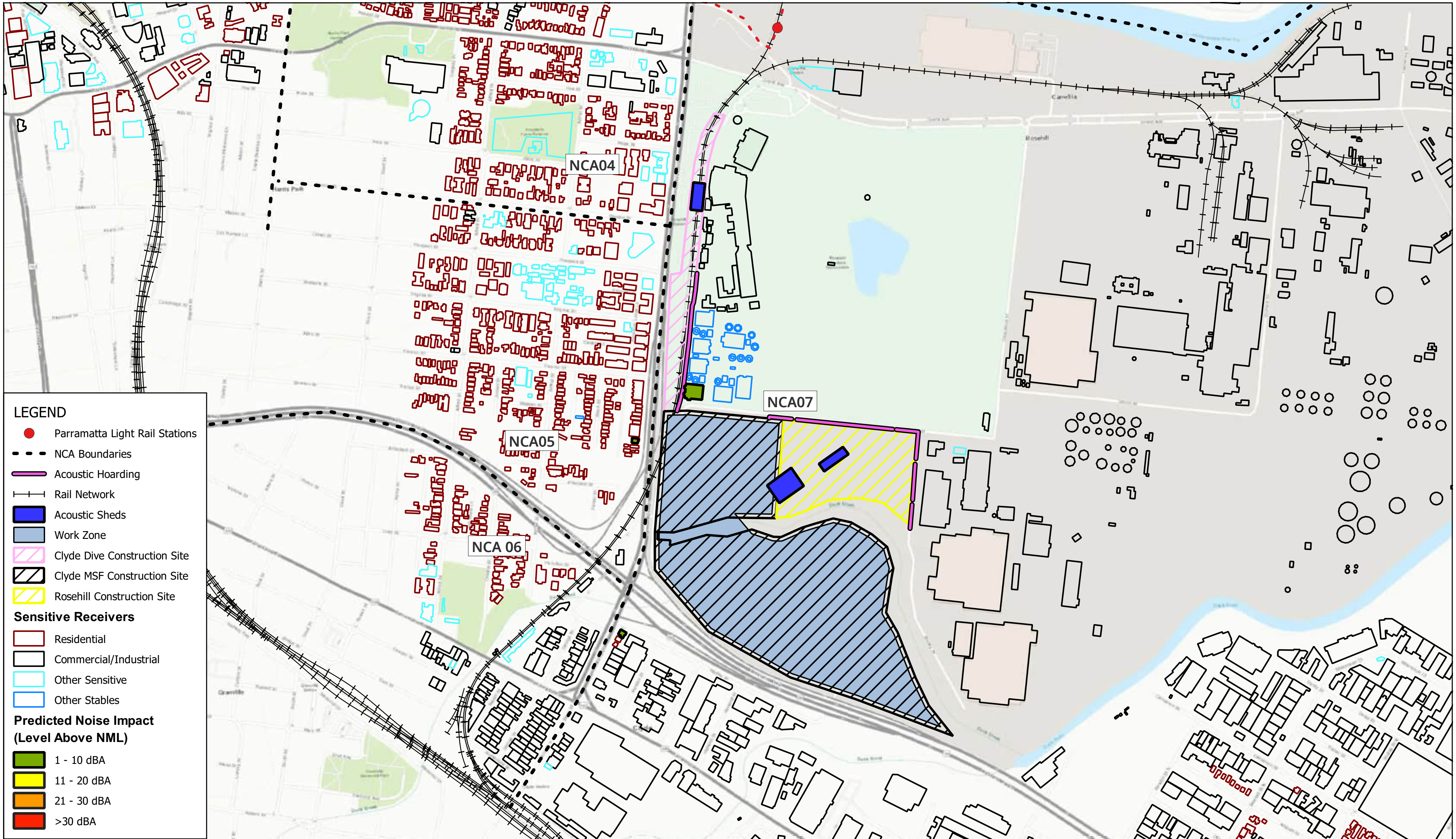
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.13 General operation of ancillary facility
Predicted Noise Impacts
(Night)

FIGURE C-187

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



0 150 300 m

Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

SLR

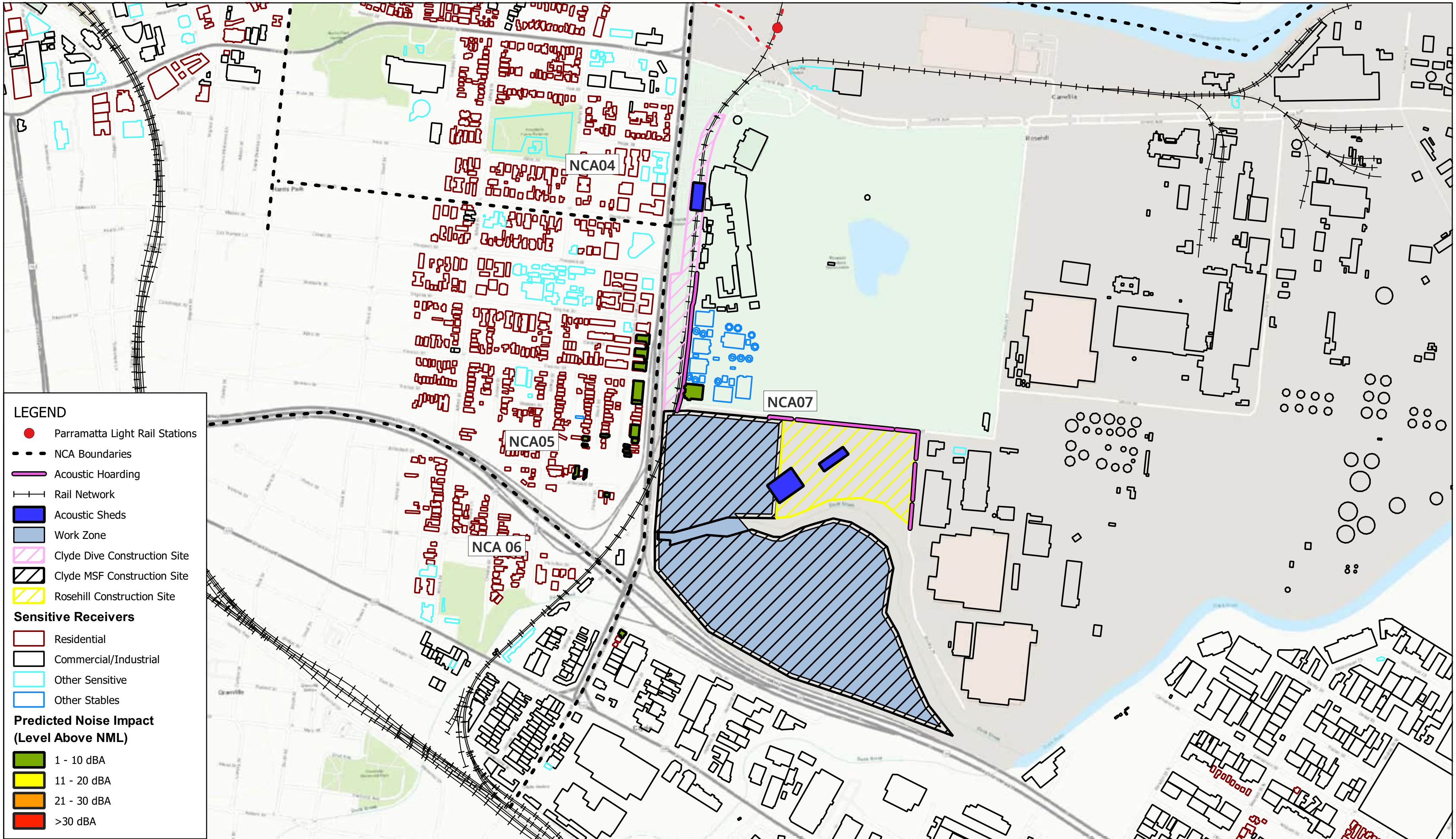
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.14 Utility adjustment work
Predicted Noise Impacts
(Approved Hours)

FIGURE C-188

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

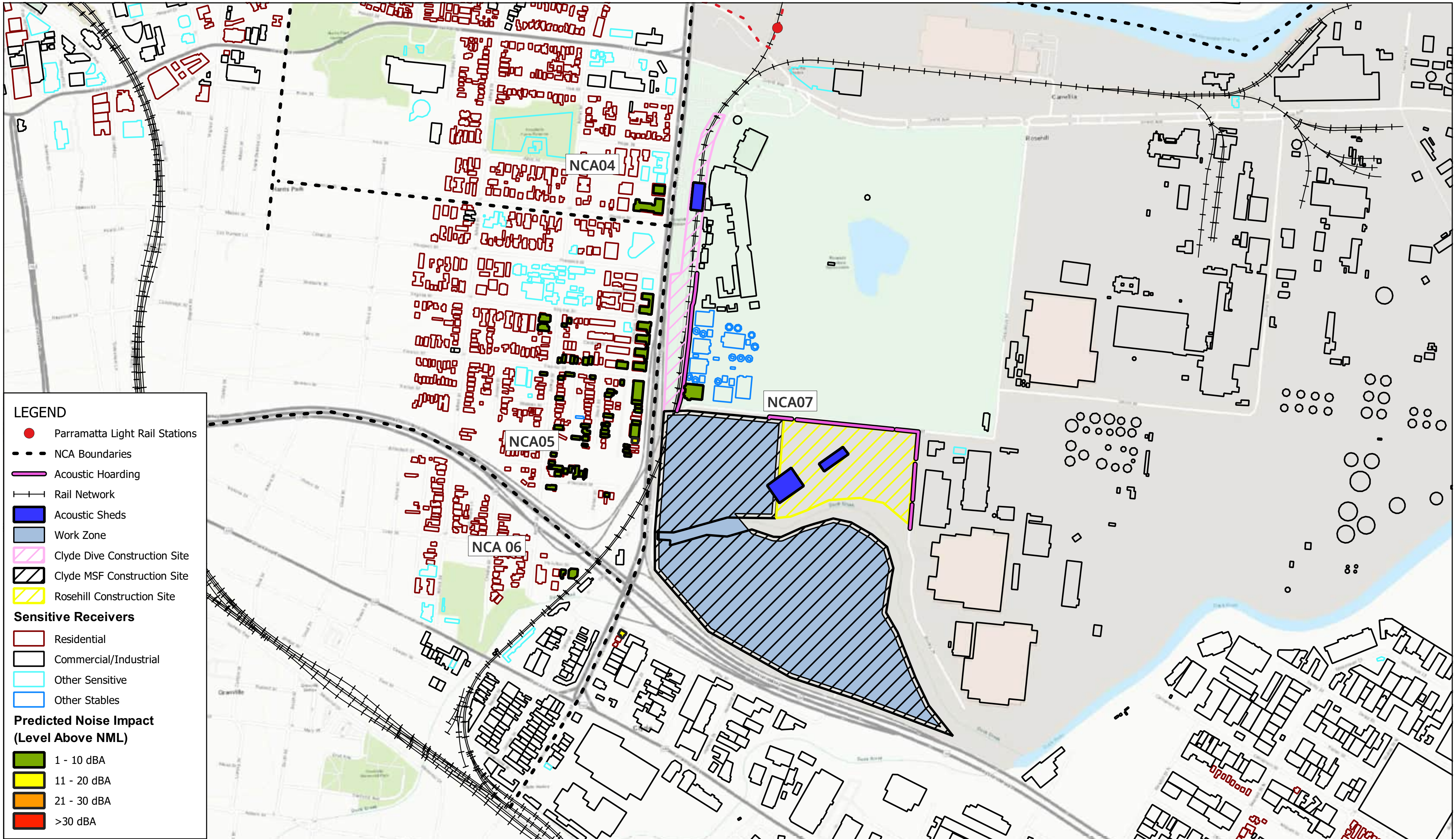
SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.14 Utility adjustment work
Predicted Noise Impacts
(Evening)

FIGURE C-189



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

SLR

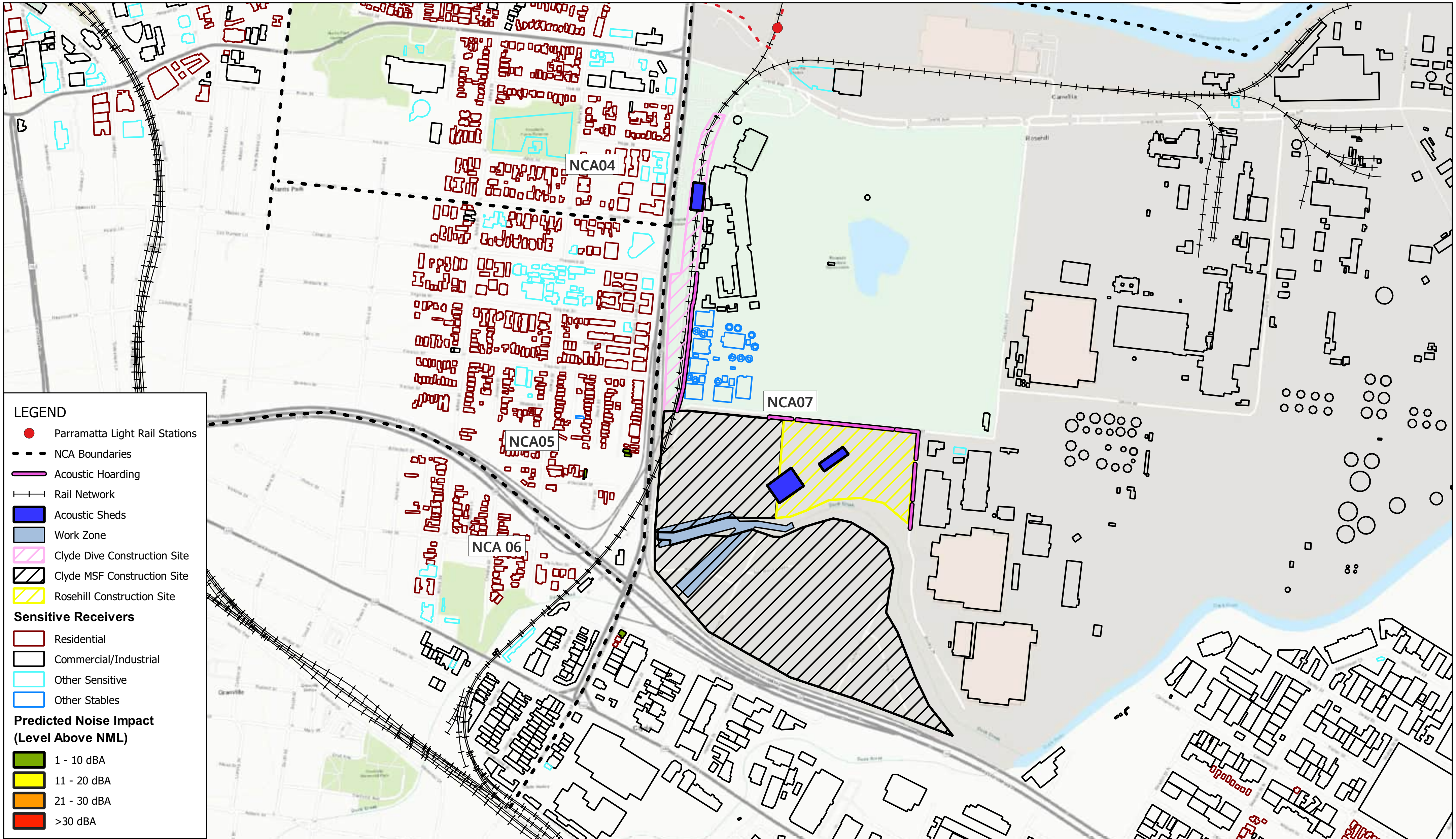
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.14 Utility adjustment work
Predicted Noise Impacts
(Night)

FIGURE C-190

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

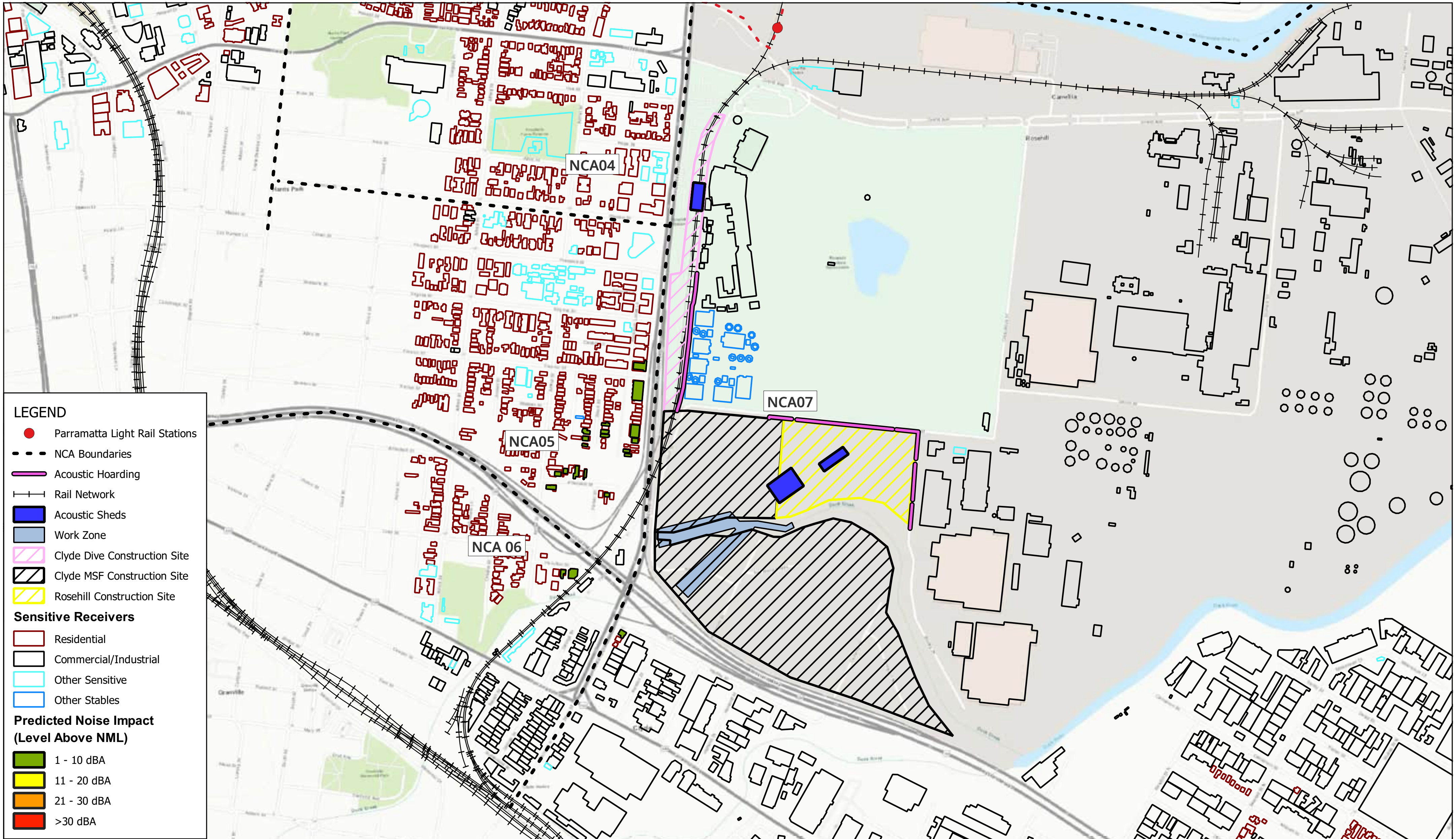
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.17 Creek Adjustment Works
Predicted Noise Impacts
(Evening)

FIGURE C-191

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

SLR

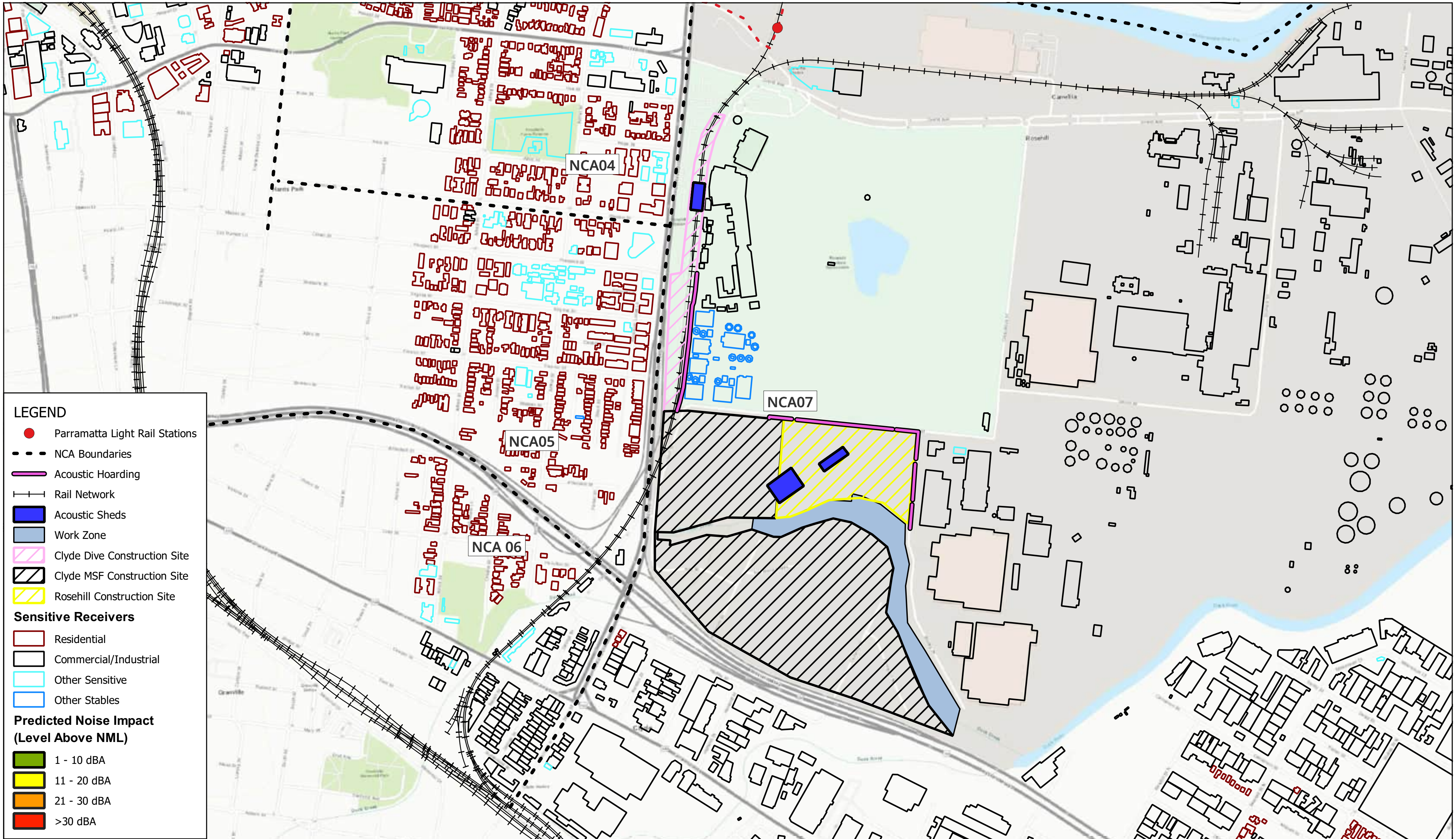
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.17 Creek Adjustment Works
Predicted Noise Impacts
(Night)

FIGURE C-192

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: Scale: 1:12,500
Coordinate System: GDA2020 / MGA zone 56

Drawn Date: 24-Jul-2024
Project Number: 610.30644

SLR

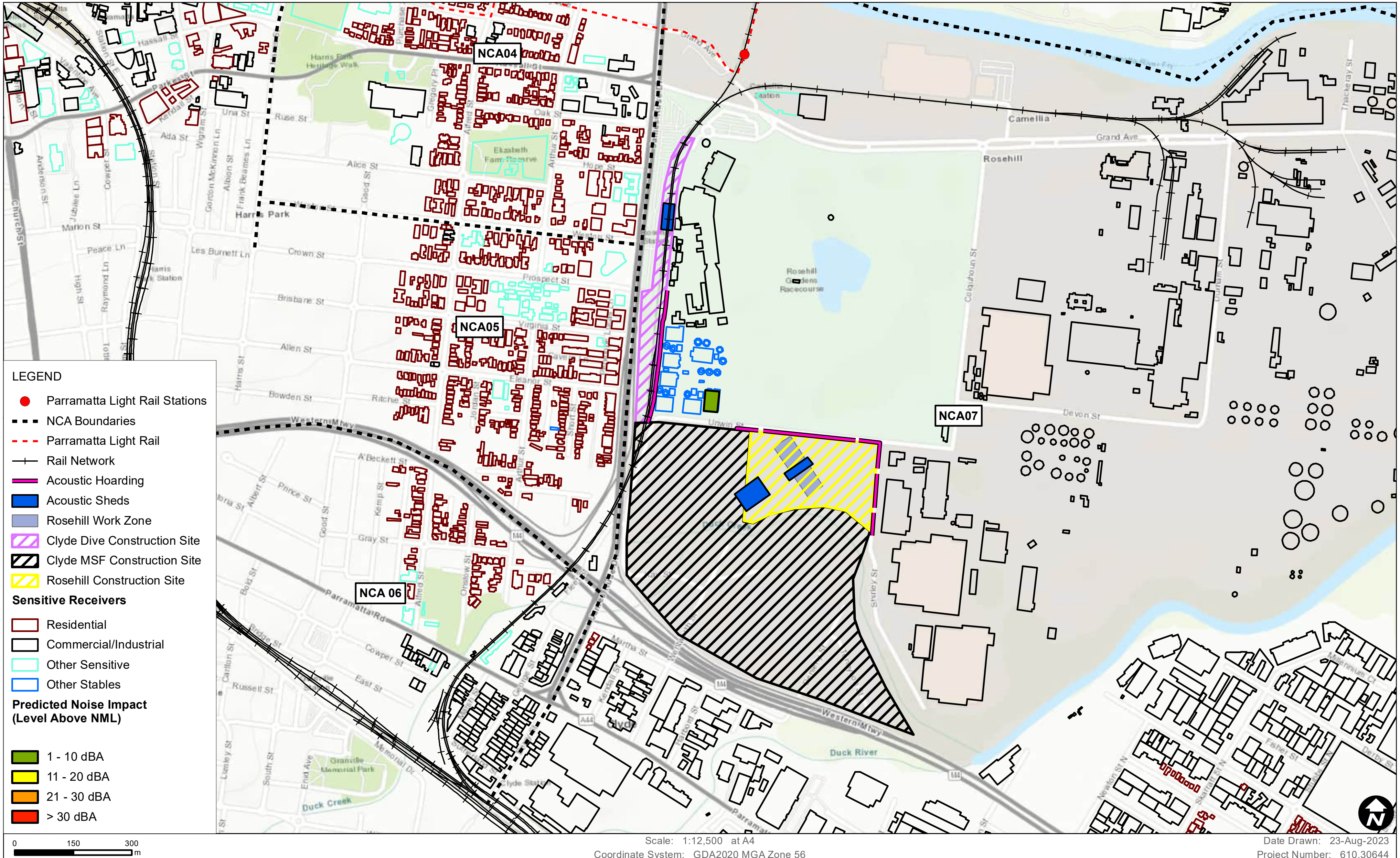
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

MSF.18 Duck Creek Detailed Site Investigations
Predicted Noise Impacts
(Approved Hours)

FIGURE C-193

\\au.slr.local\Corporate\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\QGIS\SLR61030644_CX_MSF.qgz



Scale: 1:12,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 23-Aug-2023
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

RH.17 Box excavation (from surface)
Predicted Noise Impacts
(Approved Hours)

FIGURE C-194

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_C149_RH_17_Box excavation from surface_Day_03.mxd

Scale: 1:6,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 08-Feb-2024
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.02 TBM Retrieval
Predicted Noise Impacts
(Approved Hours)

FIGURE C-195

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_SOP_02_TBM Retrieval_Day_04.mxd

Scale: 1:6,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Jun-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.02 TBM Retrieval Predicted Noise Impacts (Evening)

FIGURE C-196

LEGEND

- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Parramatta Light Rail
- Rail Network
- Work Zone
- Sydney Olympic Park Construction Site

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- > 30 dBA

0 150 300 m

Scale: 1:6,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 03-Jun-2024
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.02 TBM Retrieval Predicted Noise Impacts (Night)

FIGURE C-197

Scale: 1:6,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 05-Jun-2024
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.02b TBM Retrieval + Material load out and shotcreting of cross passages Predicted Noise Impacts (Approved Hours)

FIGURE C-198

LEGEND

- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Parramatta Light Rail
- Rail Network
- Work Zone
- Sydney Olympic Park Construction Site

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- > 30 dBA

0 150 300 m

Scale: 1:6,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 05-Jun-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.02b TBM Retrieval + Material load out and shotcreting of cross passages Predicted Noise Impacts (Evening)

FIGURE C-199

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_SOP_02b_TBM Retrieval Material Load out_Evening_04.mxd

Scale: 1:6,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 05-Jun-2024
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.02b TBM Retrieval + Material load out and shotcreting of cross passages Predicted Noise Impacts (Night)

FIGURE C-200

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_SOP_02b_TBM Retrieval Material Load out_Night_04.mxd

Scale: 1:6,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 05-Jun-2024
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.03 Nozzle Construction Predicted Noise Impacts (Approved Hours)

FIGURE C-201

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_SOP_03_Nozzle Construction_Day_04.mxd

LEGEND

- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Parramatta Light Rail
- Rail Network
- Work Zone
- Sydney Olympic Park Construction Site

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- > 30 dBA

0 150 300 m

Scale: 1:6,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 05-Jun-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.03 Nozzle Construction Predicted Noise Impacts (Evening)

FIGURE C-202

LEGEND

- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Parramatta Light Rail
- Rail Network
- Work Zone
- Sydney Olympic Park Construction Site

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- > 30 dBA

0 150 300 m

Scale: 1:6,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 05-Jun-2024
Project Number: 610.30644

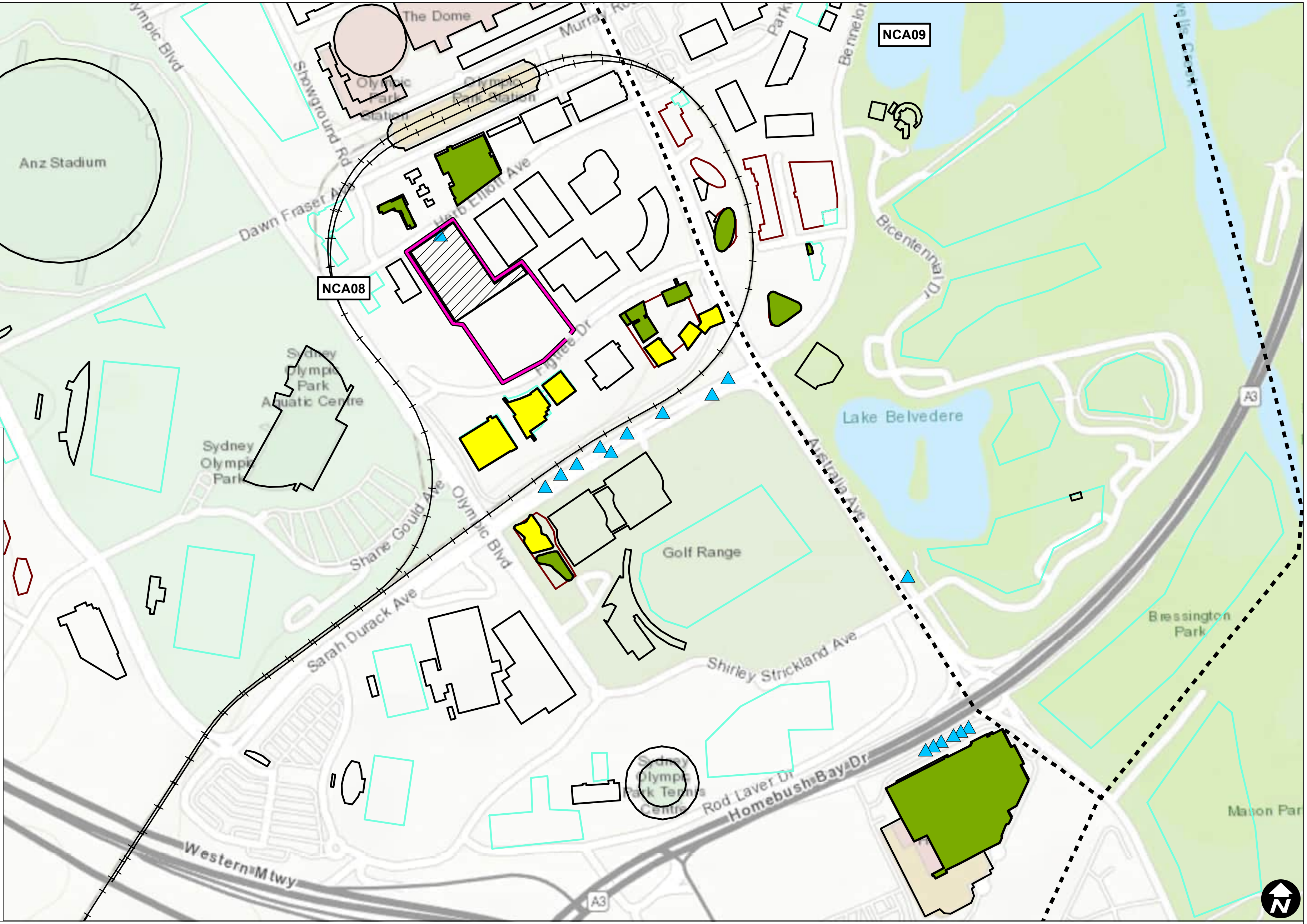
Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.03 Nozzle Construction Predicted Noise Impacts (Night)

FIGURE C-203

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_SOP_03_Nozzle Construction_Night_04.mxd



LEGEND

- Tree Trimming Work Areas
- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Parramatta Light Rail
- Rail Network
- Sydney Olympic Park Construction Site
- Work Zone

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- > 30 dBA

0 150 300 m

Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 08-Feb-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

**SOP.05 Tree Trimming for TBM Retrieval
Predicted Noise Impacts
(Approved Hours)**

FIGURE C-204

Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 08-Feb-2024
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.05 Tree Trimming for TBM Retrieval
Predicted Noise Impacts
(Evening)

FIGURE C-205

Scale: 1:7,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 08-Feb-2024
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.05 Tree Trimming for TBM Retrieval
Predicted Noise Impacts
(Night)

FIGURE C-206

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_SOP_05_Tree Trimming for TBM Retrieval_Night_04.mxd

Scale: 1:6,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 05-Jun-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.07 Cross passage concrete pours
Predicted Noise Impacts
(Approved Hours)

FIGURE C-207

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_SOP_07_Cross passage concrete pours_Day_04.mxd

Scale: 1:6,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 05-Jun-2024
Project Number: 610.30644

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

SOP.07 Cross passage concrete pours
Predicted Noise Impacts
(Evening)

FIGURE C-208

LEGEND

- Parramatta Light Rail Stations
- NCA Boundaries
- Acoustic Hoarding
- Parramatta Light Rail
- Rail Network
- Work Zone
- Sydney Olympic Park Construction Site

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Noise Impact (Level Above NML)

- 1 - 10 dBA
- 11 - 20 dBA
- 21 - 30 dBA
- > 30 dBA

0 150 300 m

Scale: 1:6,000 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 05-Jun-2024
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Note: Other Sensitive Receivers should only be considered impacted 'when in use'.

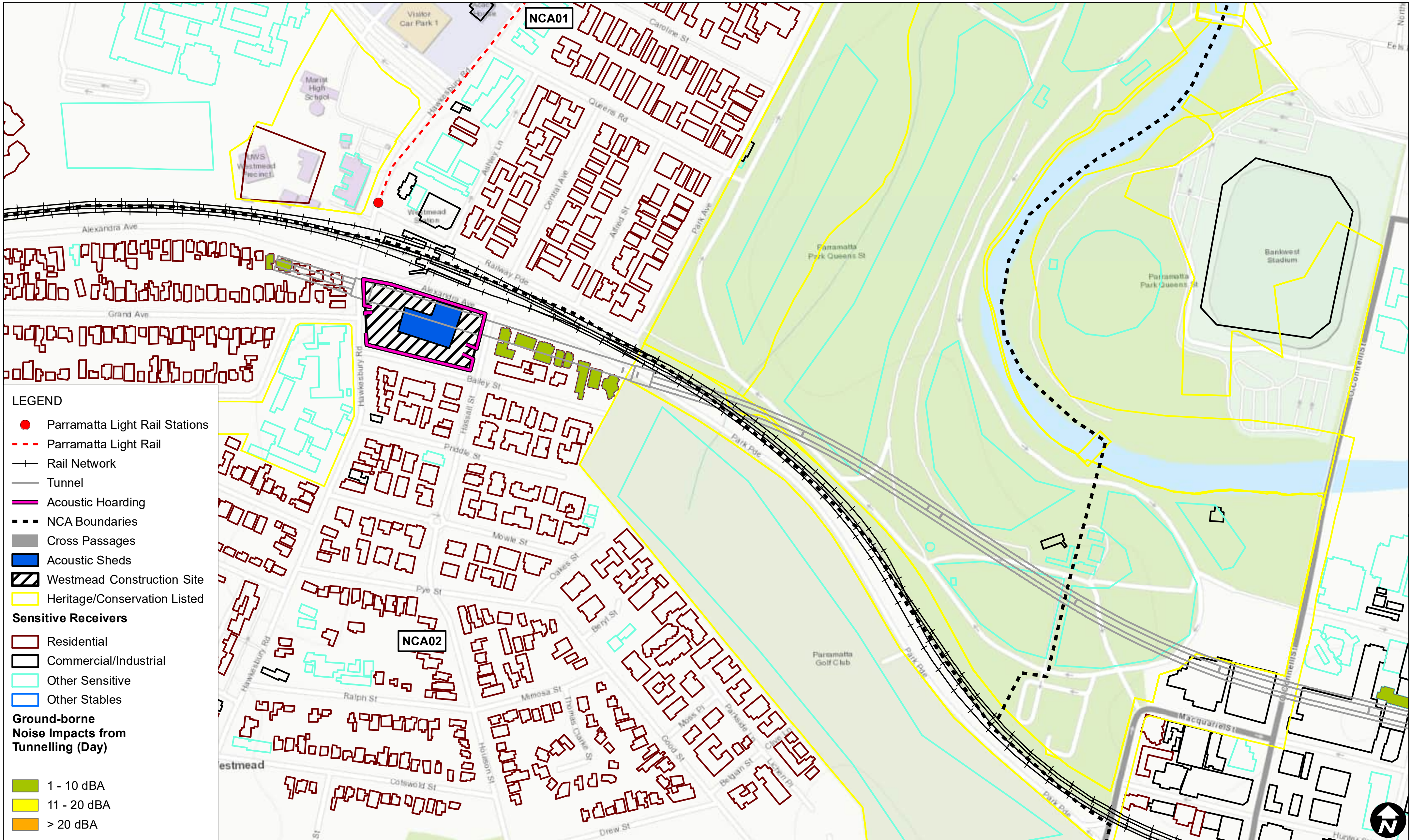
SOP.07 Cross passage concrete pours
Predicted Noise Impacts
(Night)

FIGURE C-209

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_CX_SOP_07_Cross passage concrete pours_Night_04.mxd

APPENDIX D

Tunnelling Ground-borne Noise Impact Maps



0 100 200 m

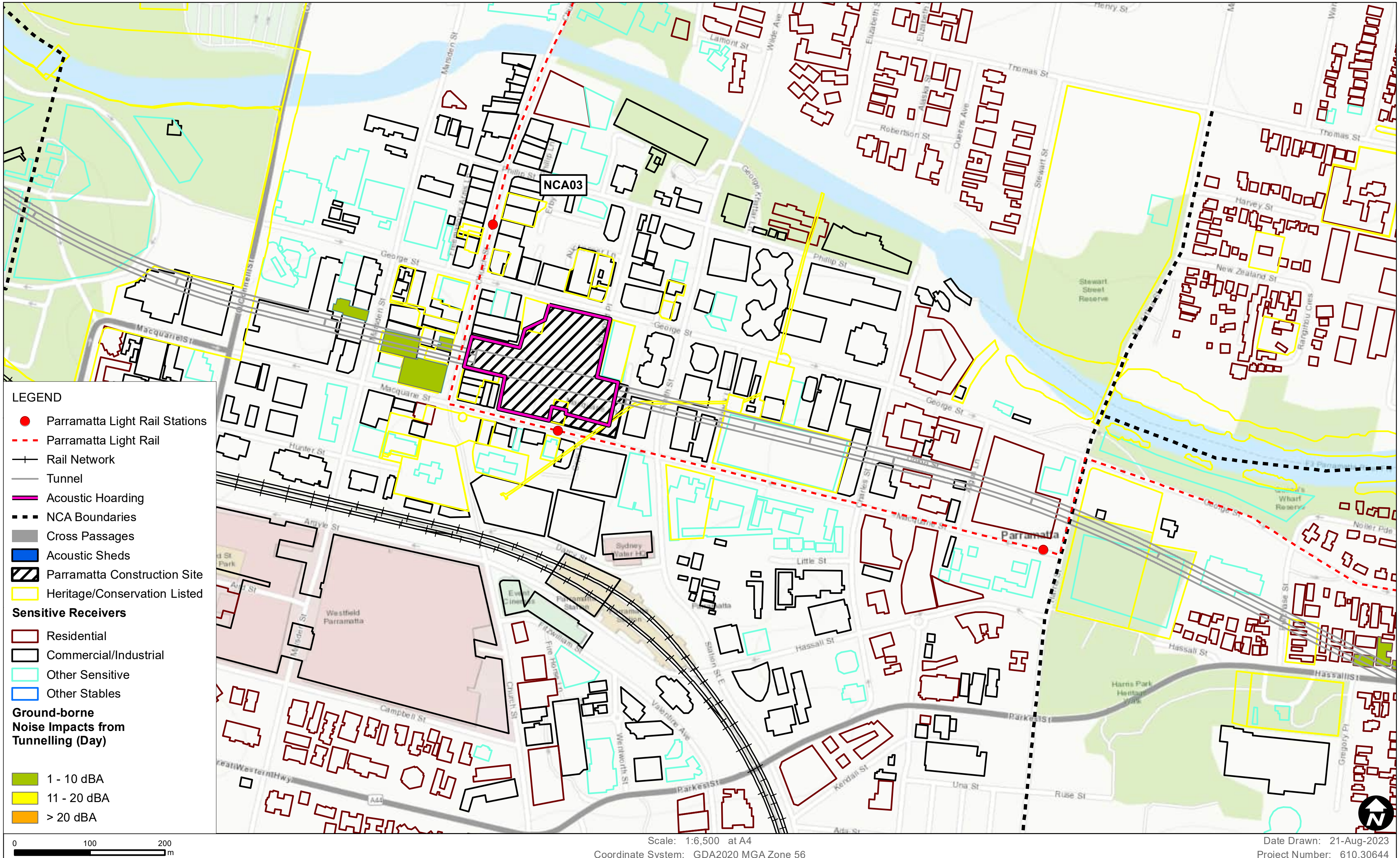
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from TBMs (Day)

FIGURE D-1



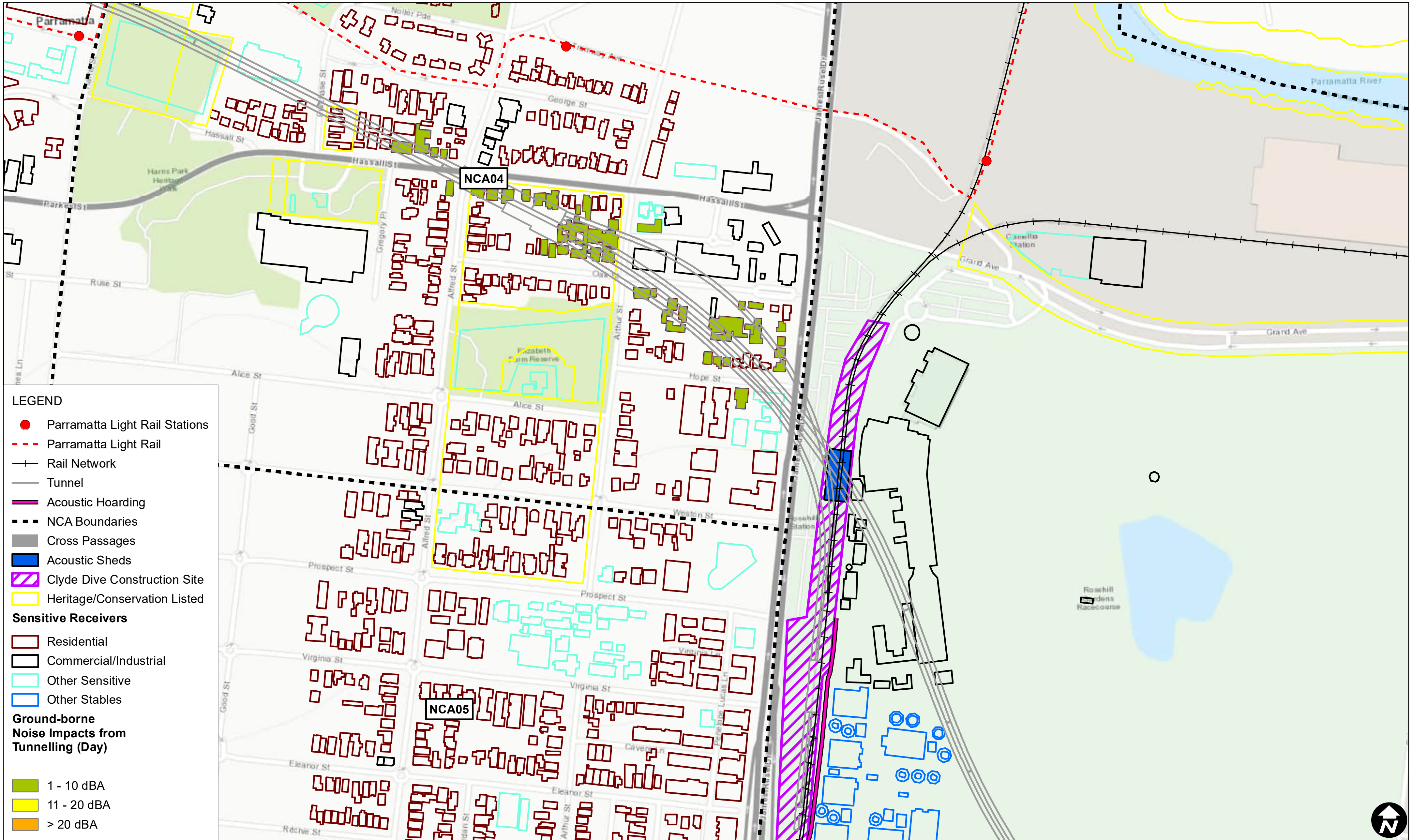
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from TBMs (Day)

FIGURE D-2



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

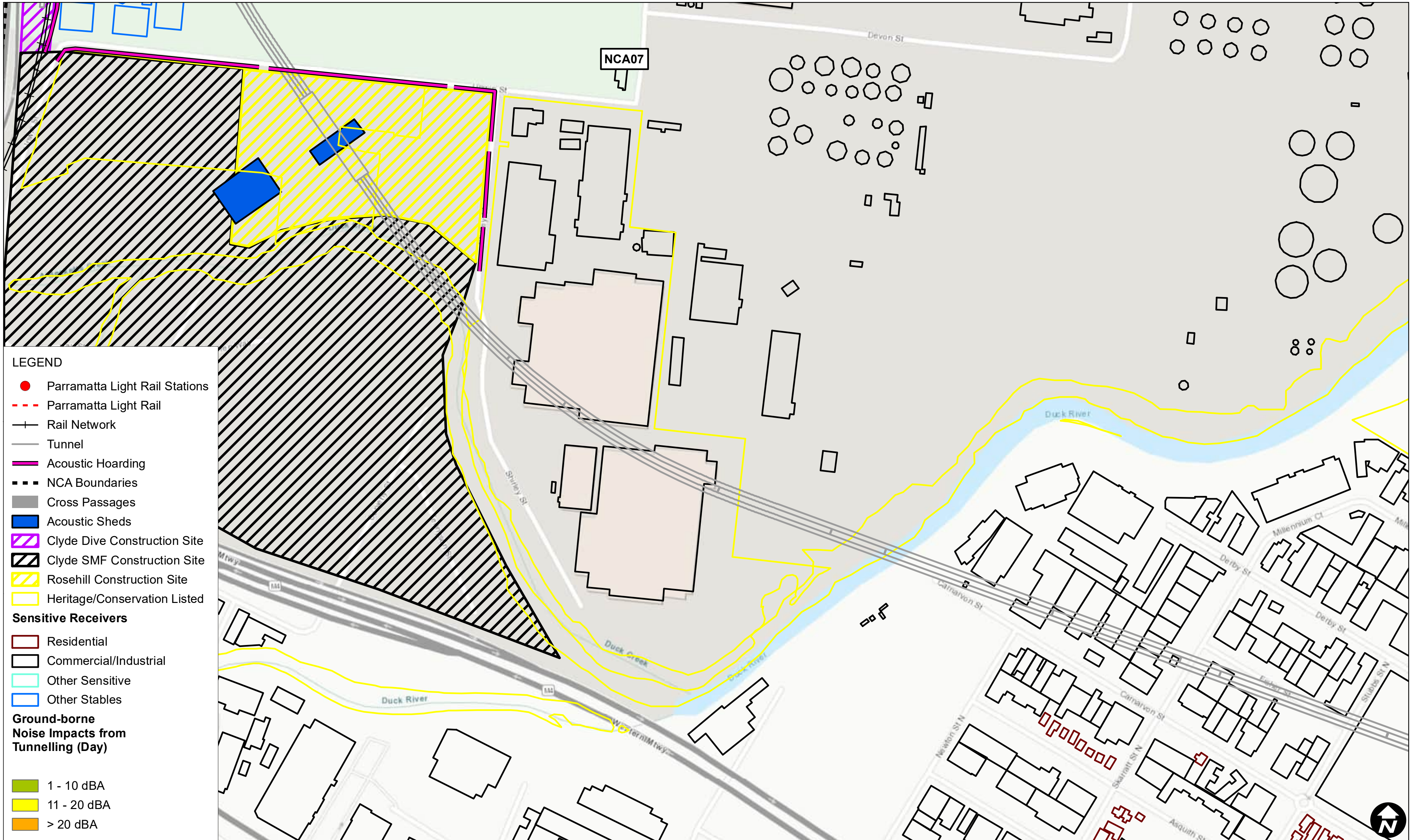
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from TBMs (Day)

FIGURE D-3

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Day_03.mxd



0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

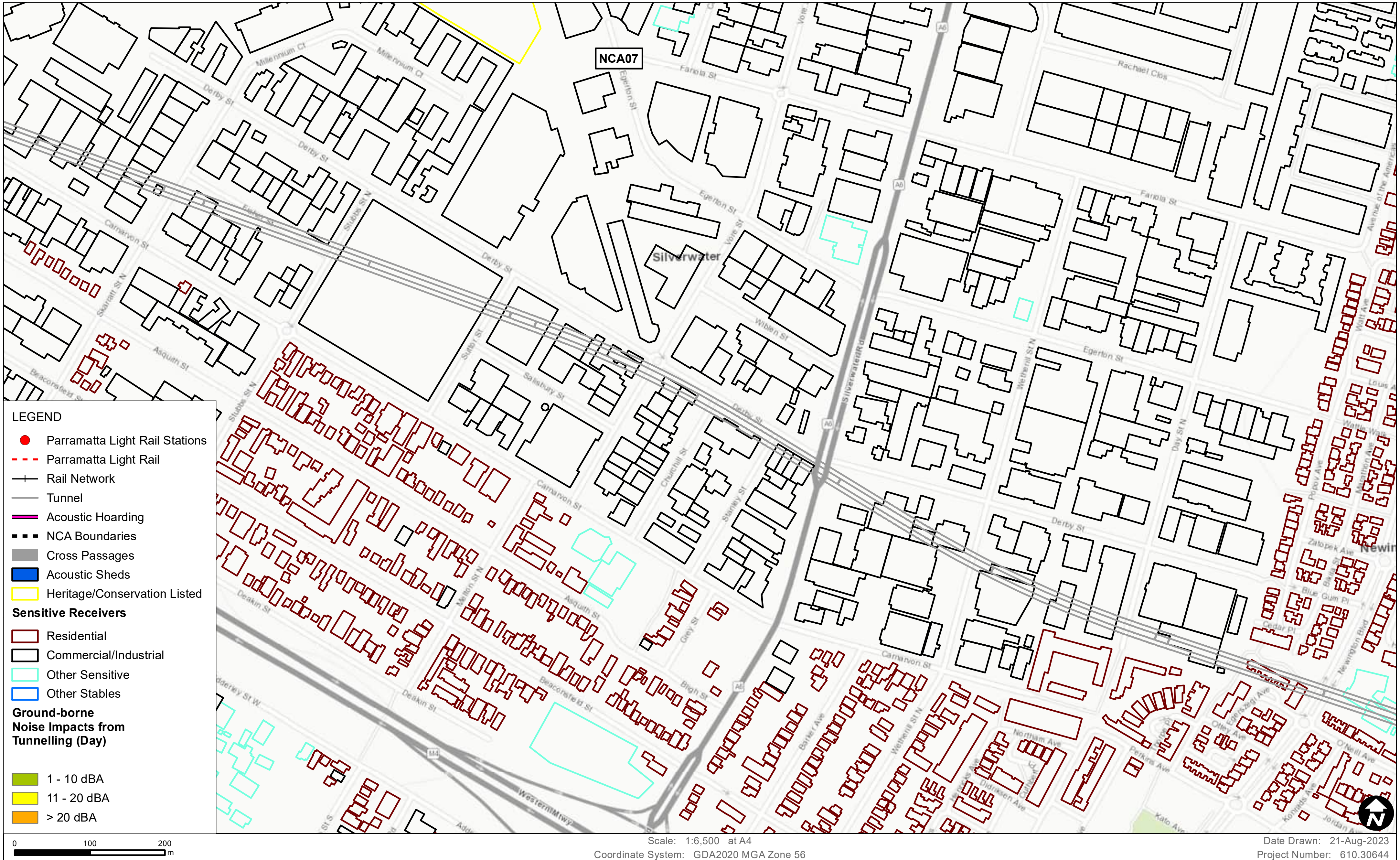
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from TBMs (Day)

FIGURE D-4

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Day_03.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

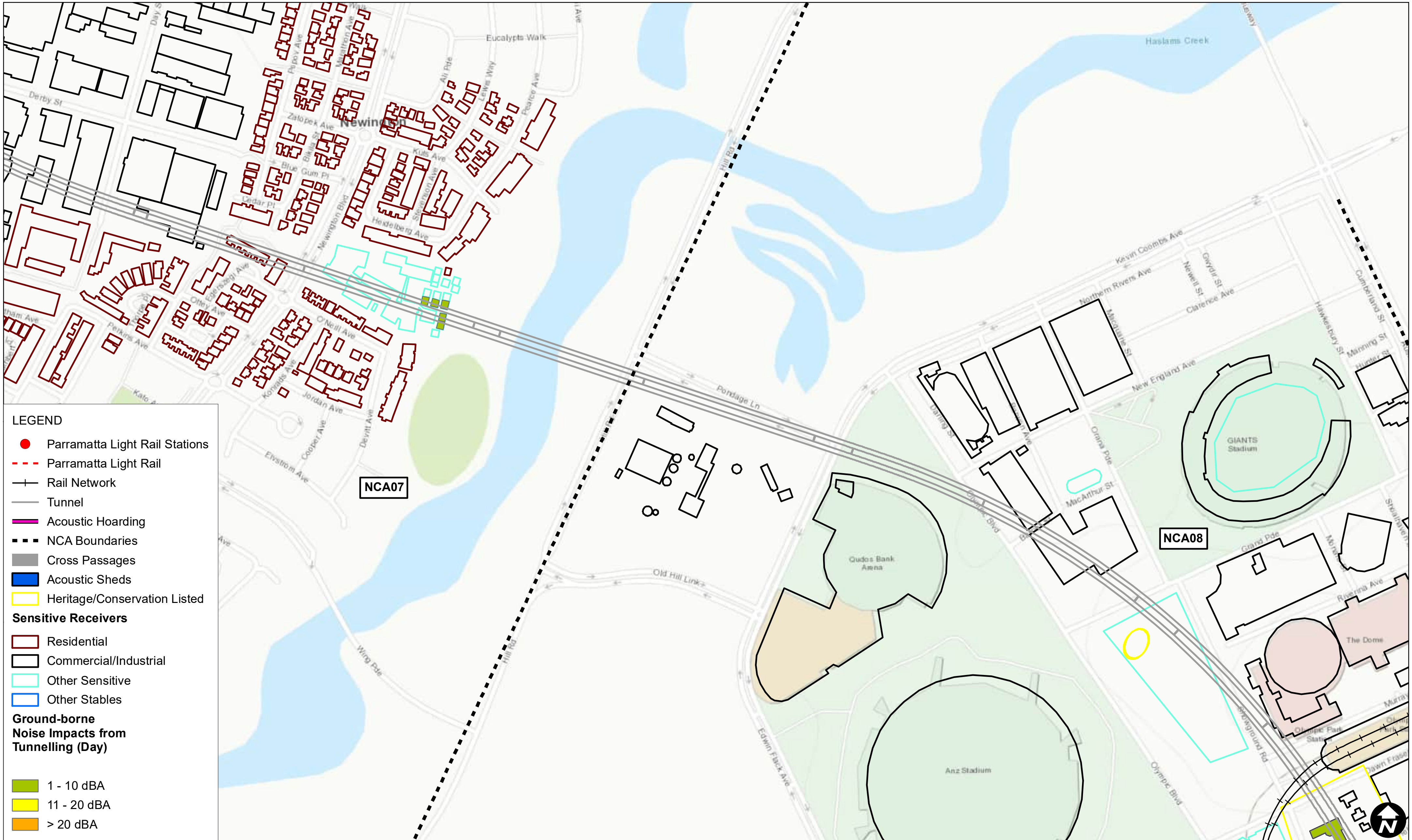
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from TBMs (Day)

FIGURE D-5

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Day_03.mxd



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Acoustic Hoarding
- NCA Boundaries
- Cross Passages
- Acoustic Sheds
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Ground-borne Noise Impacts from Tunnelling (Day)

- 1 - 10 dBA
- 11 - 20 dBA
- > 20 dBA

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from TBMs (Day)

FIGURE D-6

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Day_03.mxd

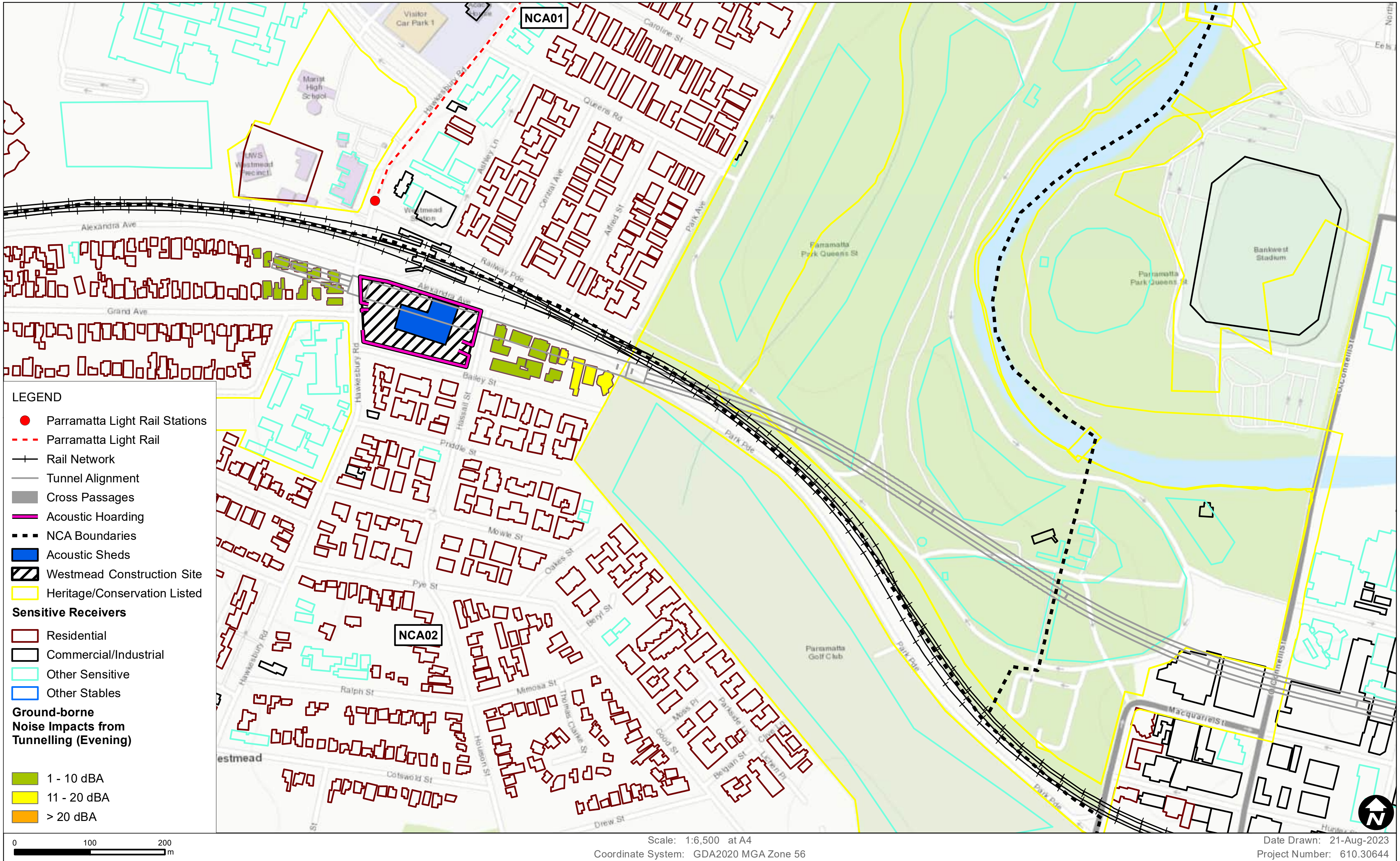
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from TBMs (Day)

FIGURE D-7



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

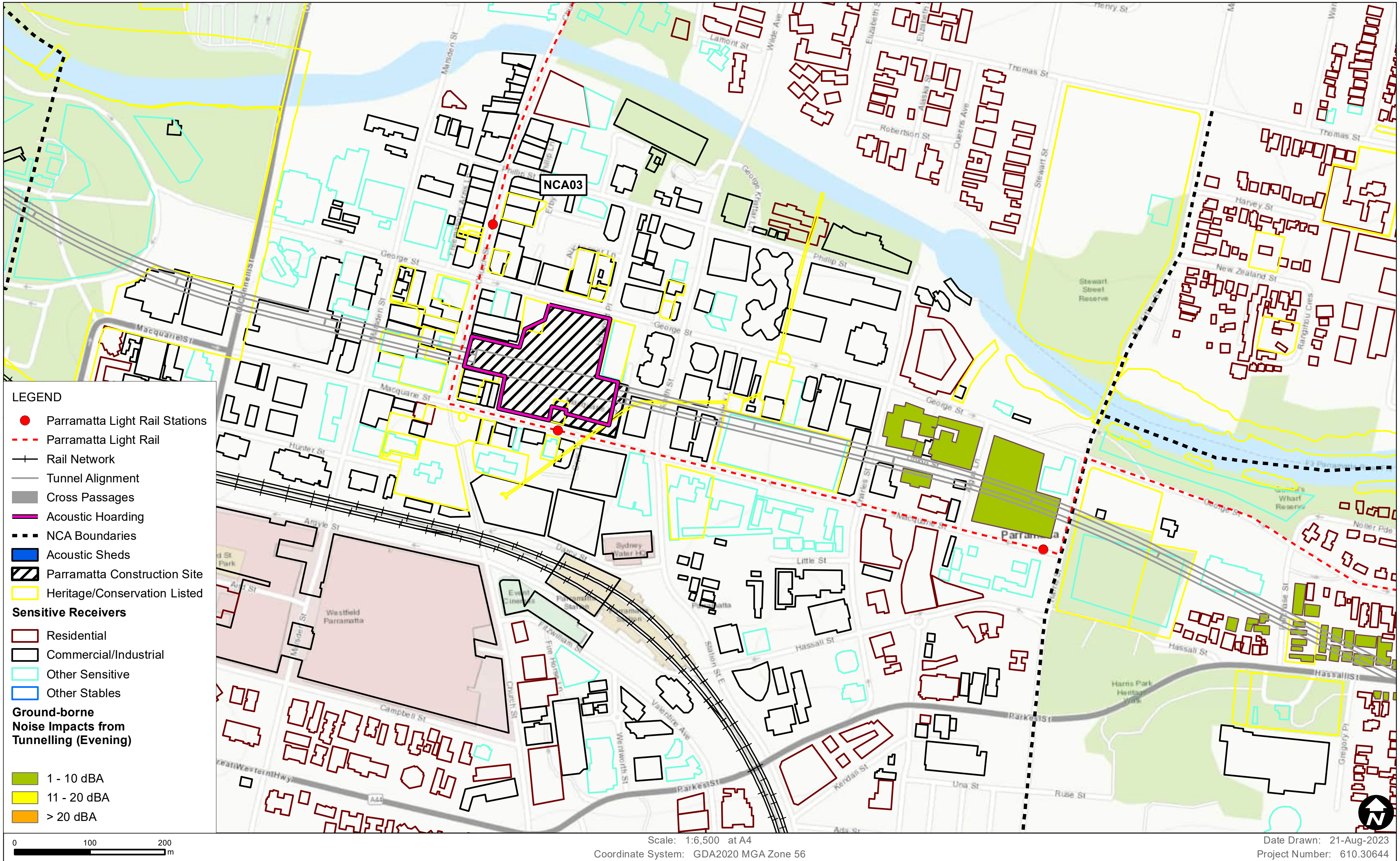
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from TBMs (Evening)

FIGURE D-8

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Evening_03.mxd



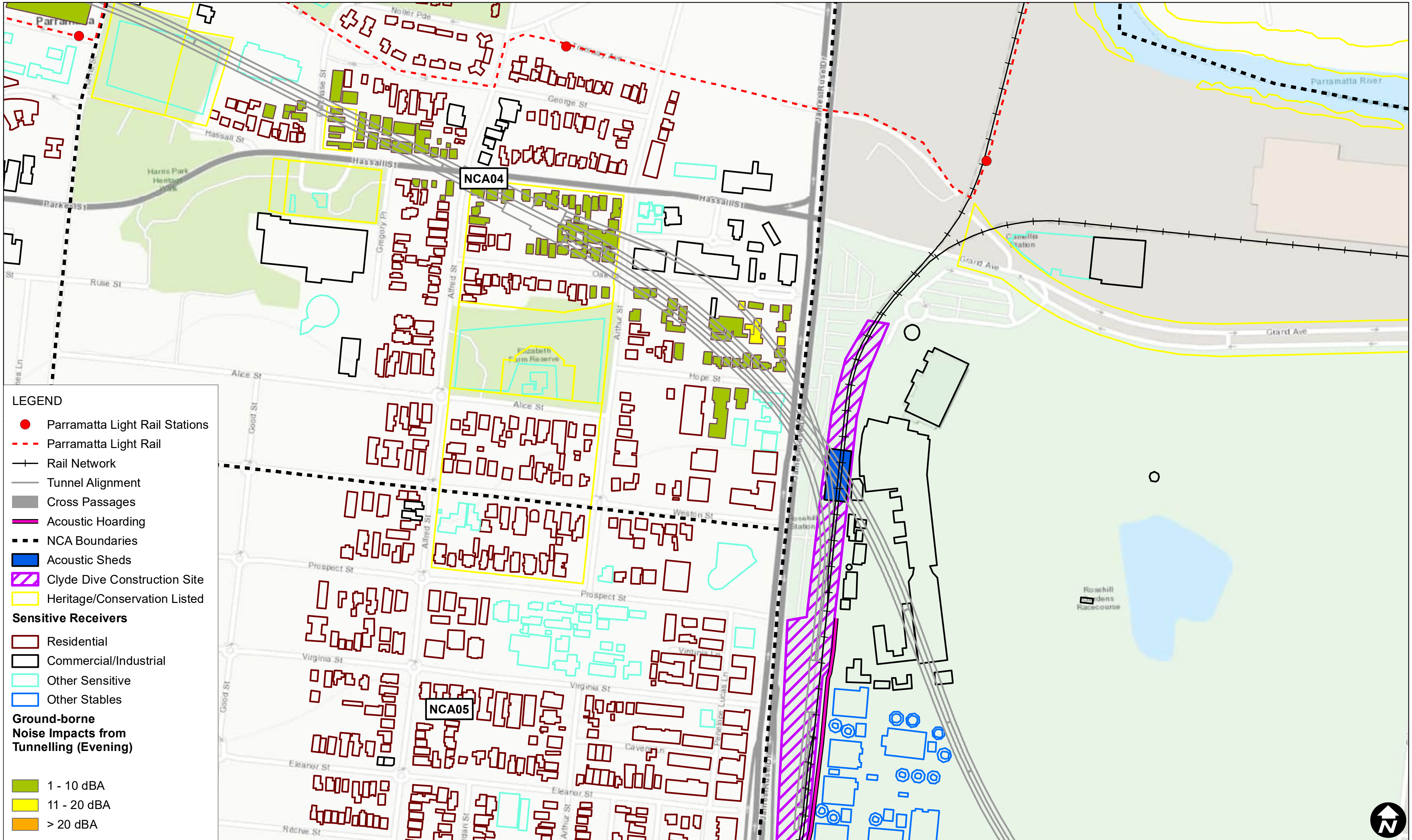
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from TBMs (Evening)

FIGURE D-9



0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

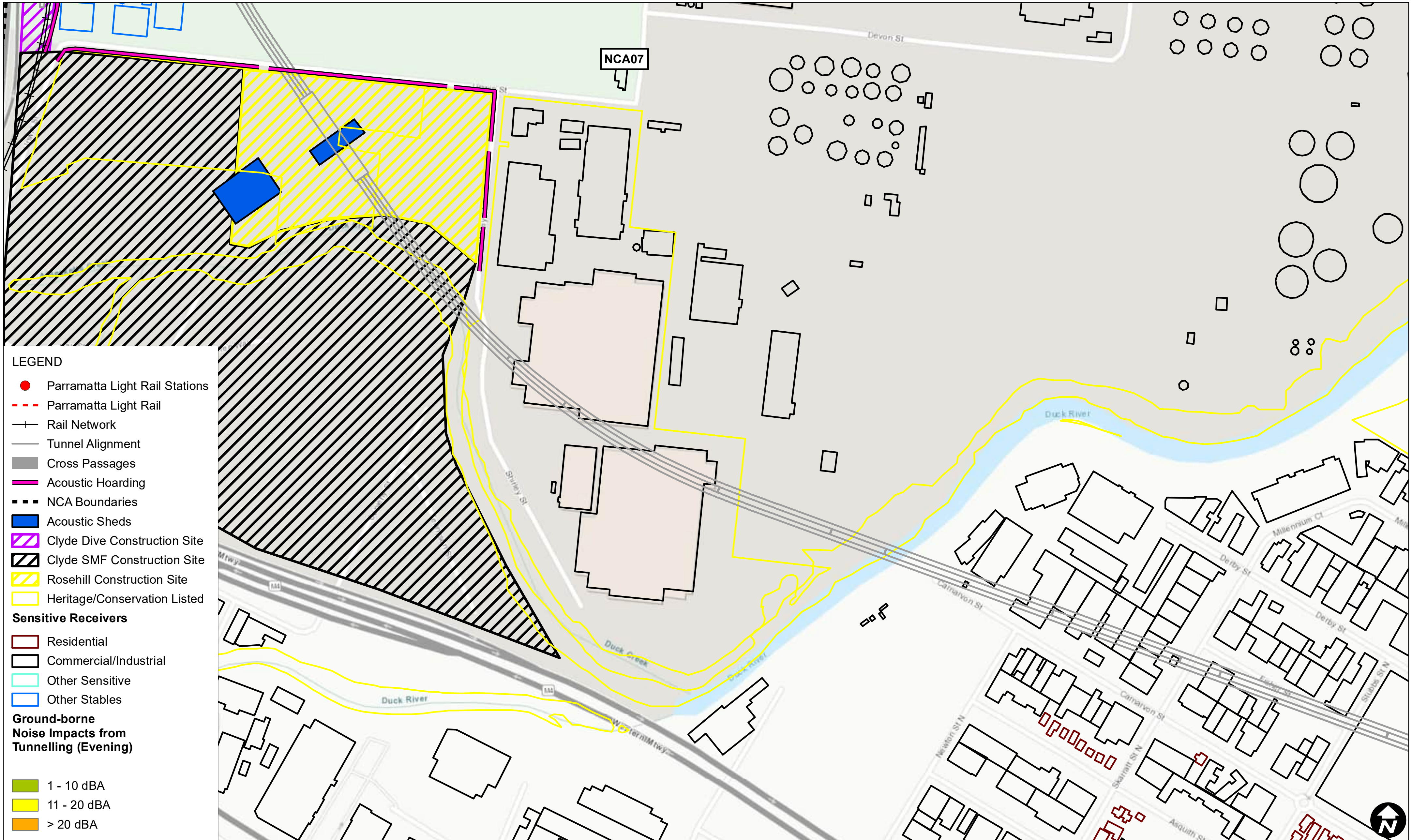
SLR

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from TBMs (Evening)

FIGURE D-10

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Evening_03.mxd



0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

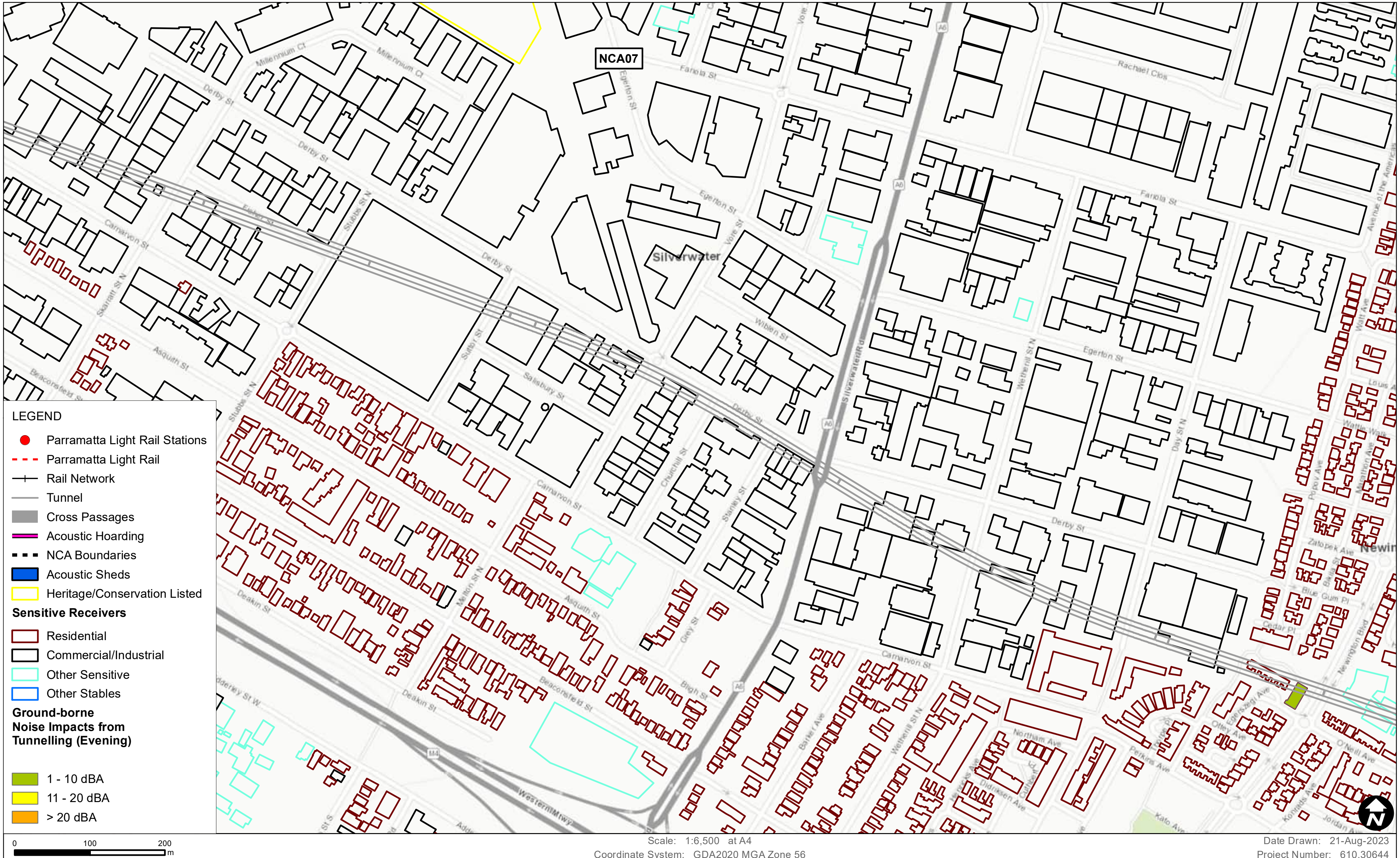
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from TBMs (Evening)

FIGURE D-11

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Evening_03.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

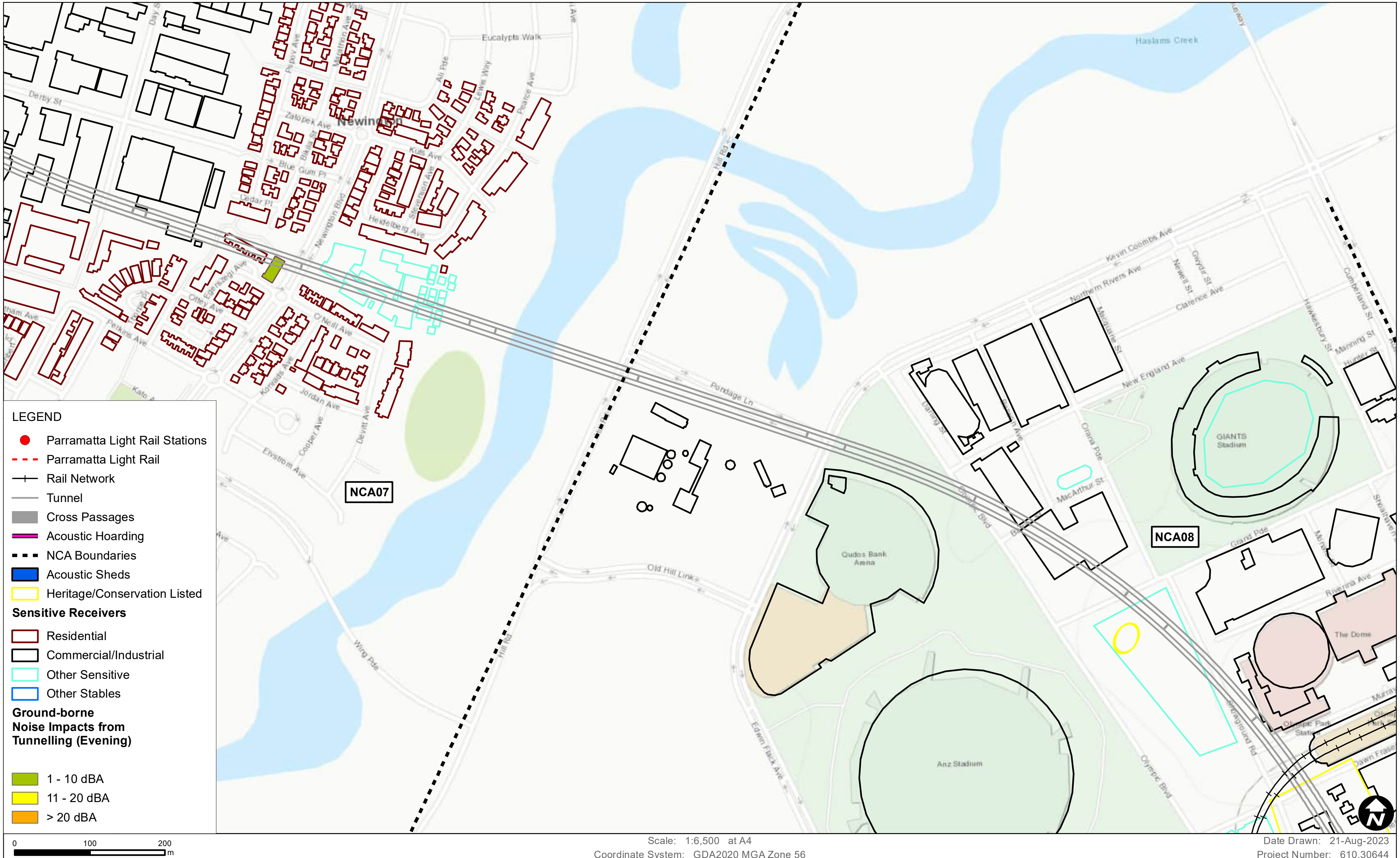
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from TBMs (Evening)

FIGURE D-12



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

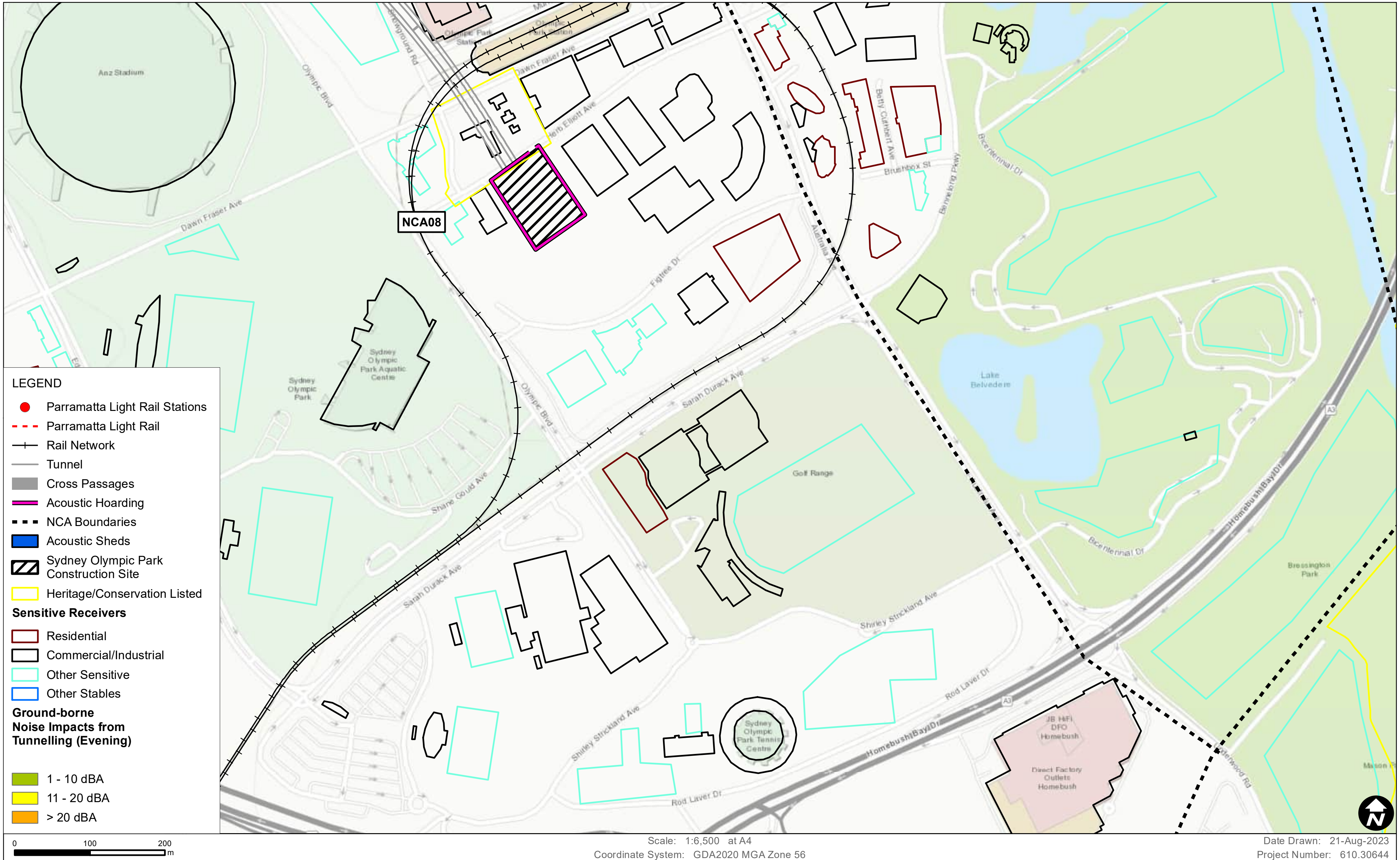
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from TBMs (Evening)

FIGURE D-13

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Evening_03.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

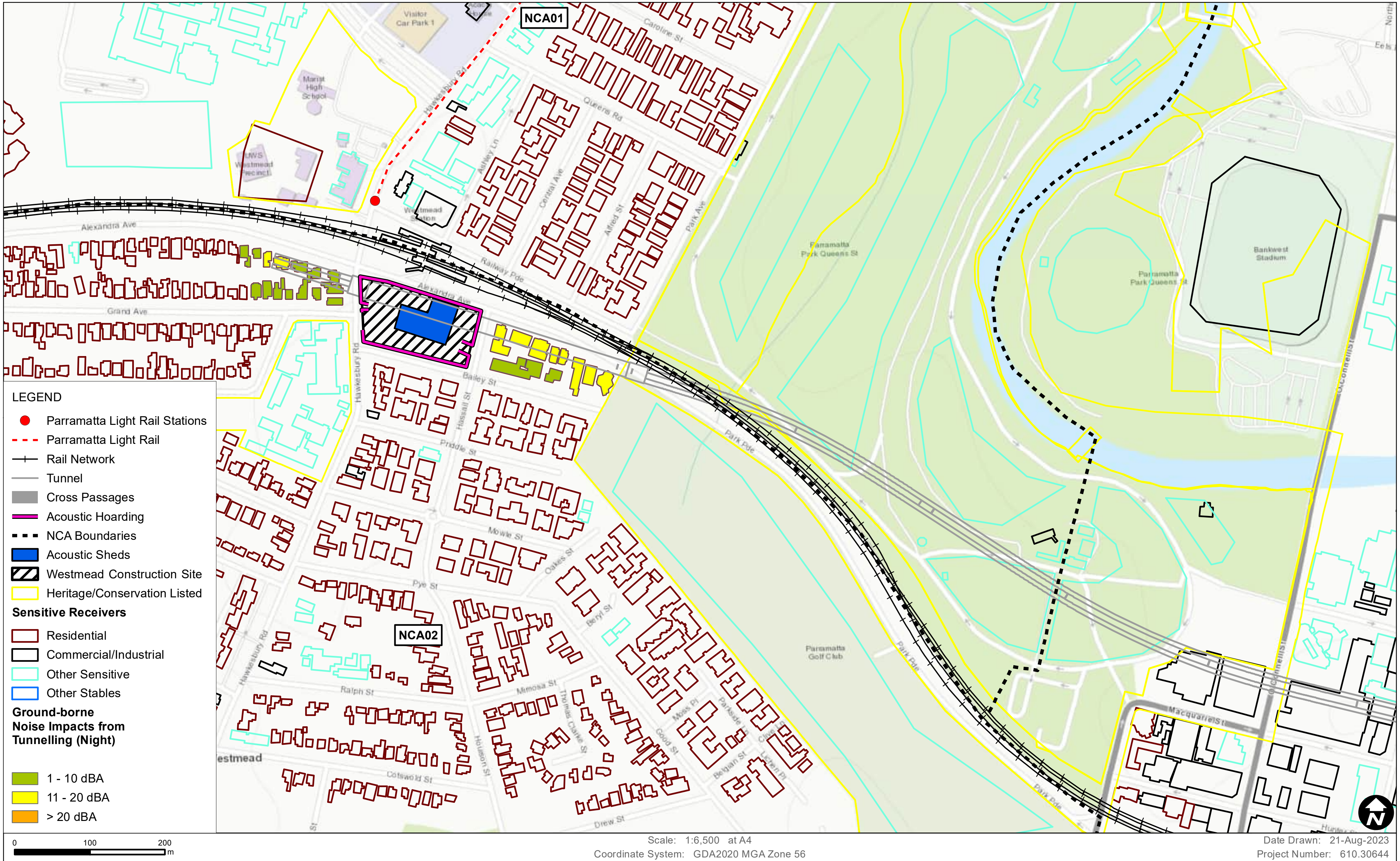
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from TBMs (Evening)

FIGURE D-14

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Evening_03.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

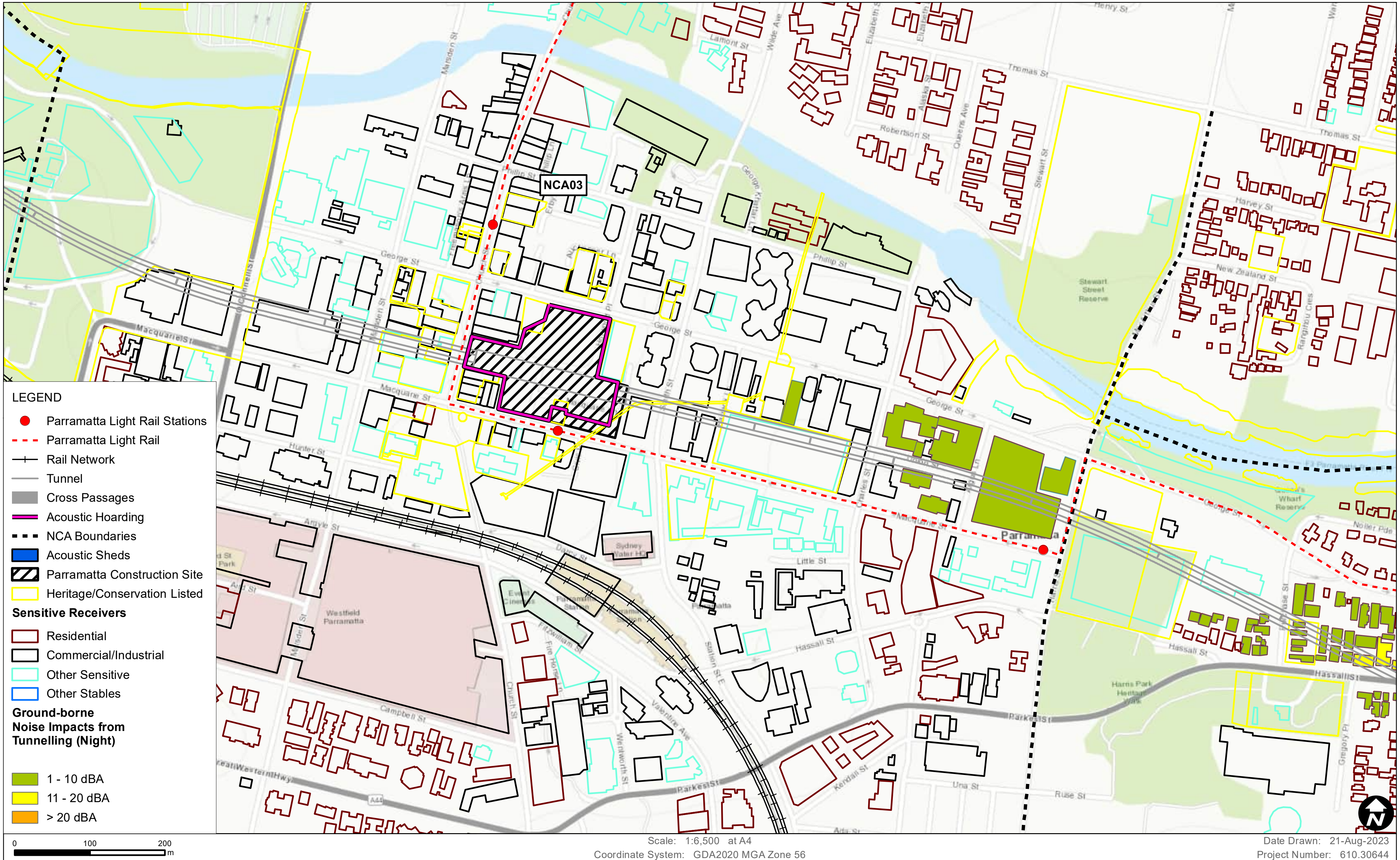
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from TBMs (Night)

FIGURE D-15

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Night_03.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

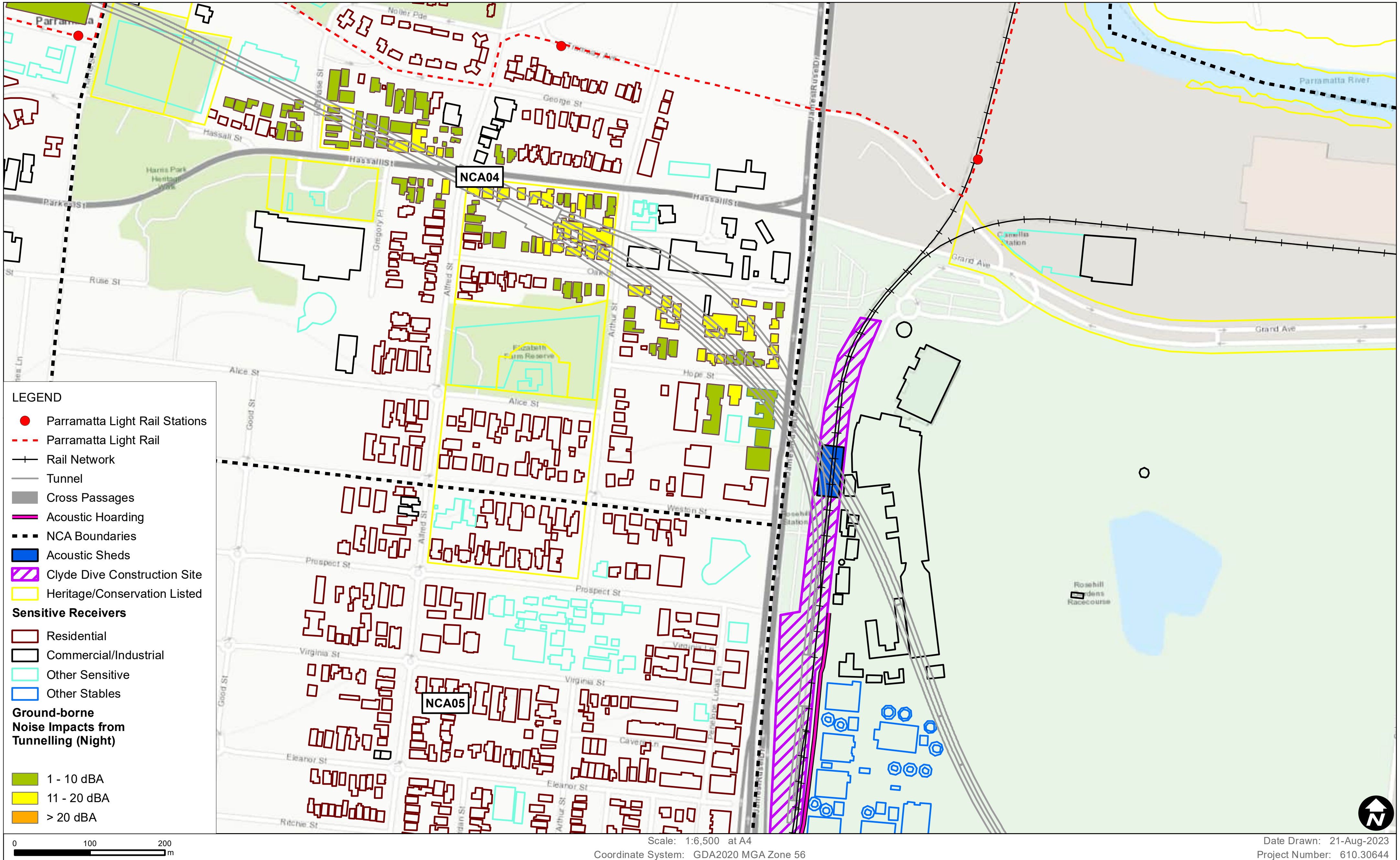
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from TBMs (Night)

FIGURE D-16

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Night_03.mxd



Scale: 1:6,500 at A4

Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023

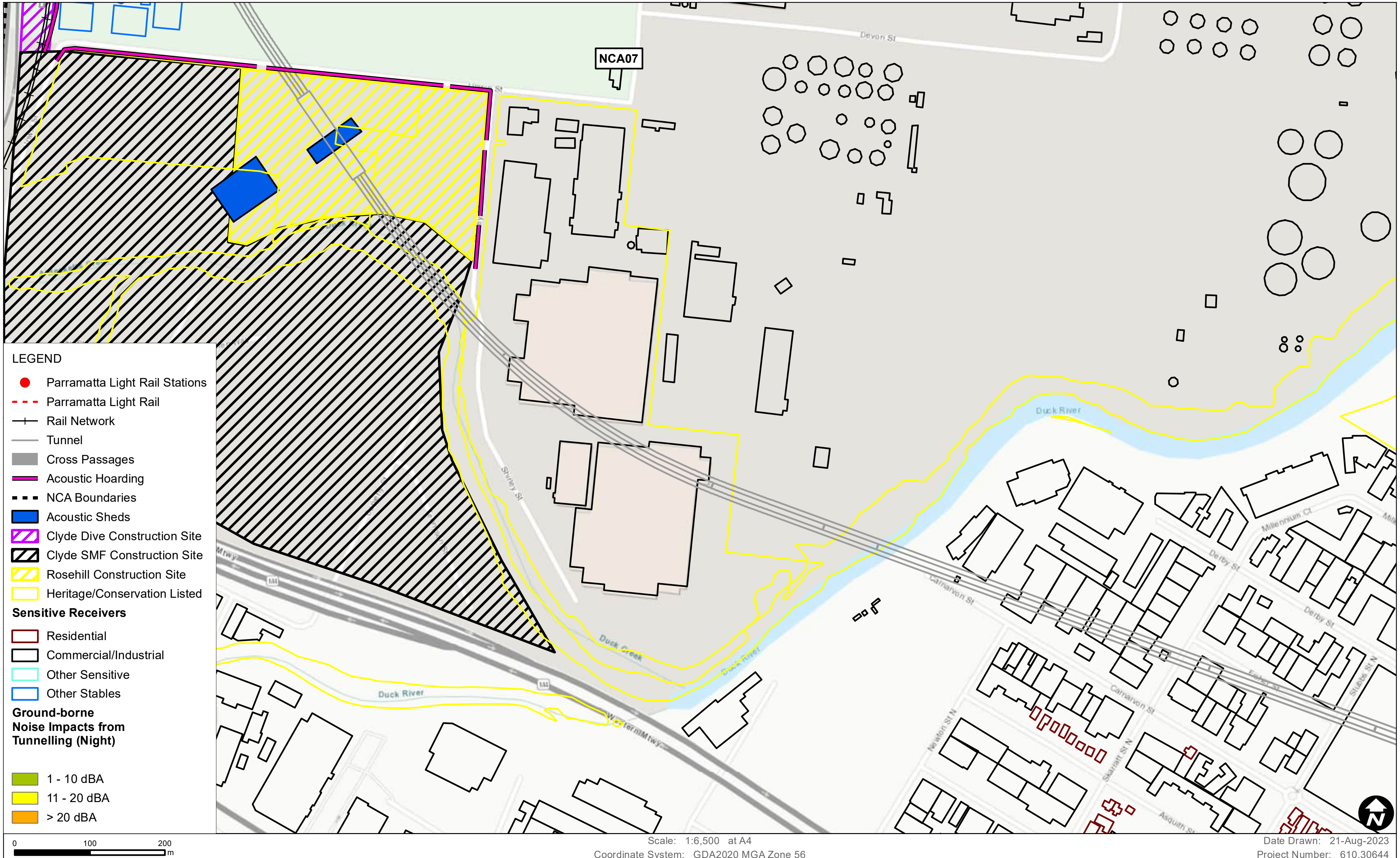
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from TBMs (Night)

FIGURE D-17

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Night_03.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

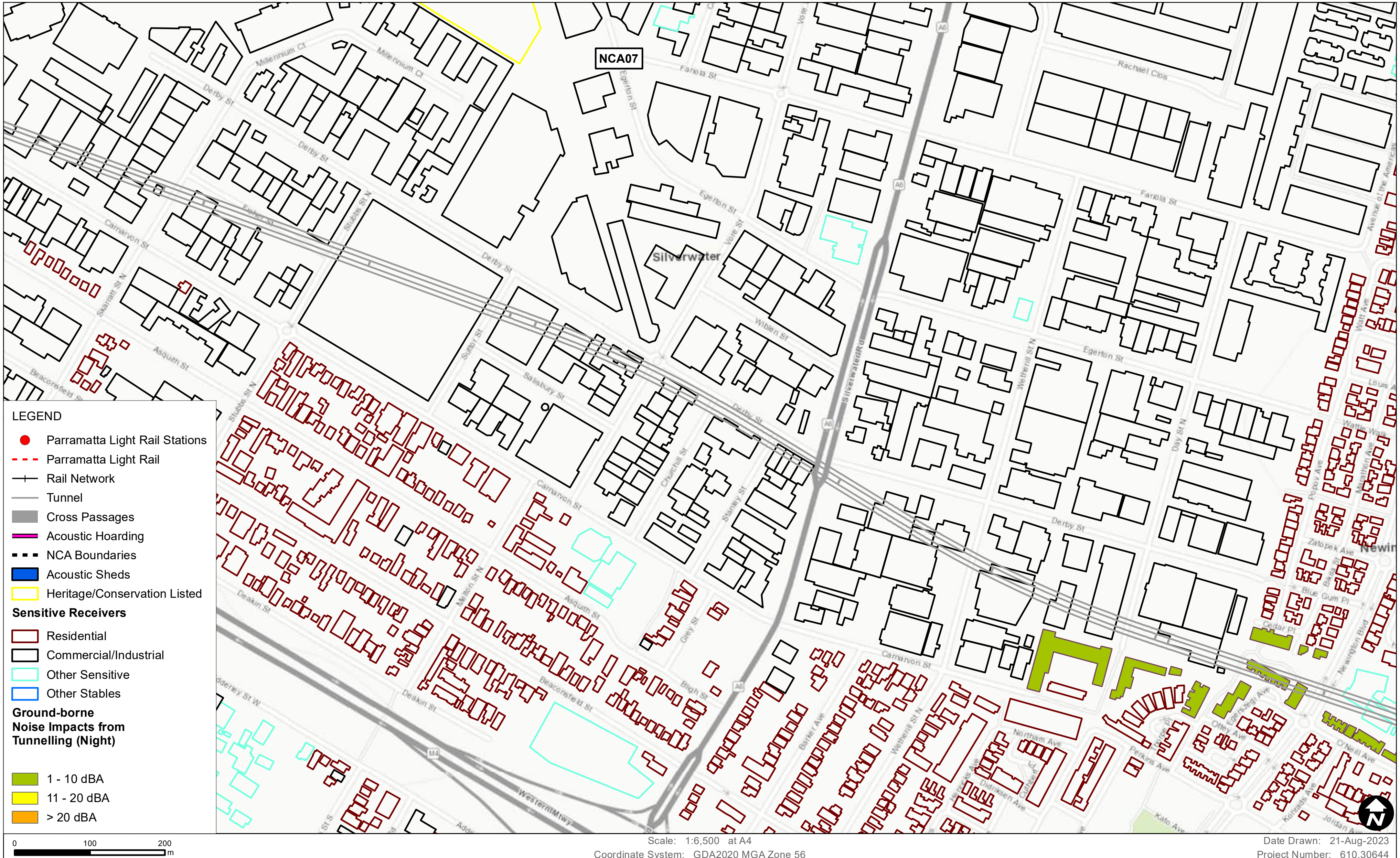
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from TBMs (Night)

FIGURE D-18

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Night_03.mxd



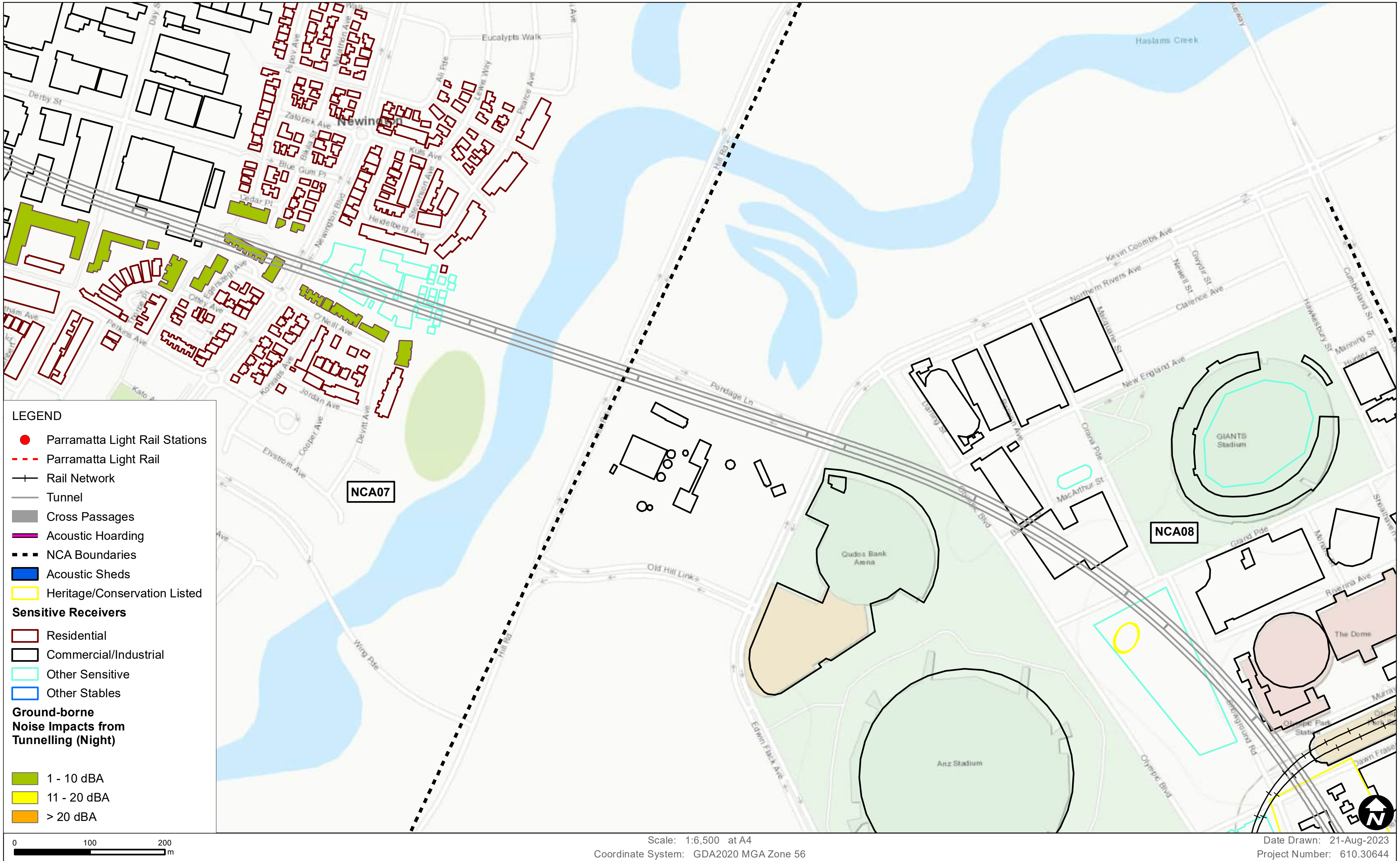
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from TBMs (Night)

FIGURE D-19



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

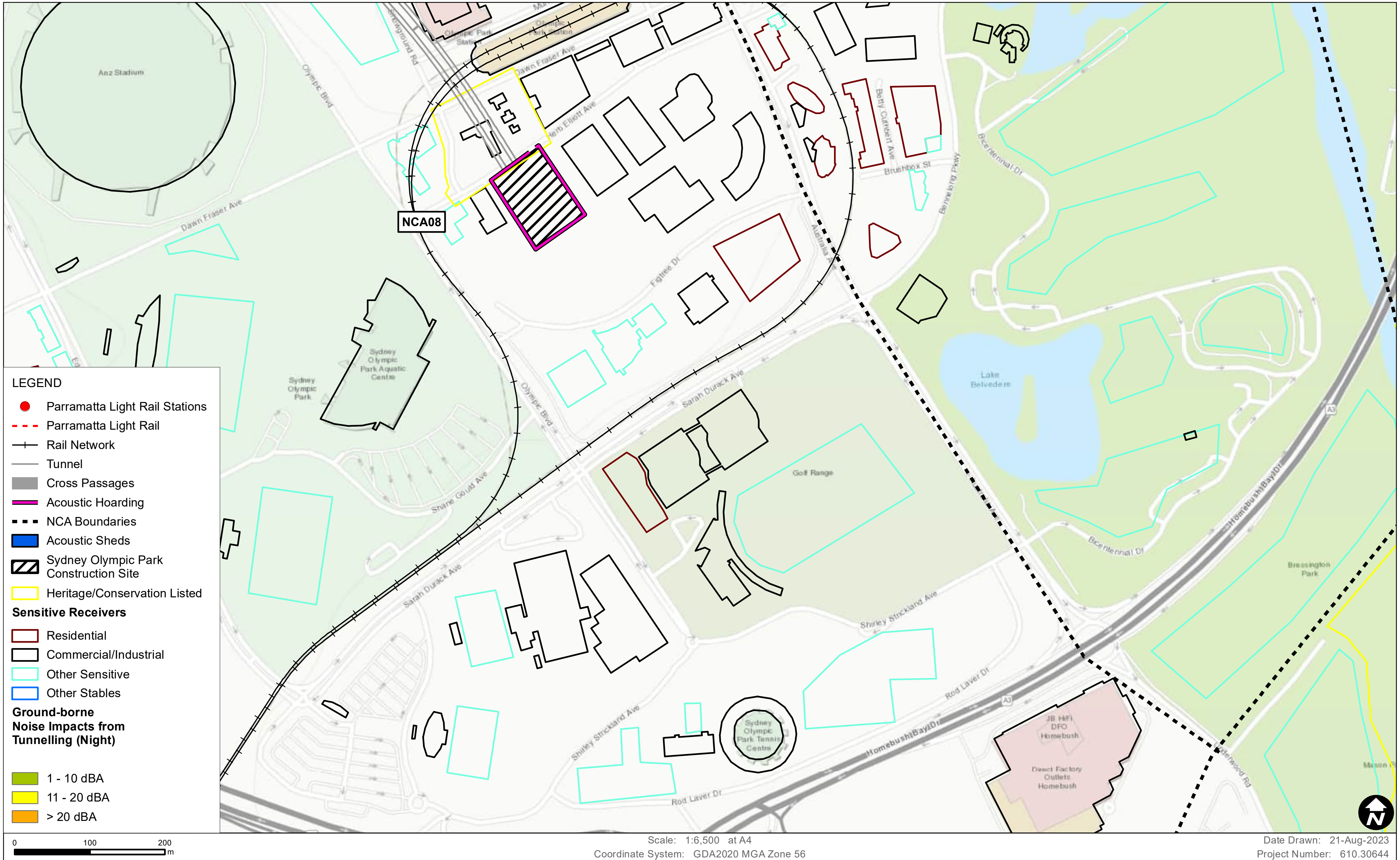
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from TBMs (Night)

FIGURE D-20

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Night_03.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

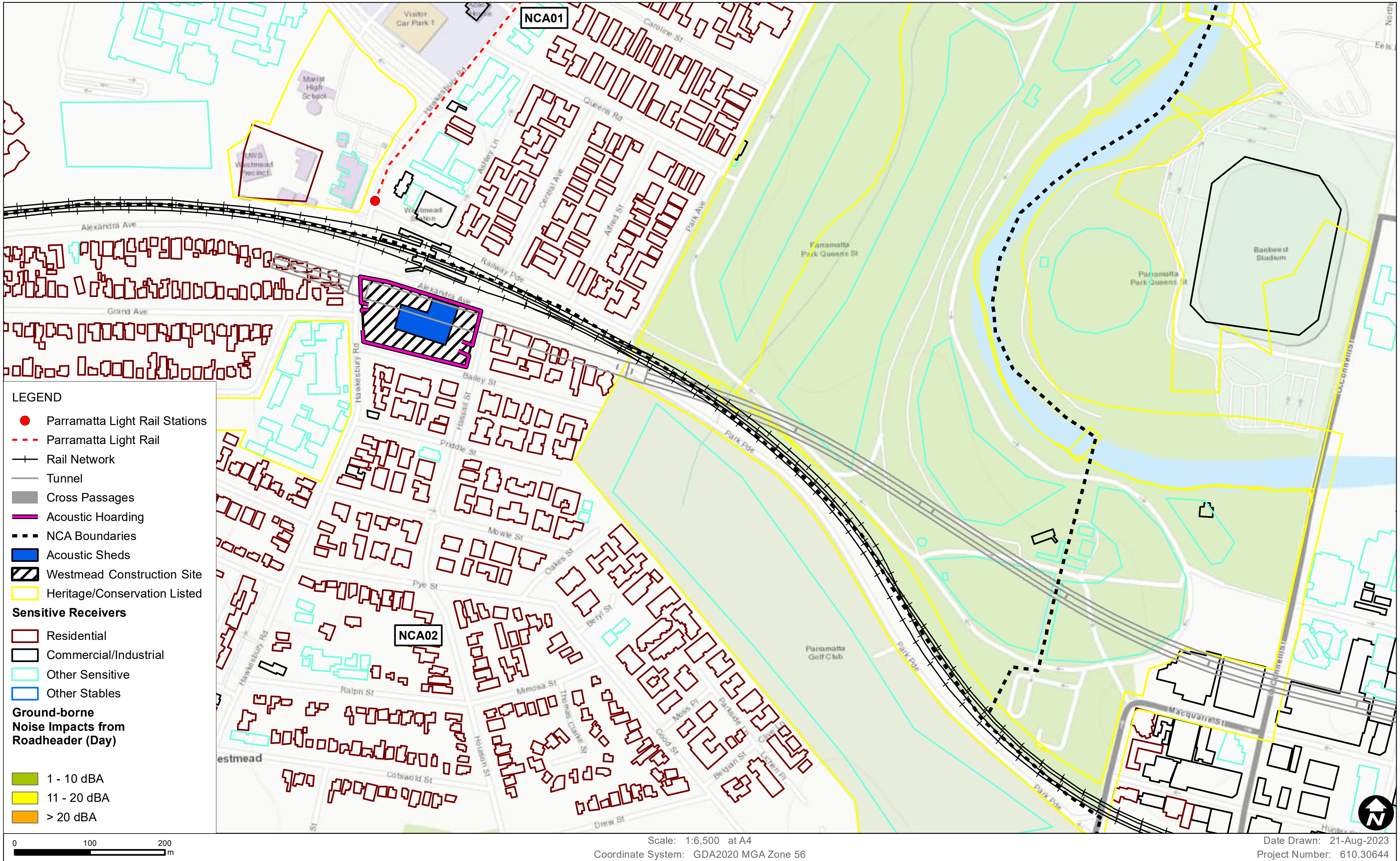
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from TBMs (Night)

FIGURE D-21

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Tunnelling_Night_03.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

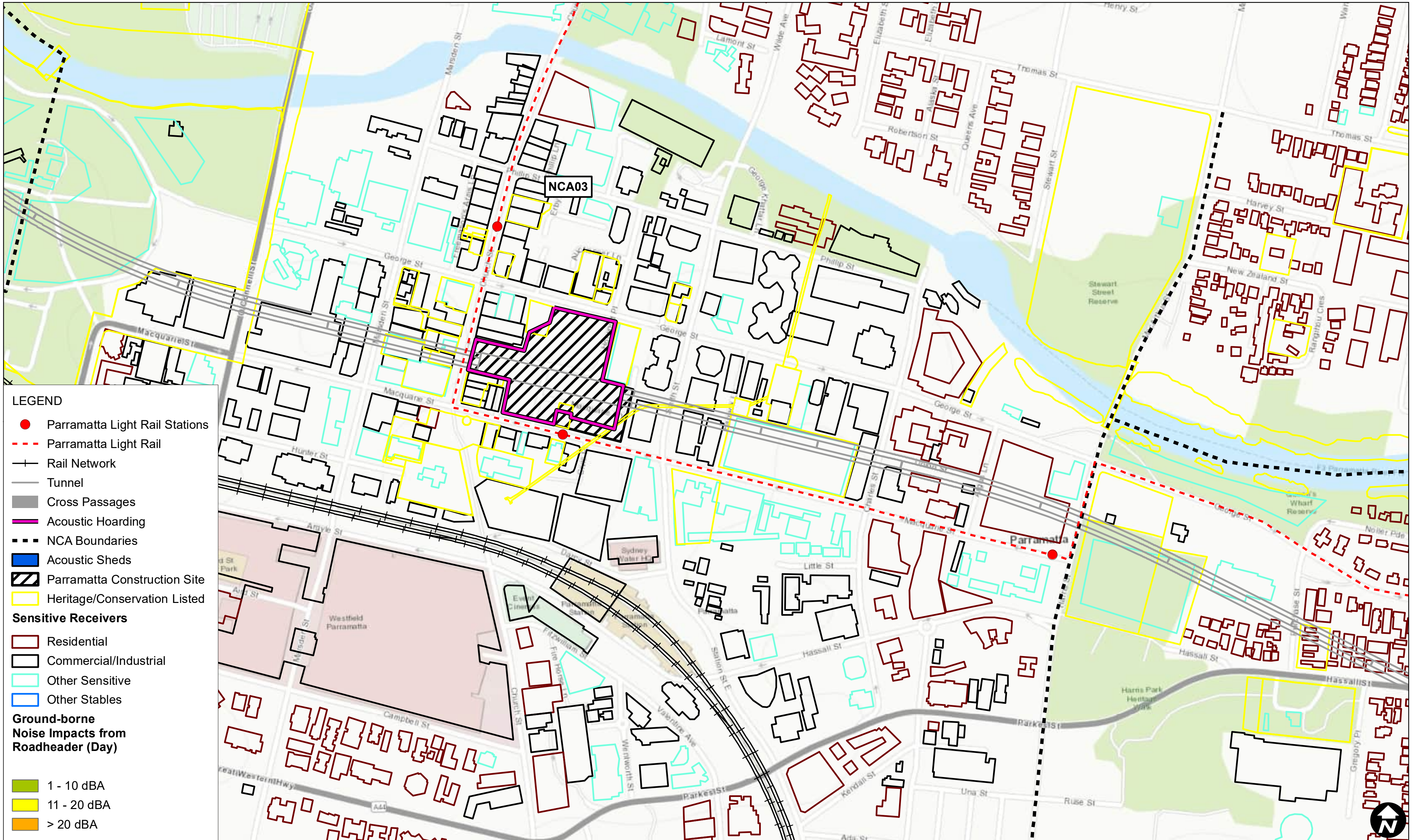
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Day)

FIGURE D-22



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Cross Passages
- Acoustic Hoarding
- NCA Boundaries
- Acoustic Sheds
- Parramatta Construction Site
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Ground-borne Noise Impacts from Roadheader (Day)

- 1 - 10 dBA
- 11 - 20 dBA
- > 20 dBA

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

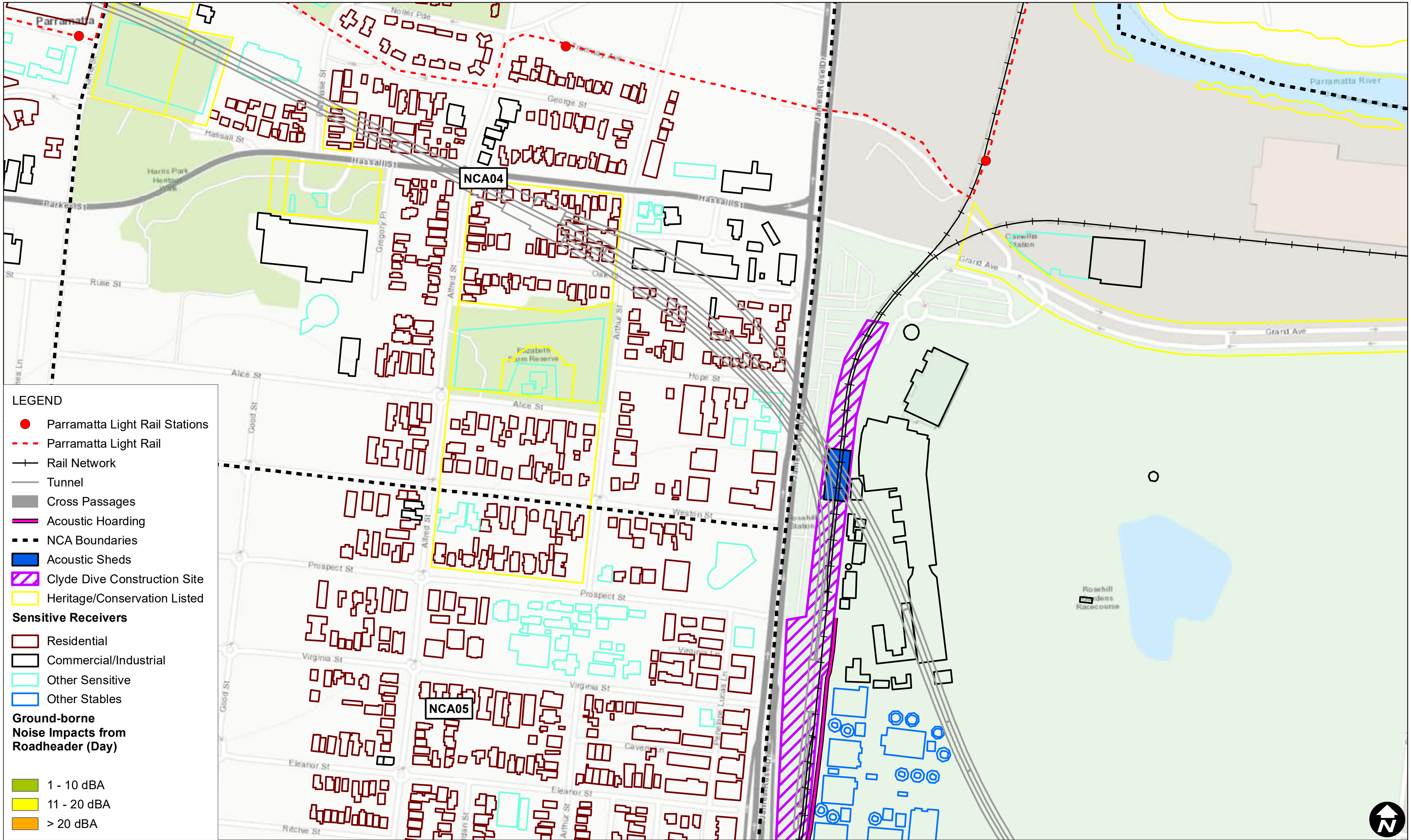
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Day)

FIGURE D-23

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Roadheader_Day_01.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

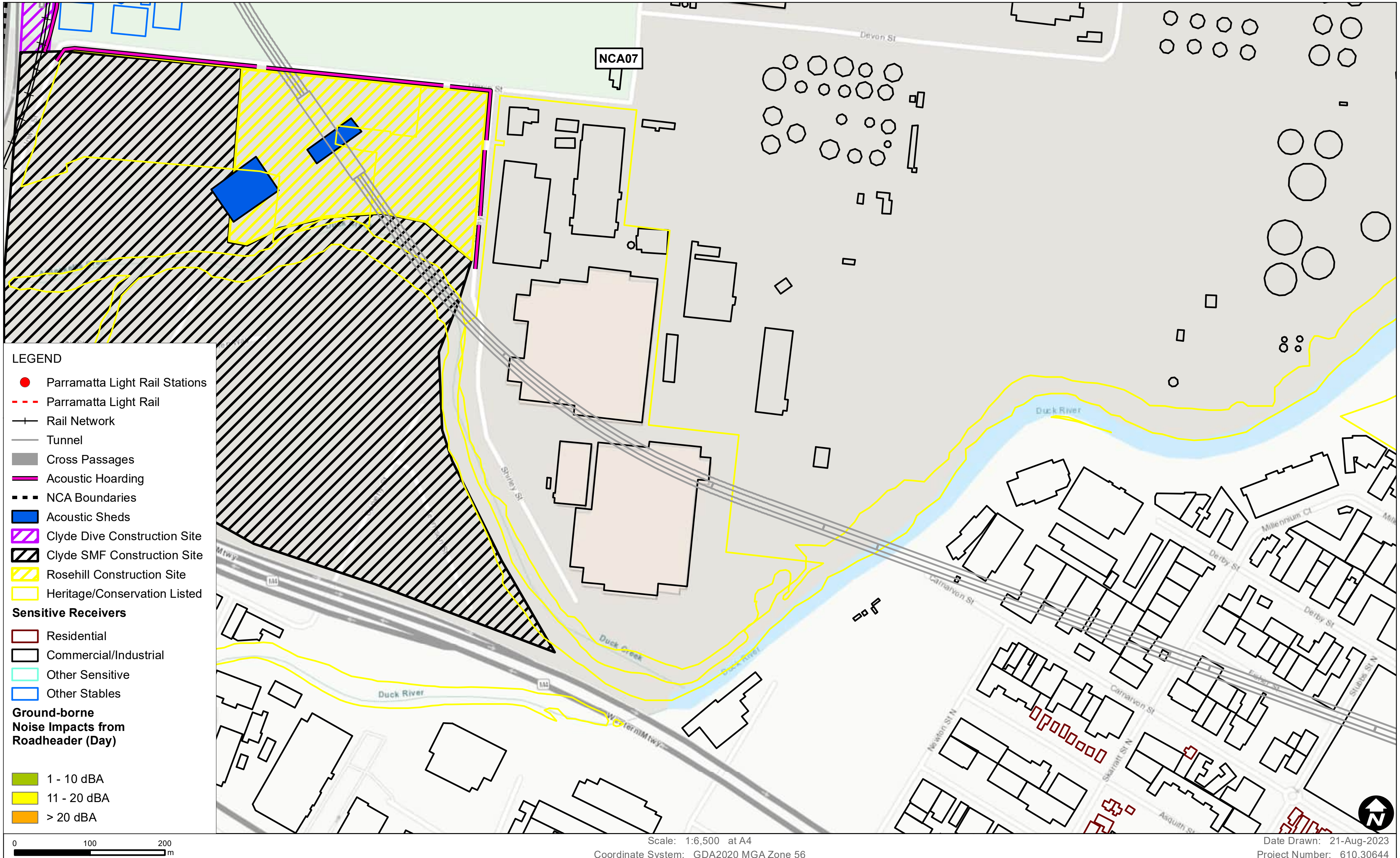
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Roadheader (Day)

FIGURE D-24

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Roadheader_Day_01.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

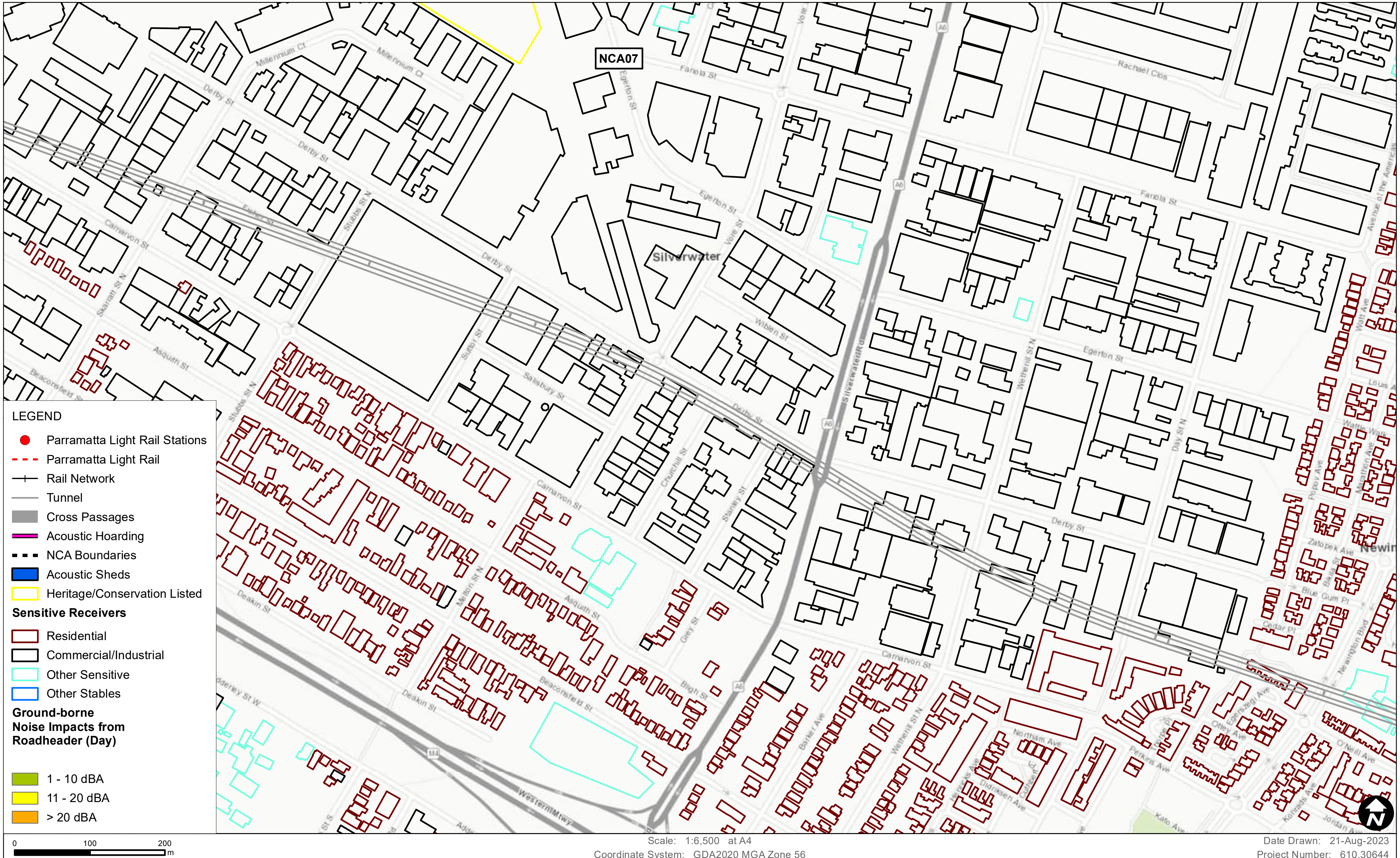
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Day)

FIGURE D-25



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

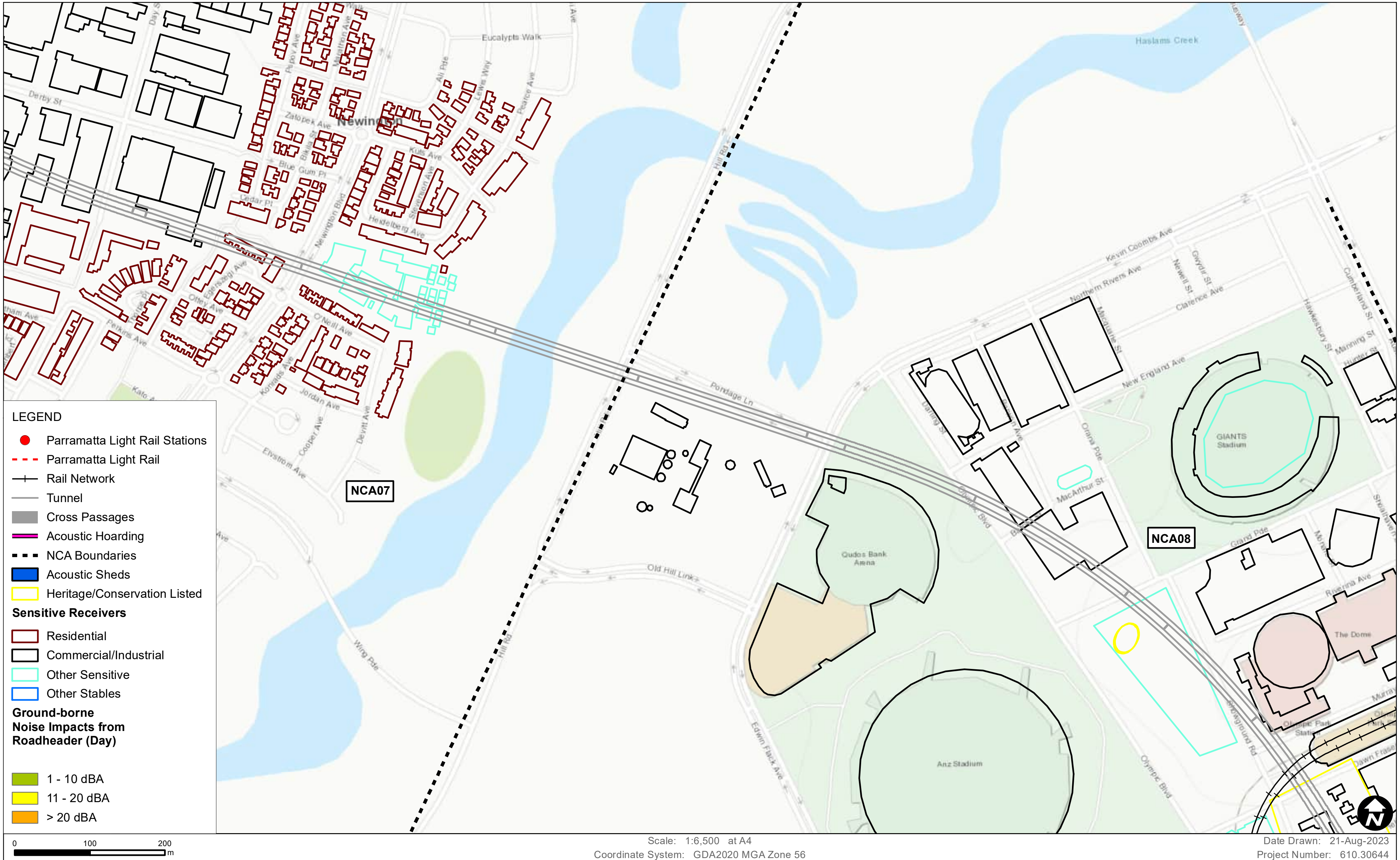
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Day)

FIGURE D-26

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Roadheader_Day_01.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

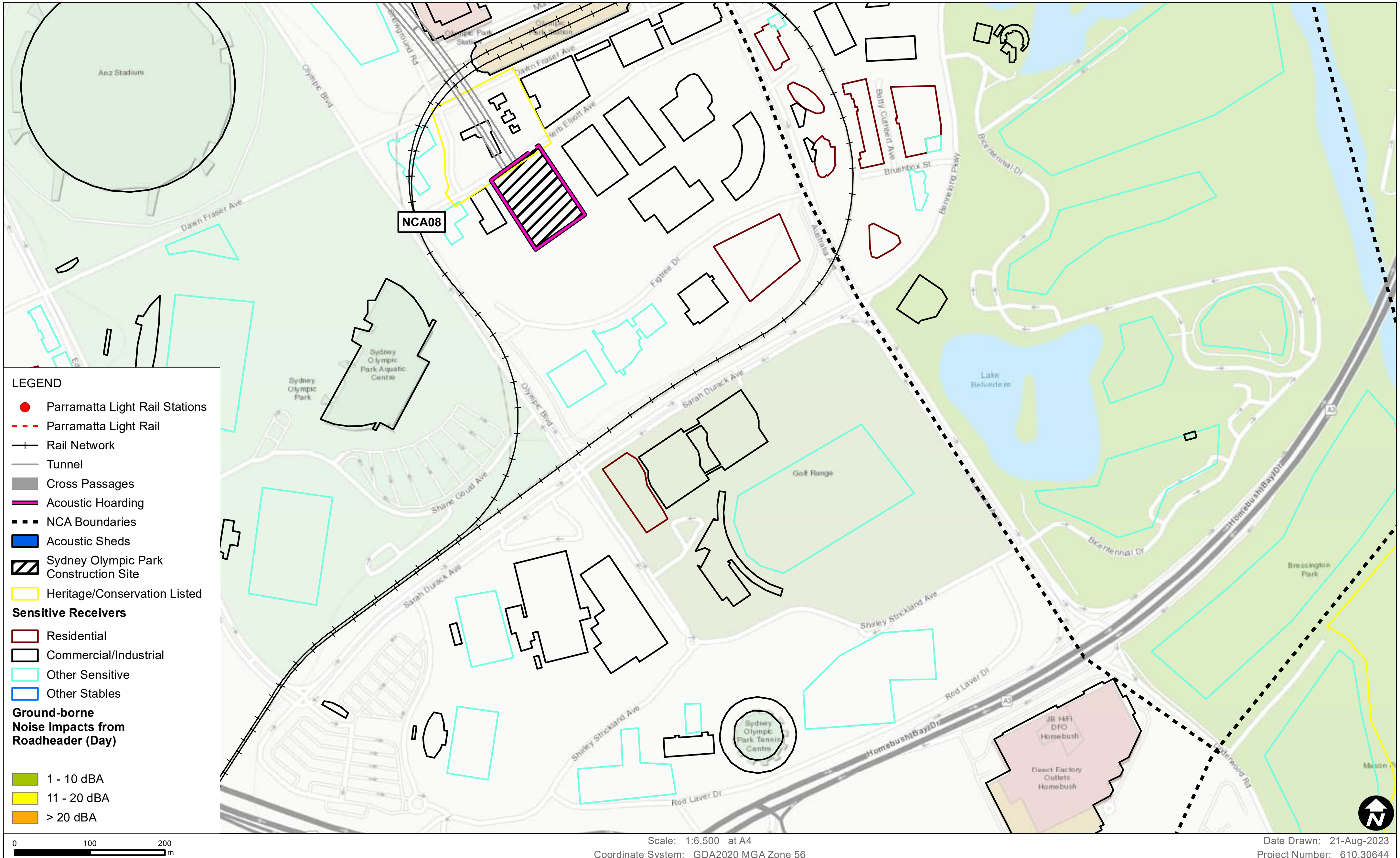
Date Drawn: 21-Aug-2023
Project Number: 610.30644

SLR

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Roadheader (Day)

FIGURE D-27



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

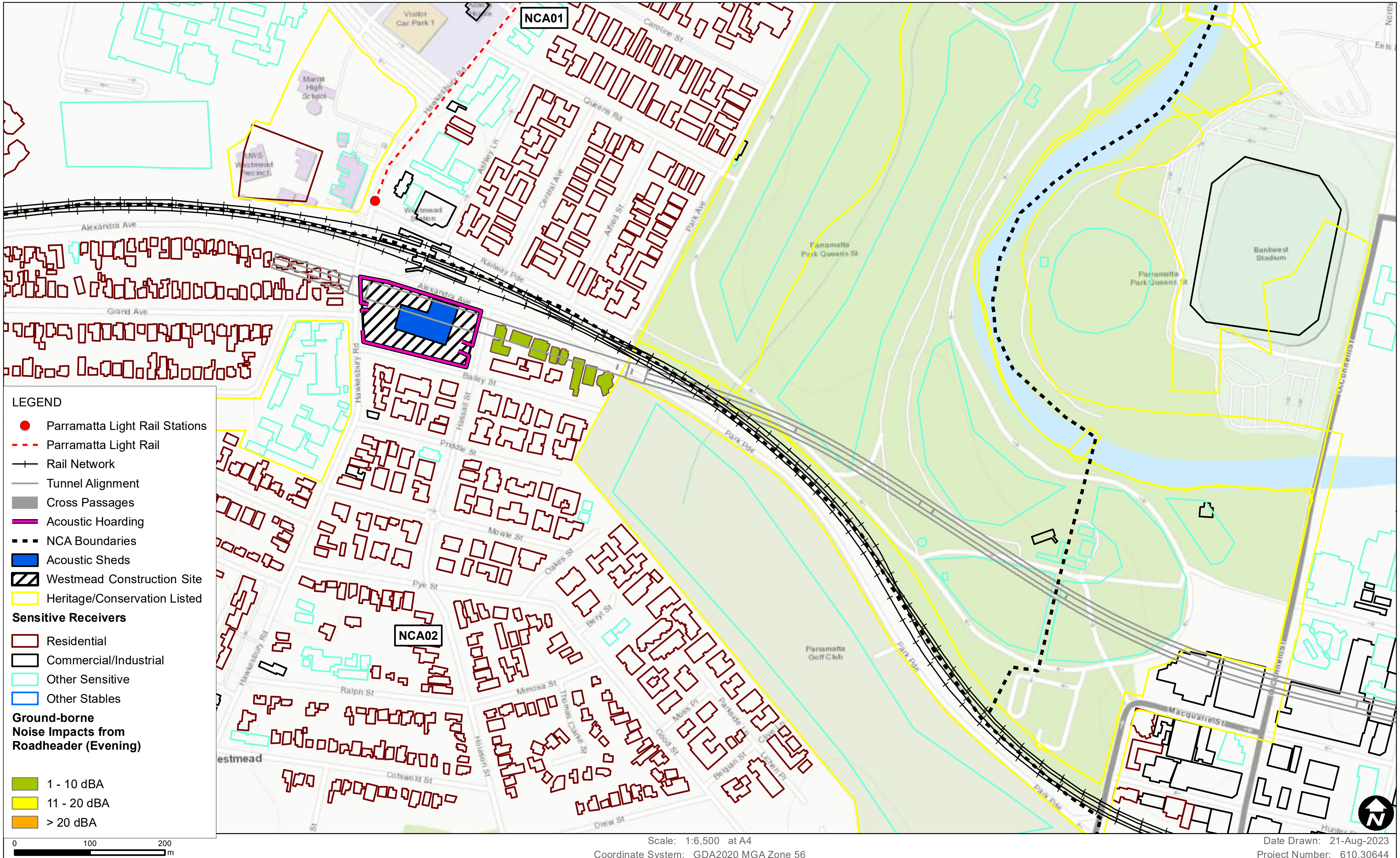
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Day)

FIGURE D-28



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

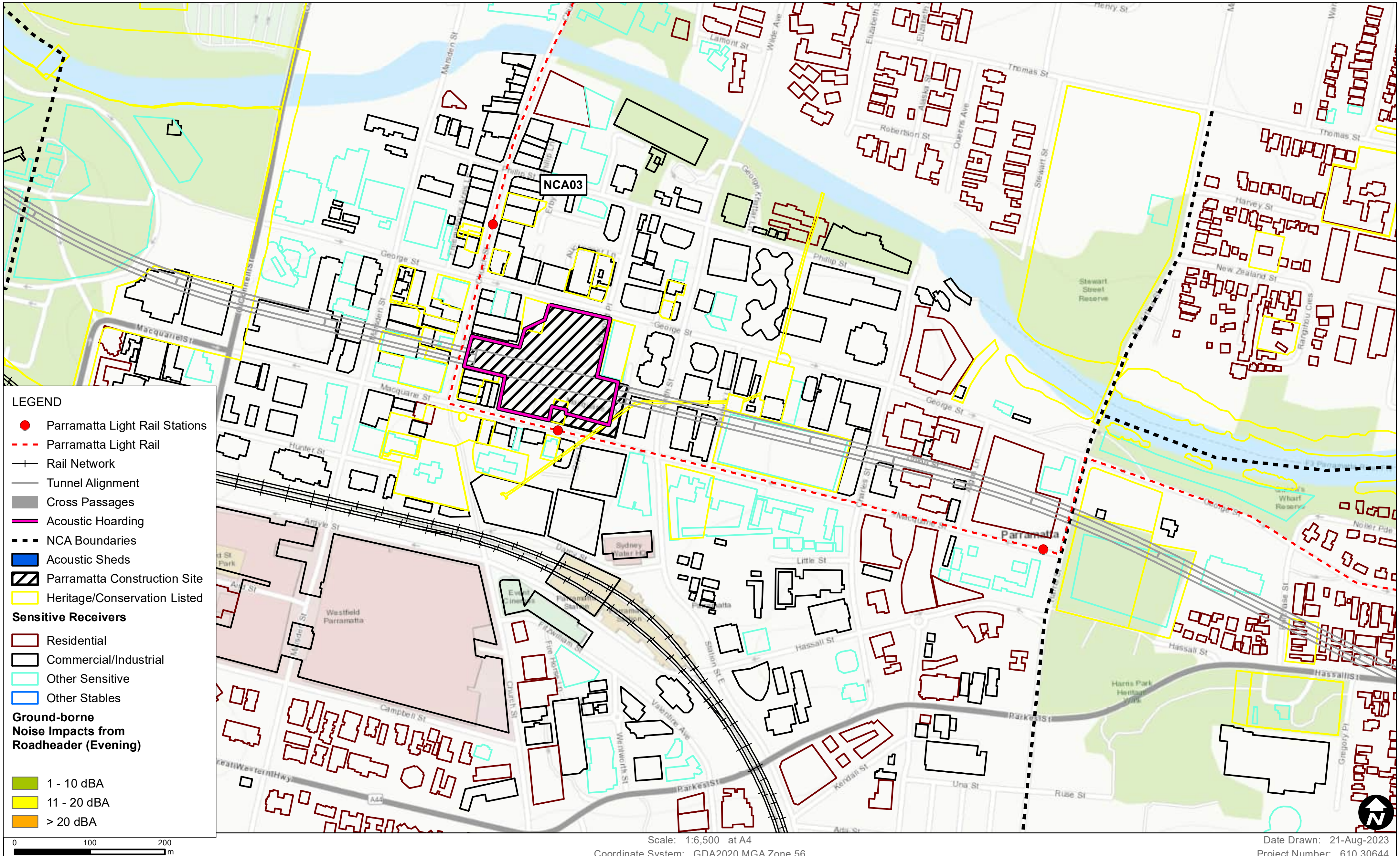
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Evening)

FIGURE D-29

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Roadheader_Evening_01.mxd



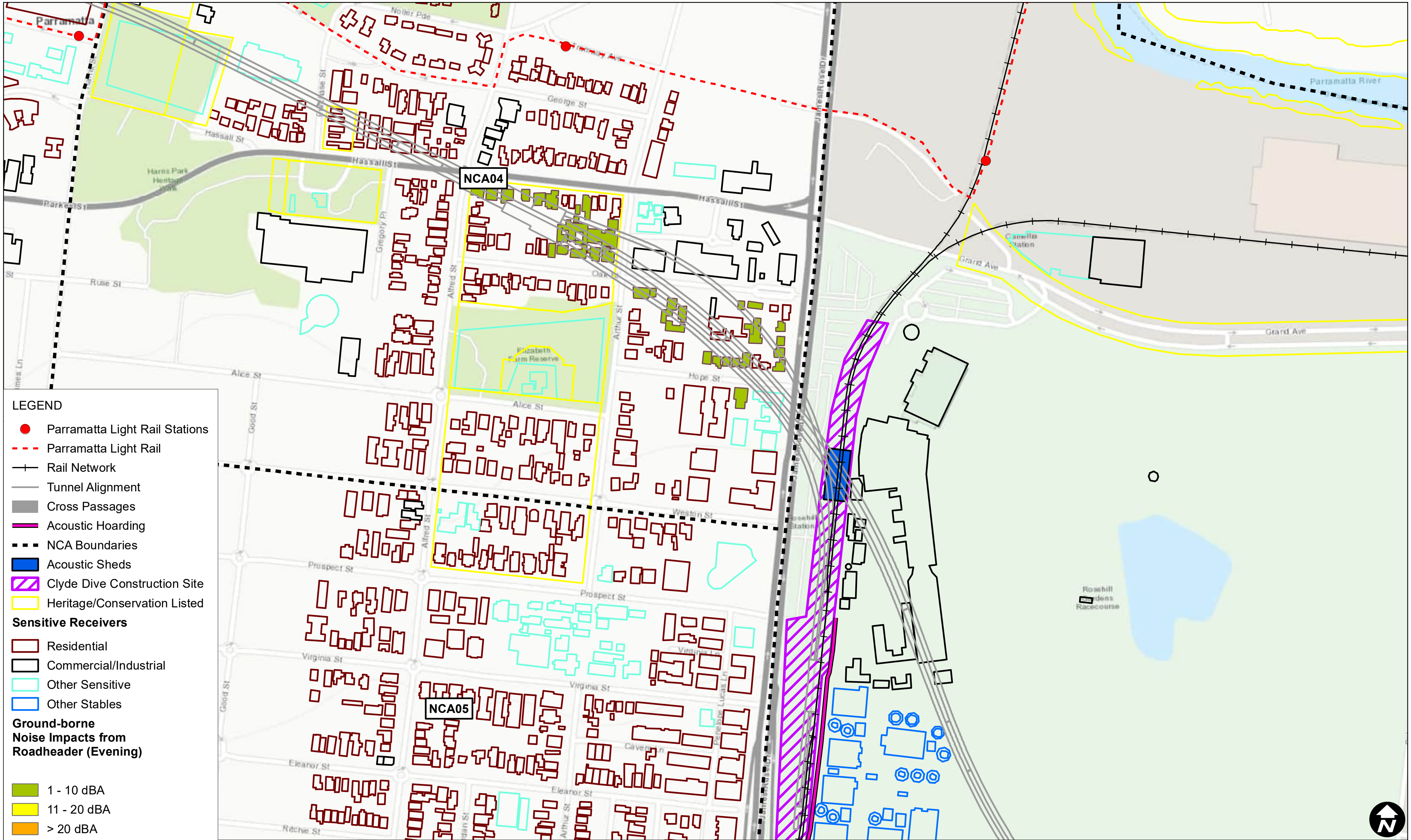
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Roadheader (Evening)

FIGURE D-30



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel Alignment
- Cross Passages
- Acoustic Hoarding
- NCA Boundaries
- Acoustic Sheds
- Clyde Dive Construction Site
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Ground-borne Noise Impacts from Roadheader (Evening)

- 1 - 10 dBA
- 11 - 20 dBA
- > 20 dBA

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

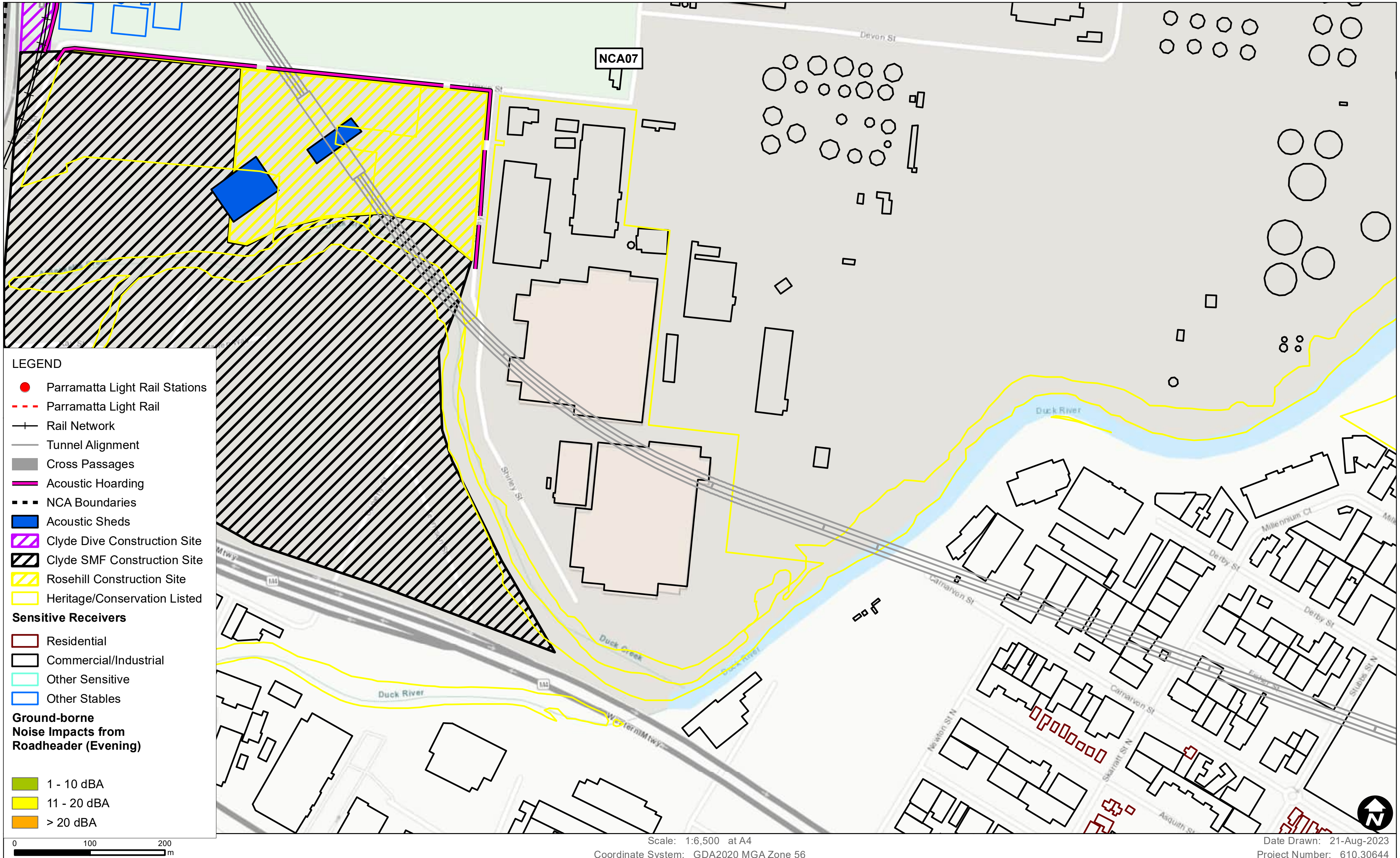
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Roadheader (Evening)

FIGURE D-31

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Roadheader_Evening_01.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

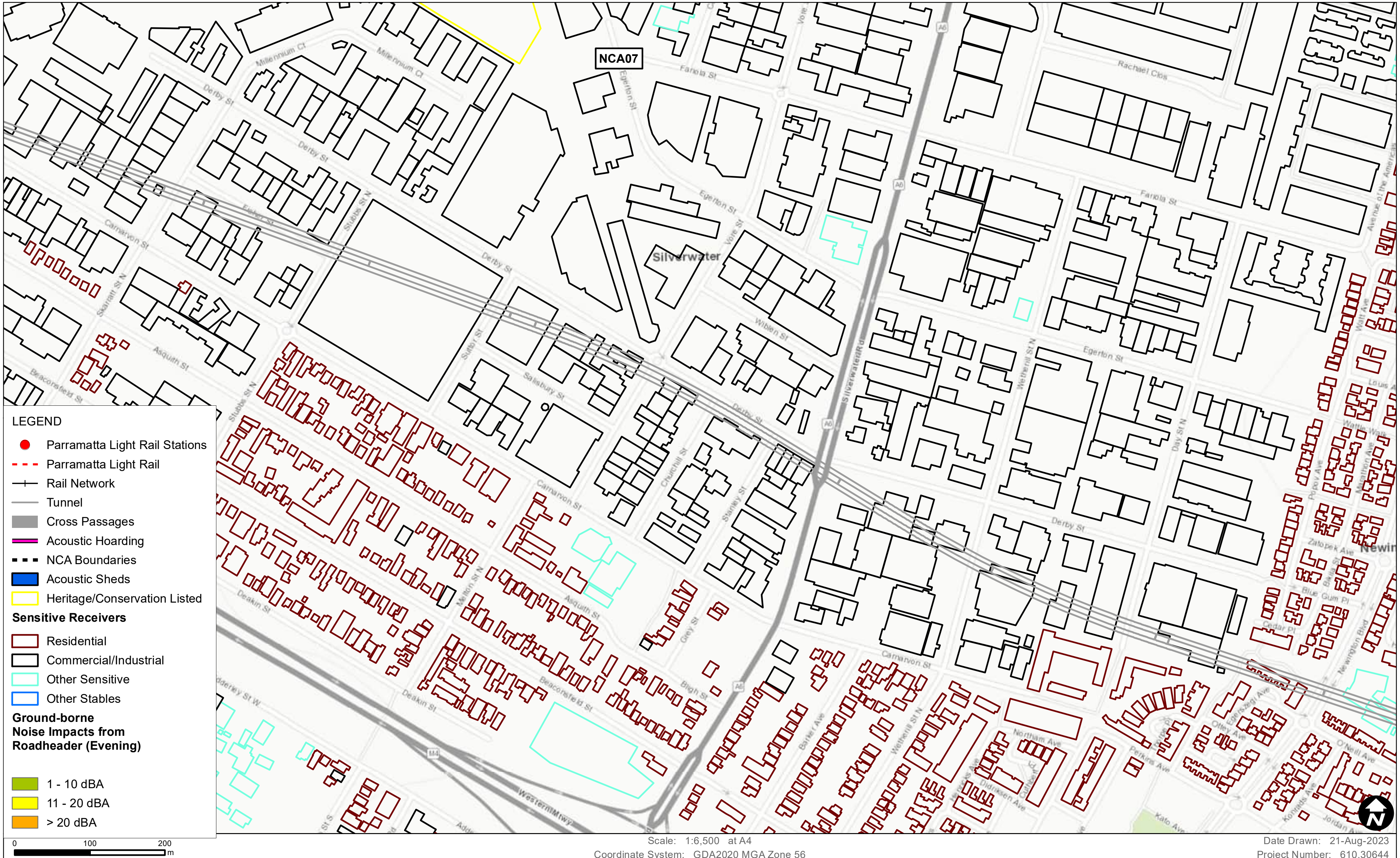
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Evening)

FIGURE D-32

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Roadheader_Evening_01.mxd



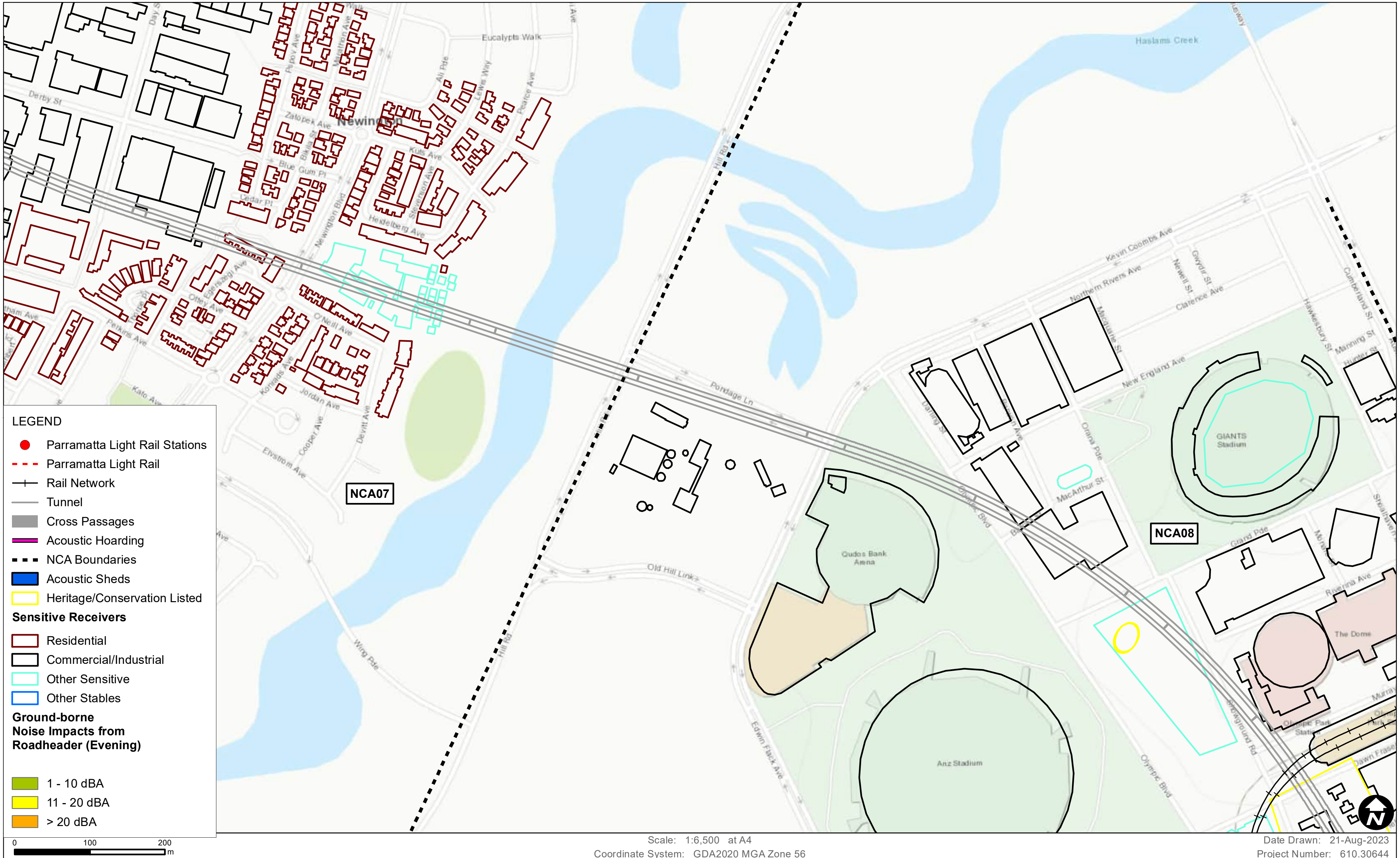
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Roadheader (Evening)

FIGURE D-33



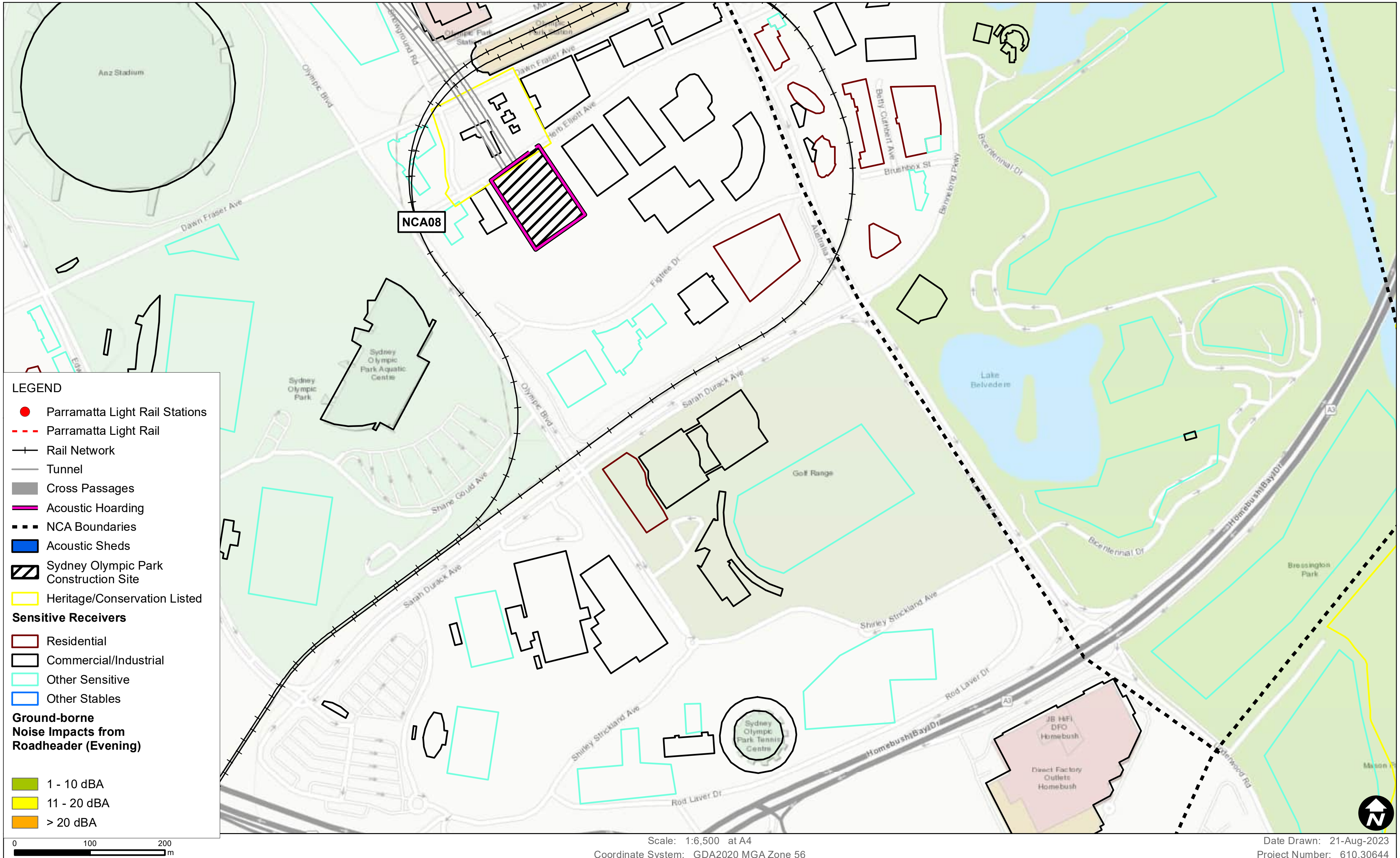
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Roadheader (Evening)

FIGURE D-34



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

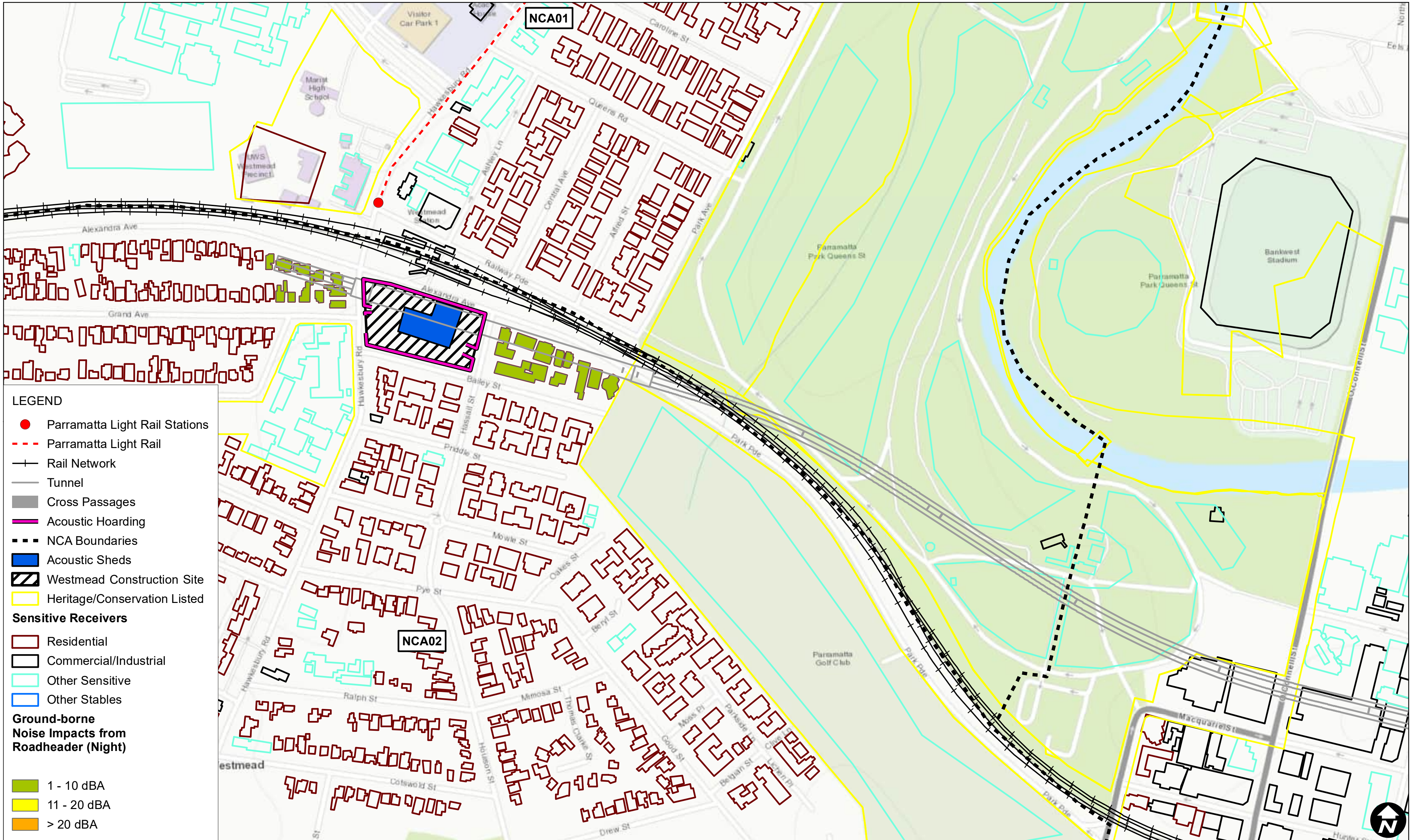
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Evening)

FIGURE D-35

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Roadheader_Evening_01.mxd



0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

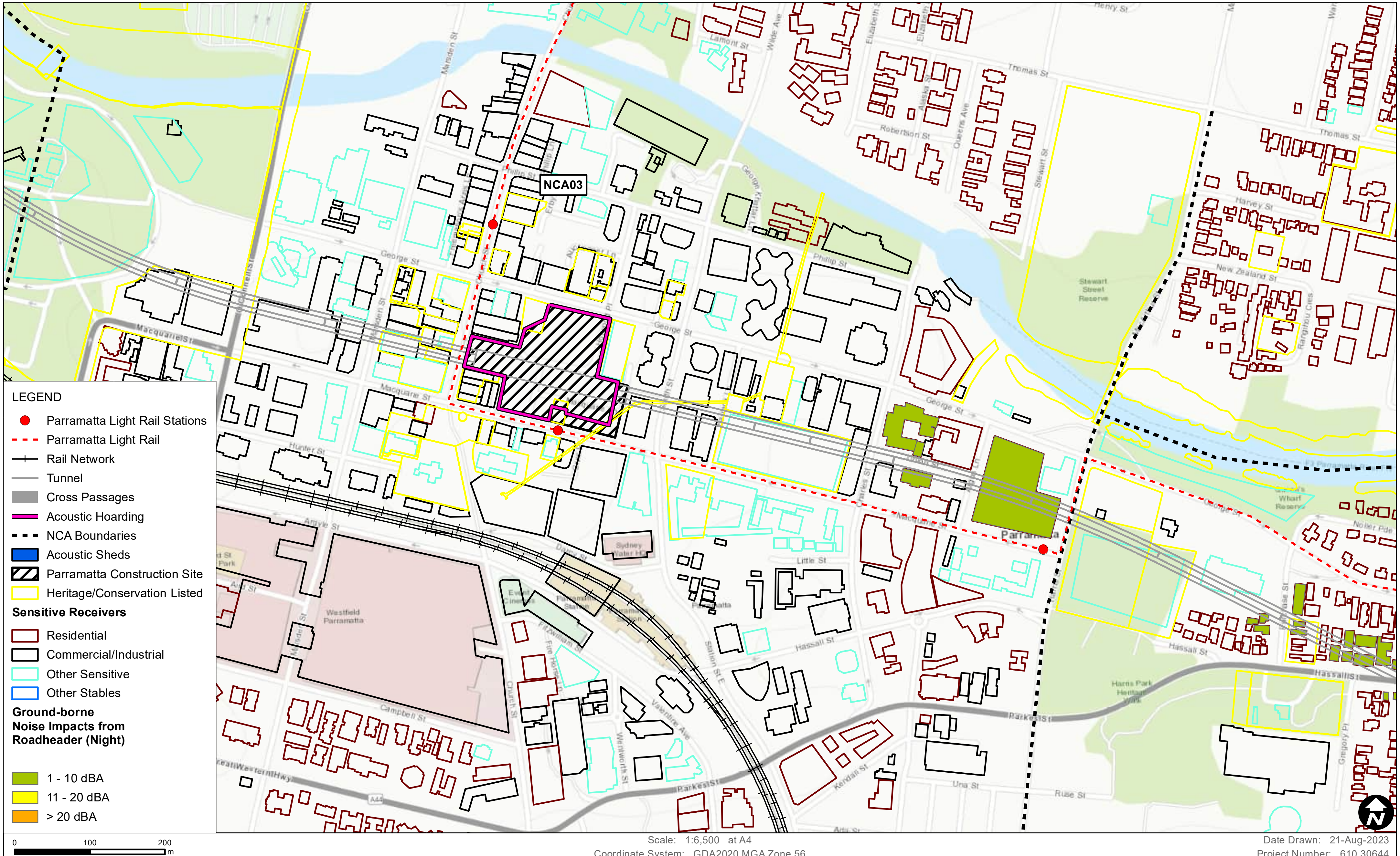
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Night)

FIGURE D-36

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Roadheader_Night_01.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

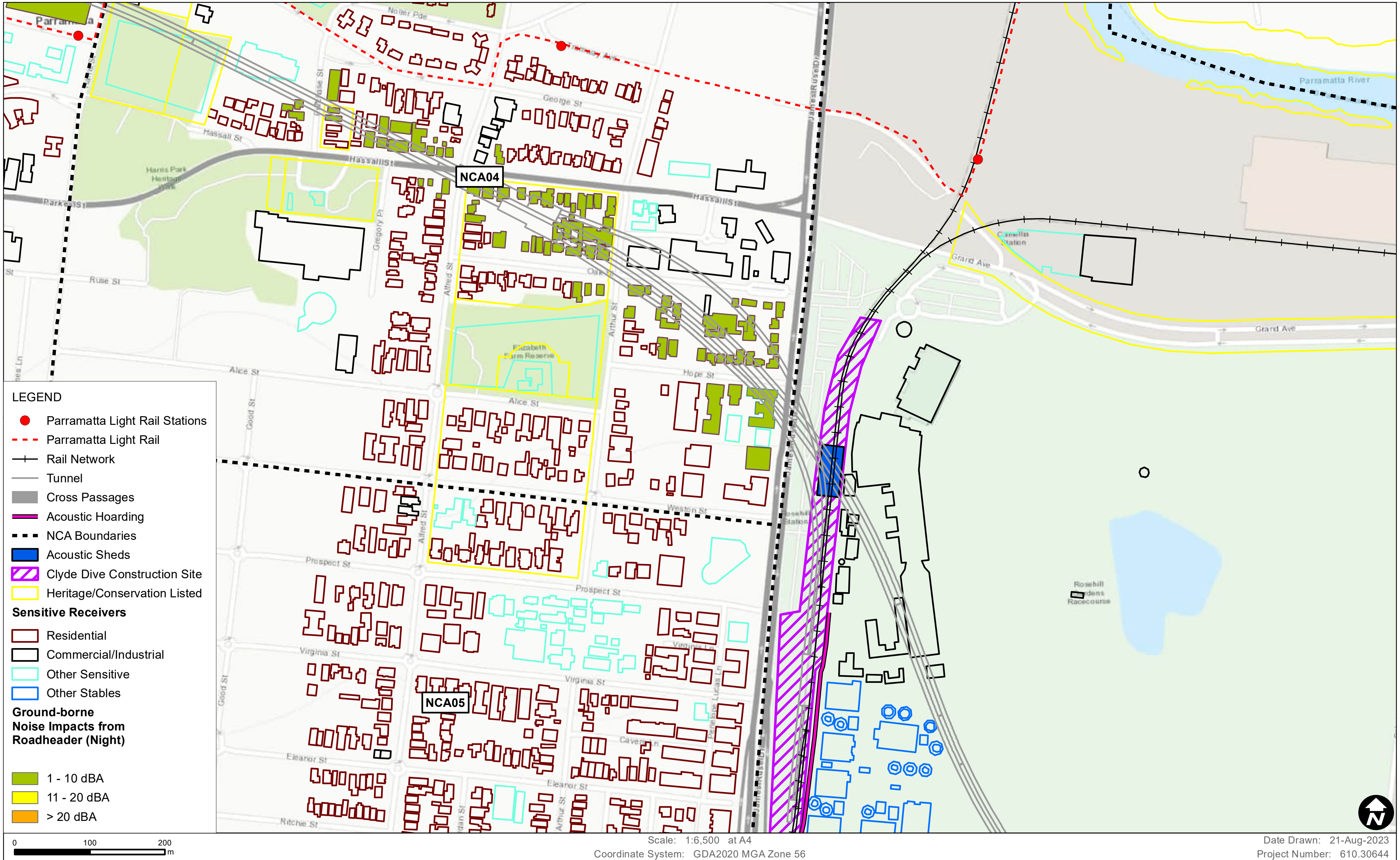
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Night)

FIGURE D-37



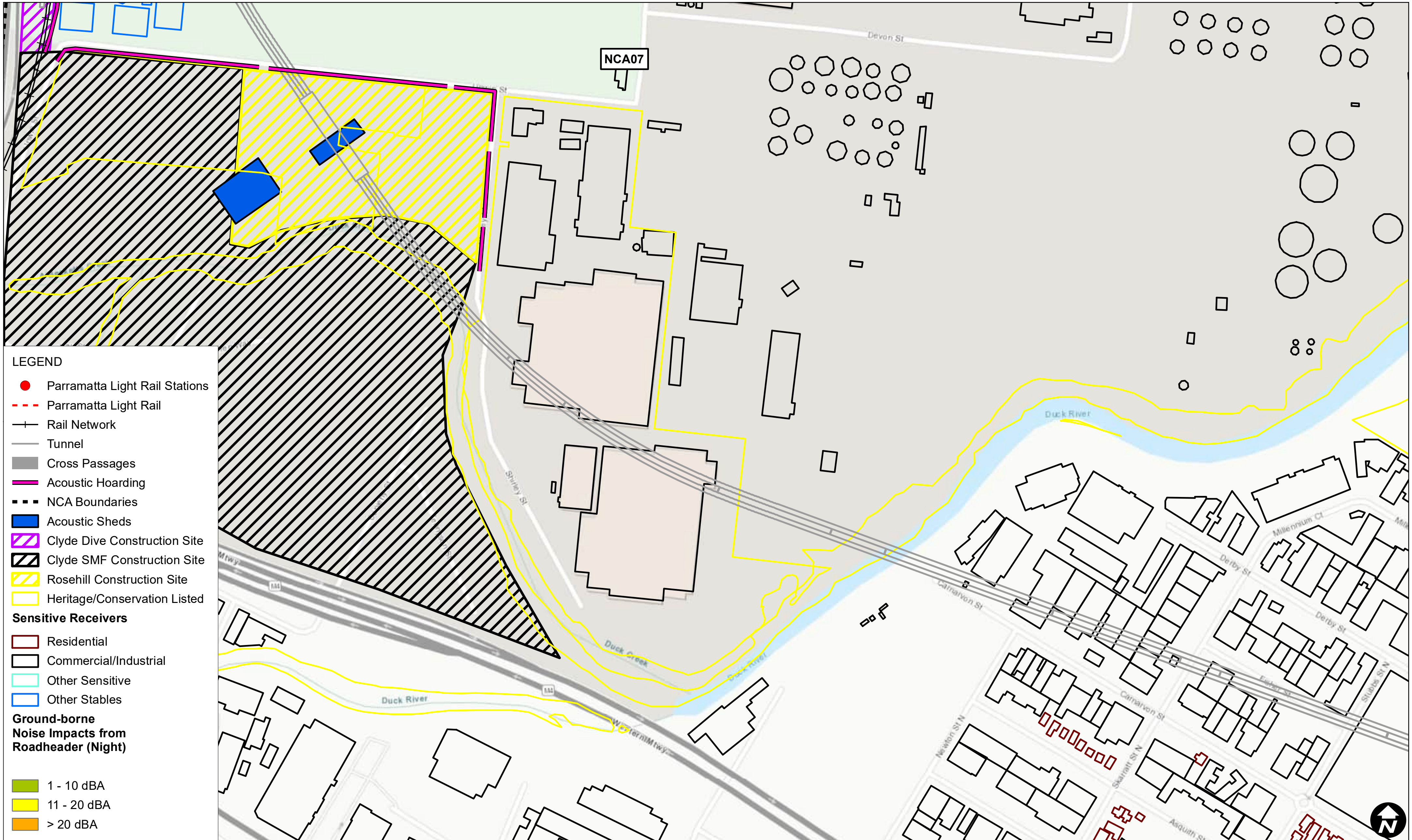
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Roadheader (Night)

FIGURE D-38



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Cross Passages
- Acoustic Hoarding
- NCA Boundaries
- Acoustic Sheds
- Clyde Dive Construction Site
- Clyde SMF Construction Site
- Rosehill Construction Site
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Ground-borne Noise Impacts from Roadheader (Night)

- 1 - 10 dBA
- 11 - 20 dBA
- > 20 dBA

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

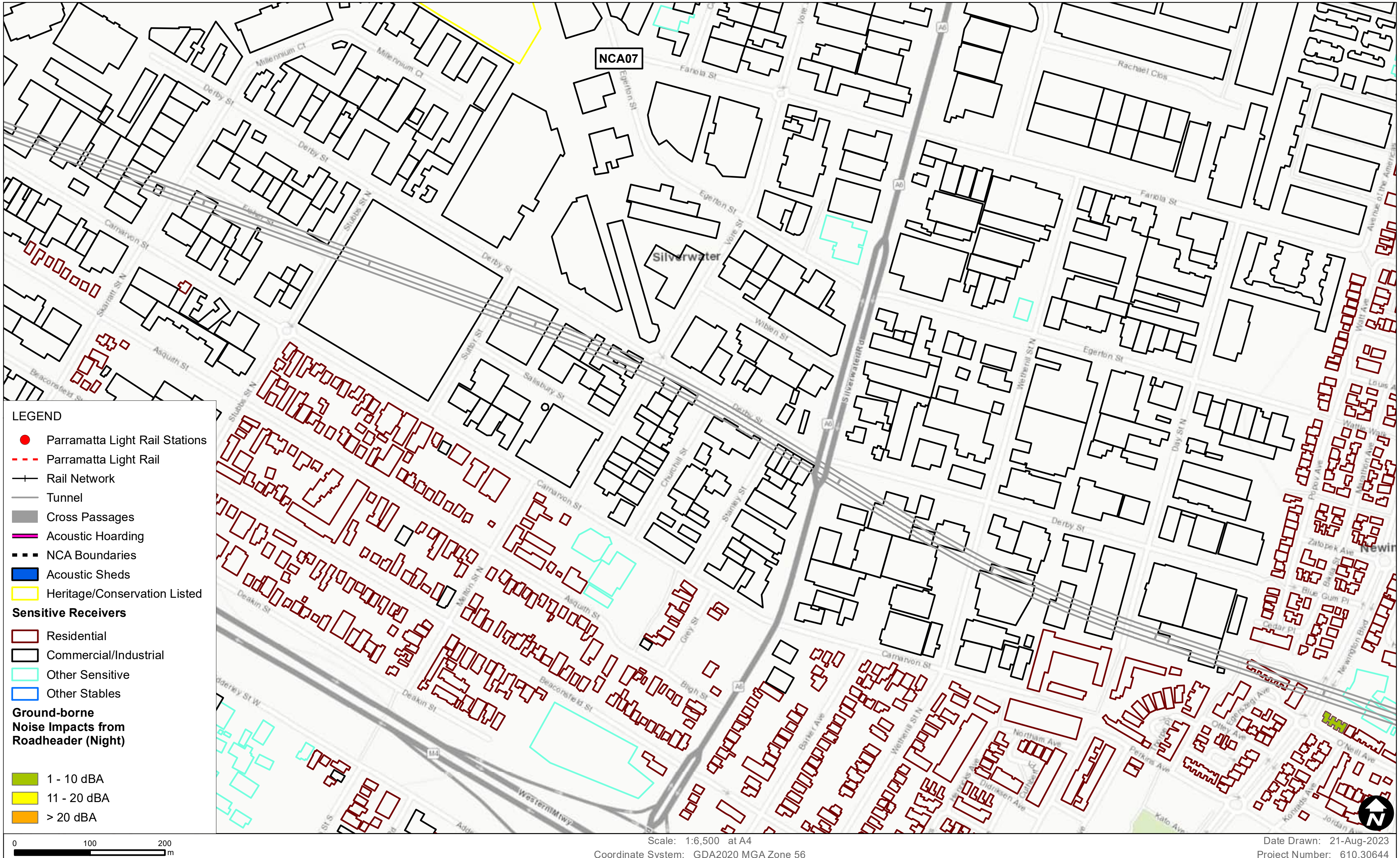
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Roadheader (Night)

FIGURE D-39

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Roadheader_Night_01.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

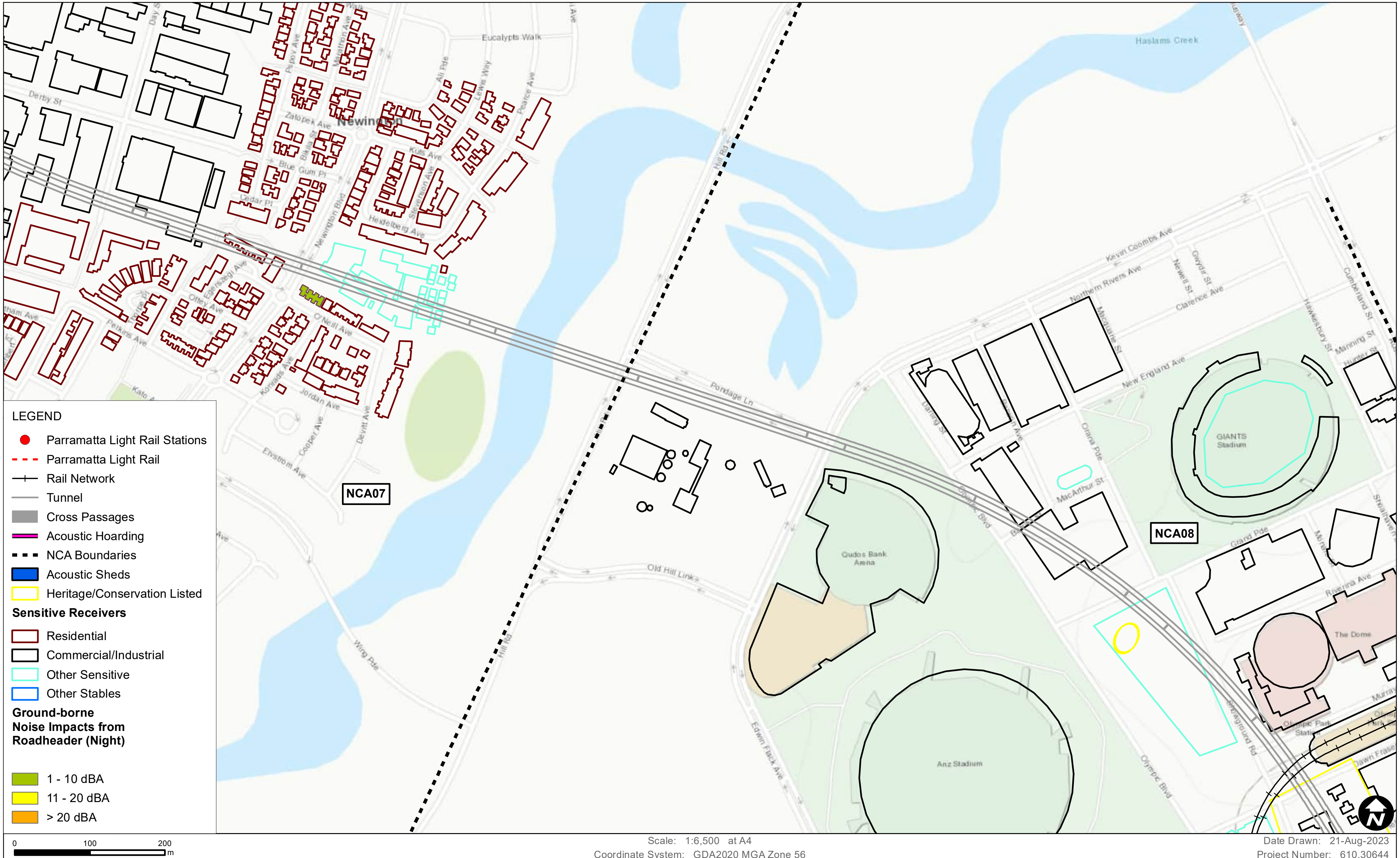
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Night)

FIGURE D-40



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

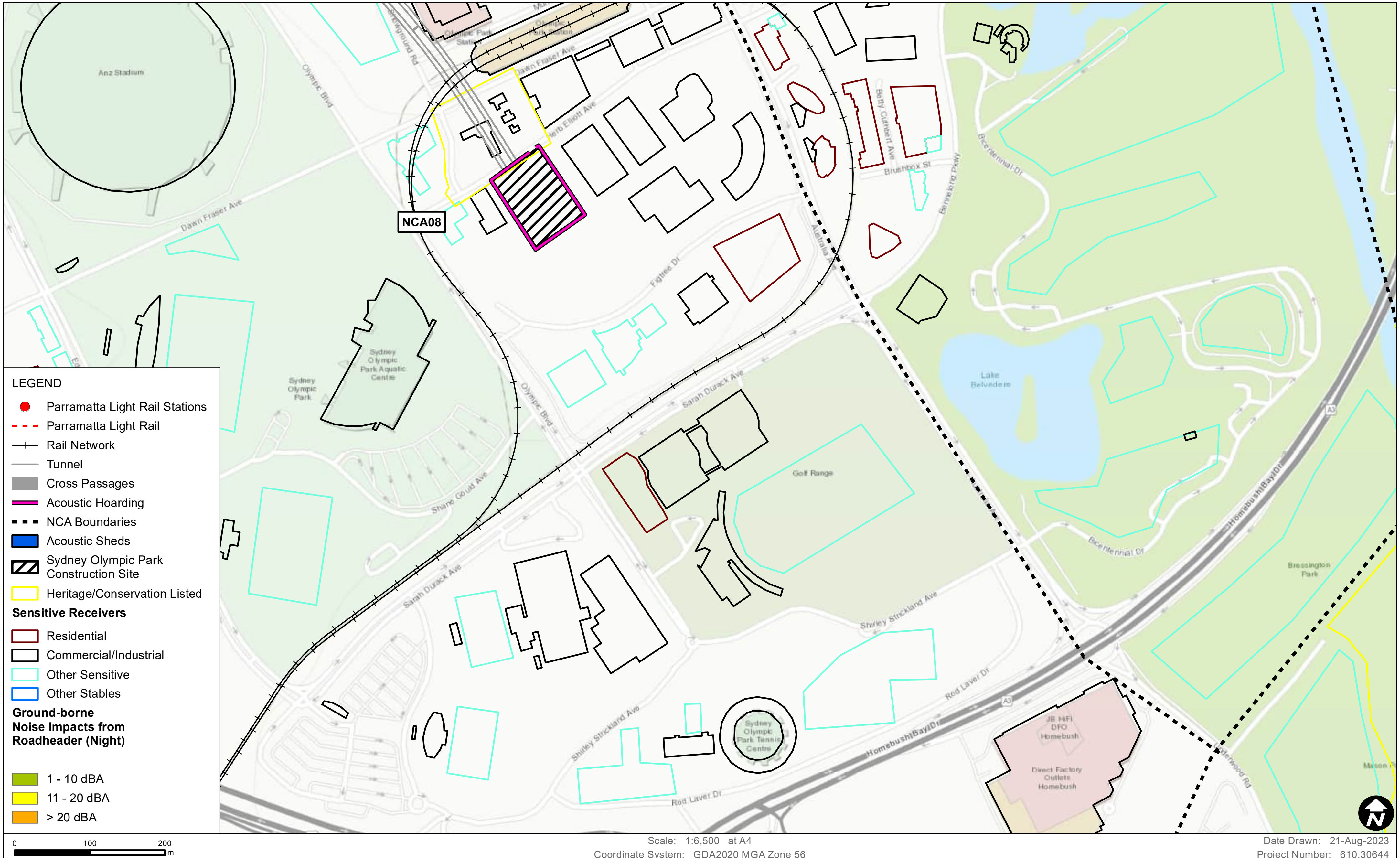
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Night)

FIGURE D-41

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Roadheader_Night_01.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

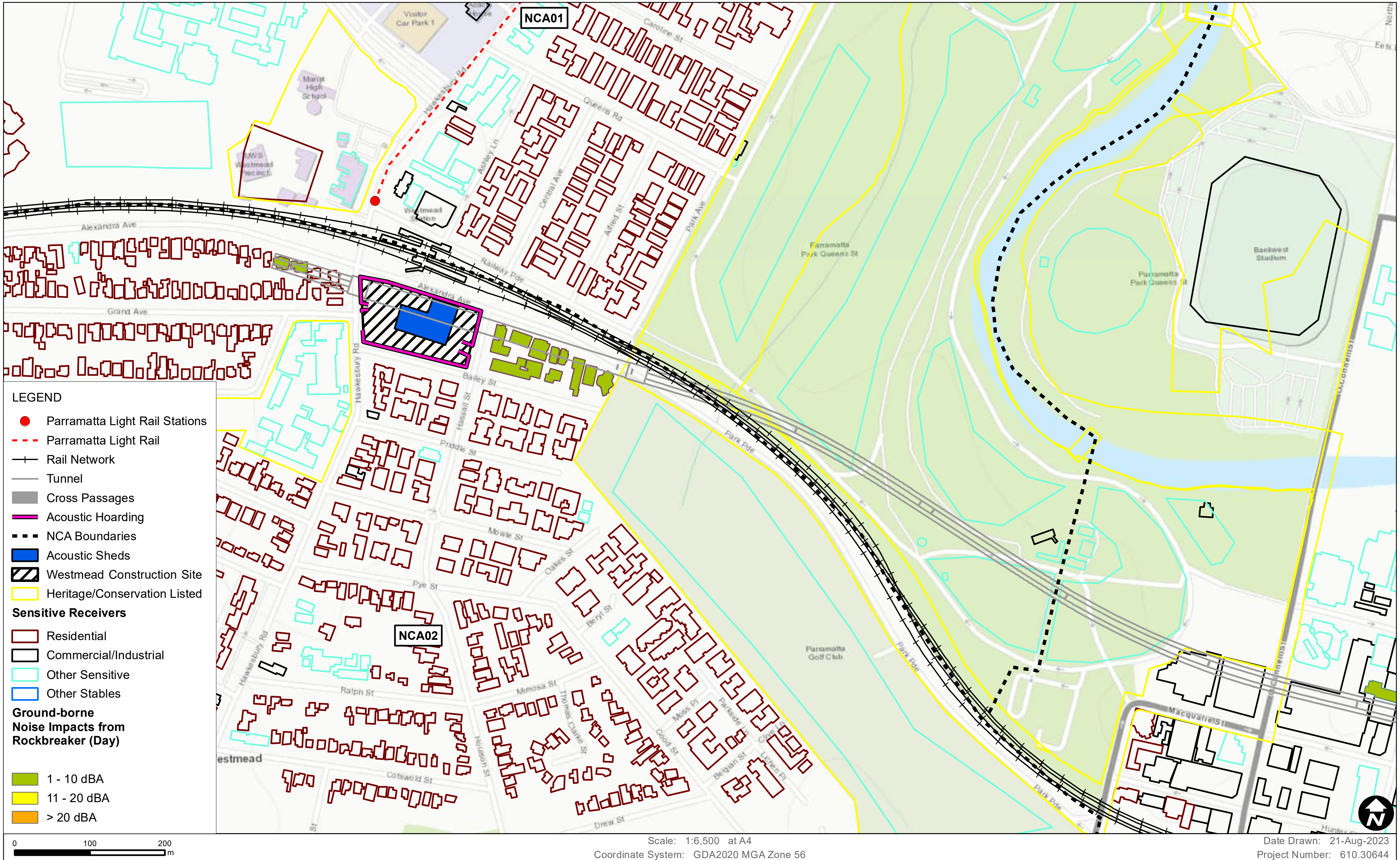
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Roadheader (Night)

FIGURE D-42



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

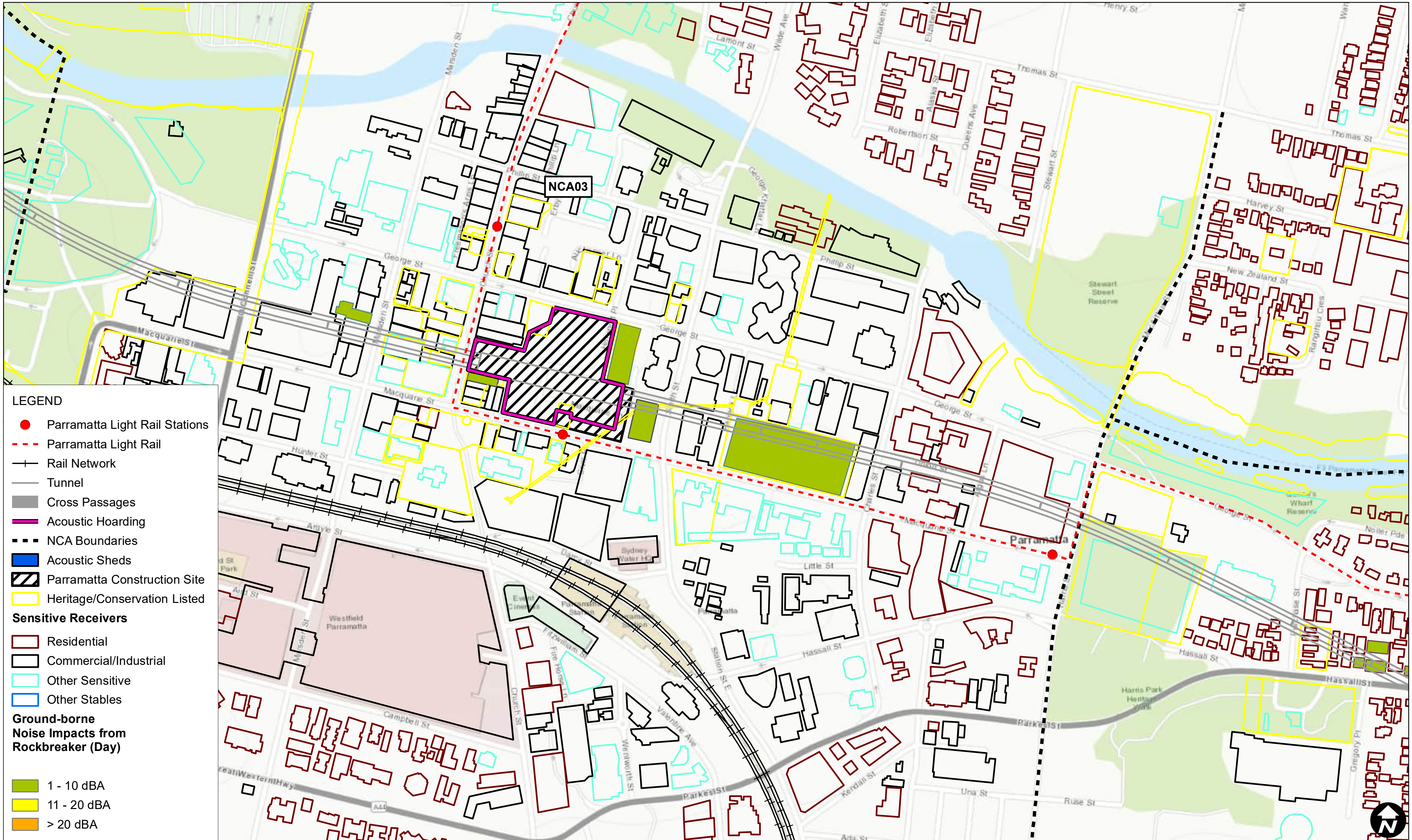
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Rockbreaker (Day)

FIGURE D-43

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Rockbreaker_Day_01.mxd



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Cross Passages
- Acoustic Hoarding
- NCA Boundaries
- Acoustic Sheds
- Parramatta Construction Site
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Ground-borne Noise Impacts from Rockbreaker (Day)

- 1 - 10 dBA
- 11 - 20 dBA
- > 20 dBA

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

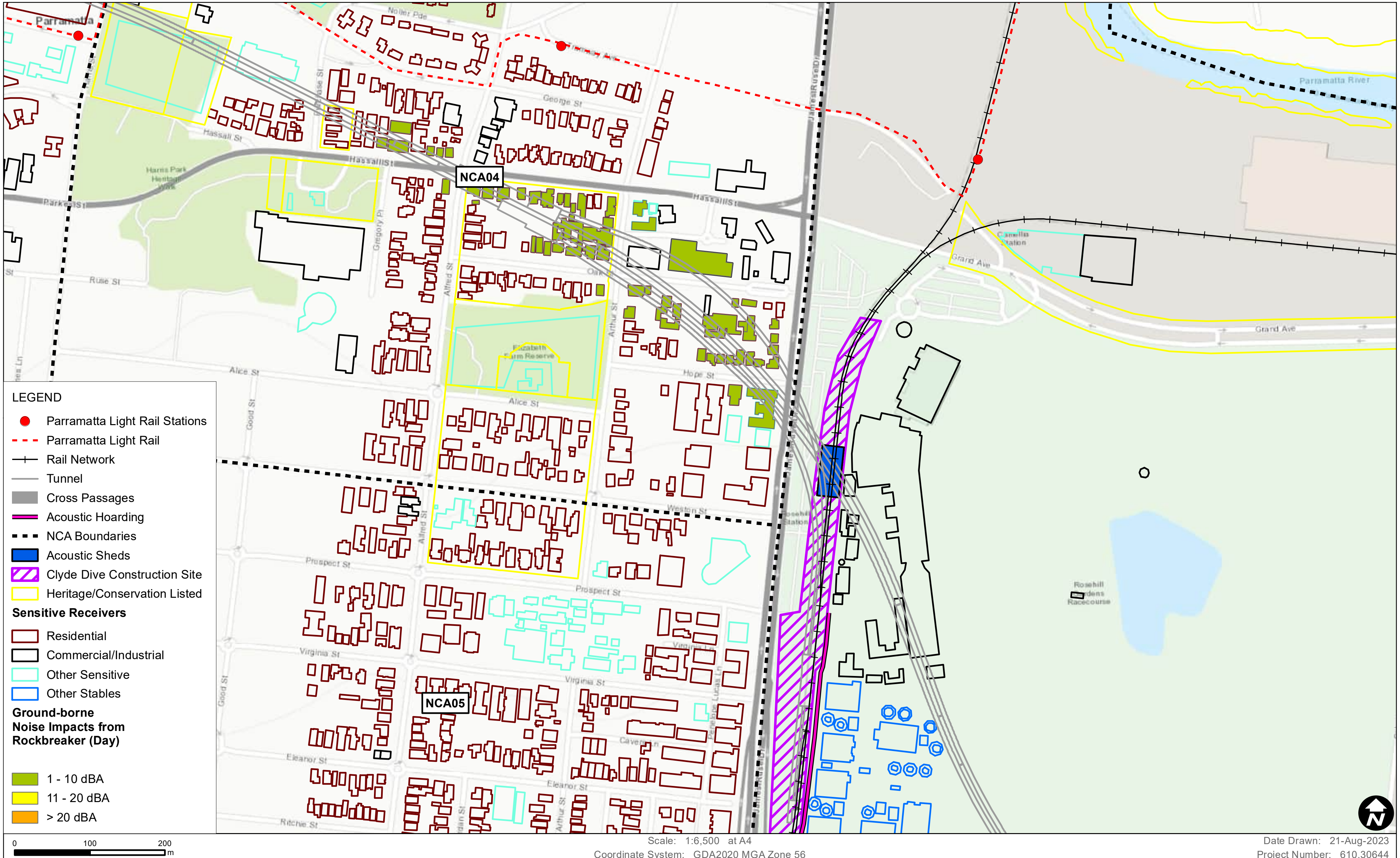
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Rockbreaker (Day)

FIGURE D-44

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Rockbreaker_Day_01.mxd



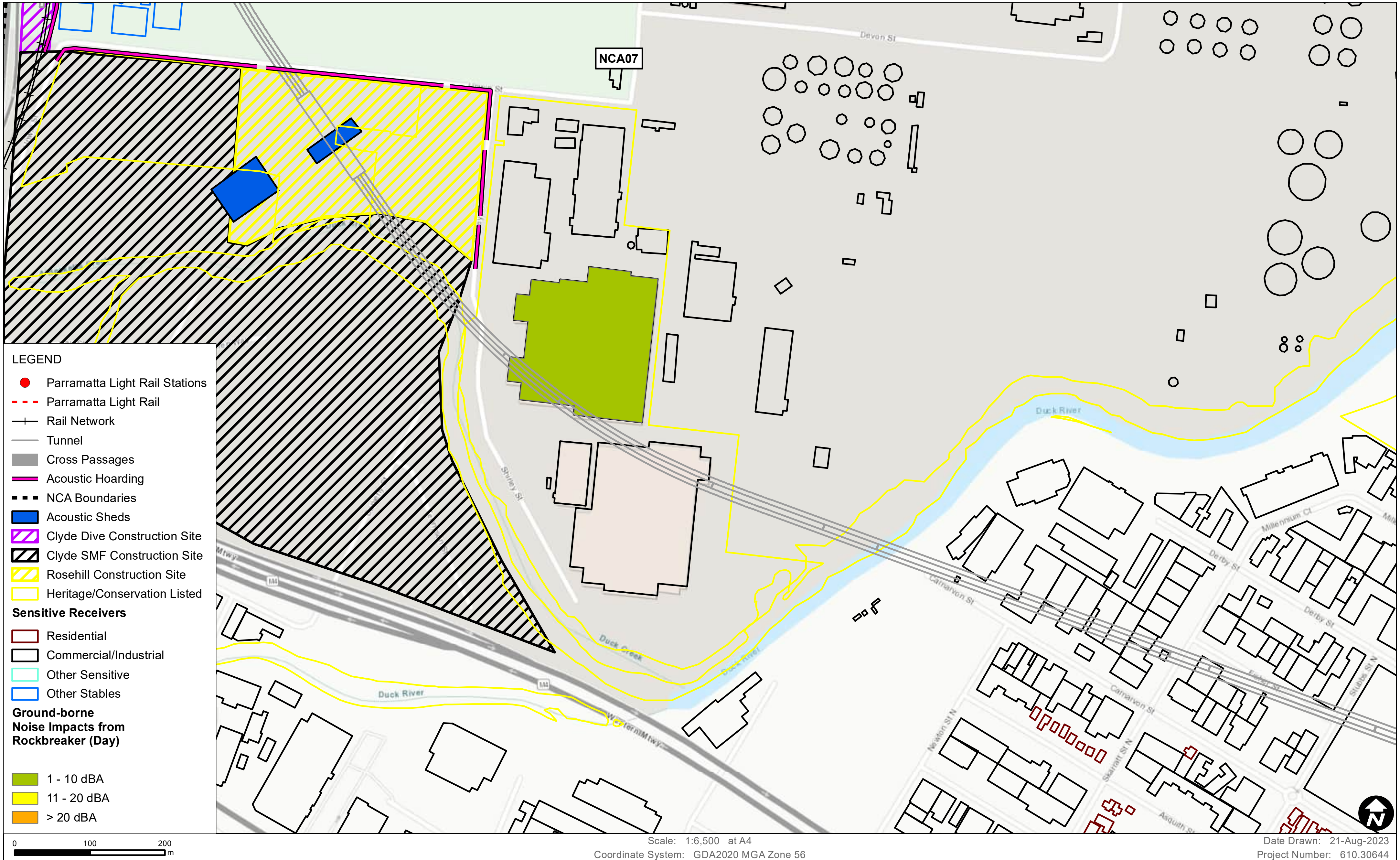
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Rockbreaker (Day)

FIGURE D-45



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Rockbreaker (Day)

FIGURE D-46

LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Cross Passages
- Acoustic Hoarding
- NCA Boundaries
- Acoustic Sheds
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Ground-borne Noise Impacts from Rockbreaker (Day)

- 1 - 10 dBA
- 11 - 20 dBA
- > 20 dBA

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

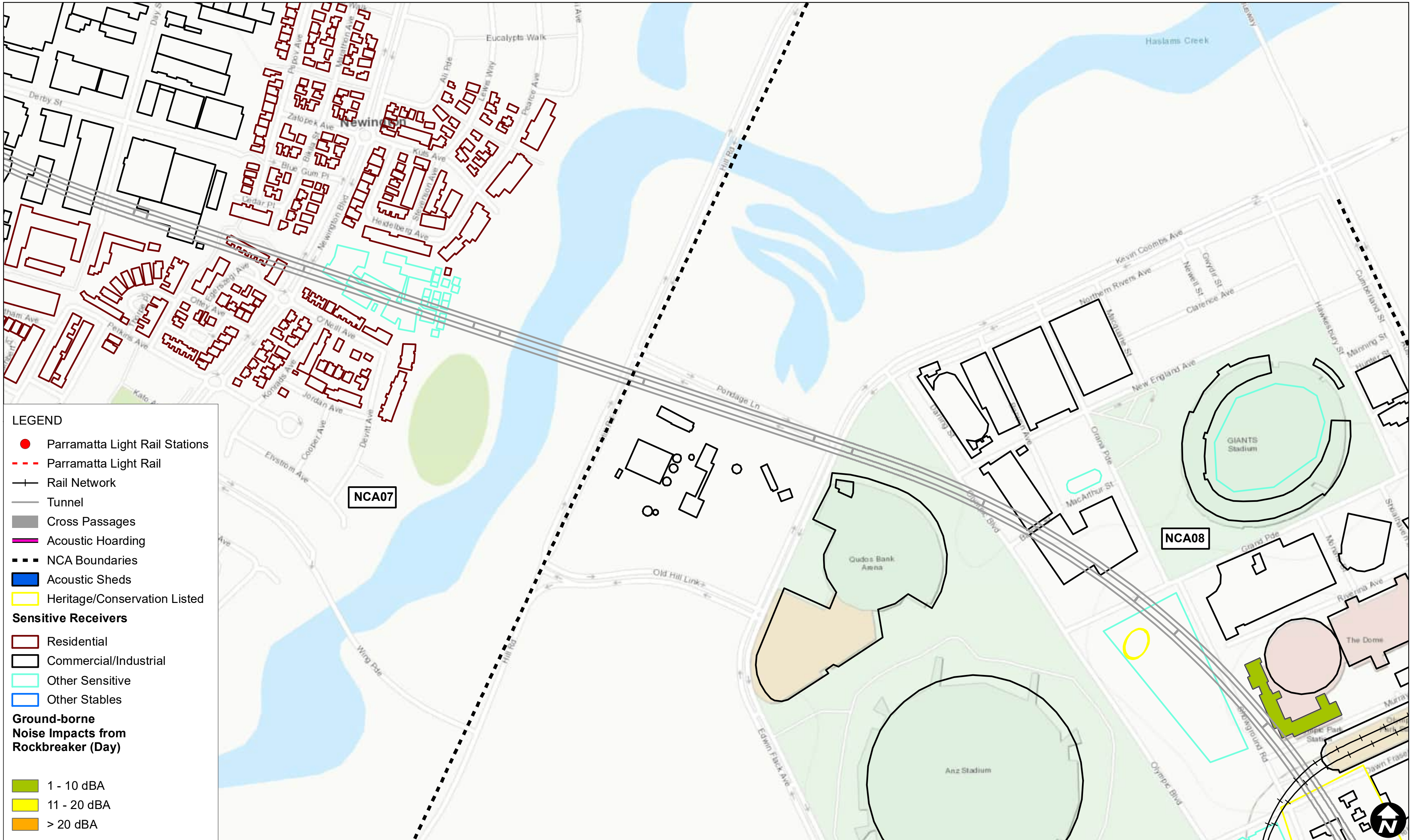
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Rockbreaker (Day)

FIGURE D-47

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Rockbreaker_Day_01.mxd



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Cross Passages
- Acoustic Hoarding
- NCA Boundaries
- Acoustic Sheds
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Ground-borne Noise Impacts from Rockbreaker (Day)

- 1 - 10 dBA
- 11 - 20 dBA
- > 20 dBA

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

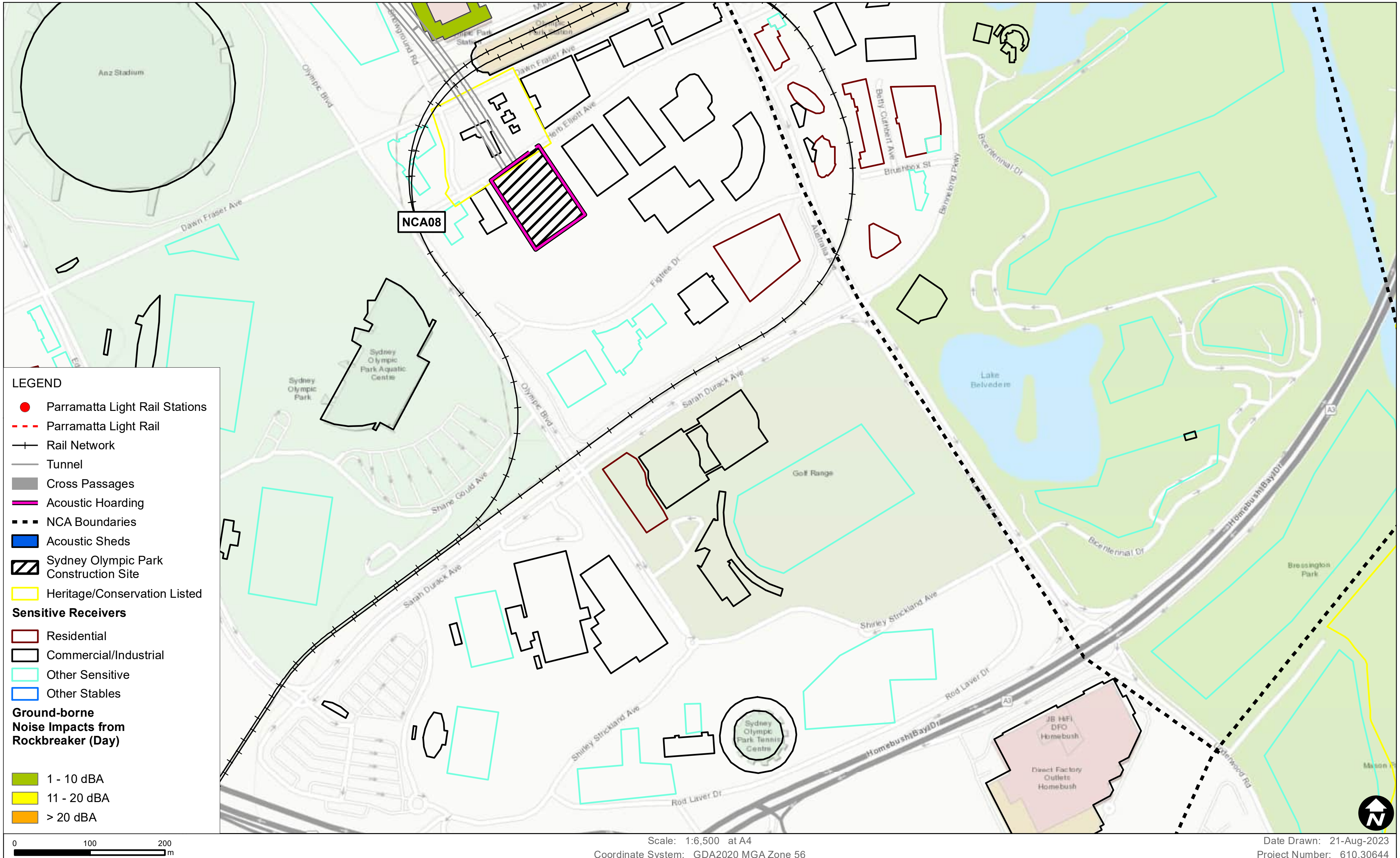
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Rockbreaker (Day)

FIGURE D-48

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Rockbreaker_Day_01.mxd



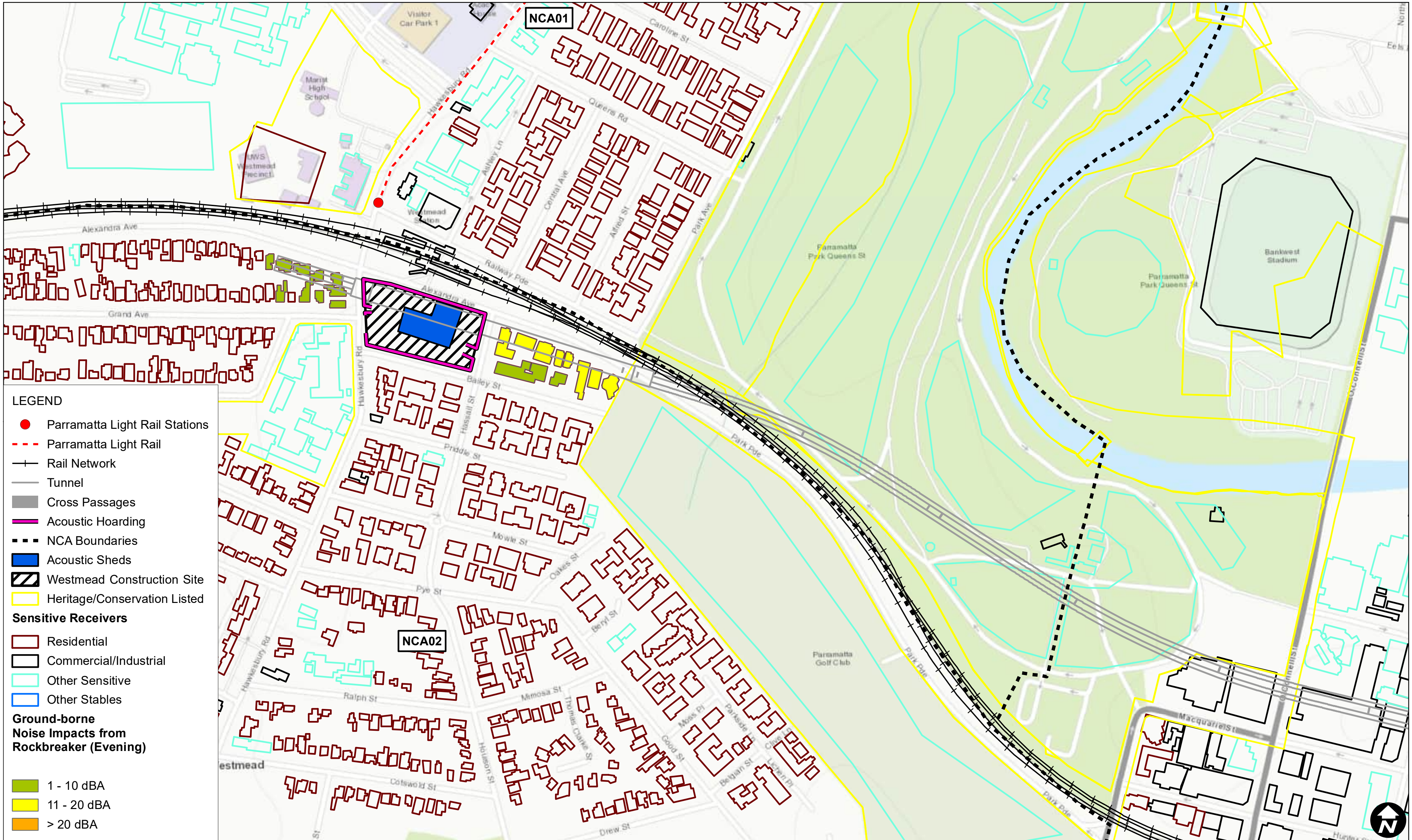
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Rockbreaker (Day)

FIGURE D-49



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Cross Passages
- Acoustic Hoarding
- NCA Boundaries
- Acoustic Sheds
- Westmead Construction Site
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Ground-borne Noise Impacts from Rockbreaker (Evening)

- 1 - 10 dBA
- 11 - 20 dBA
- > 20 dBA

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

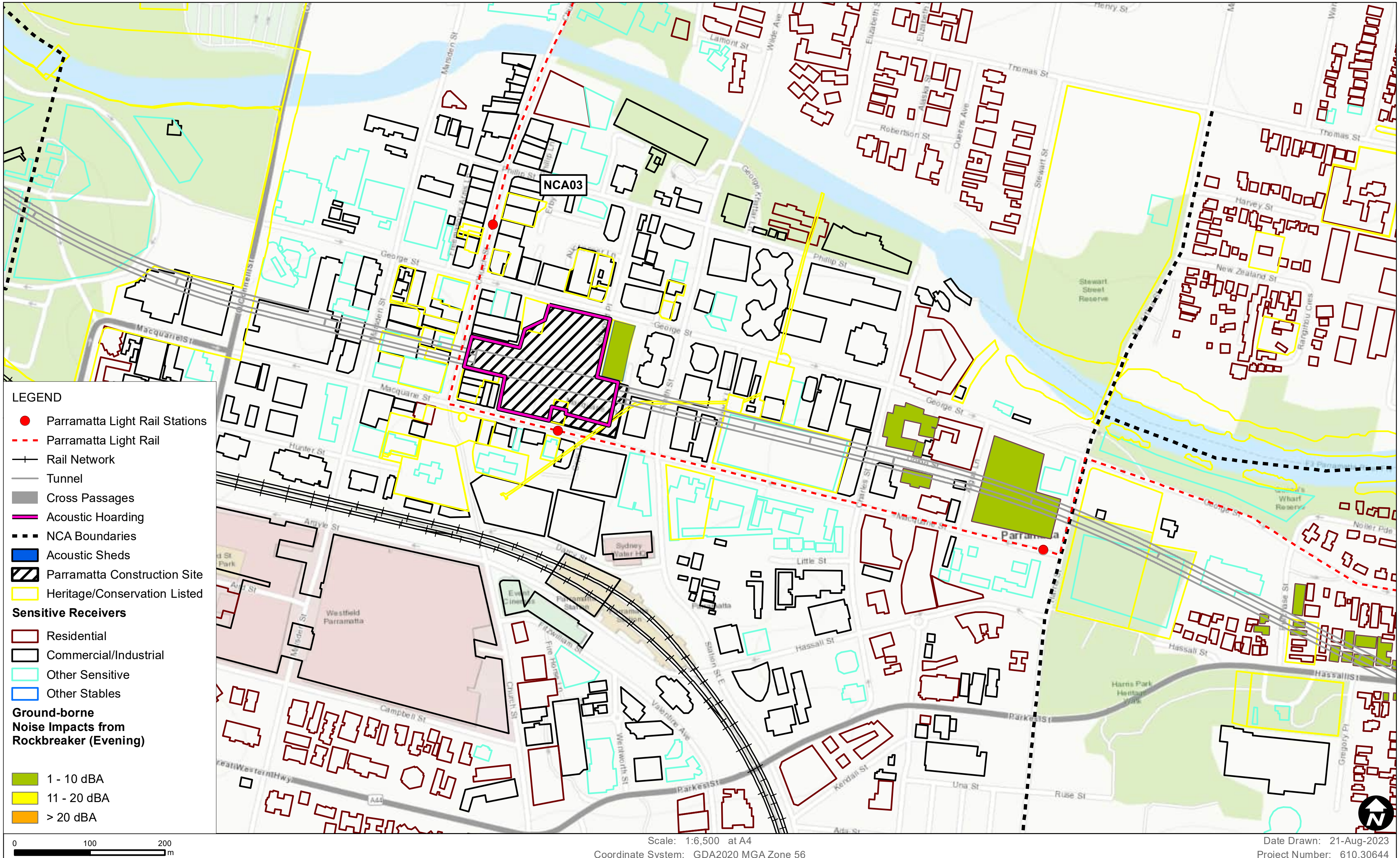
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Rockbreaker (Evening)

FIGURE D-50

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Rockbreaker_Evening_01.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

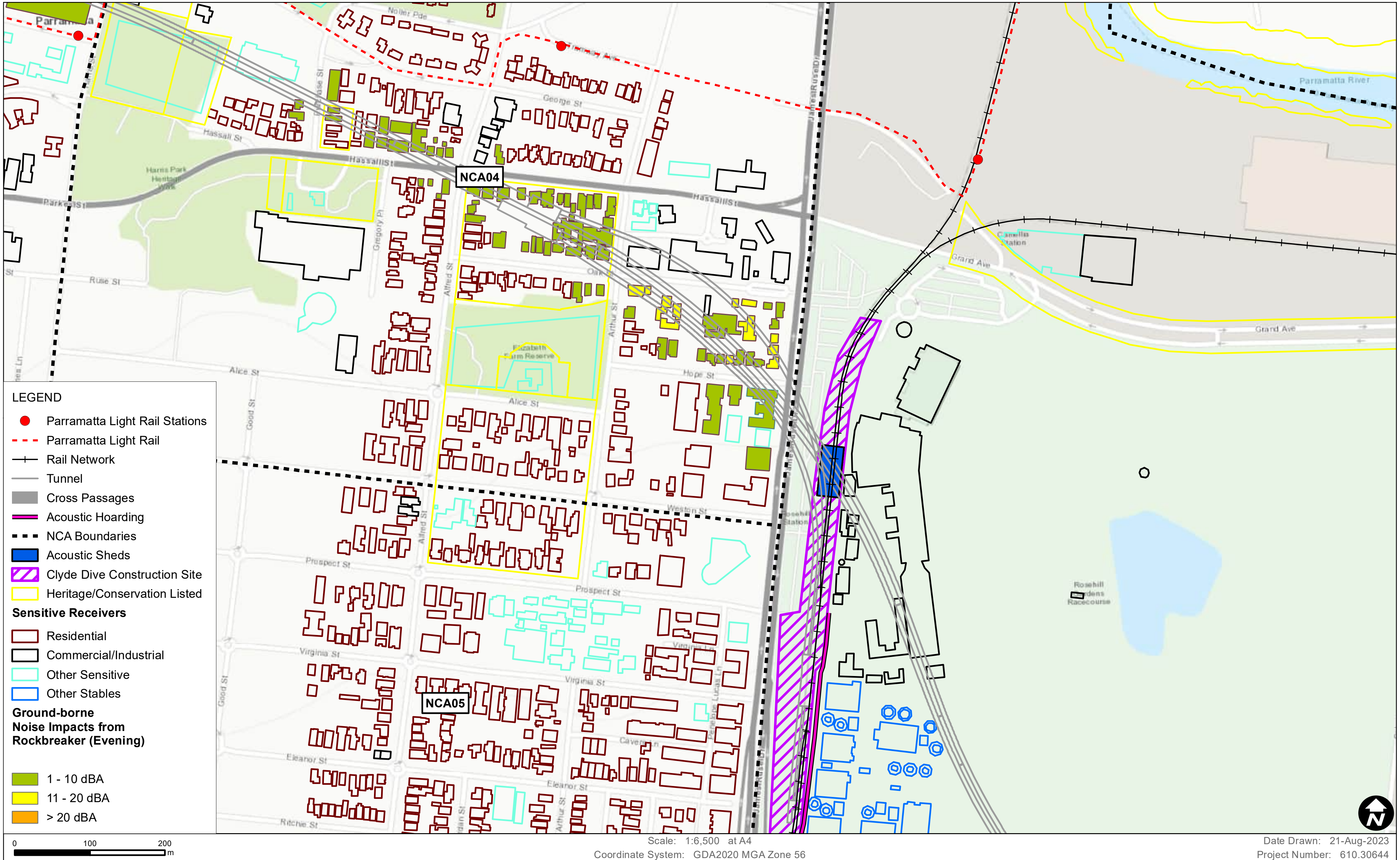
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Rockbreaker (Evening)

FIGURE D-51



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

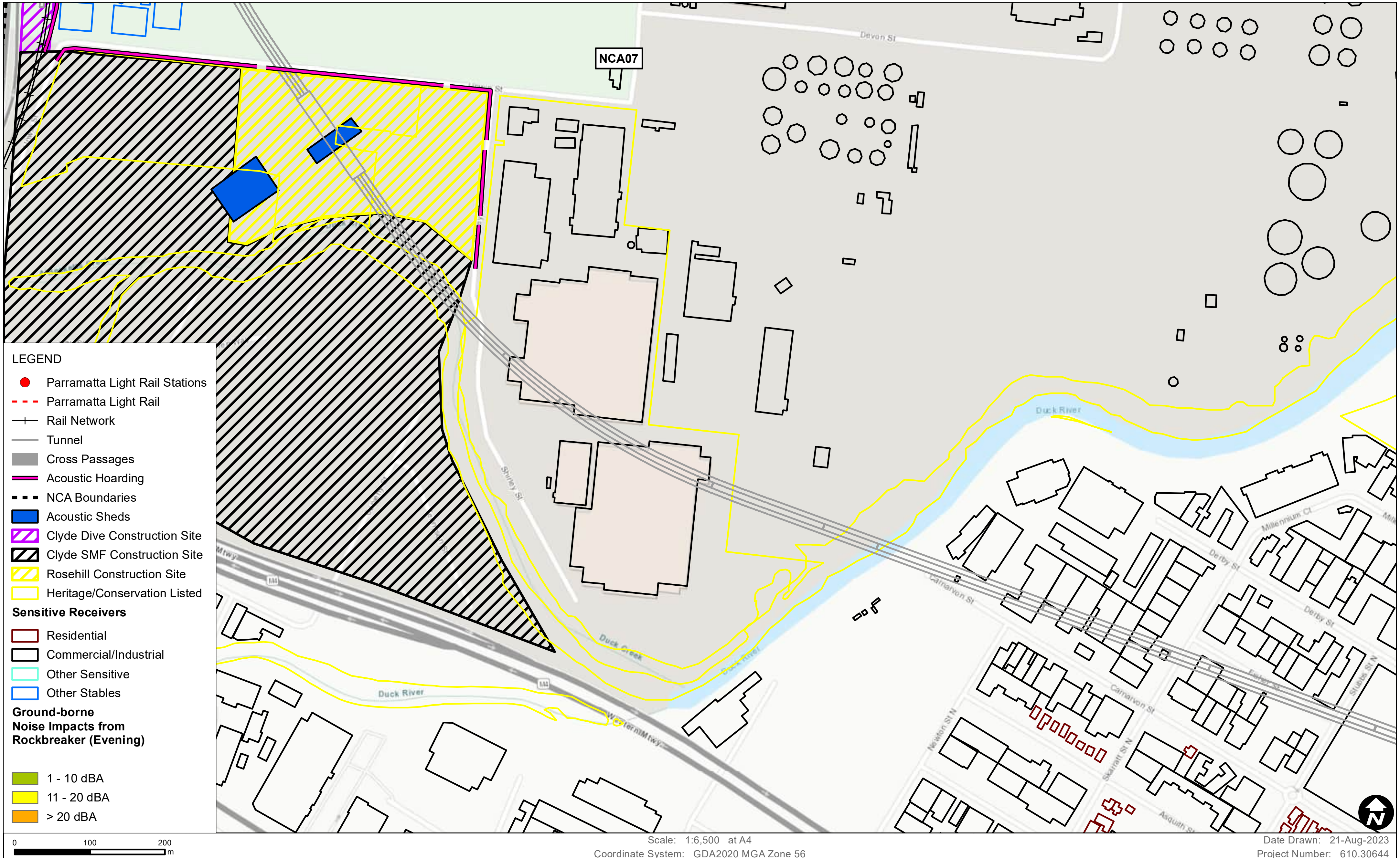
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Rockbreaker (Evening)

FIGURE D-52



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

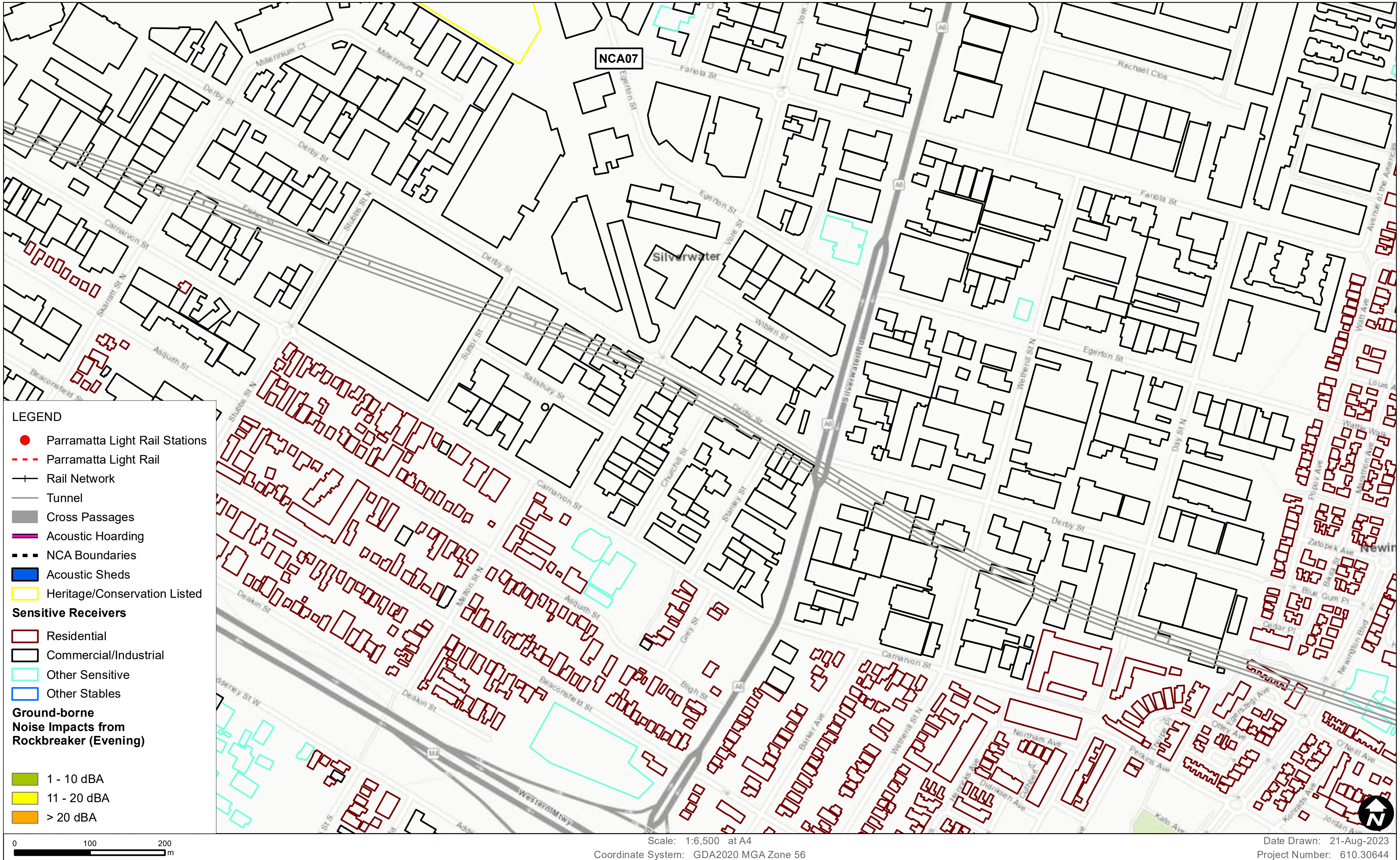
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Rockbreaker (Evening)

FIGURE D-53



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

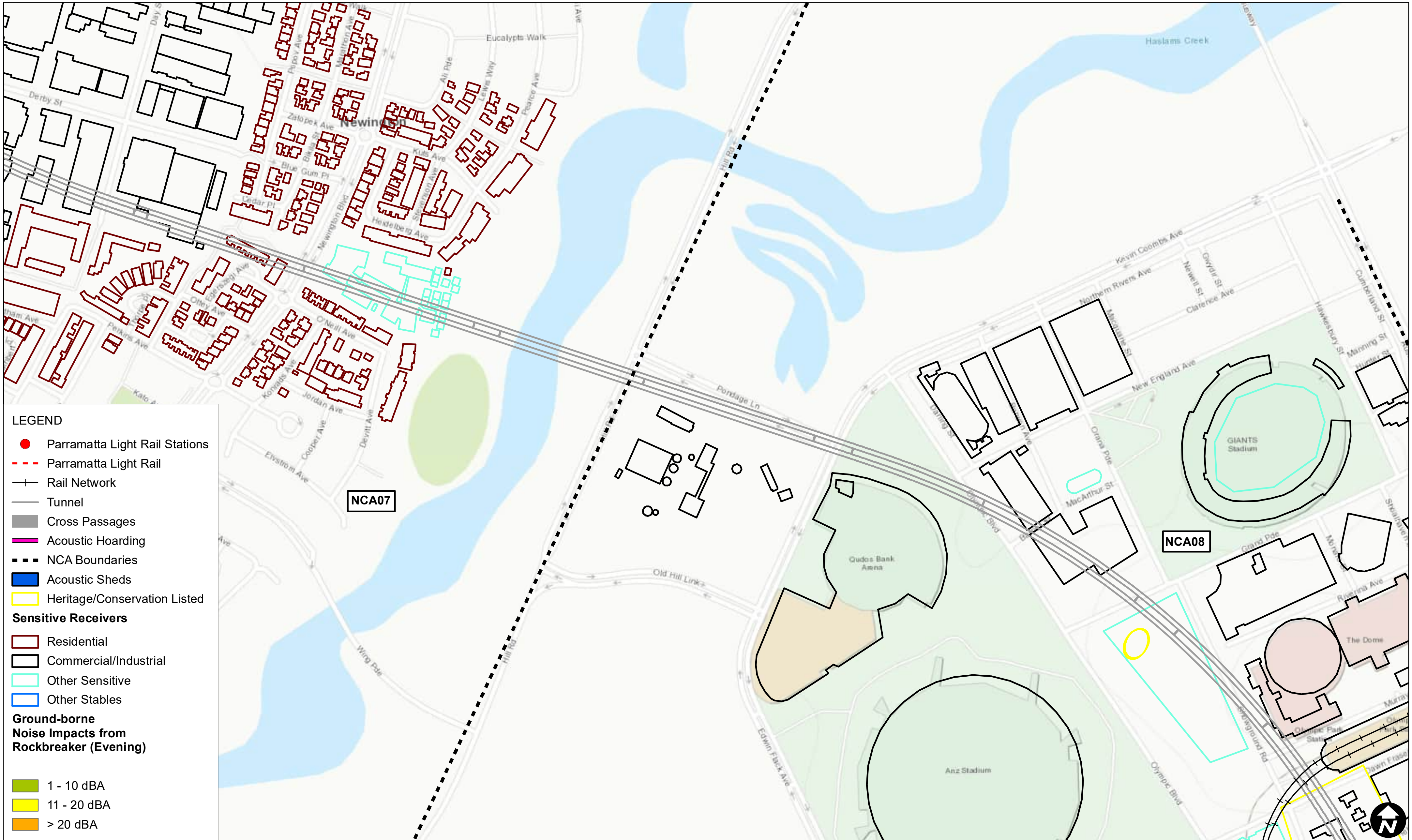
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Rockbreaker (Evening)

FIGURE D-54

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Rockbreaker_Evening_01.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

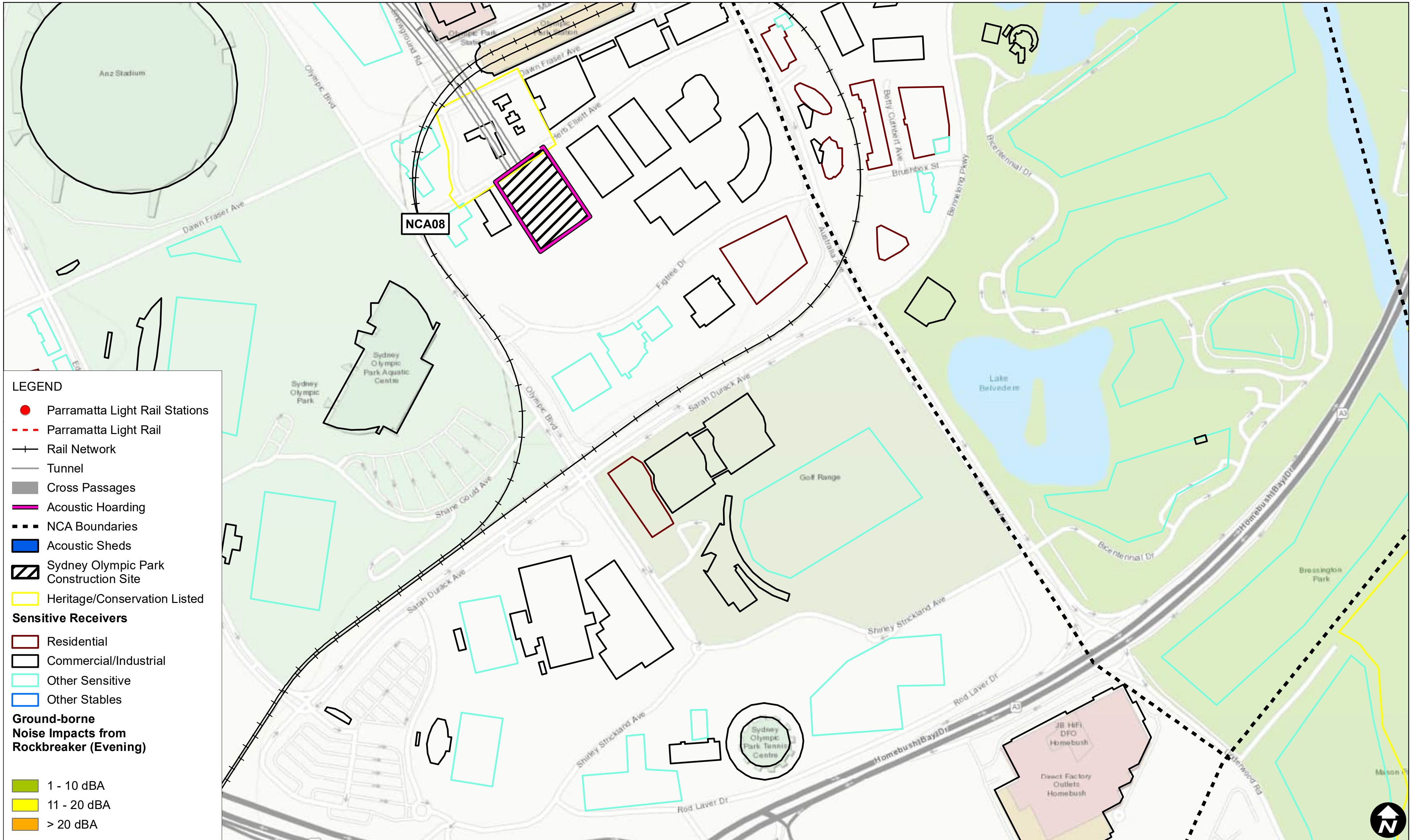
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Rockbreaker (Evening)

FIGURE D-55

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Rockbreaker_Evening_01.mxd



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Cross Passages
- Acoustic Hoarding
- NCA Boundaries
- Acoustic Sheds
- Sydney Olympic Park Construction Site
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Ground-borne Noise Impacts from Rockbreaker (Evening)

- 1 - 10 dBA
- 11 - 20 dBA
- > 20 dBA

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

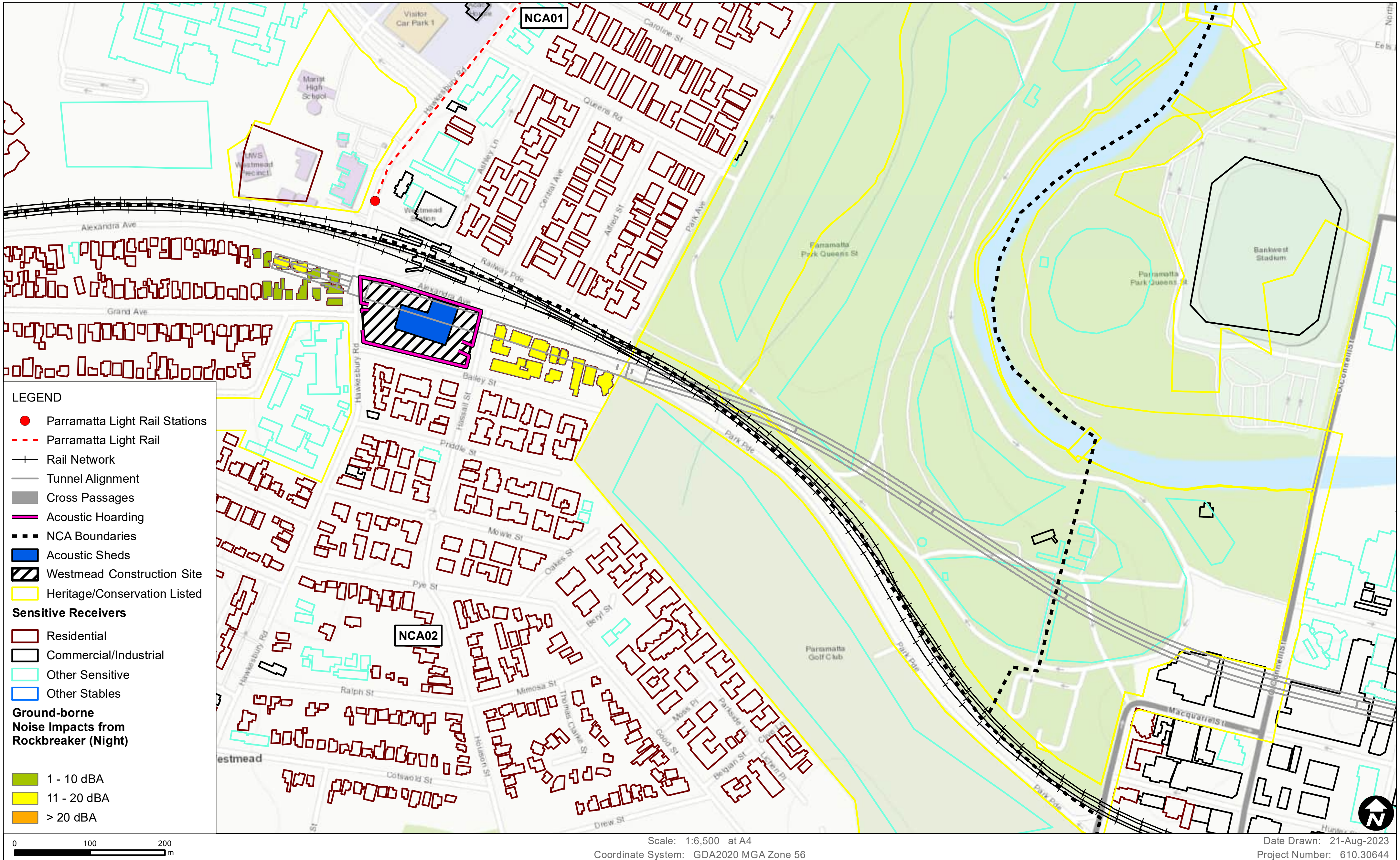
Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Rockbreaker (Evening)

FIGURE D-56

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Rockbreaker_Evening_01.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

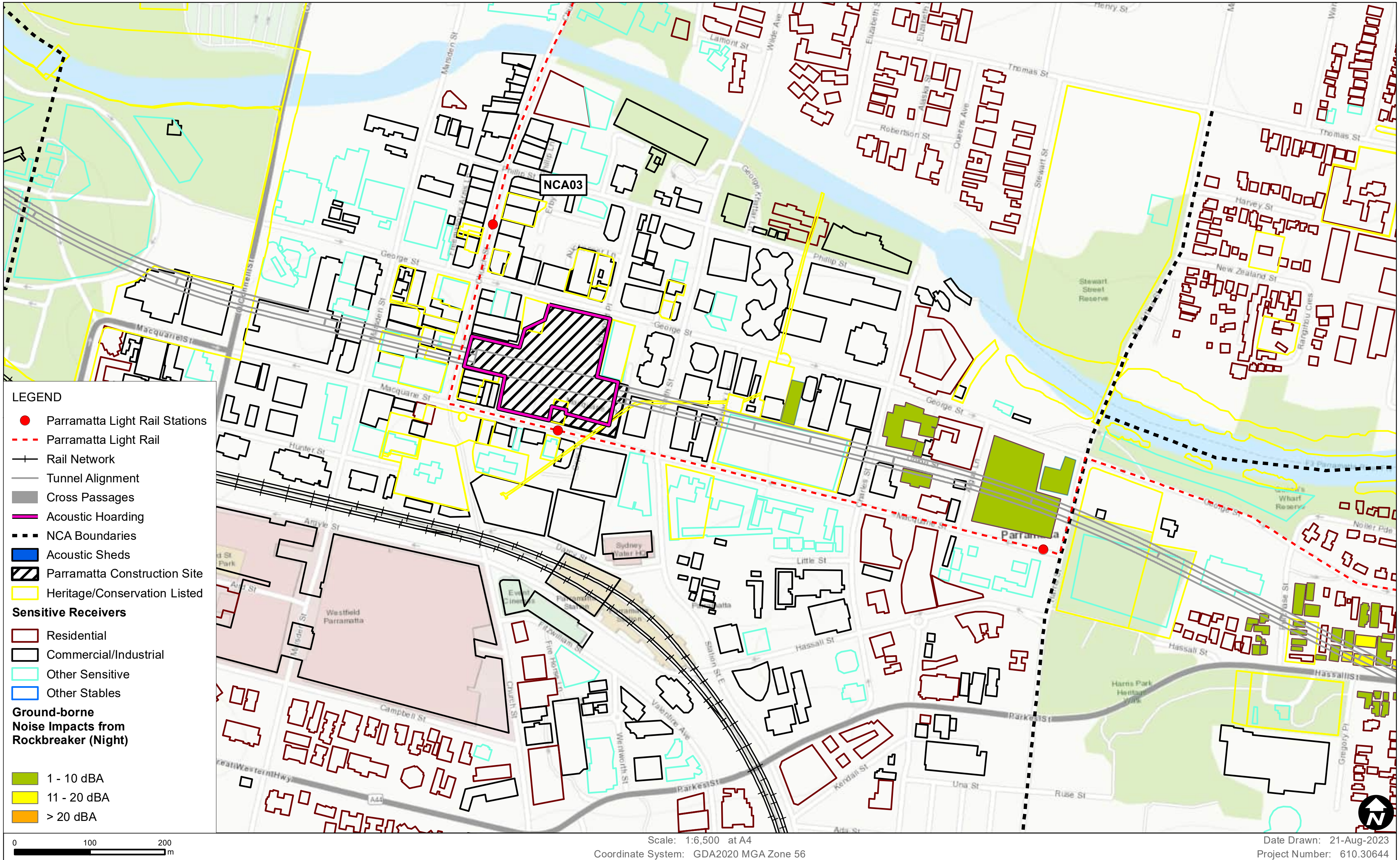
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Ground-borne Noise Impacts from Rockbreaker (Night)

FIGURE D-57



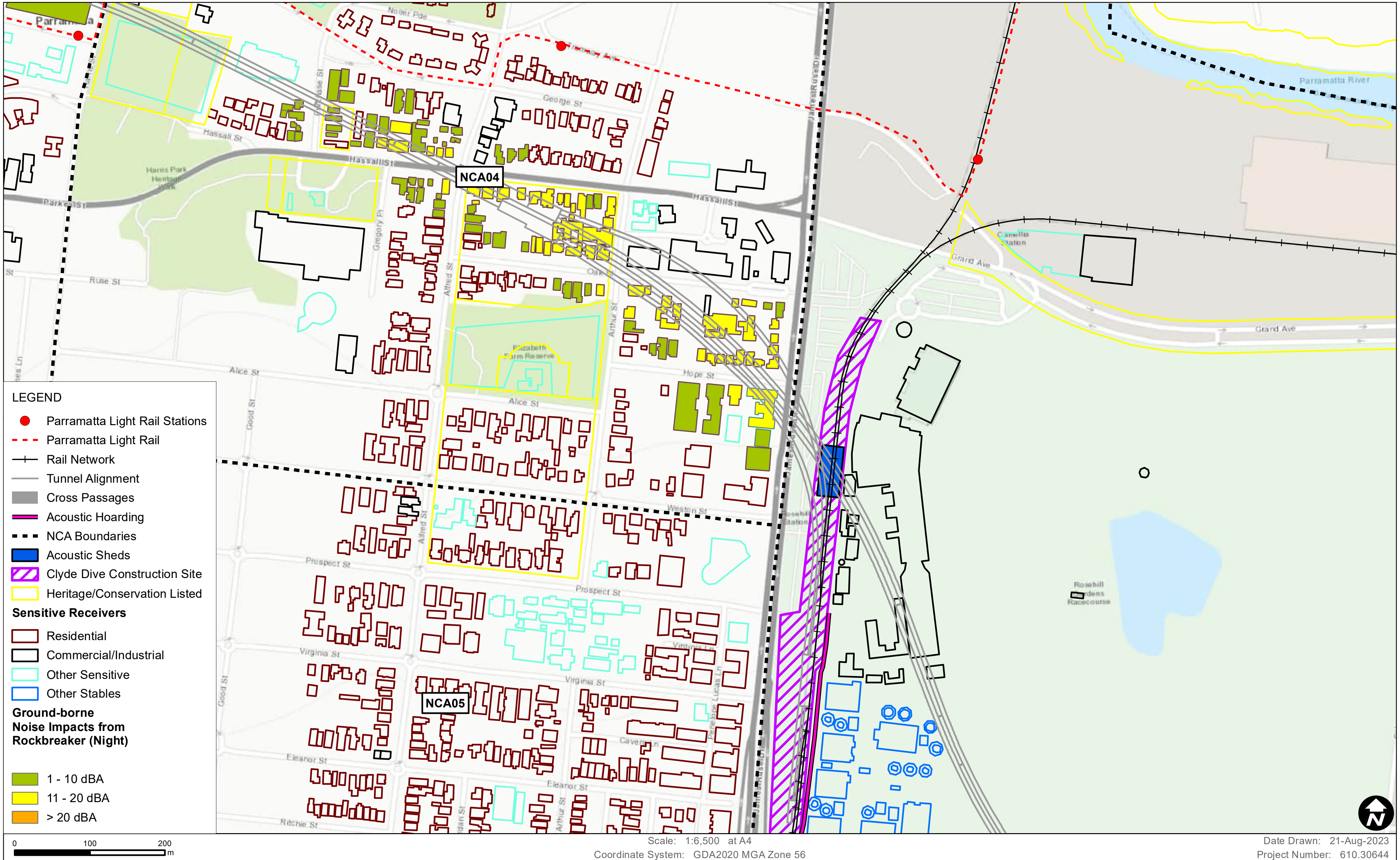
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Rockbreaker (Night)

FIGURE D-58



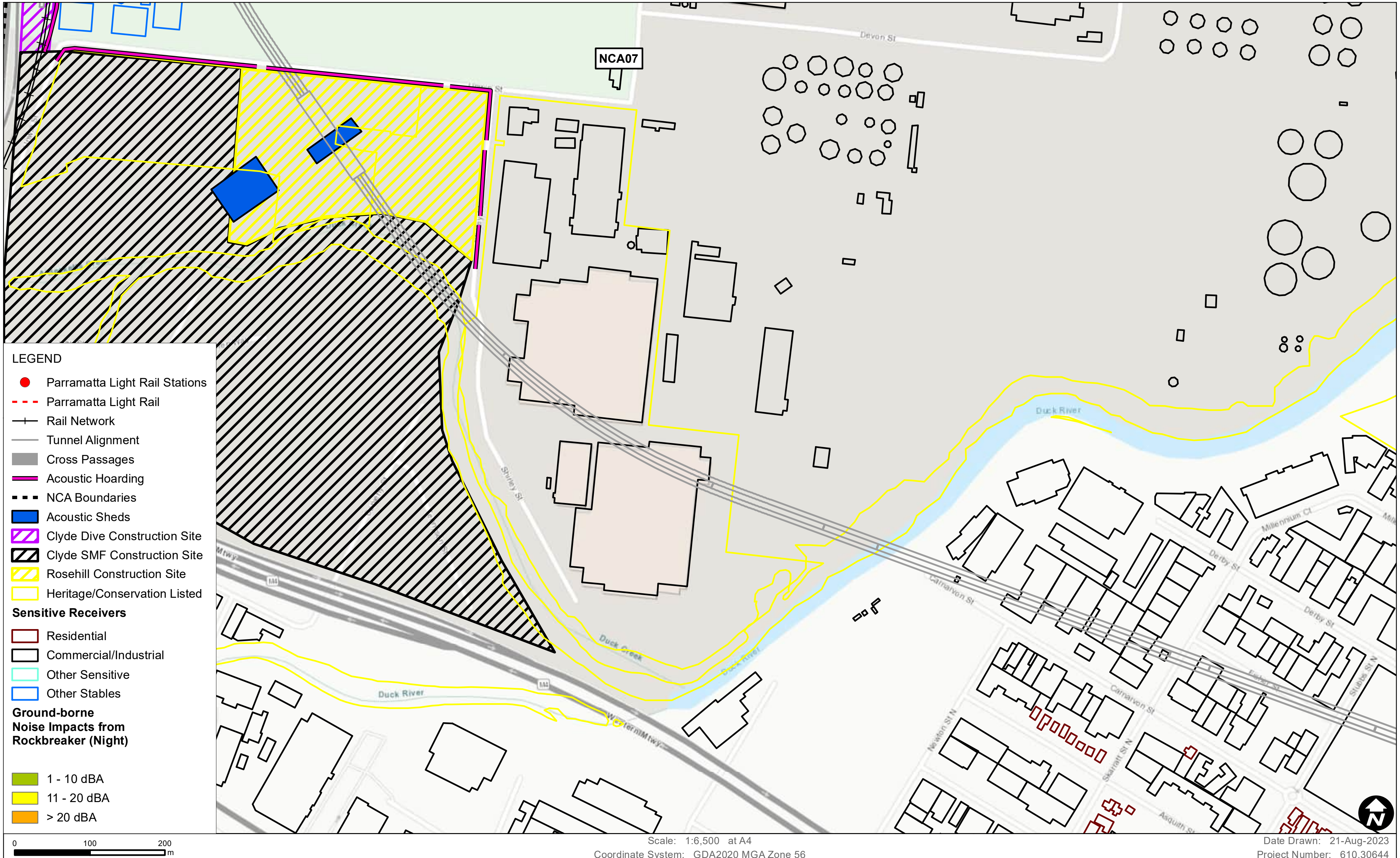
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Rockbreaker (Night)

FIGURE D-59



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

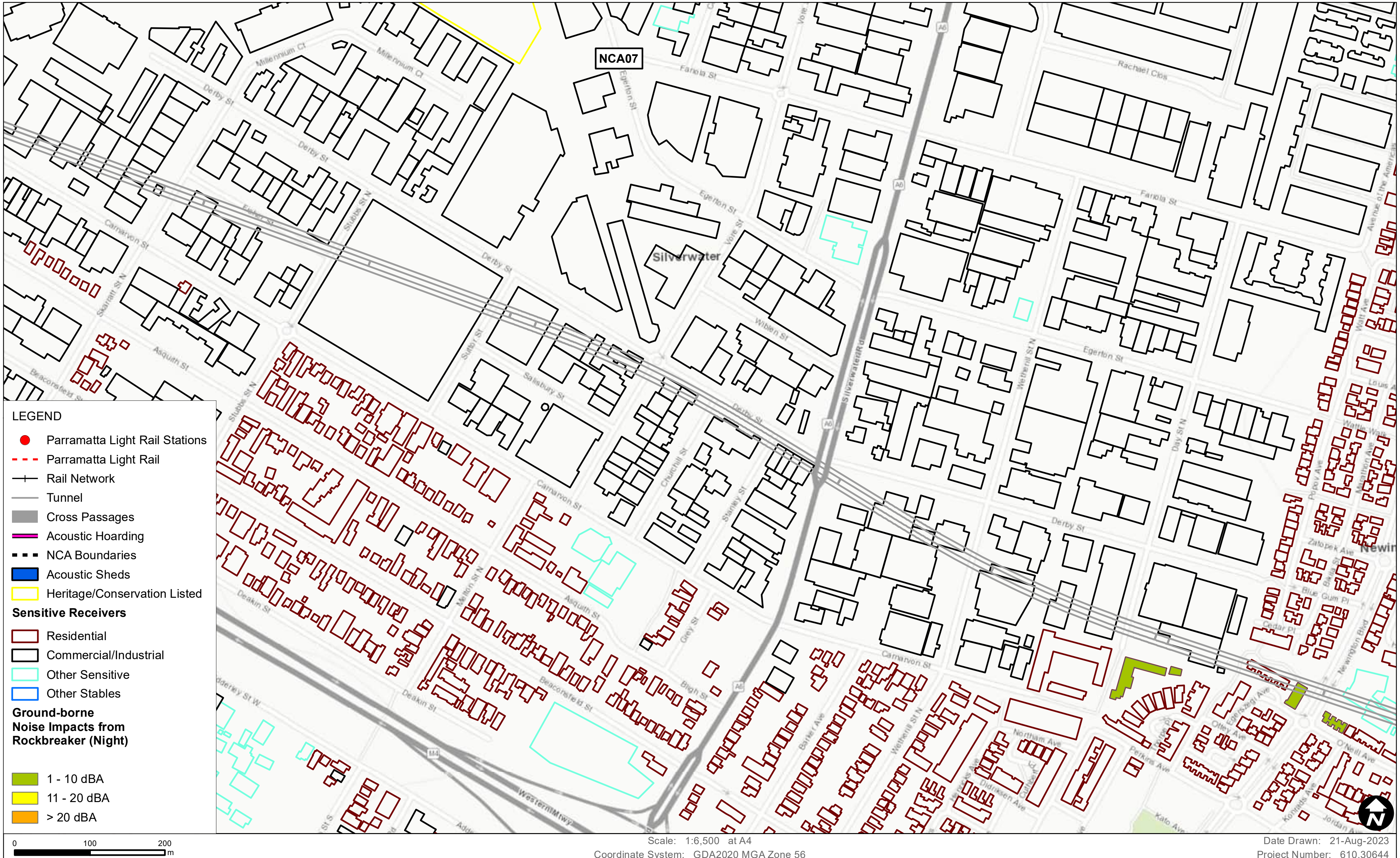
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Rockbreaker (Night)

FIGURE D-60

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Rockbreaker_Night_01.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

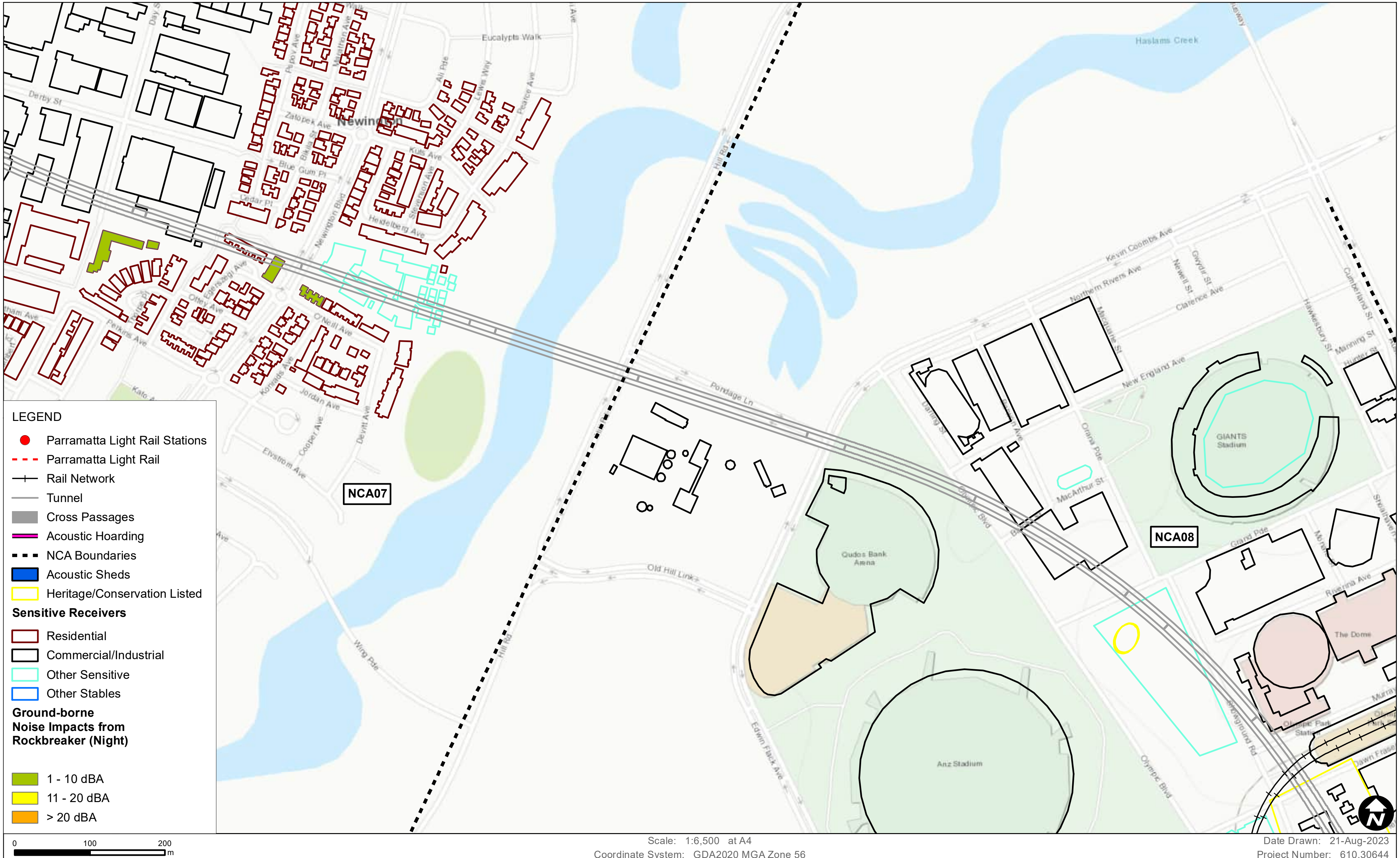
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Rockbreaker (Night)

FIGURE D-61

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Worst_case_Ground_borne_Noise_Impacts_from_Rockbreaker_Night_01.mxd



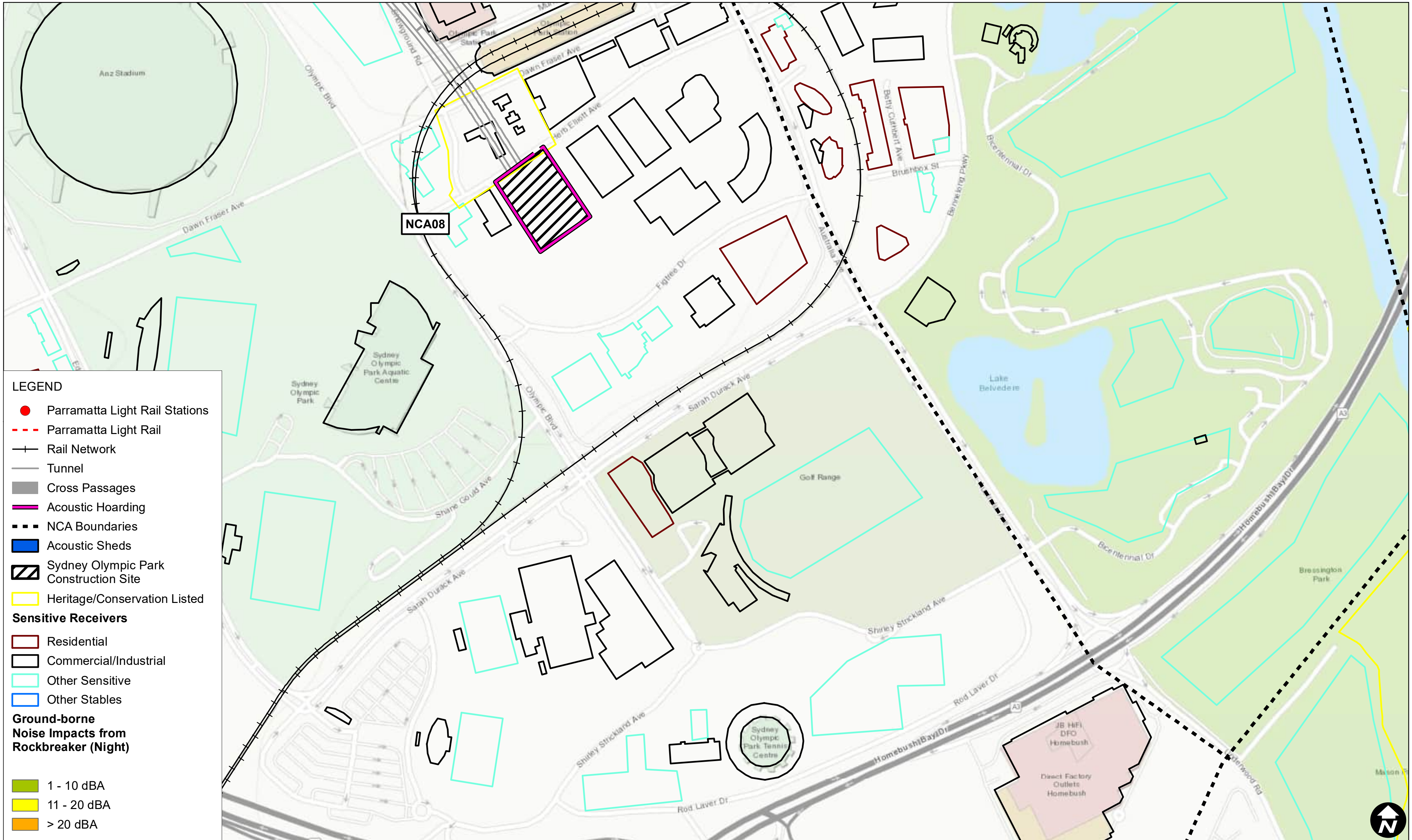
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Rockbreaker (Night)

FIGURE D-62



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Cross Passages
- Acoustic Hoarding
- NCA Boundaries
- Acoustic Sheds
- Sydney Olympic Park Construction Site
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Ground-borne Noise Impacts from Rockbreaker (Night)

- 1 - 10 dBA
- 11 - 20 dBA
- > 20 dBA

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

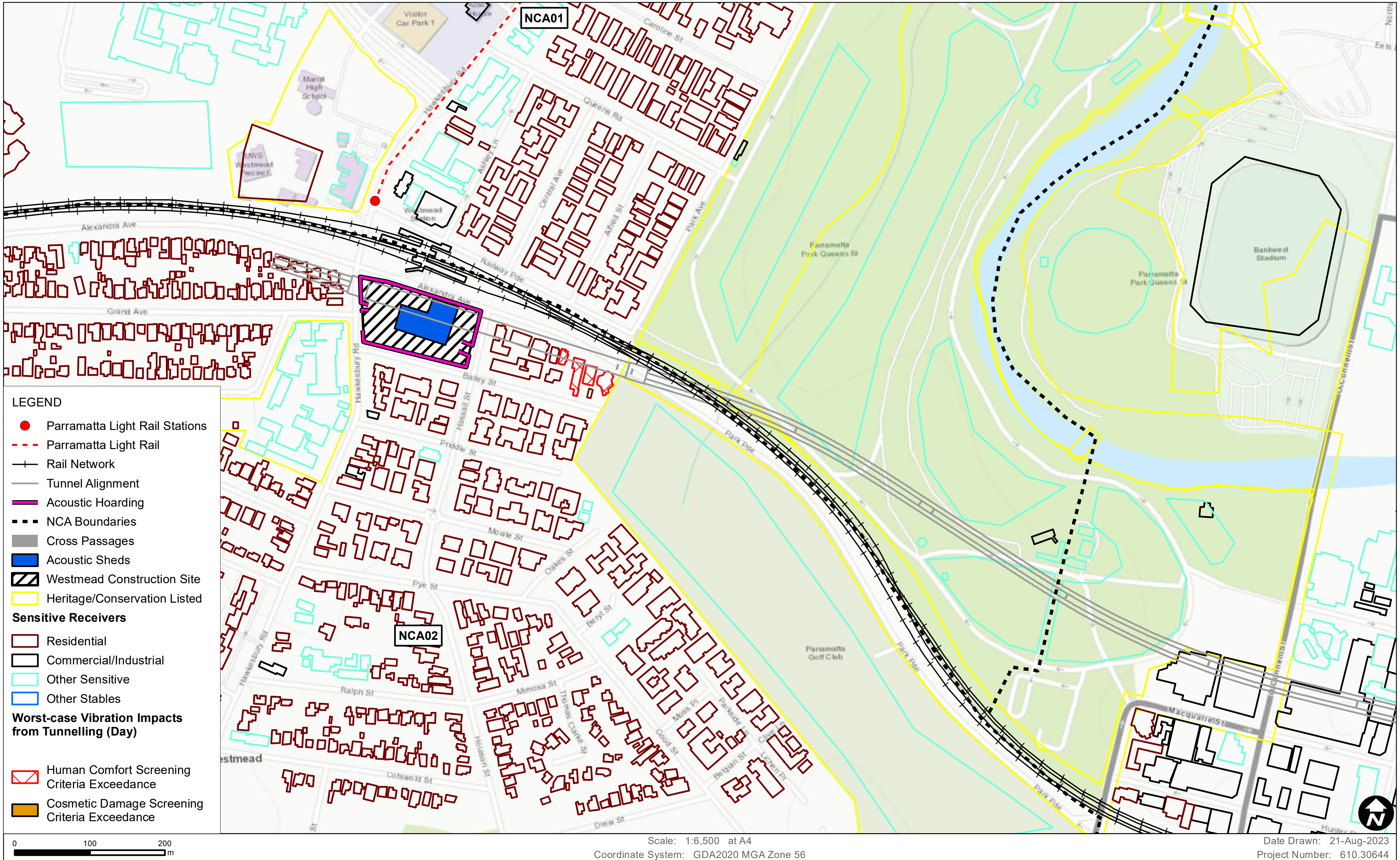
Data Source:
ESRI Topographic

Ground-borne Noise Impacts from Rockbreaker (Night)

FIGURE D-63

APPENDIX E

Tunnelling Vibration Impact Maps



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

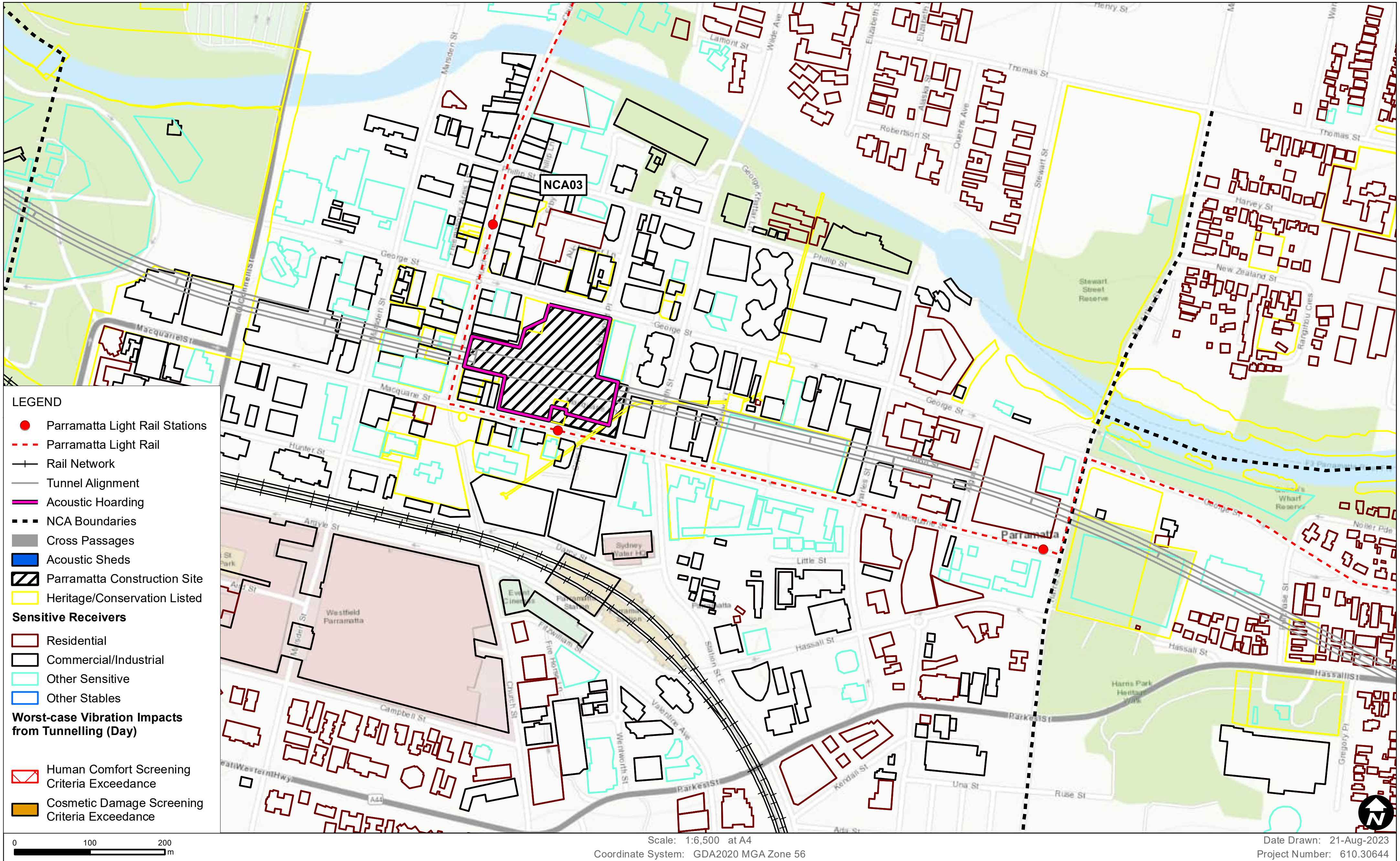
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from TBMs (Day)

FIGURE E-1



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

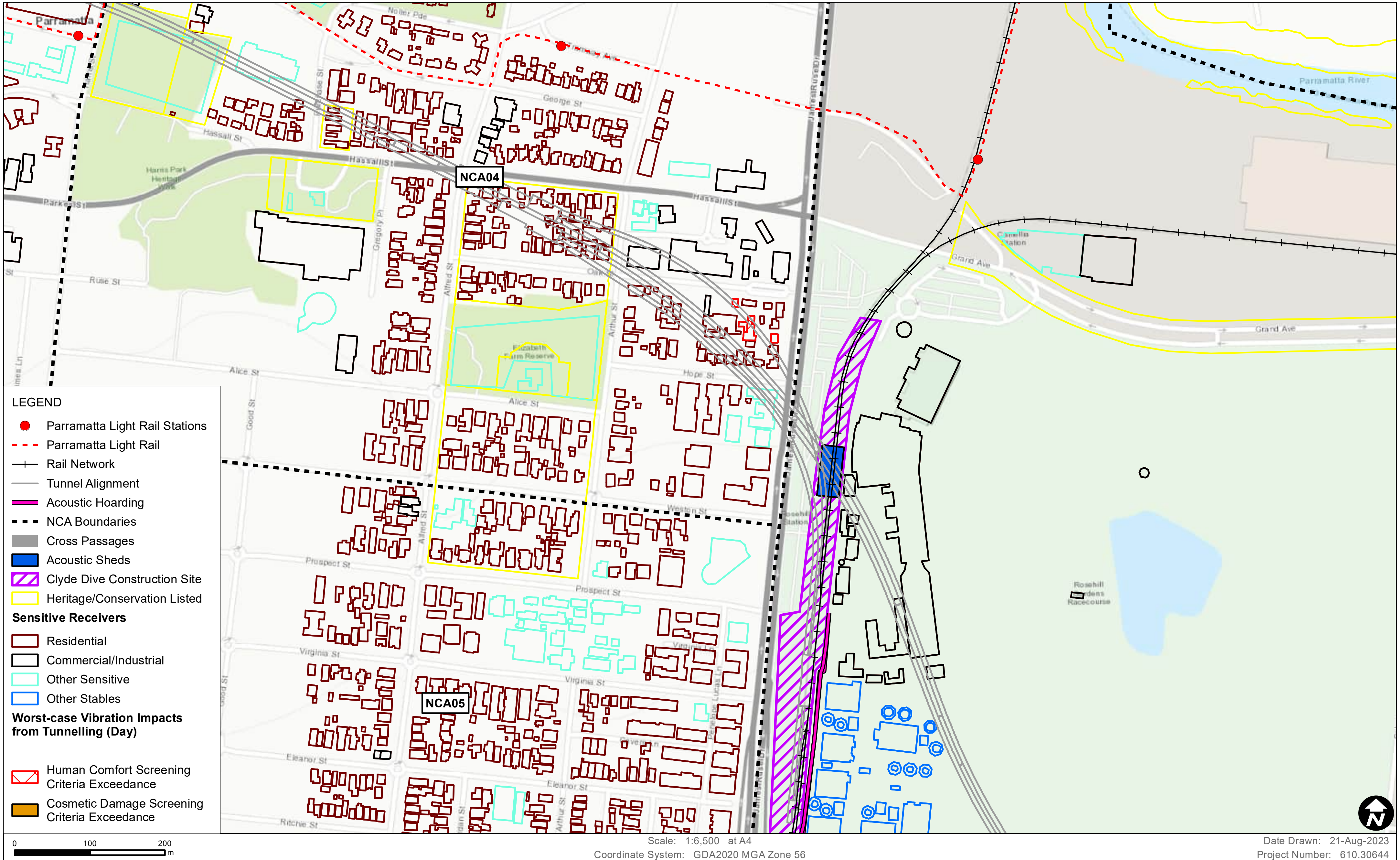
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from TBMs (Day)

FIGURE E-2



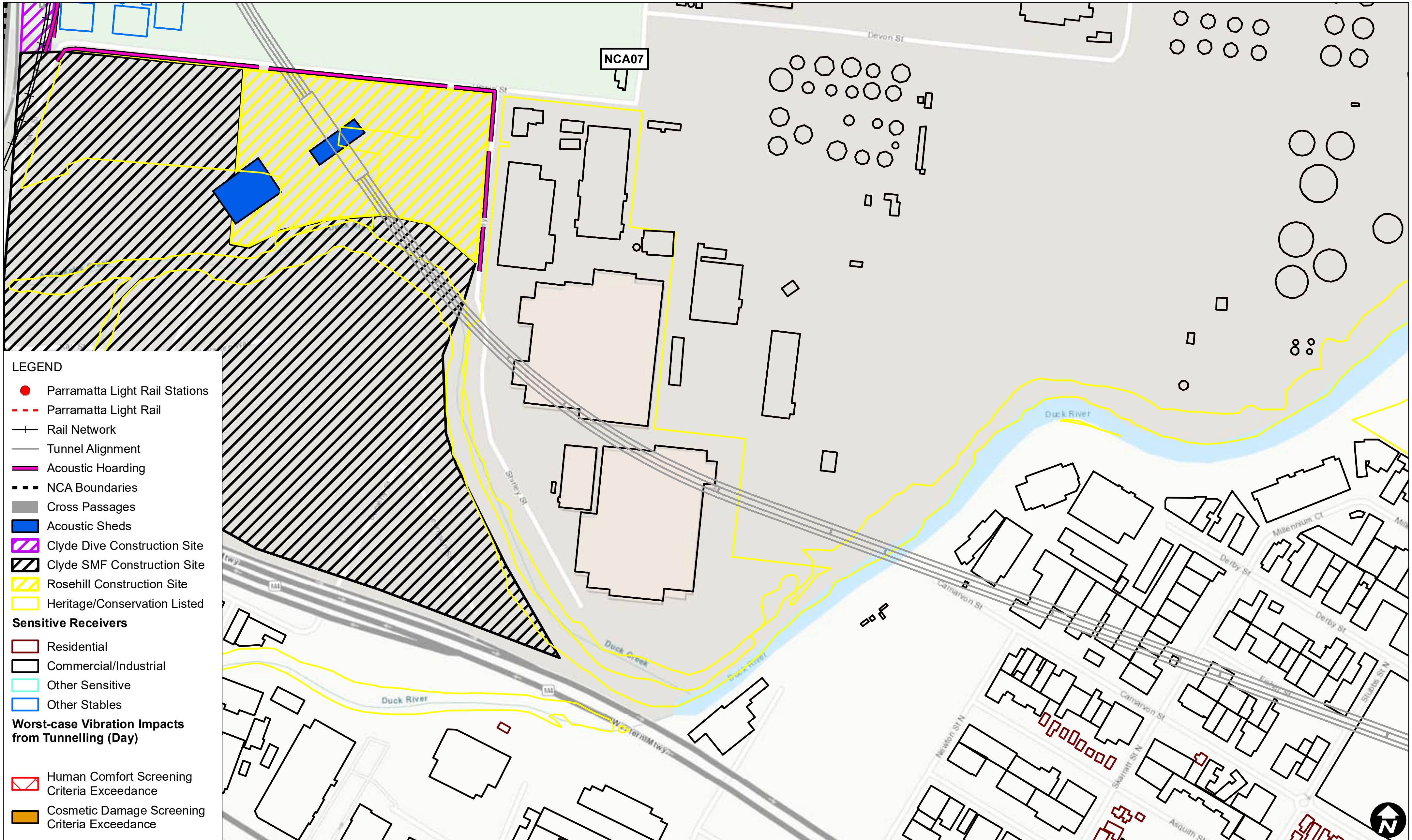
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from TBMs (Day)

FIGURE E-3



0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

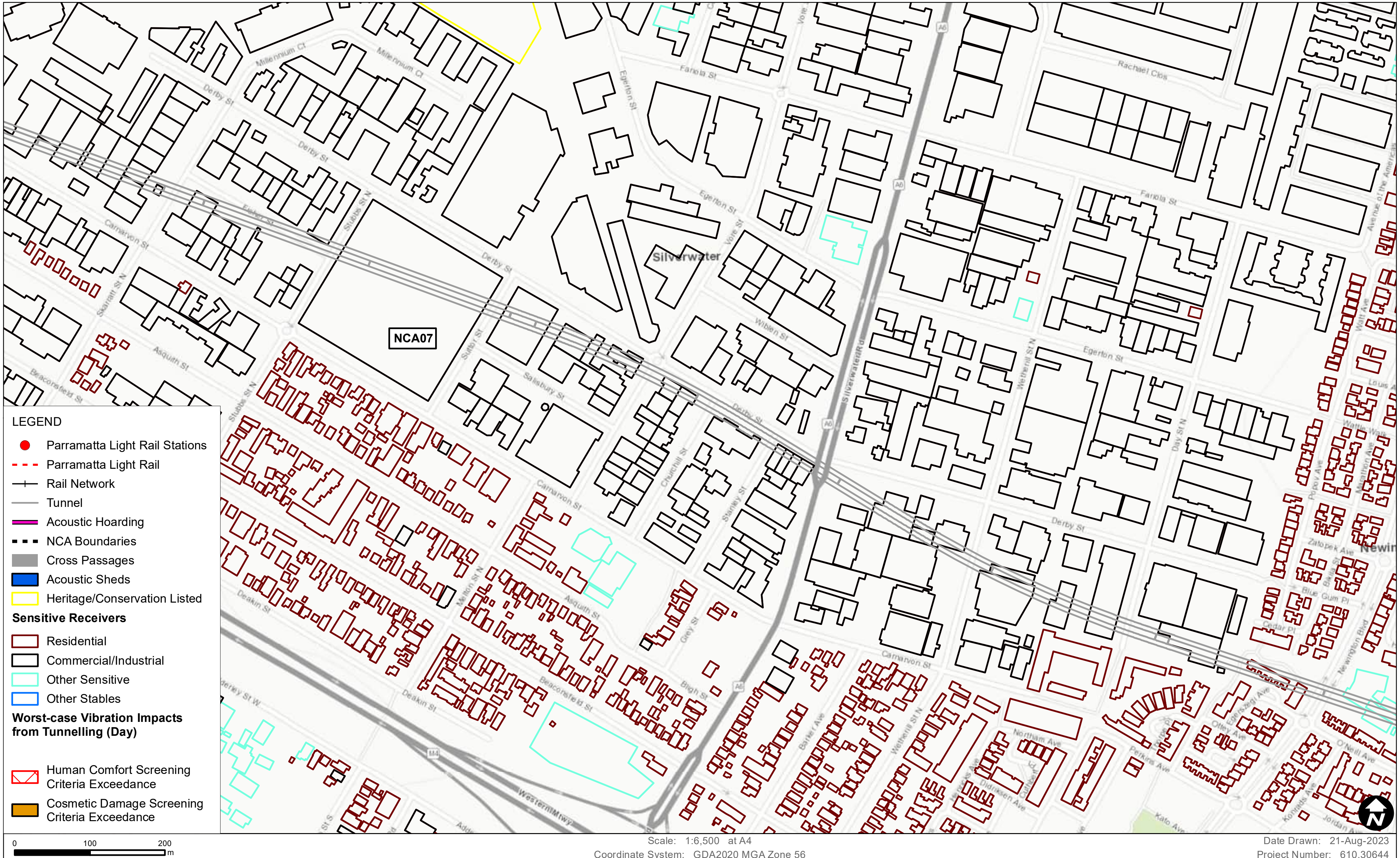
SLR

Data Source:
ESRI Topographic

Predicted Vibration Impacts from TBMs (Day)

FIGURE E-4

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Tunnelling_Day_02.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

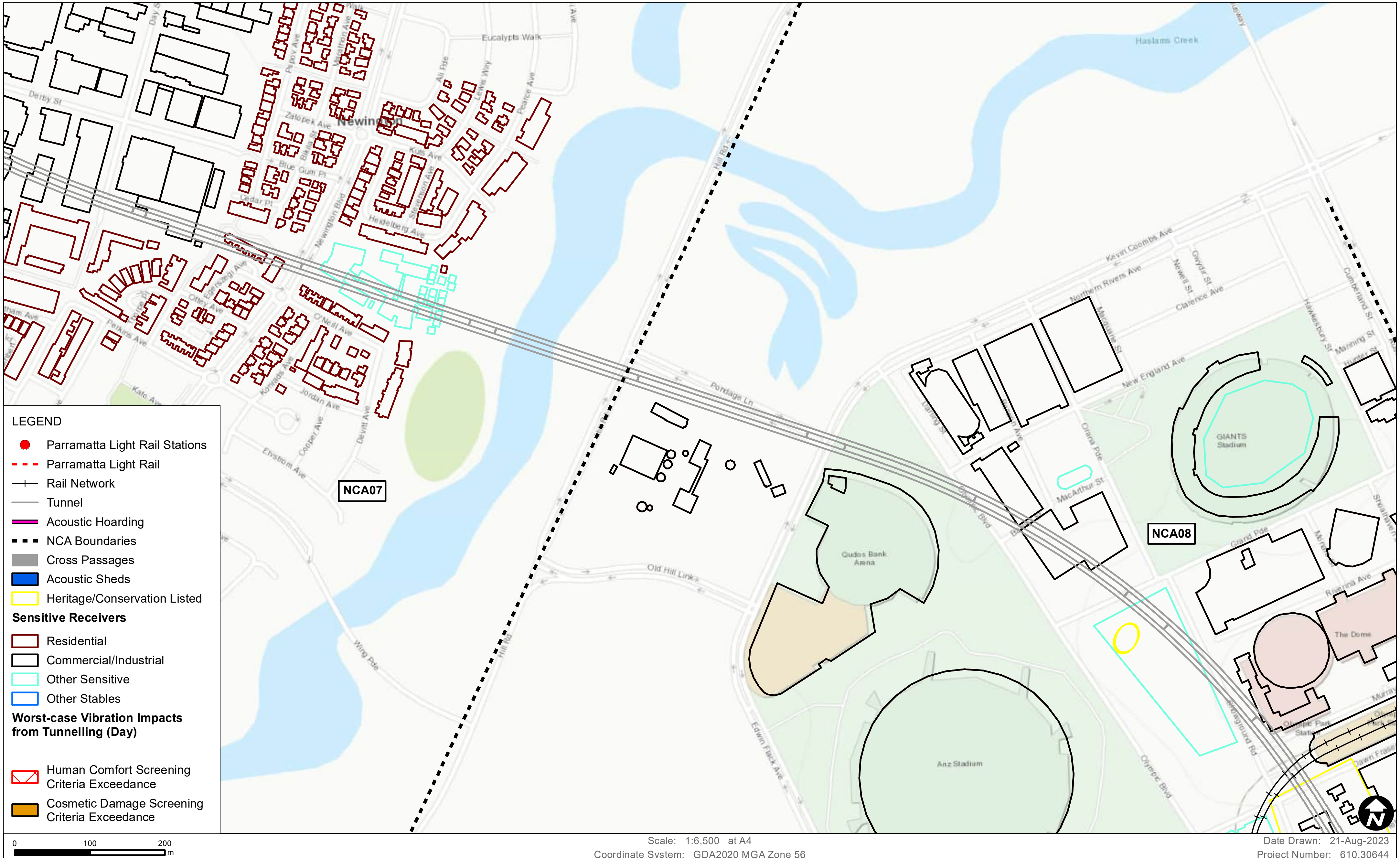
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from TBMs (Day)

FIGURE E-5

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Tunnelling_Day_02.mxd



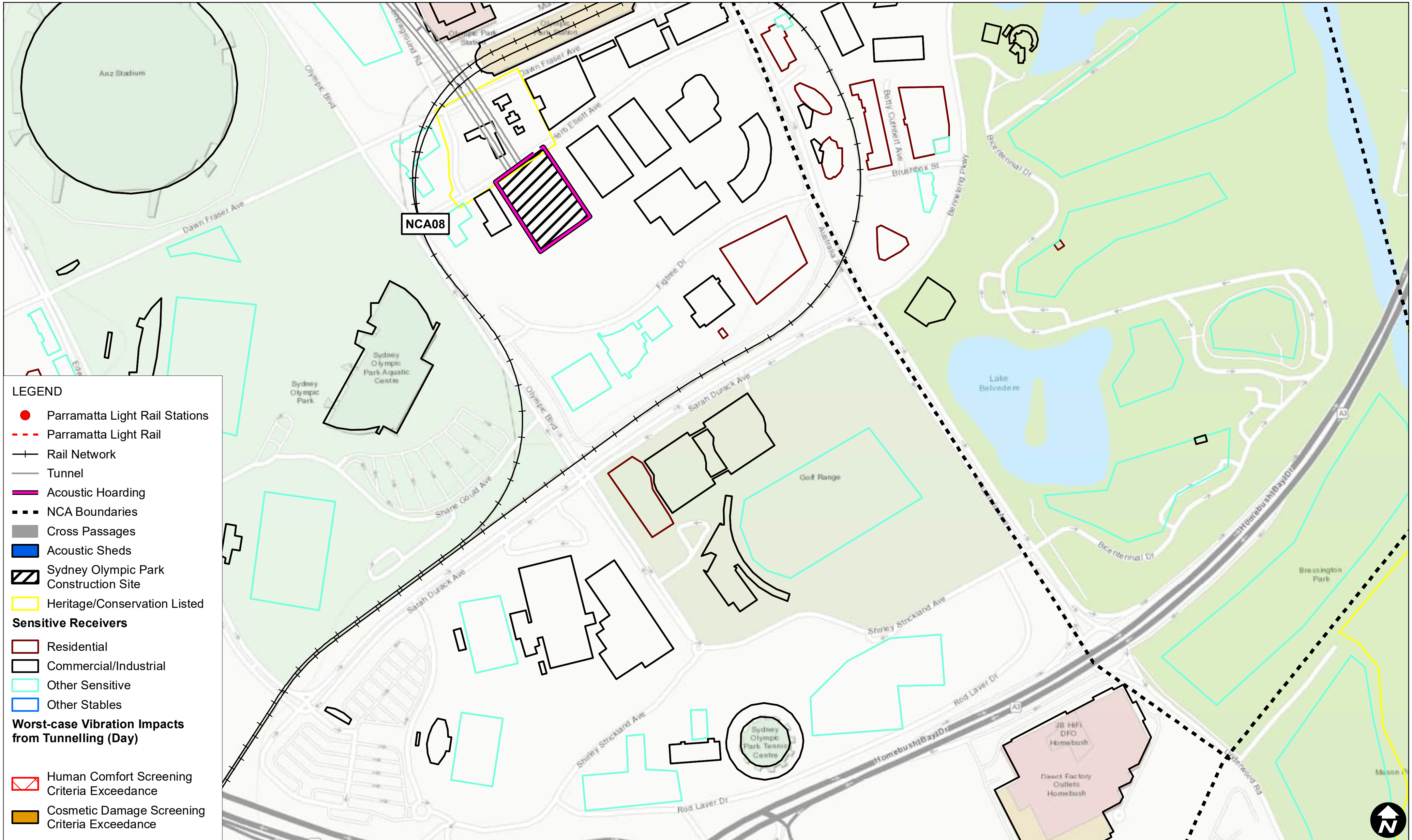
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from TBMs (Day)

FIGURE E-6



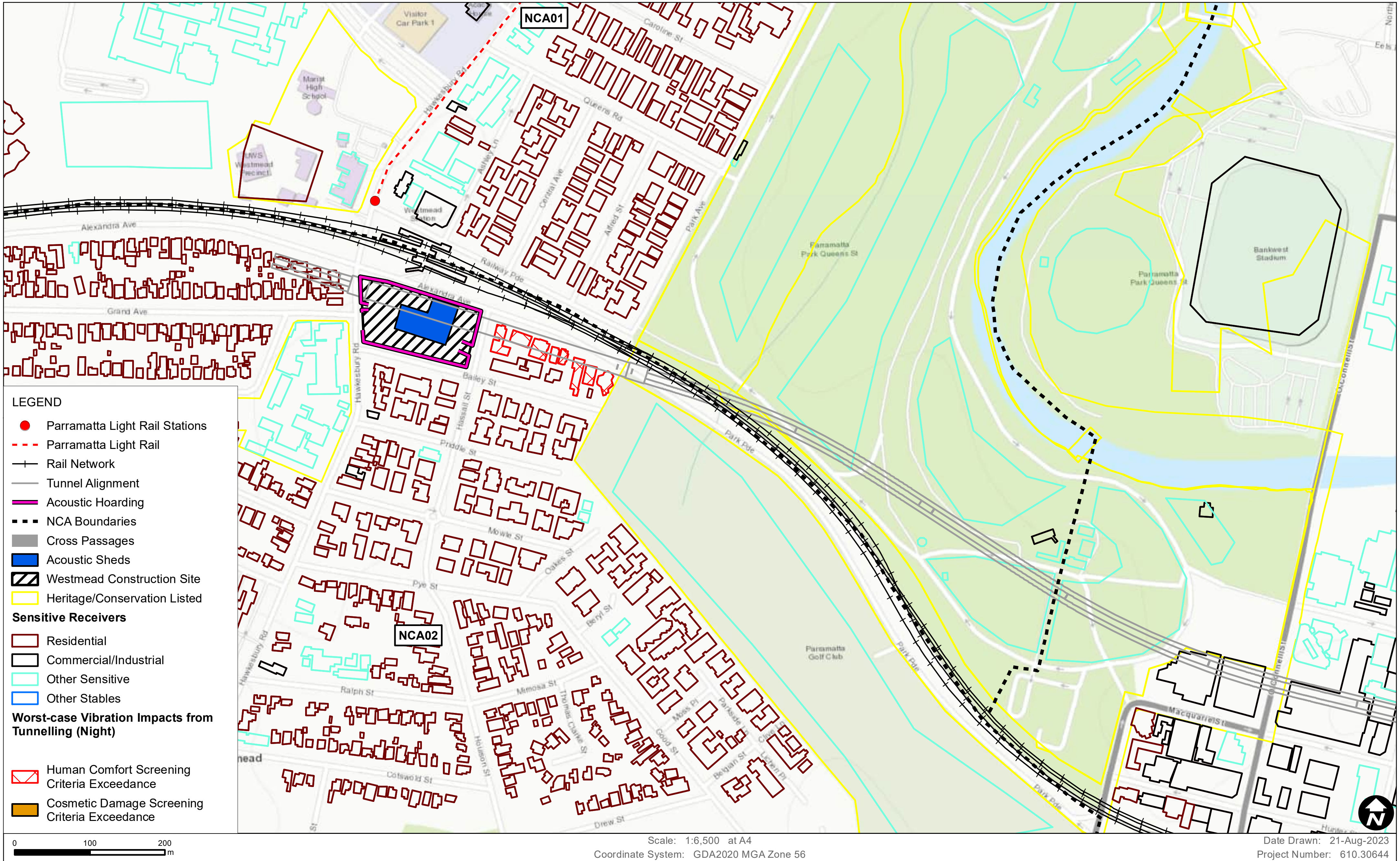
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from TBMs (Day)

FIGURE E-7



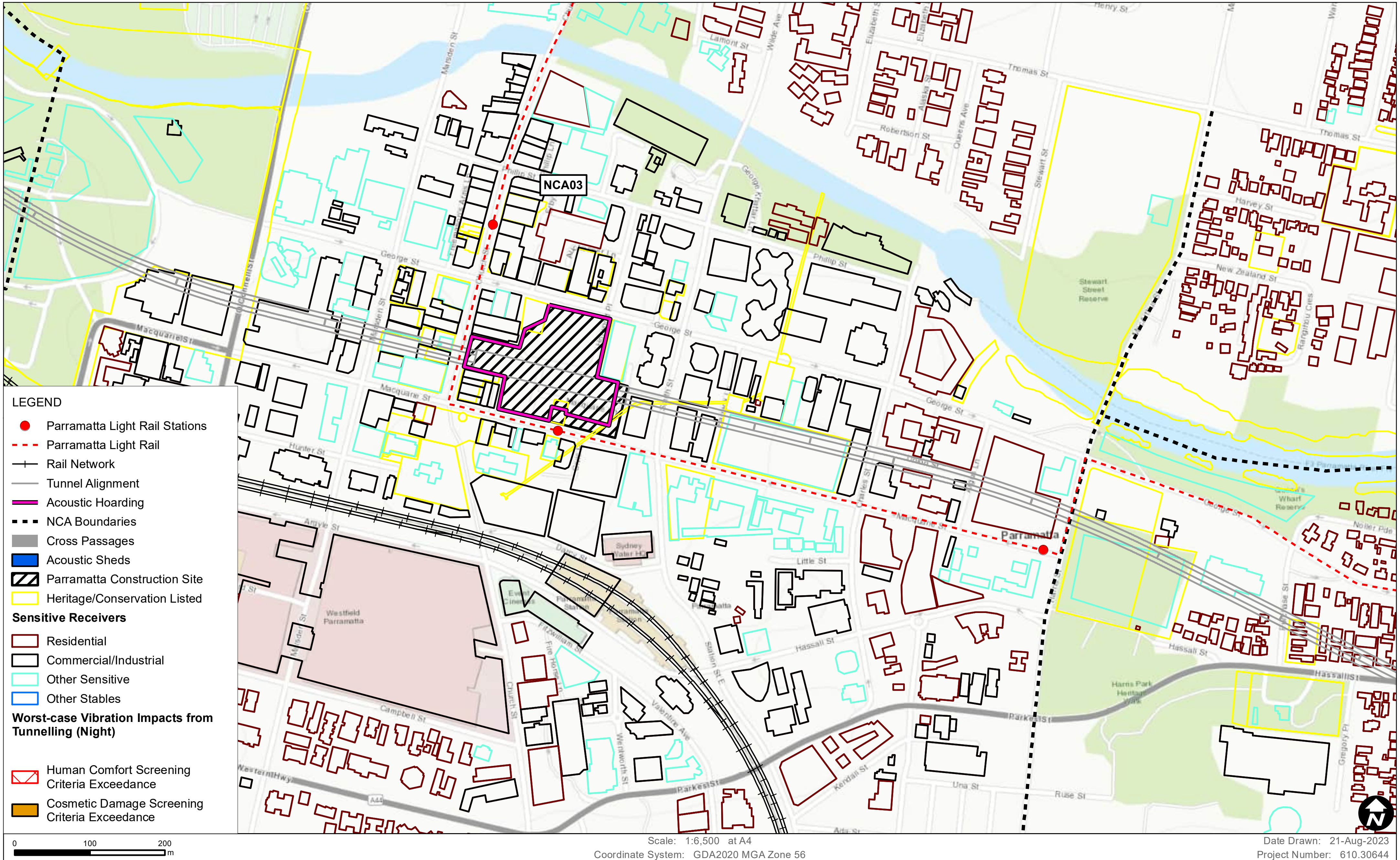
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from TBMs (Night)

FIGURE E-8



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

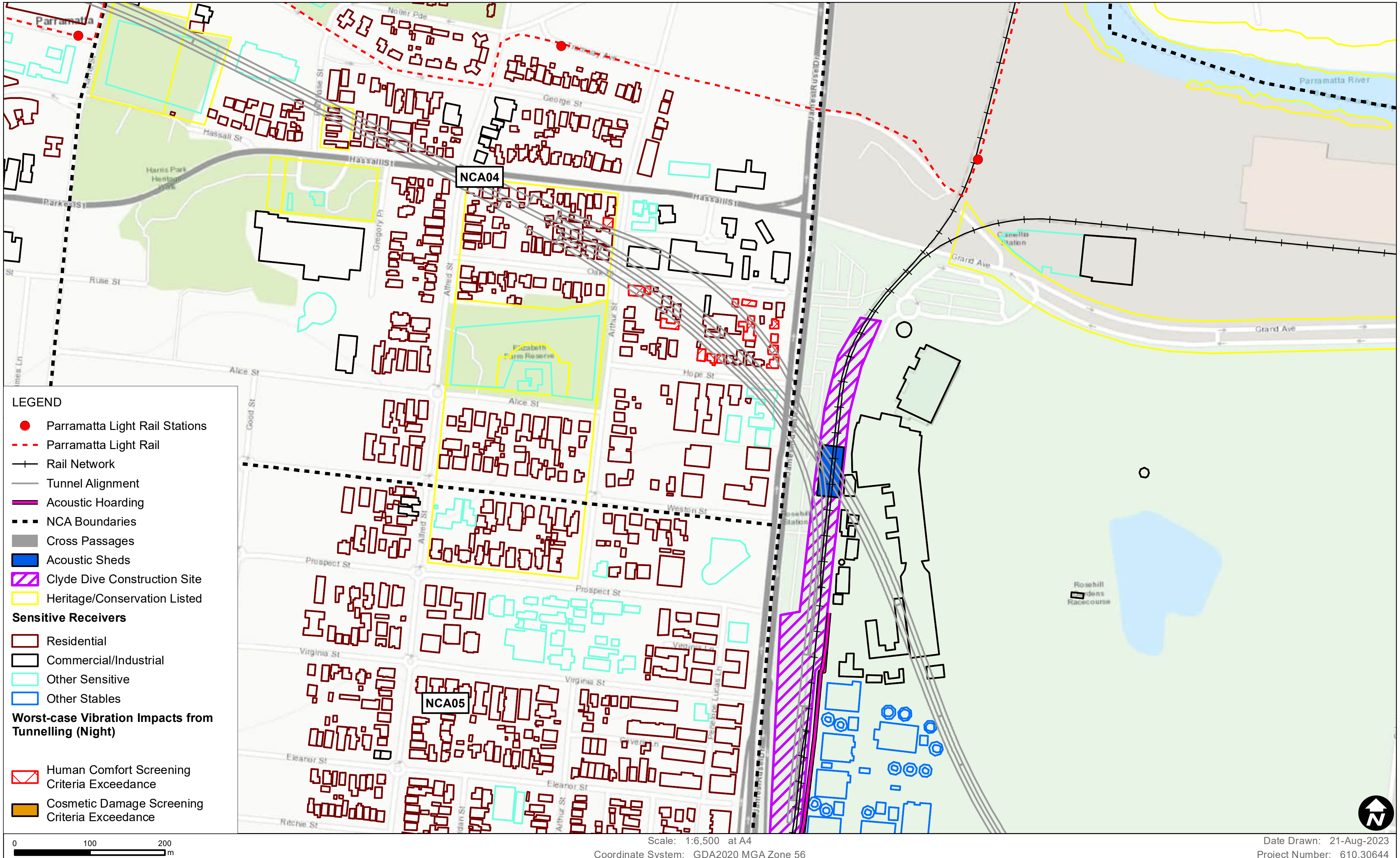
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from TBMs (Night)

FIGURE E-9

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Tunnelling_Night_02.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

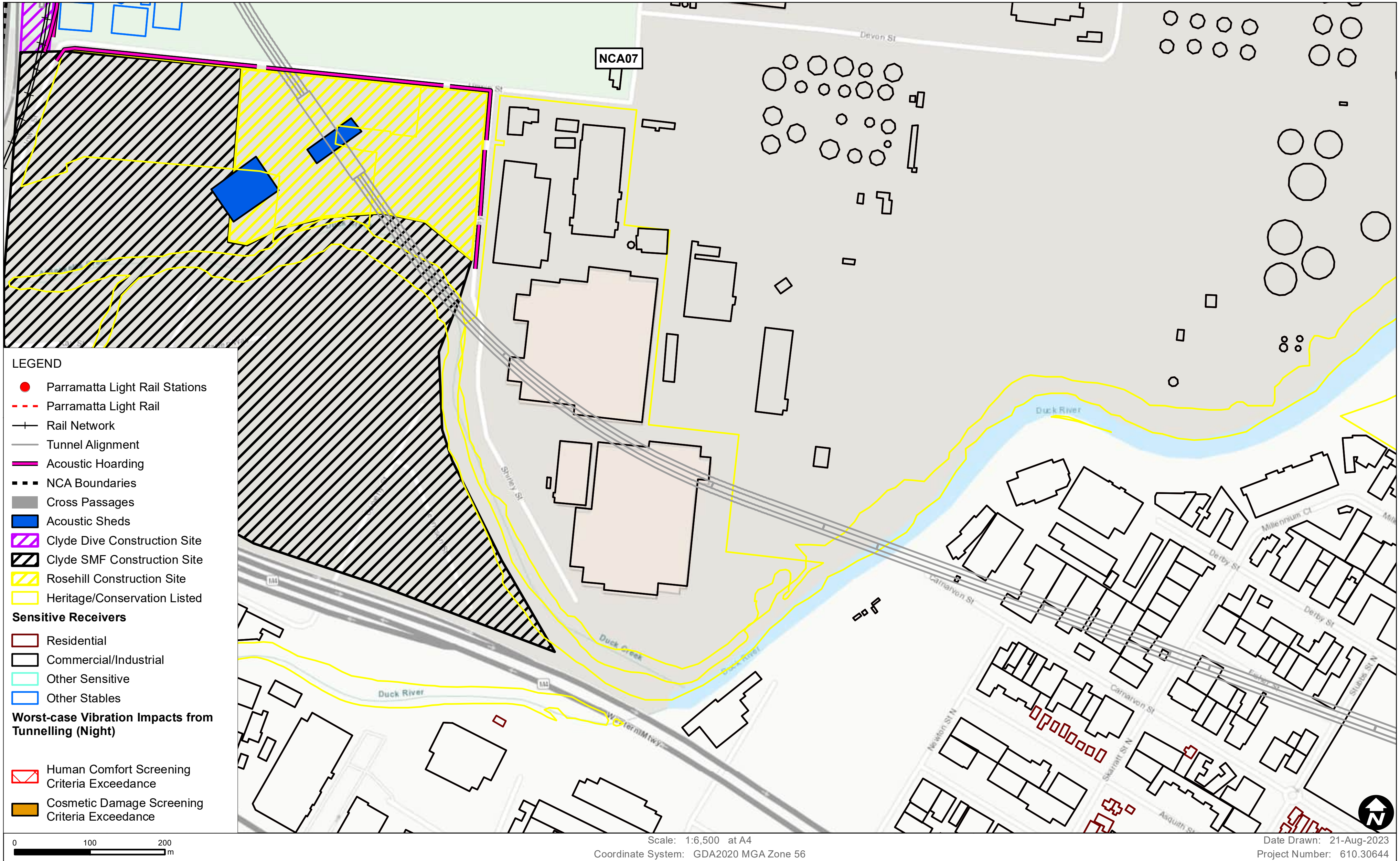
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from TBMs (Night)

FIGURE E-10

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Tunnelling_Night_02.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

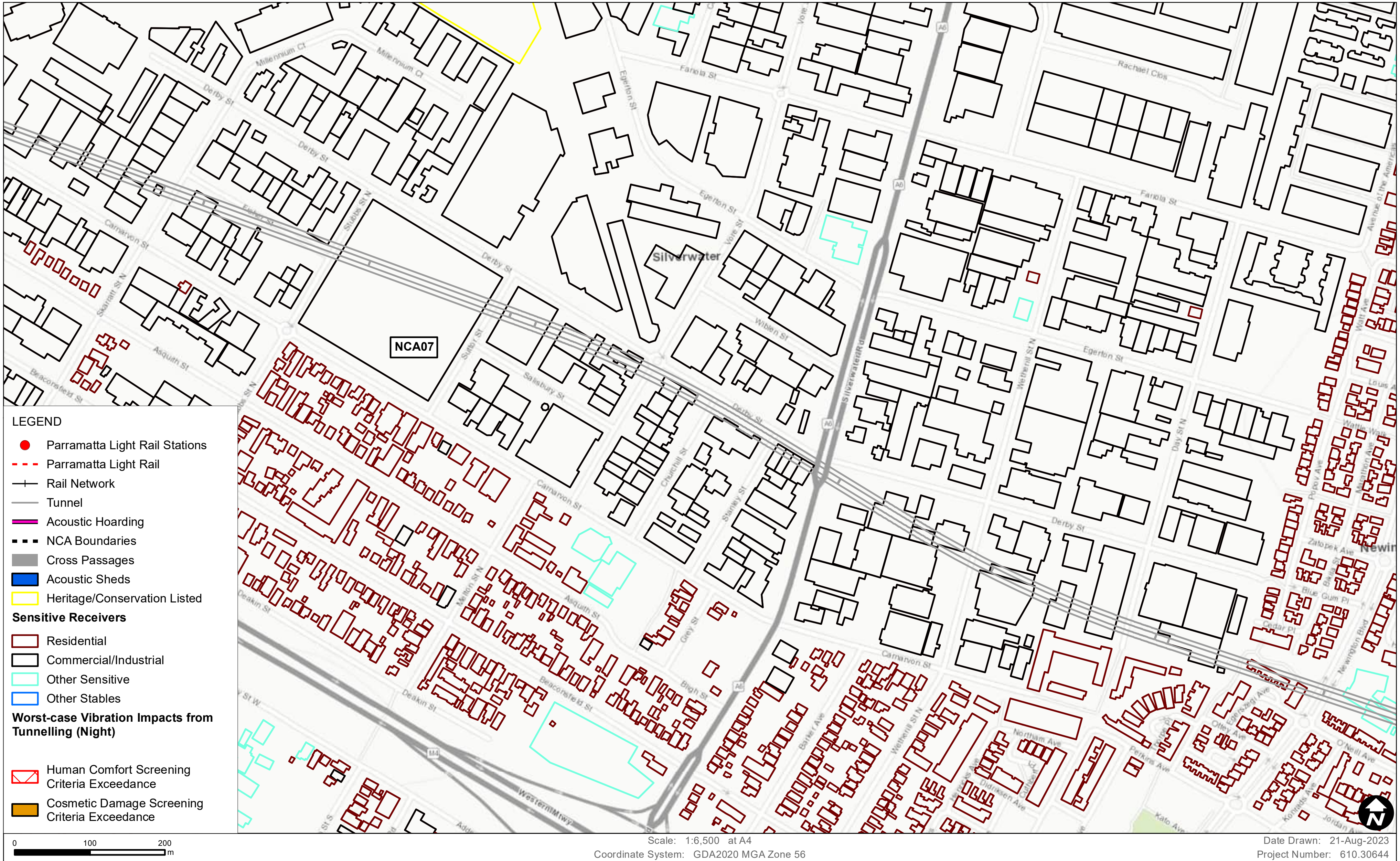
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from TBMs (Night)

FIGURE E-11

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Tunnelling_Night_02.mxd



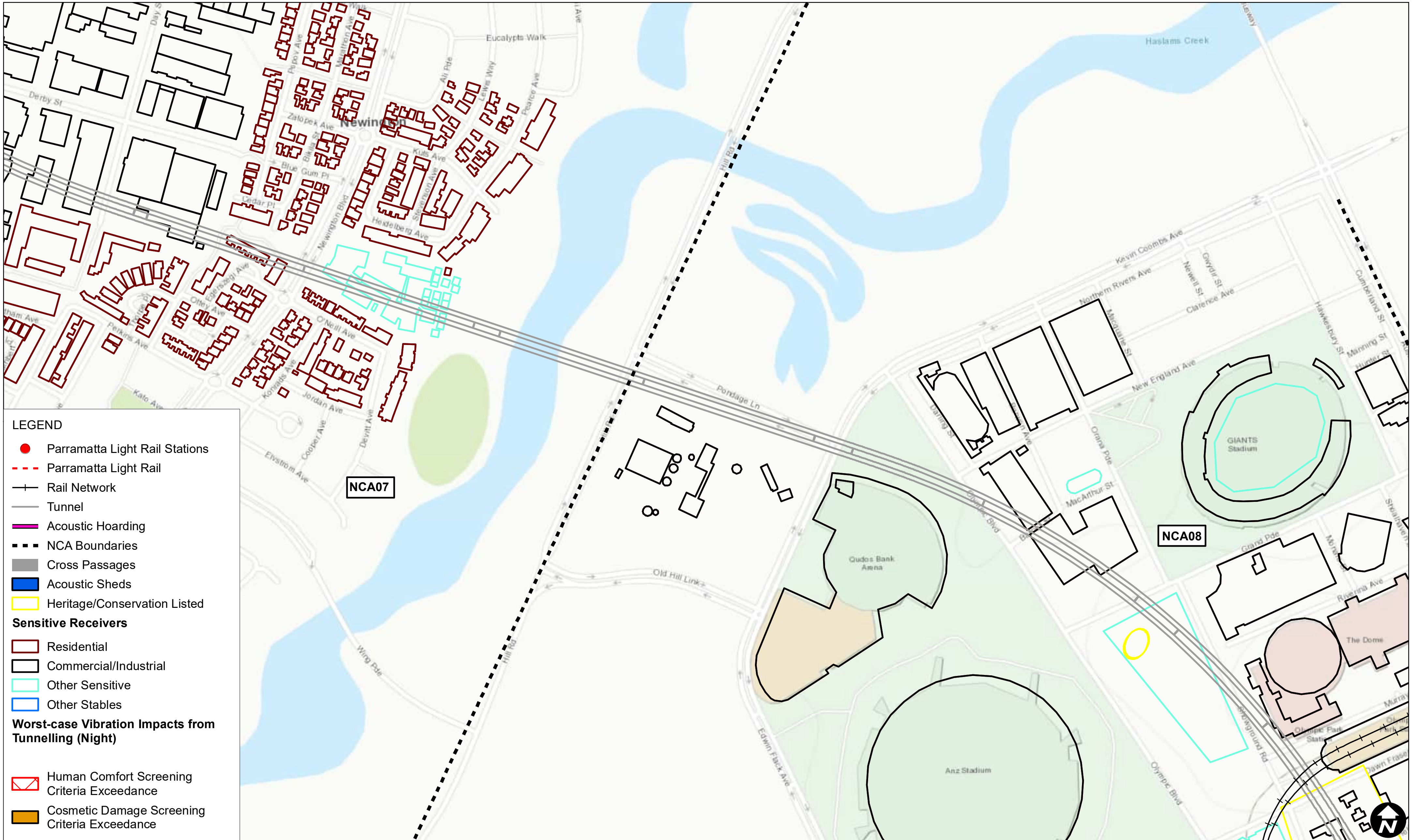
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from TBMs (Night)

FIGURE E-12



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Acoustic Hoarding
- NCA Boundaries
- Cross Passages
- Acoustic Sheds
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Worst-case Vibration Impacts from Tunnelling (Night)

- Human Comfort Screening Criteria Exceedance
- Cosmetic Damage Screening Criteria Exceedance

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

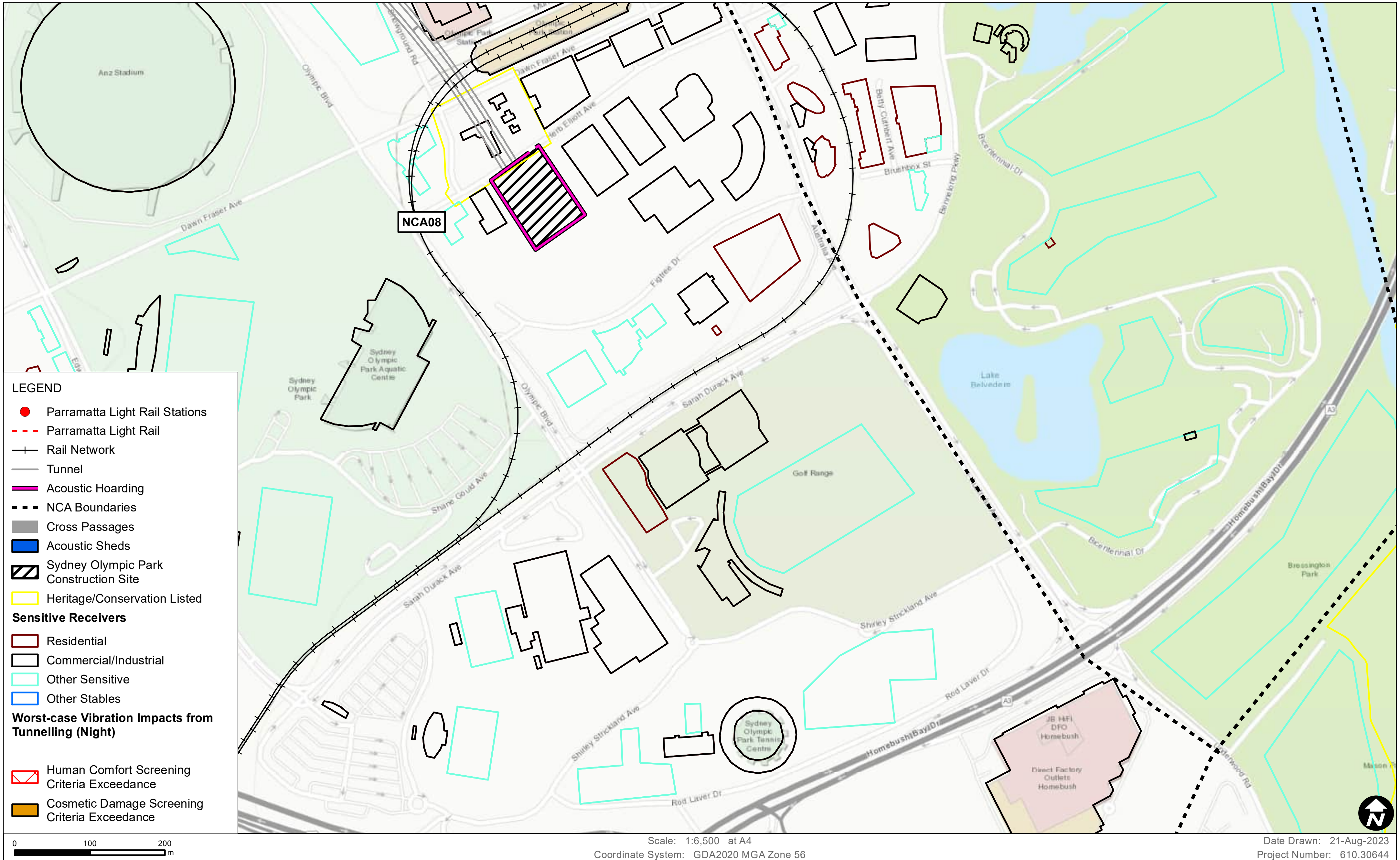
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from TBMs (Night)

FIGURE E-13

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Tunnelling_Night_02.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

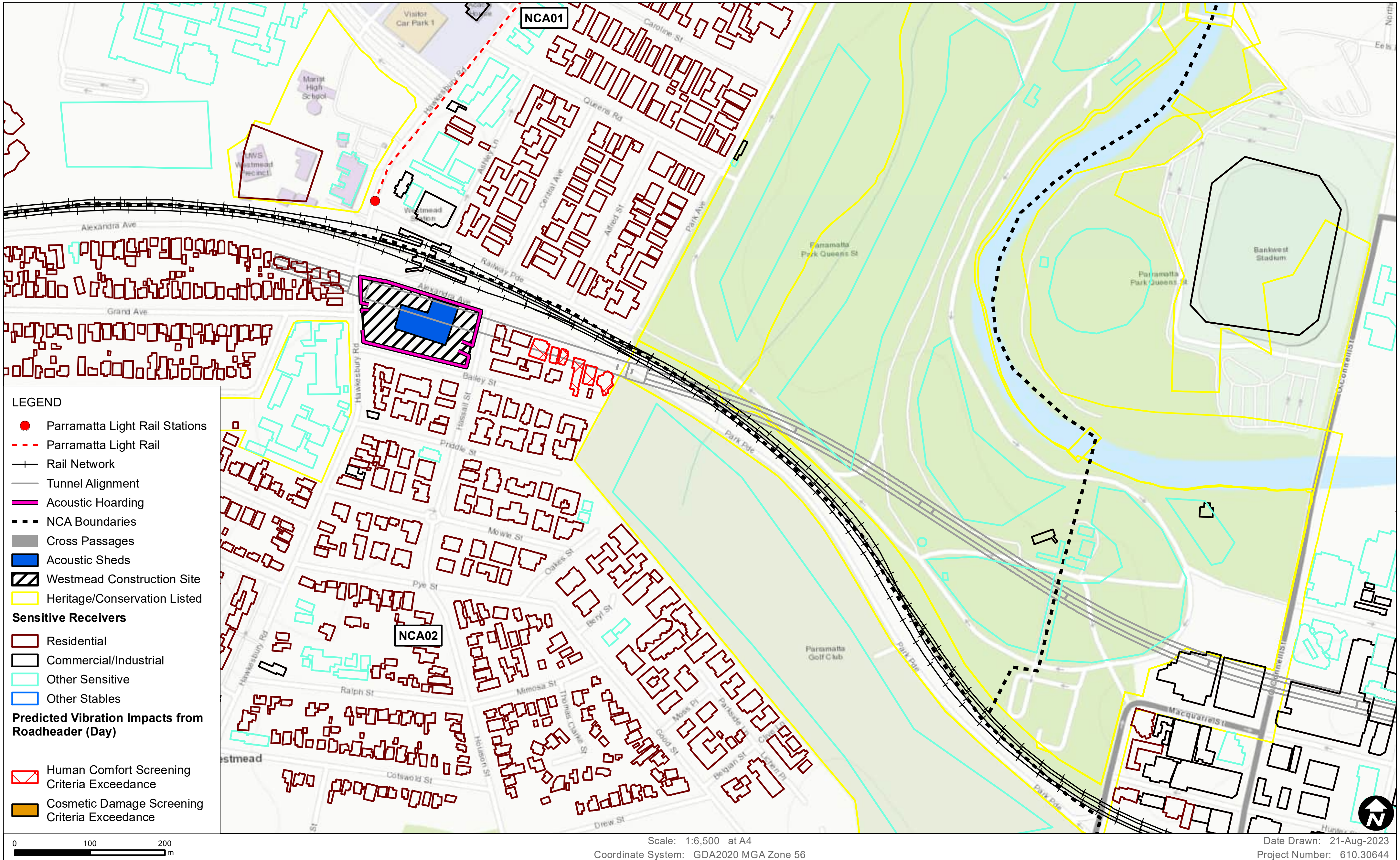
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from TBMs (Night)

FIGURE E-14

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Tunnelling_Night_02.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

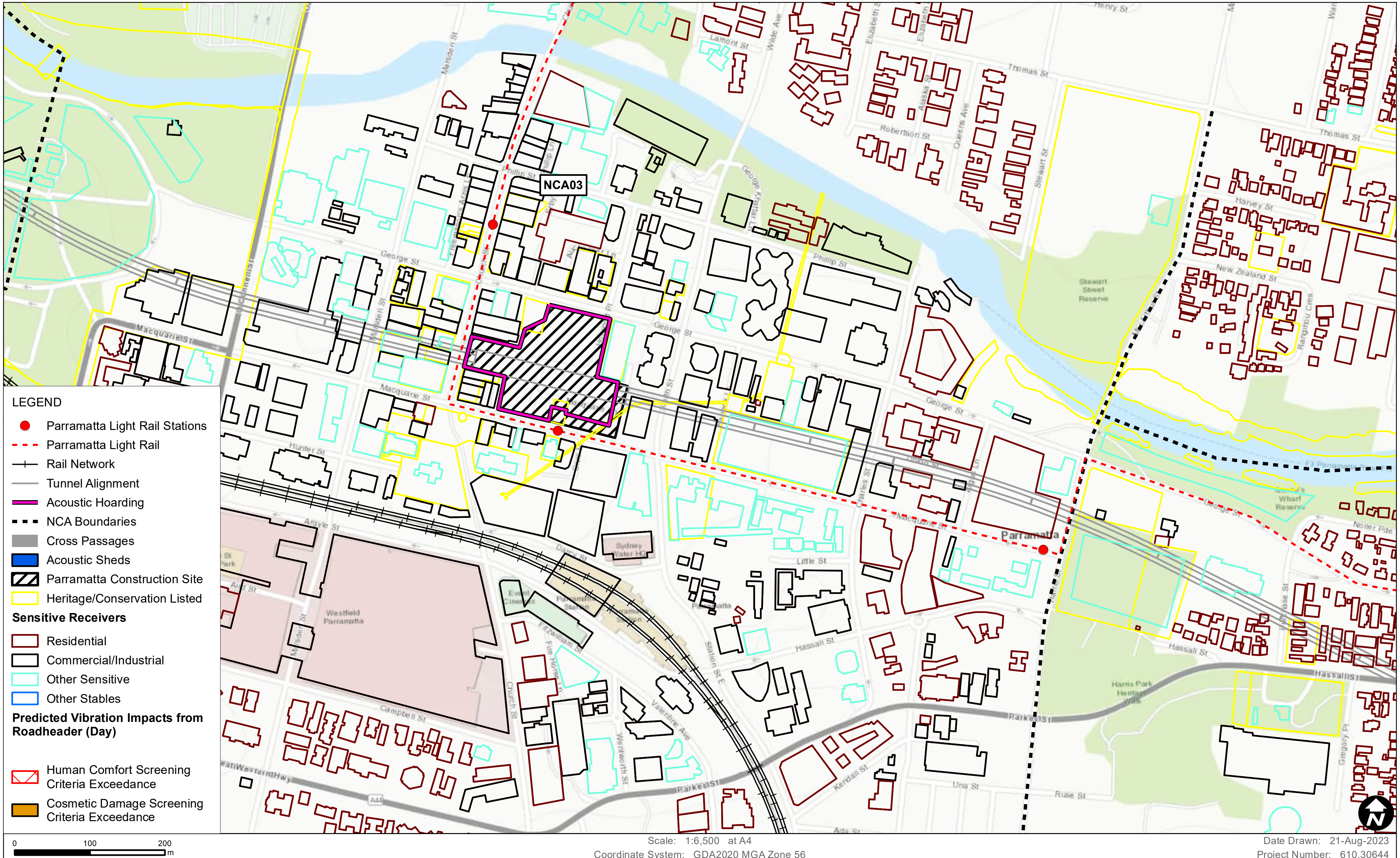
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Roadheader (Day)

FIGURE E-15

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Roadheader_Day_02.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

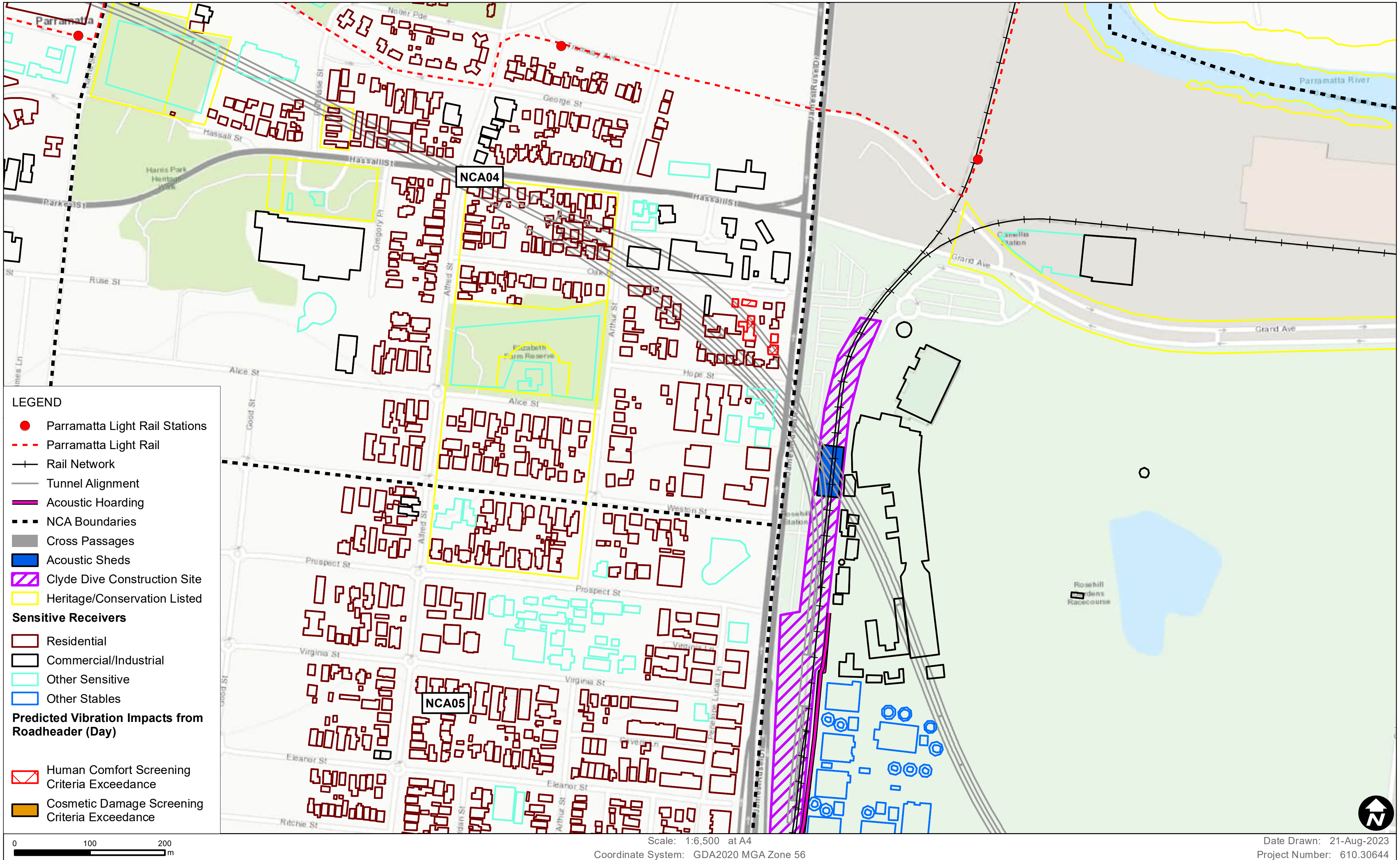
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Roadheader (Day)

FIGURE E-16



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

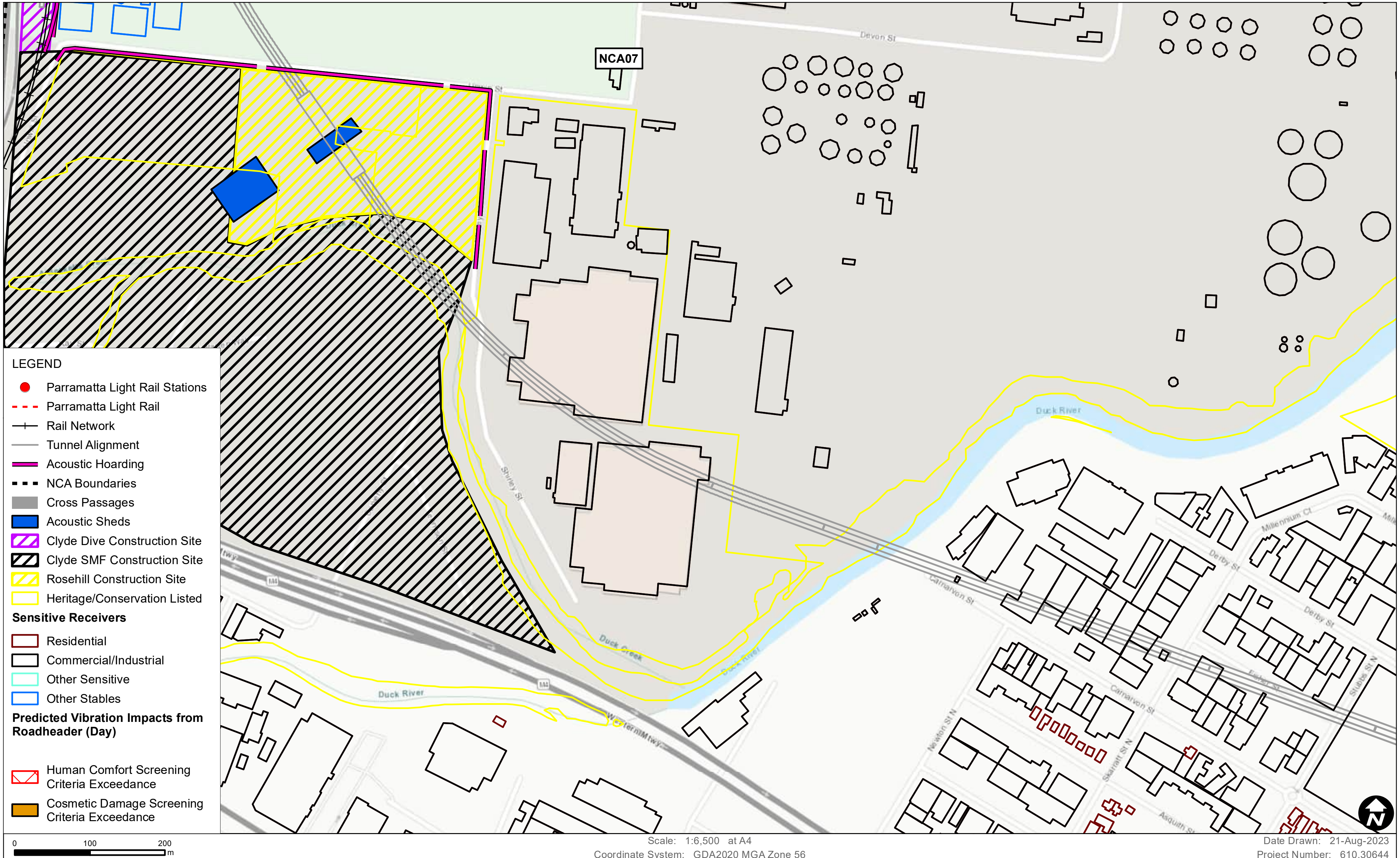
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Roadheader (Day)

FIGURE E-17

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Roadheader_Day_02.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Roadheader (Day)

FIGURE E-18

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

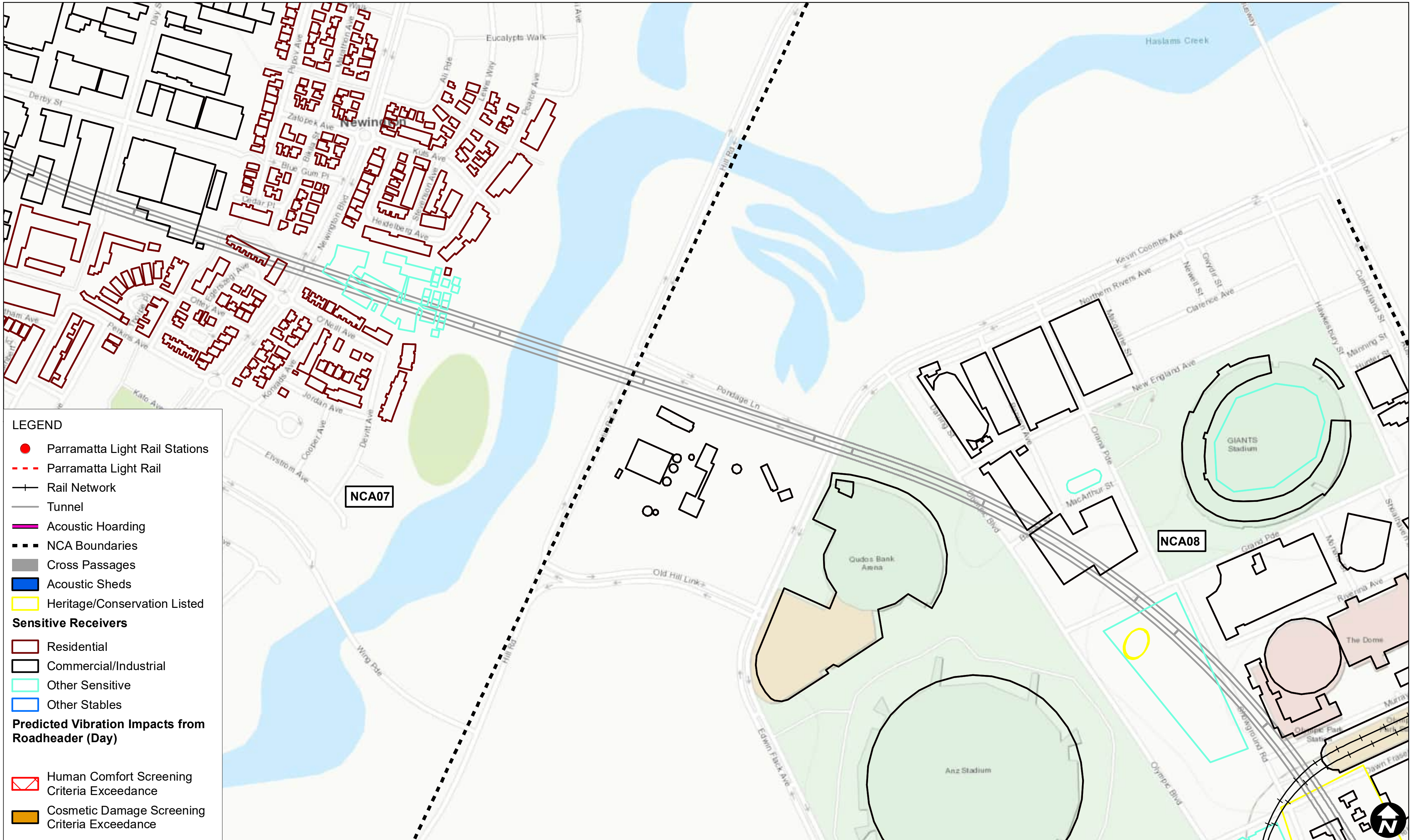
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Roadheader (Day)

FIGURE E-19

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Roadheader_Day_02.mxd



0 100 200 m

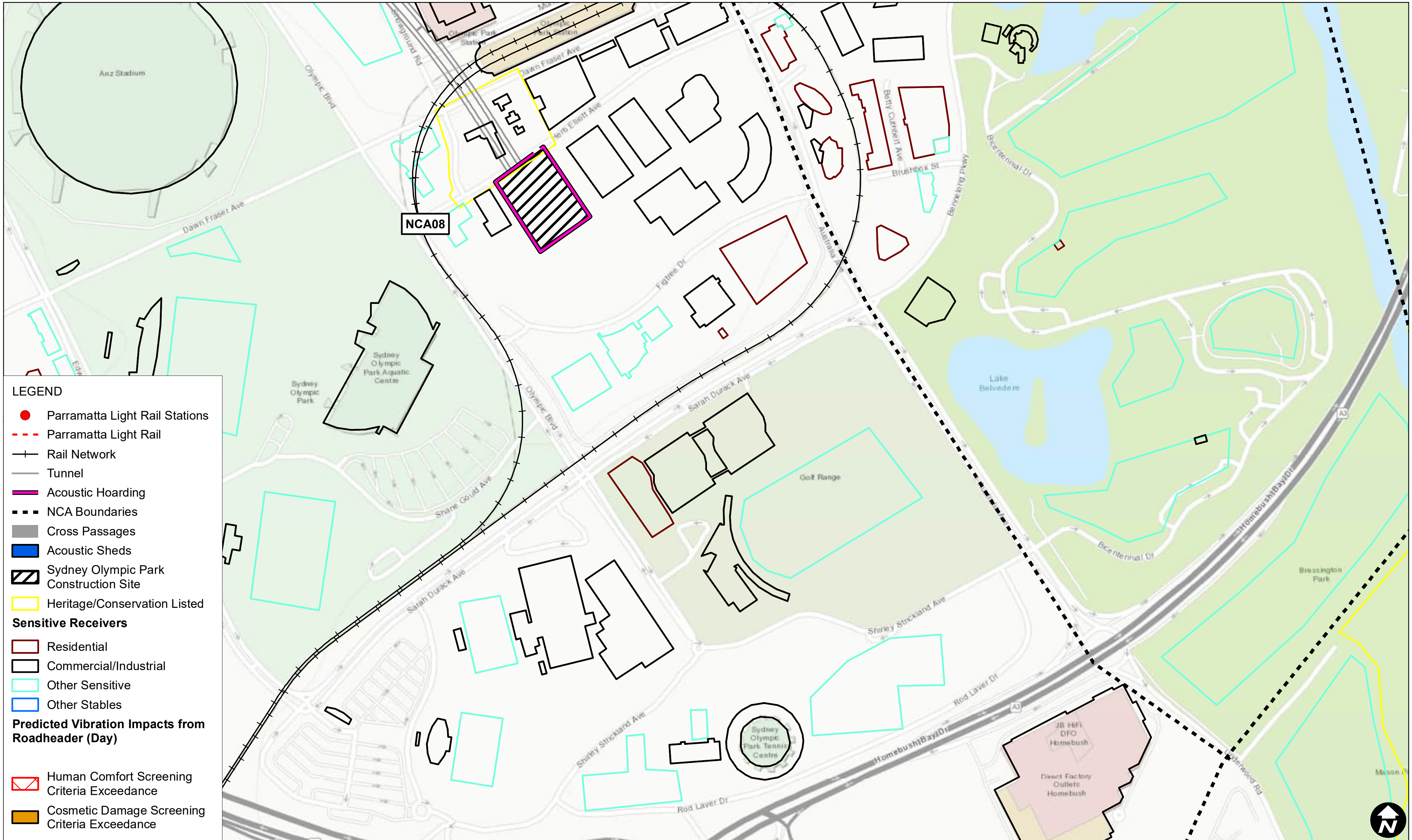
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Roadheader (Day)

FIGURE E-20



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

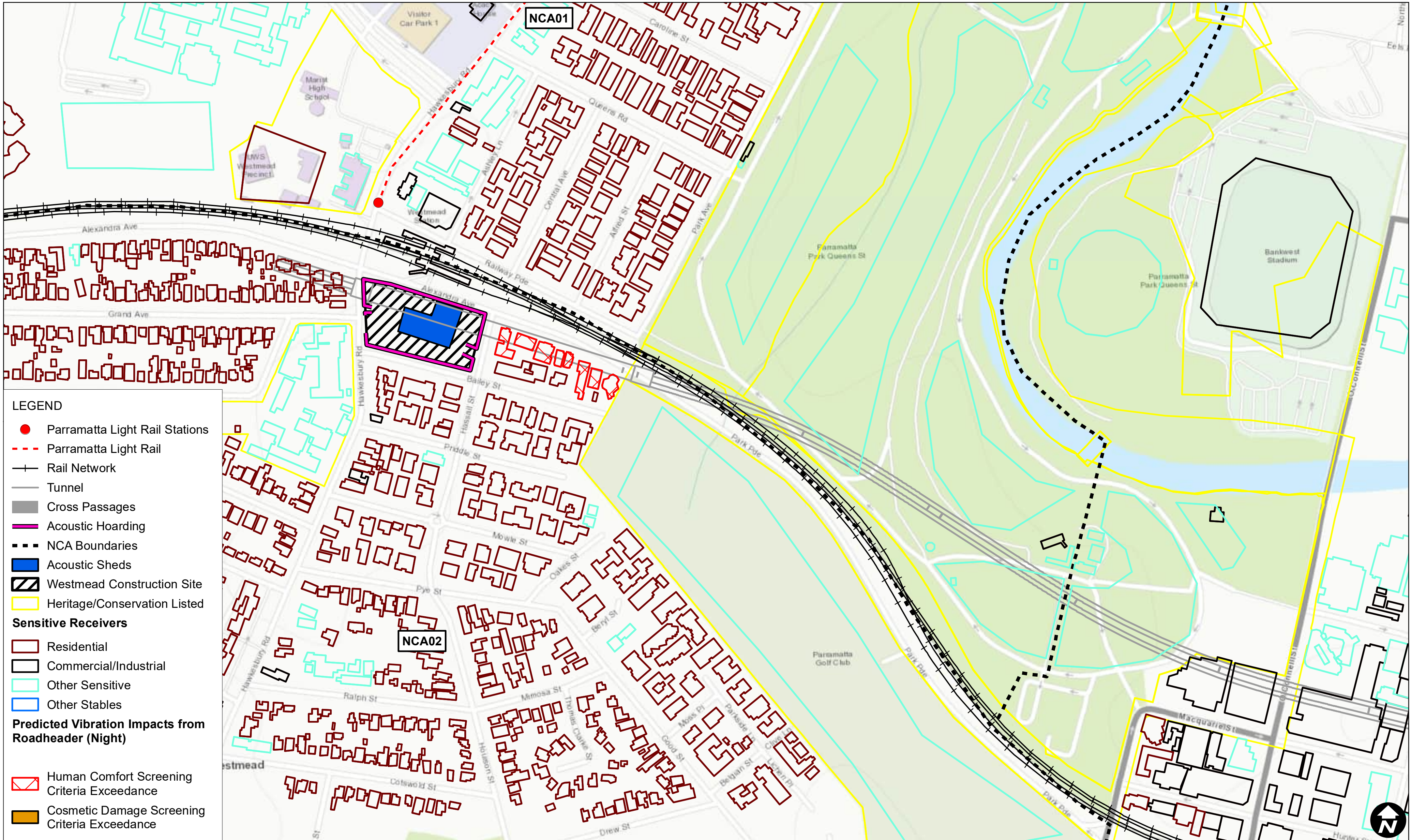
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Roadheader (Day)

FIGURE E-21

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Roadheader_Day_02.mxd



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Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

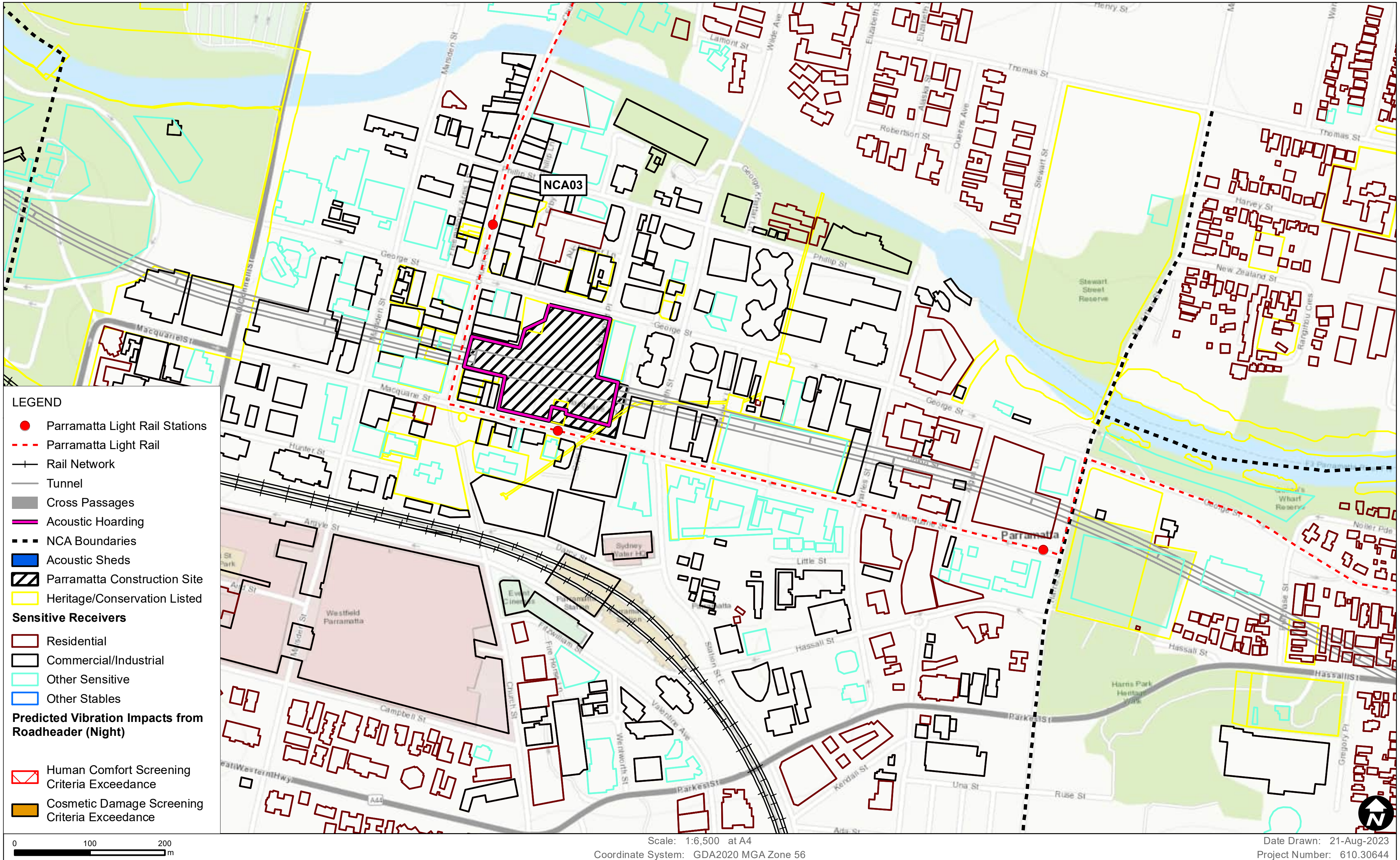
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Roadheader (Night)

FIGURE E-22

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Roadheader_Night_02.mxd



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Coordinate System: GDA2020 MGA Zone 56

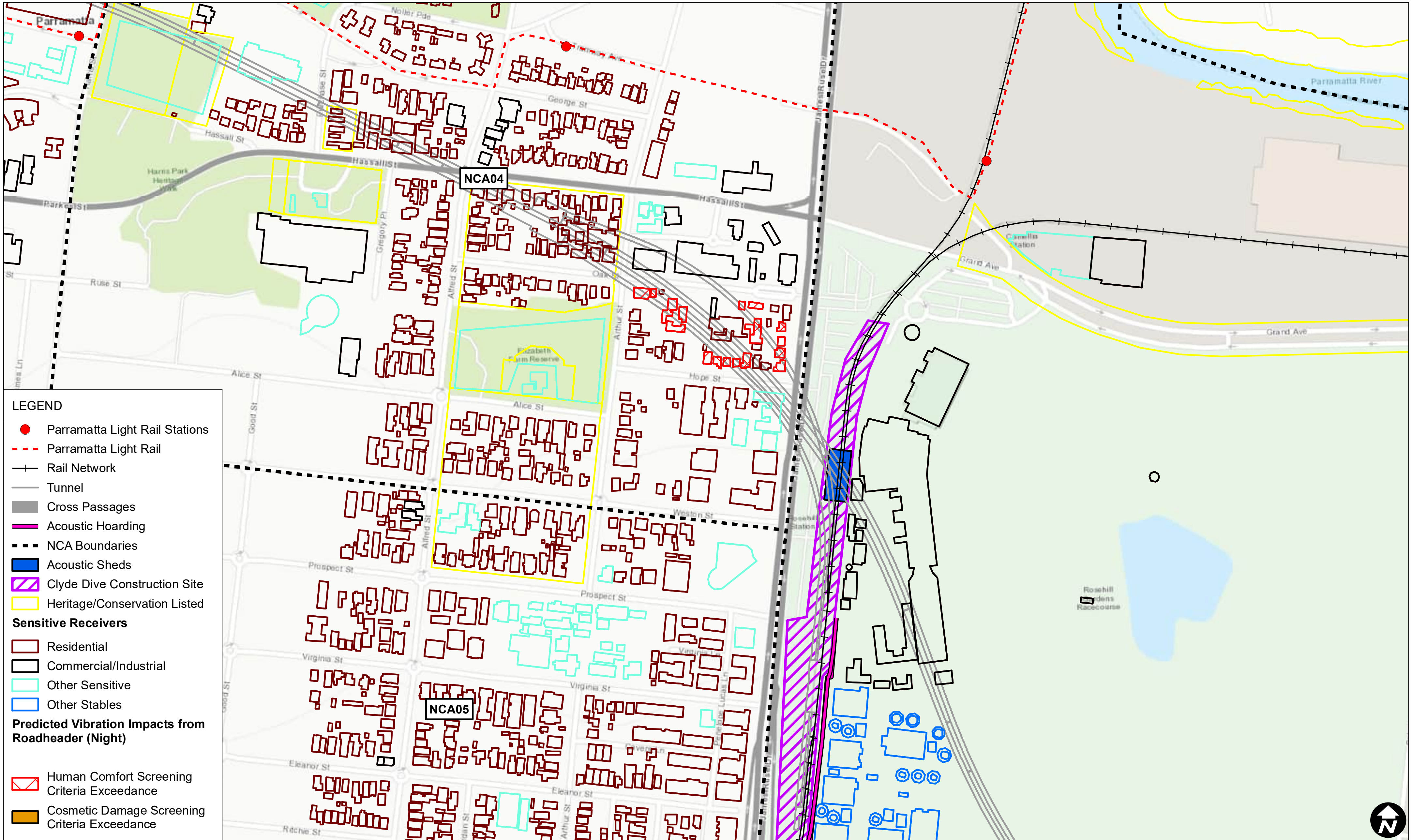
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Roadheader (Night)

FIGURE E-23



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Cross Passages
- Acoustic Hoarding
- NCA Boundaries
- Acoustic Sheds
- Clyde Dive Construction Site
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Vibration Impacts from Roadheader (Night)

- Human Comfort Screening Criteria Exceedance
- Cosmetic Damage Screening Criteria Exceedance

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

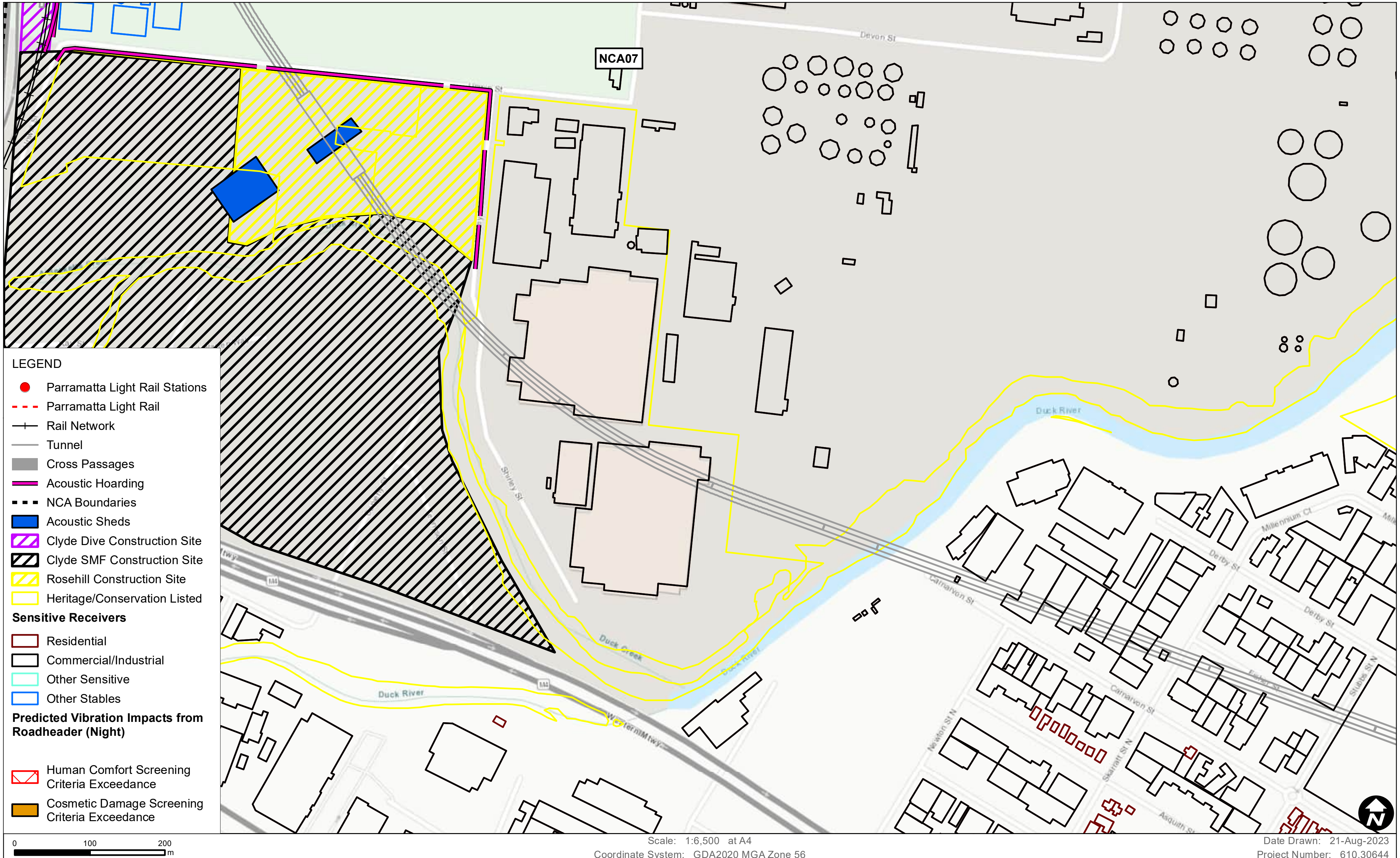
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Roadheader (Night)

FIGURE E-24

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Roadheader_Night_02.mxd



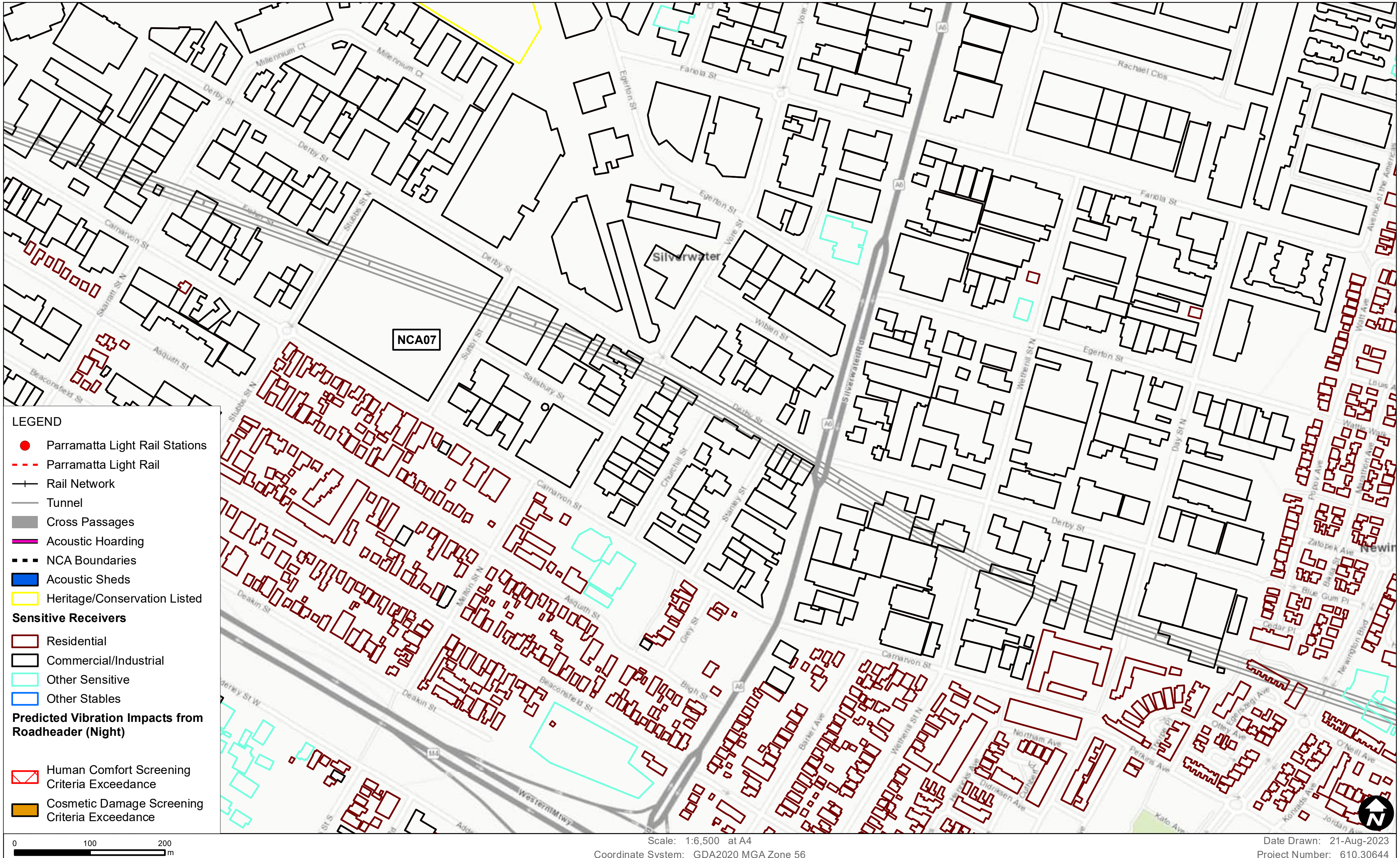
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Roadheader (Night)

FIGURE E-25



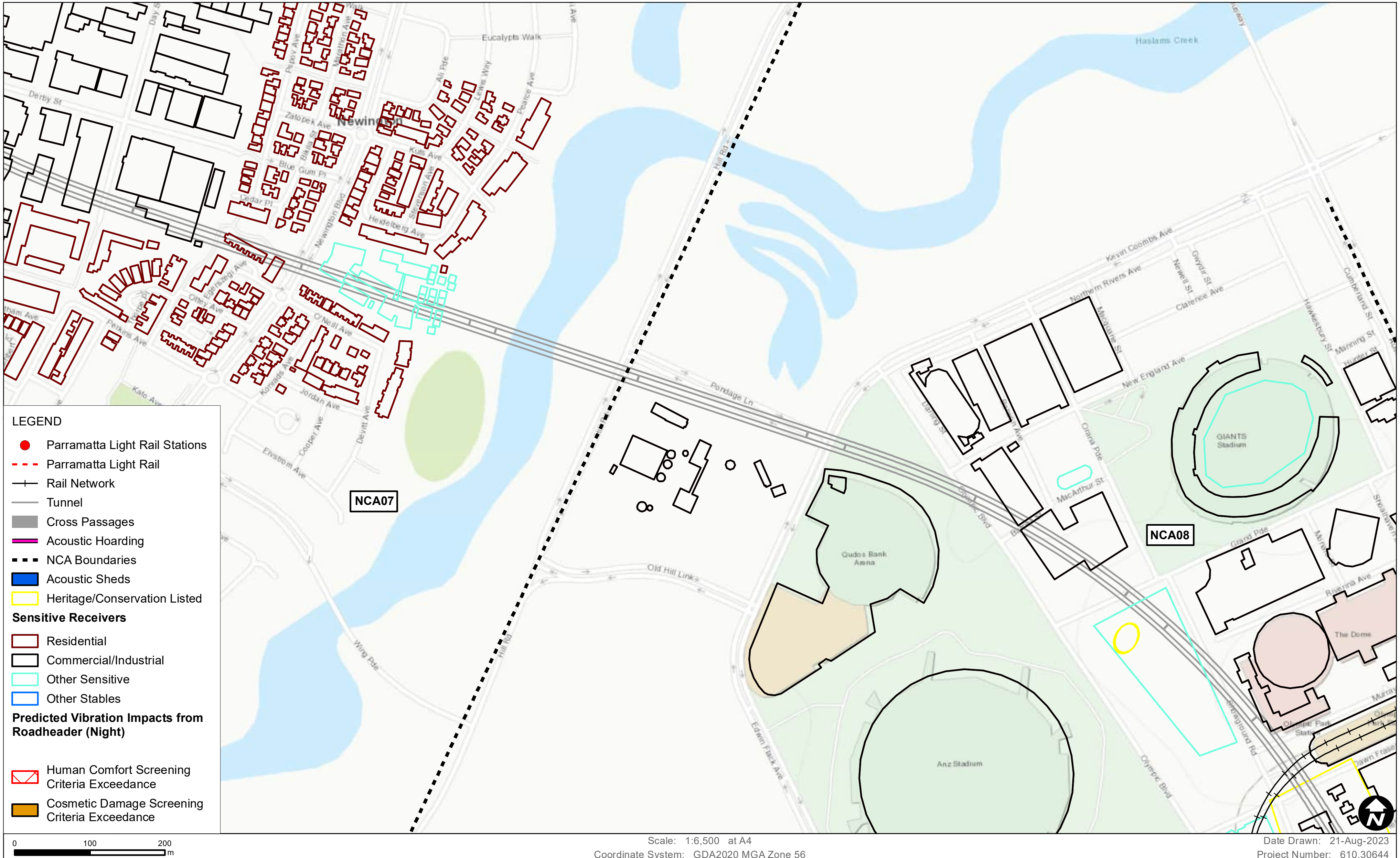
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Roadheader (Night)

FIGURE E-26



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

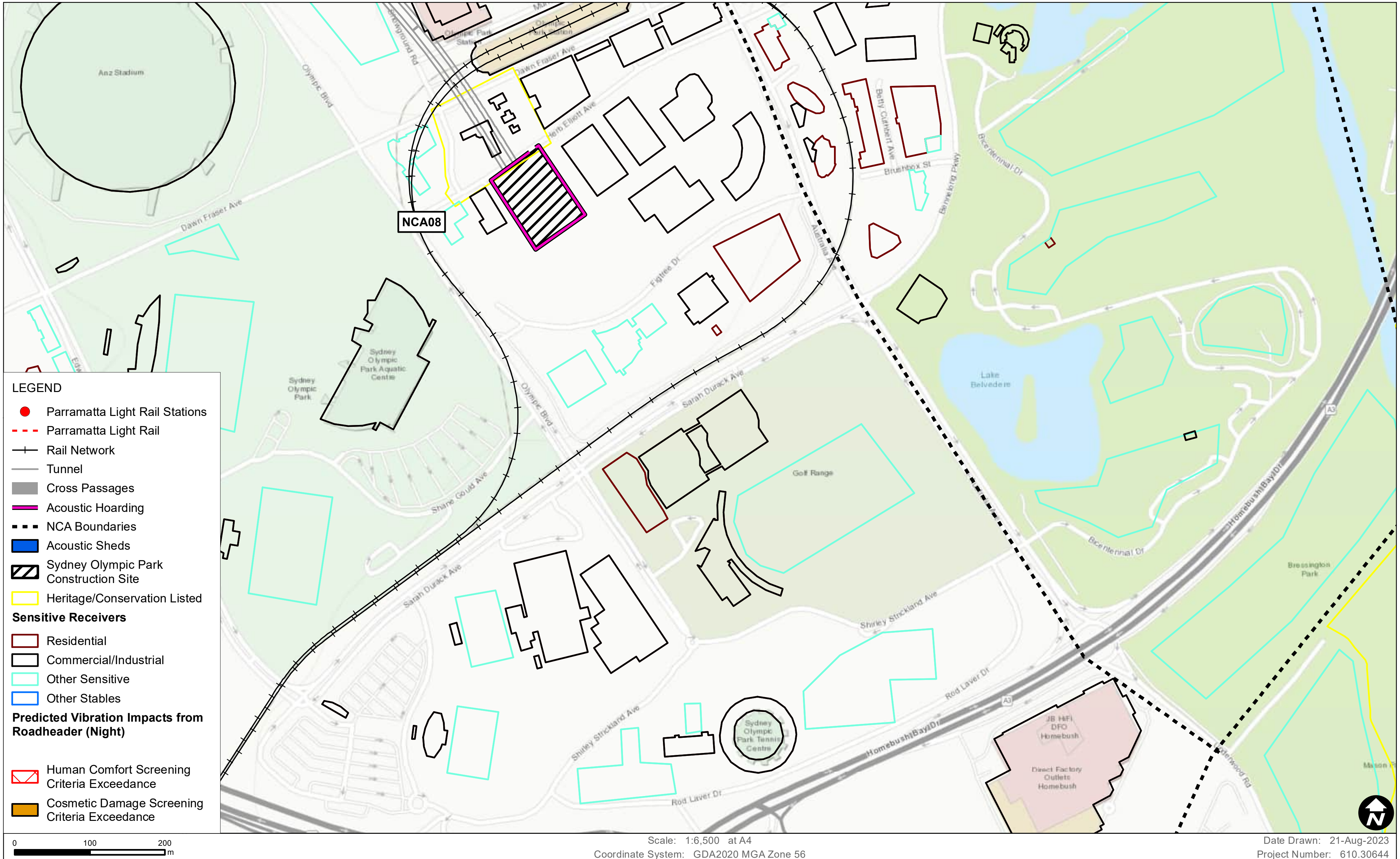
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Roadheader (Night)

FIGURE E-27



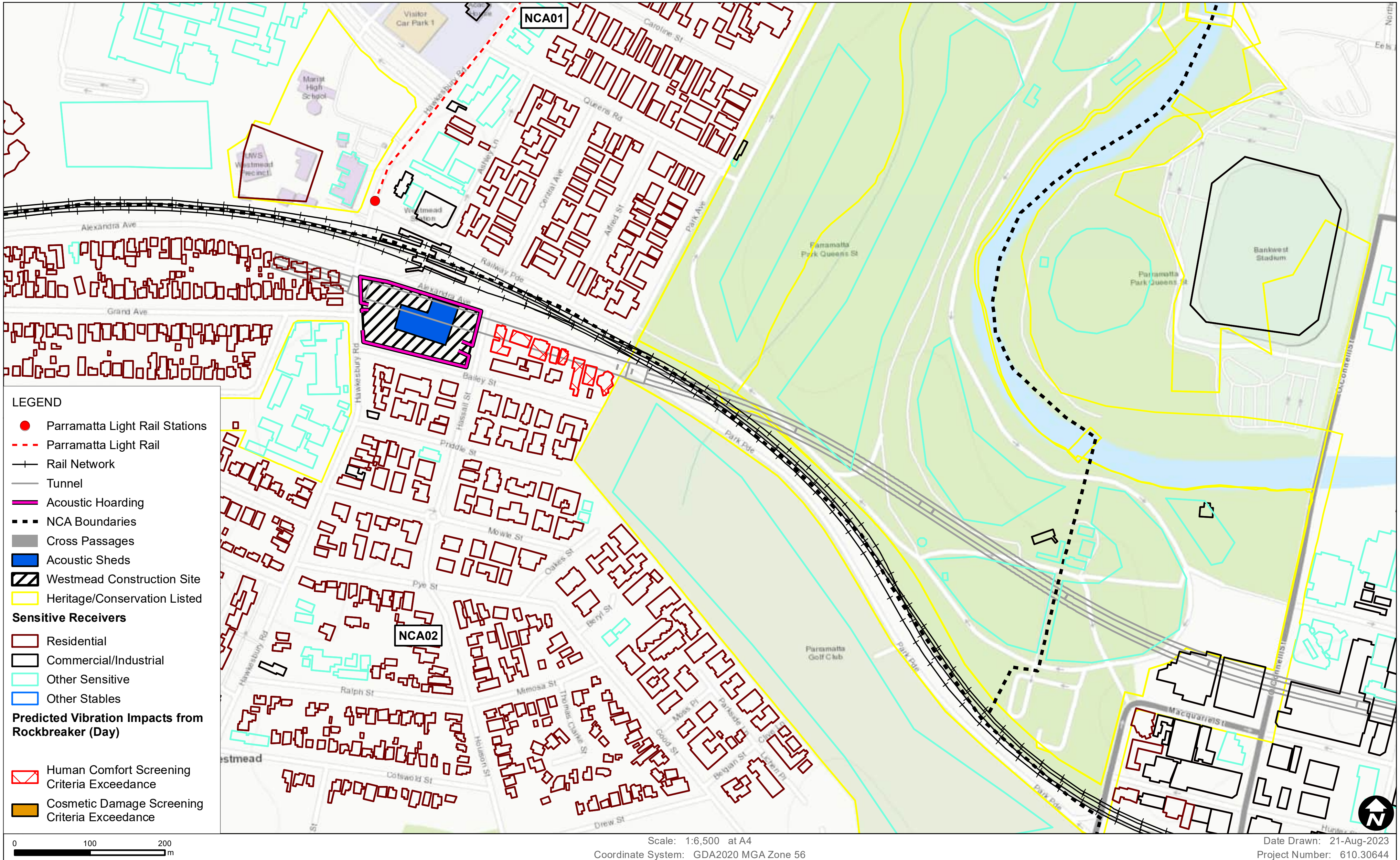
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Roadheader (Night)

FIGURE E-28



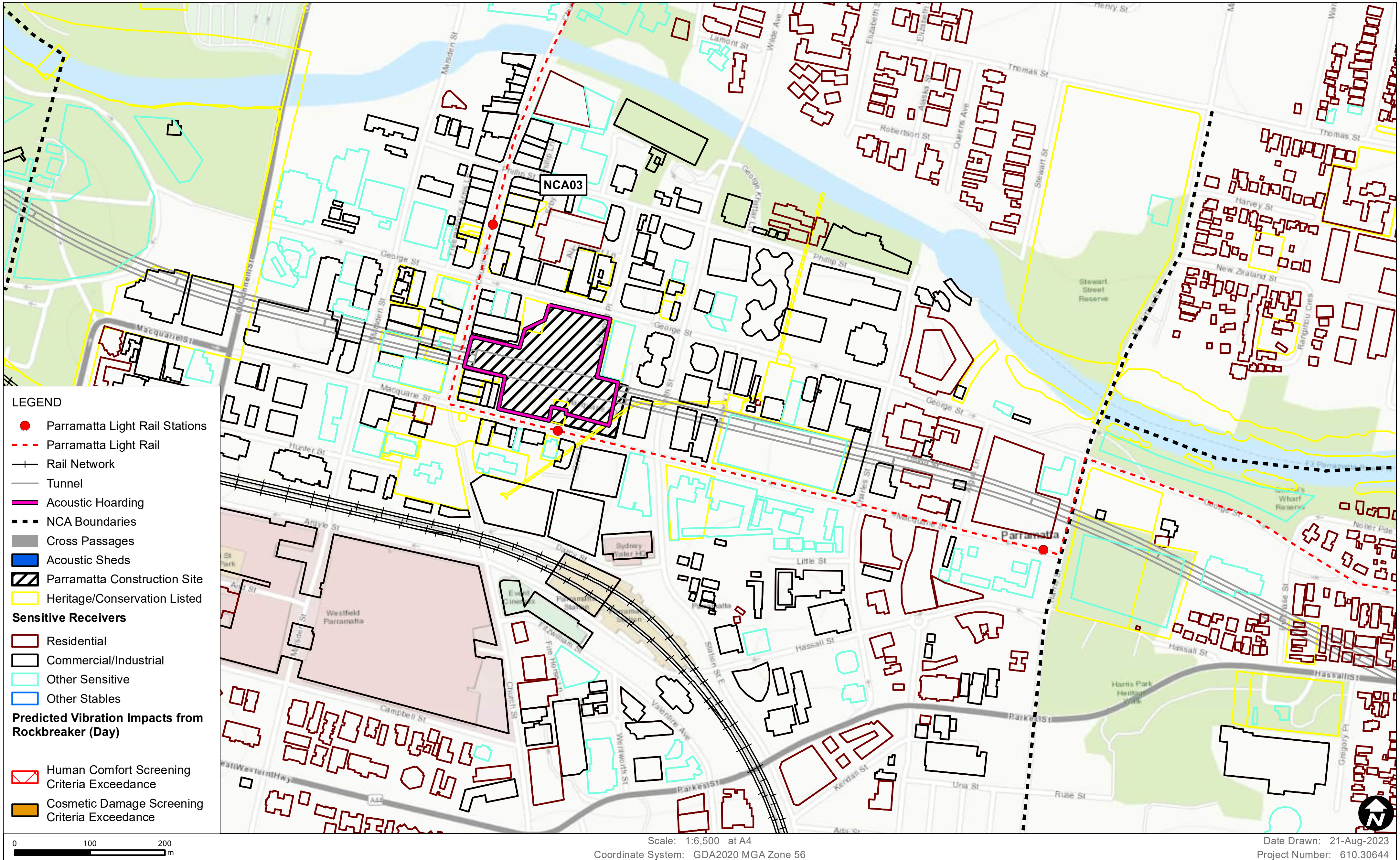
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Rockbreaker (Day)

FIGURE E-29



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

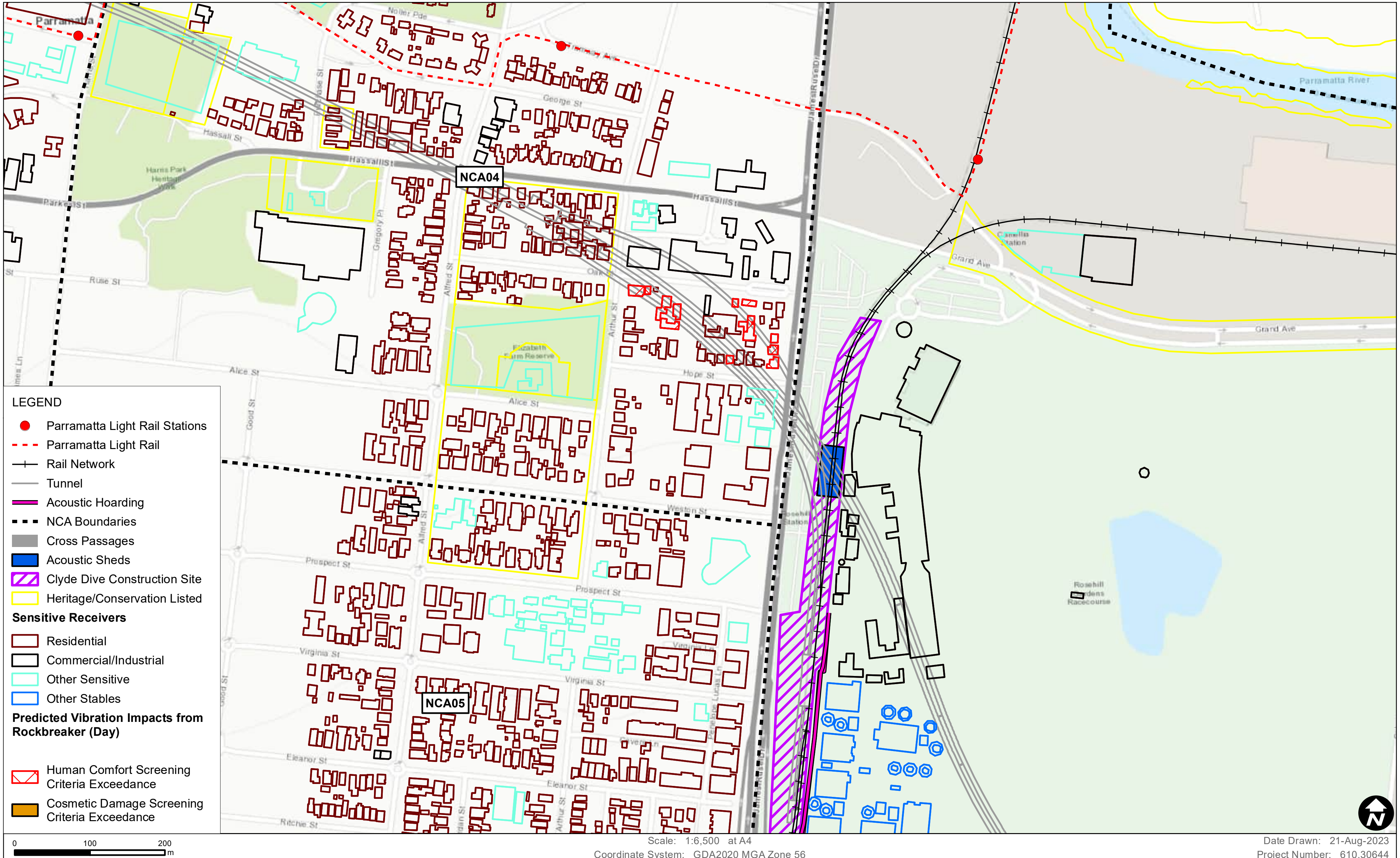
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Rockbreaker (Day)

FIGURE E-30



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

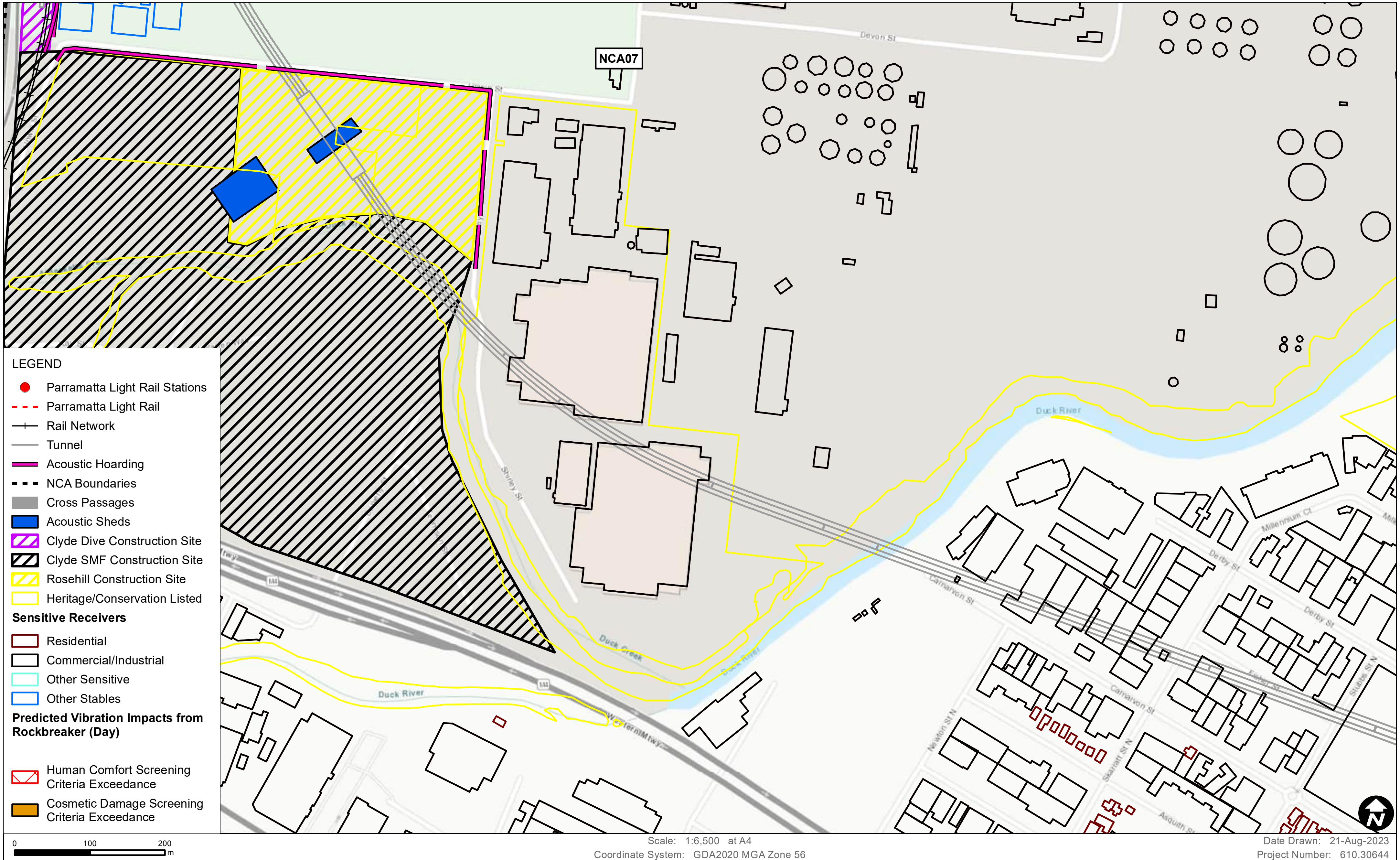
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Rockbreaker (Day)

FIGURE E-31

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Rockbreker_Day_02.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Rockbreaker (Day)

FIGURE E-32

LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Acoustic Hoarding
- NCA Boundaries
- Cross Passages
- Acoustic Sheds
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Vibration Impacts from Rockbreaker (Day)

- Human Comfort Screening Criteria Exceedance
- Cosmetic Damage Screening Criteria Exceedance

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

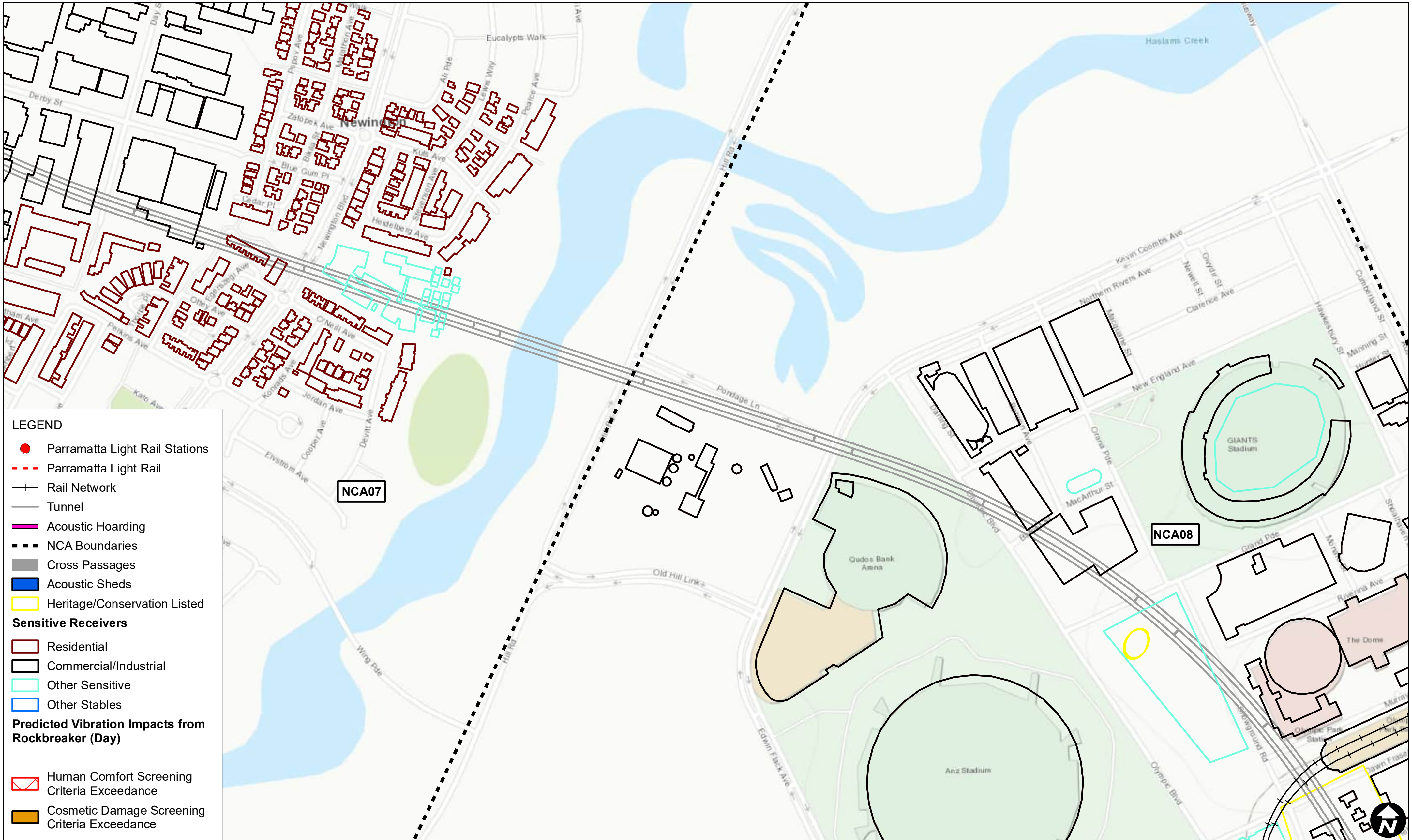
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Rockbreaker (Day)

FIGURE E-33

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Rockbreker_Day_02.mxd



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Acoustic Hoarding
- NCA Boundaries
- Cross Passages
- Acoustic Sheds
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Vibration Impacts from Rockbreaker (Day)

- Human Comfort Screening Criteria Exceedance
- Cosmetic Damage Screening Criteria Exceedance

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

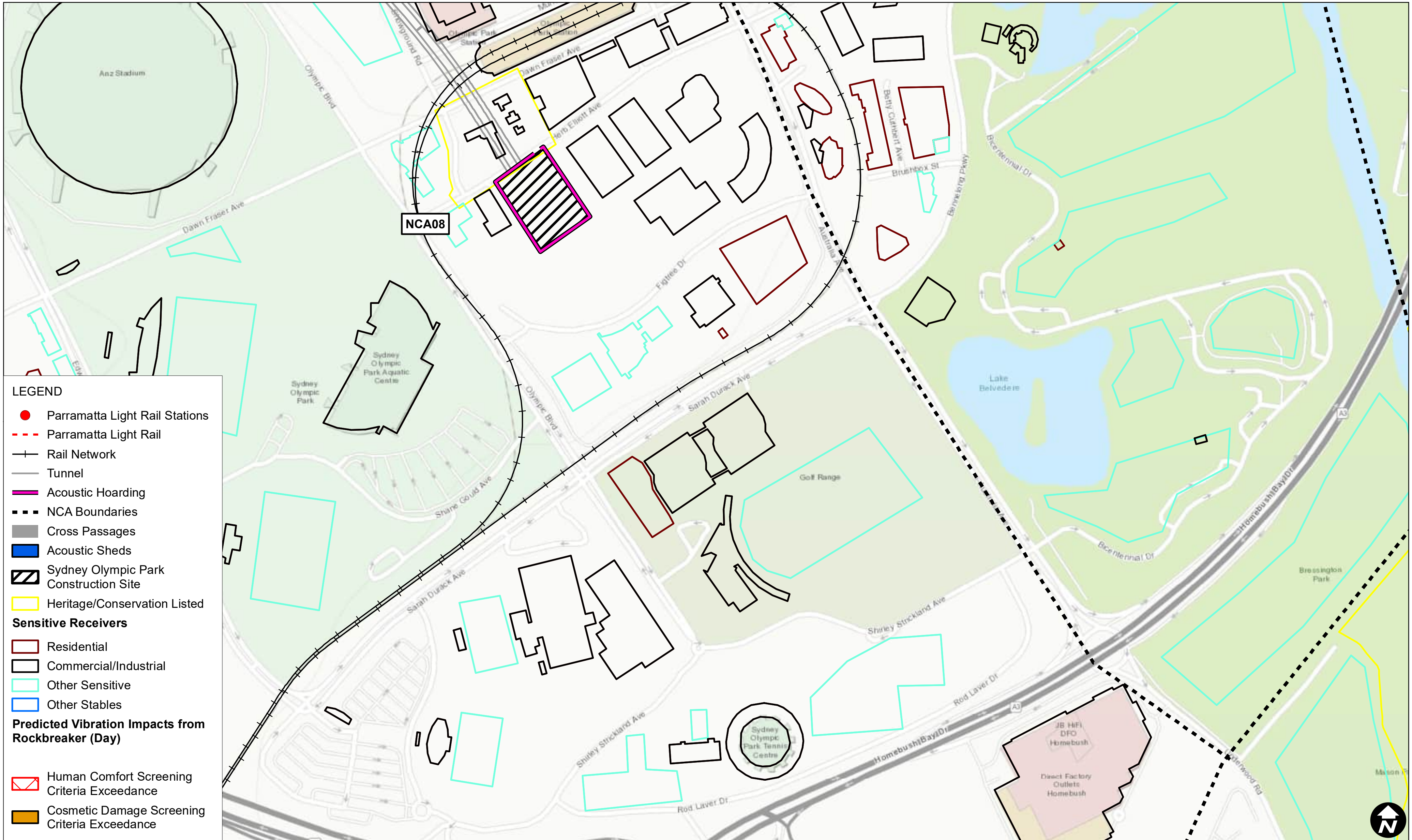
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Rockbreaker (Day)

FIGURE E-34

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Rockbreker_Day_02.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

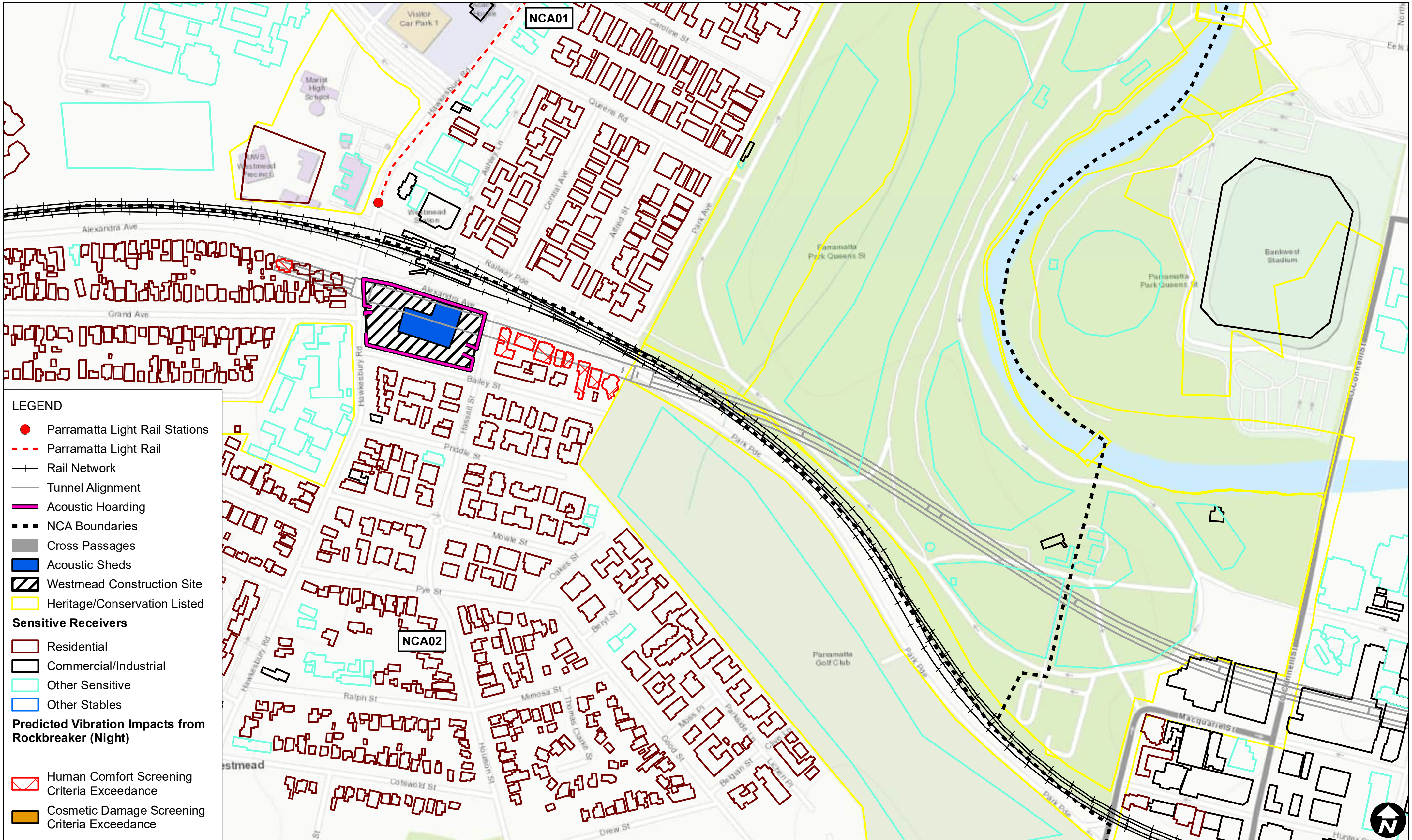
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Rockbreaker (Day)

FIGURE E-35

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Rockbreker_Day_02.mxd



0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

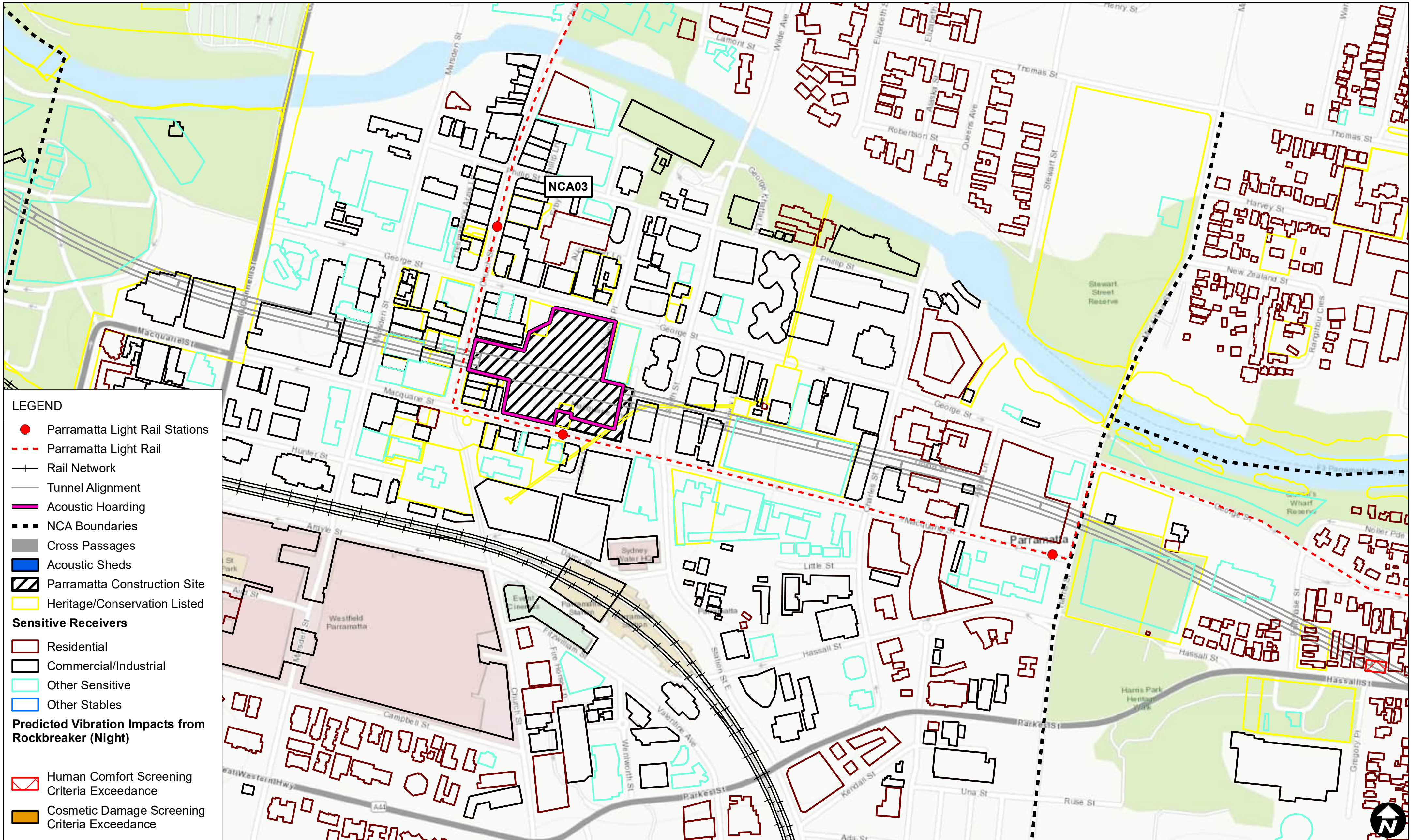
Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Rockbreaker (Night)

FIGURE E-36

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Rockbreaker_Night_02.mxd



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel Alignment
- Acoustic Hoarding
- NCA Boundaries
- Cross Passages
- Acoustic Sheds
- Parramatta Construction Site
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Vibration Impacts from Rockbreaker (Night)

- Human Comfort Screening Criteria Exceedance
- Cosmetic Damage Screening Criteria Exceedance

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

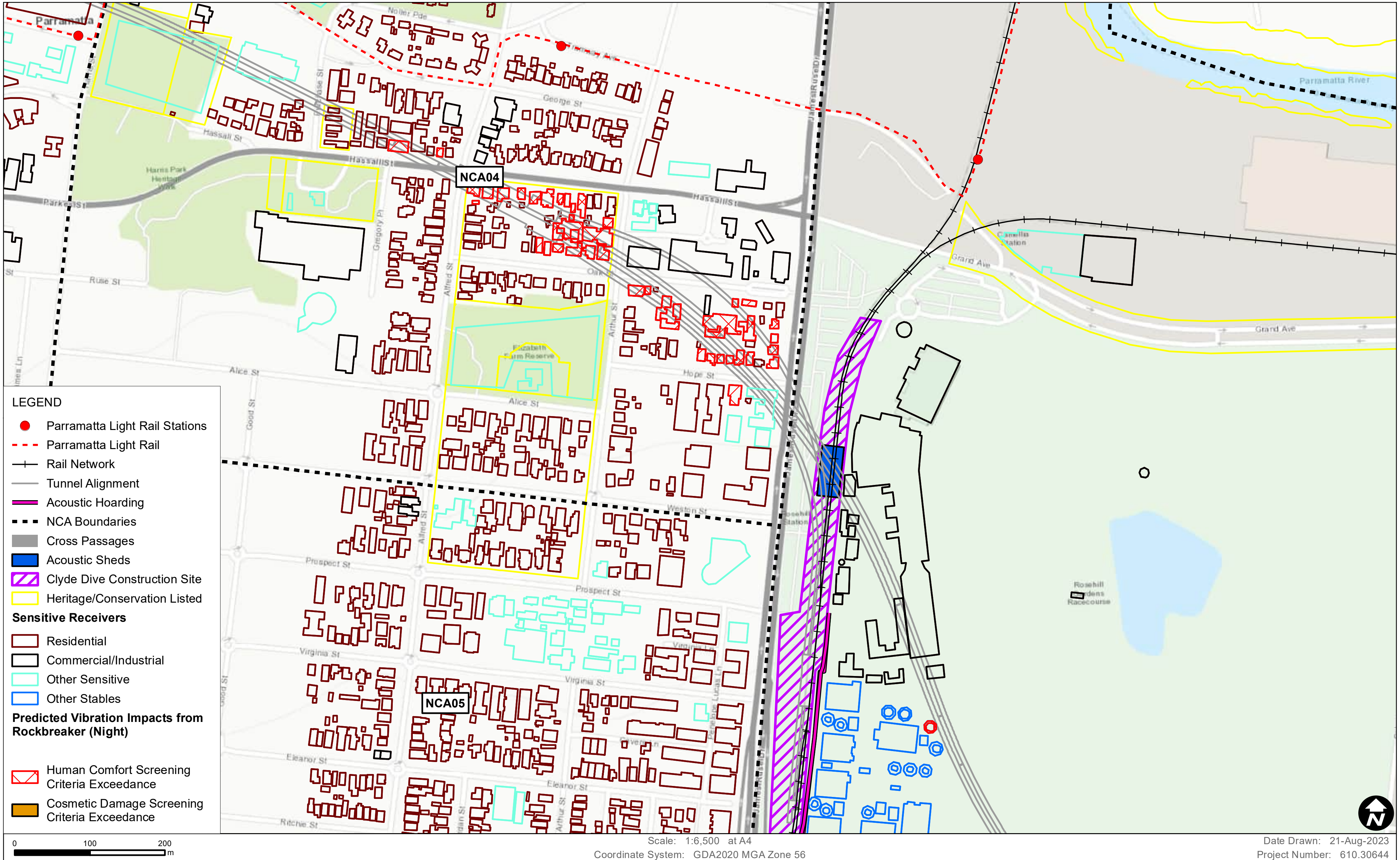
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Rockbreaker (Night)

FIGURE E-37

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Rockbreaker_Night_02.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

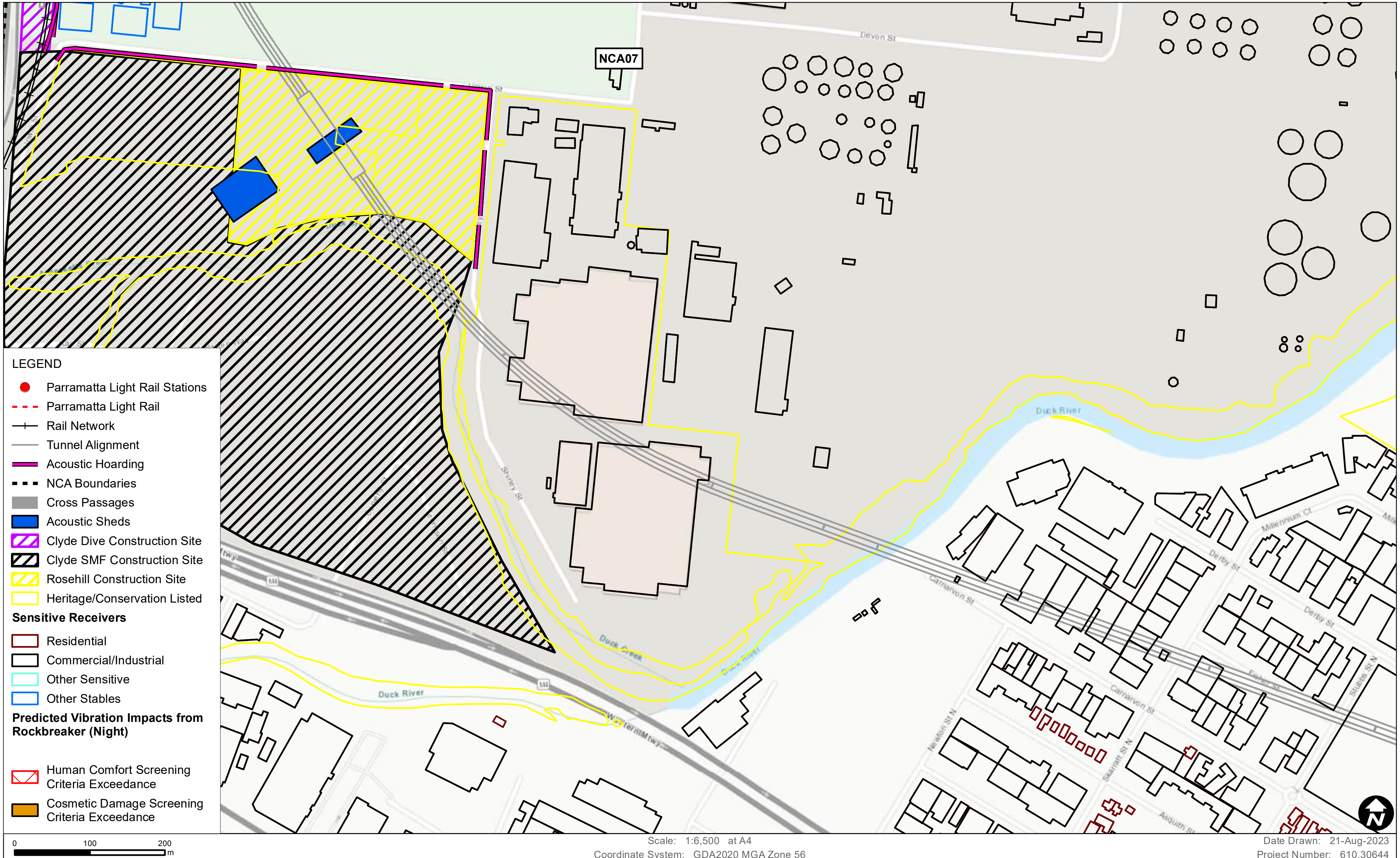
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Rockbreaker (Night)

FIGURE E-38

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Rockbreaker_Night_02.mxd



Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Rockbreaker (Night)

FIGURE E-39

LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Acoustic Hoarding
- NCA Boundaries
- Cross Passages
- Acoustic Sheds
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Vibration Impacts from Rockbreaker (Night)

- Human Comfort Screening Criteria Exceedance
- Cosmetic Damage Screening Criteria Exceedance

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

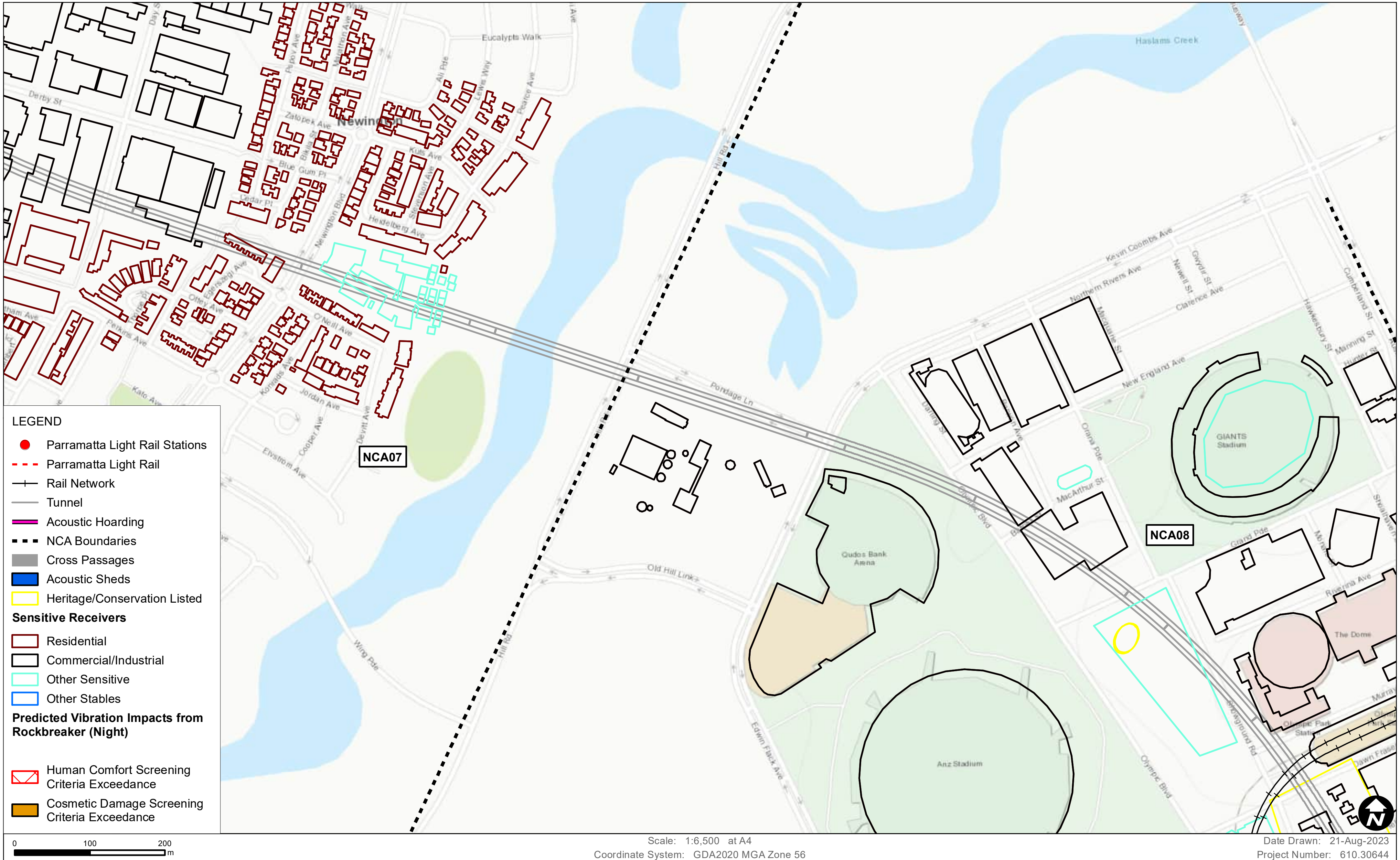
Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Rockbreaker (Night)

FIGURE E-40

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Rockbreaker_Night_02.mxd



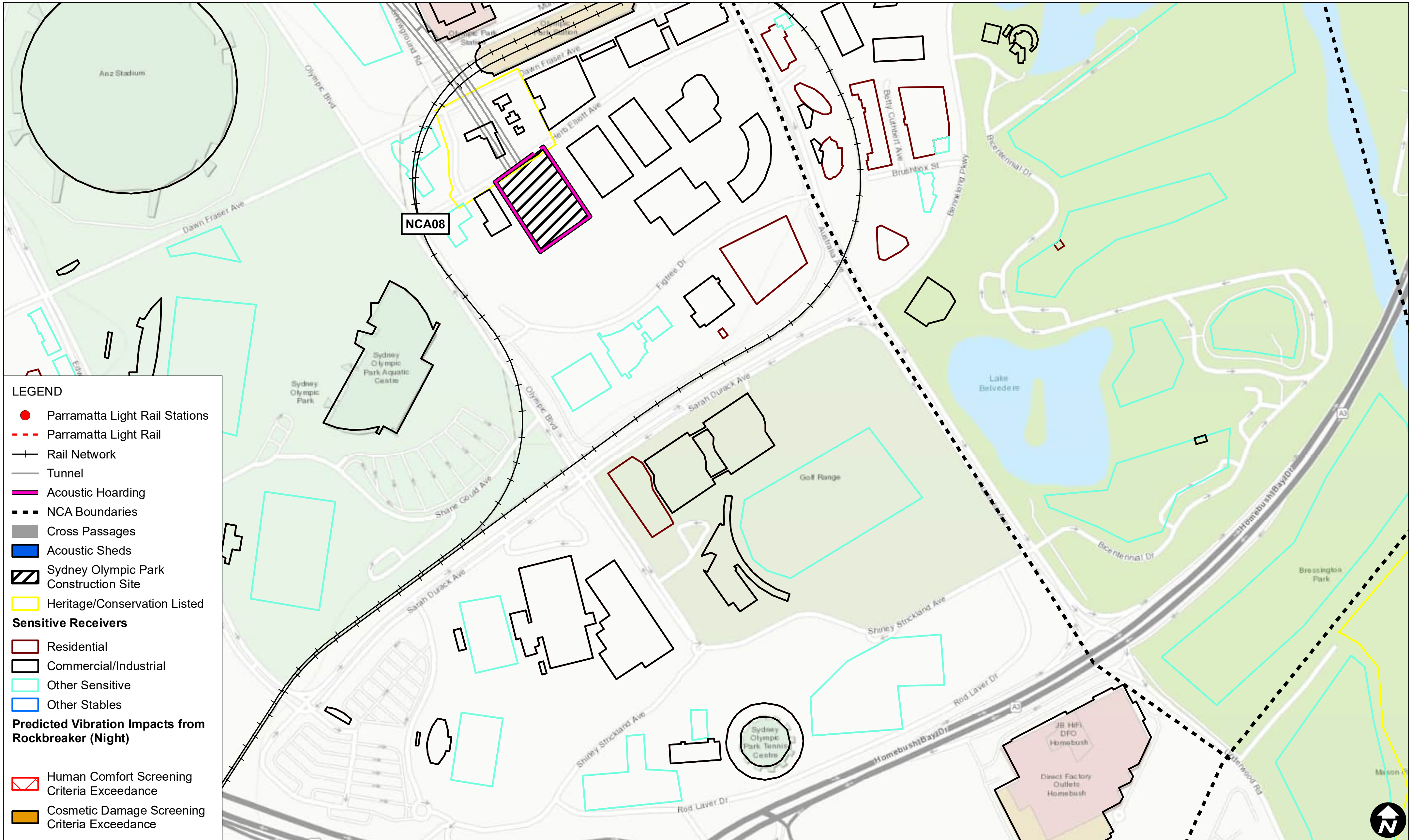
Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

Predicted Vibration Impacts from Rockbreaker (Night)

FIGURE E-41



LEGEND

- Parramatta Light Rail Stations
- Parramatta Light Rail
- Rail Network
- Tunnel
- Acoustic Hoarding
- NCA Boundaries
- Cross Passages
- Acoustic Sheds
- Sydney Olympic Park Construction Site
- Heritage/Conservation Listed

Sensitive Receivers

- Residential
- Commercial/Industrial
- Other Sensitive
- Other Stables

Predicted Vibration Impacts from Rockbreaker (Night)

- Human Comfort Screening Criteria Exceedance
- Cosmetic Damage Screening Criteria Exceedance

0 100 200 m

Scale: 1:6,500 at A4
Coordinate System: GDA2020 MGA Zone 56

Date Drawn: 21-Aug-2023
Project Number: 610.30644

Data Source:
ESRI Topographic

SLR

Predicted Vibration Impacts from Rockbreaker (Night)

FIGURE E-42

H:\Projects-SLR\610-SrvSYD\610-SYD\610.30644.00000 Sydney Metro West Western Tunnelling P\06 SLR Data\01 CADGIS\GIS\SLR61030644_Predicted_Vibration_Impacts_from_Rockbreaker_Night_02.mxd

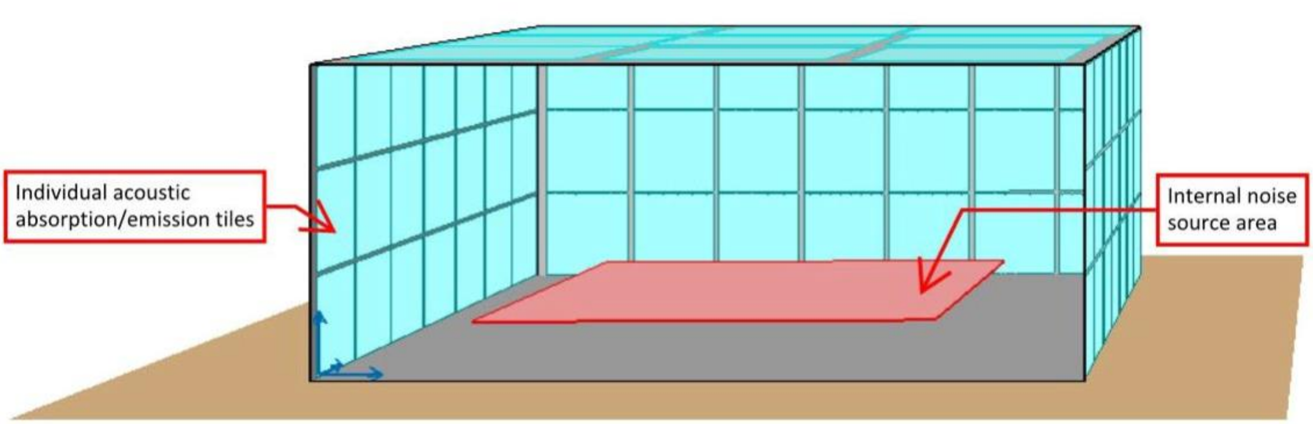
APPENDIX F

Acoustic Shed Properties

The acoustic sheds have been modelled with a height of between 10 metres and 20 metres. The footprint of each shed was determined from design information provided by the Project team and the sheds were positioned to cover the excavation and internal spoil handling areas. All sheds have been modelled to include exhaust/ventilation fans.

The sheds were modelled with sound absorption and transmission loss properties applied to each wall, floor and ceiling surface as indicatively shown in **Figure F1**. The various internal construction noise sources were represented in the model using area sources.

Figure F1 Example Acoustic Shed Arrangement



The sheds were modelled with internal acoustic absorption applied to surfaces five metres above ground level and the shed floors were conservatively modelled as reflective as they would mostly be concrete or other equivalent hard ground.

A ‘doors open’ scenario was modelled for locations where trucks are required to drive in and out of the sheds to collect spoil. No specific mitigation measures were included regarding noise transmitted through open doors.

Acoustic absorption and transmission loss values were based on data for products used to construct acoustic sheds on previous stages of Sydney Metro, and new supplier information provided by the project team.

Due to the larger distance offset from the Rosehill site to nearby sensitive receivers, it was determined that acoustic treatment of the segment shed and the spoil shed at the Rosehill construction site is not required. The Rosehill segment shed design also includes permanent openings for the gantry crane on the southwest and northeast ends.

An acoustic enclosure has also been modelled over the Westmead box excavation for some scenarios, this enclosure will be constructed following a clearance depth of approximately 6 m.

A summary of the modelled sound absorption coefficients is shown in **Table F1** and the transmission loss values for each shed element are summarised in **Table F2**. These absorption and transmission loss values should be used to procure acoustic treatment for the sheds at the Westmead and Clyde Dive Construction Sites.

Table F1 Acoustic Shed Absorption Coefficient Values

Internal Shed Element	Example Construction	Absorption Coefficient, α							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	Total α_ω
Roof	0.48 mm steel cladding with 55 mm Permastop building blanket (12 kg/m3)	0.15	0.45	0.70	0.70	0.70	0.70	0.70	0.70
Walls	51.0 mm SpeedWall panel (600kg/m3)	0.30	0.40	0.30	0.15	0.10	0.04	0.12	0.10
Open Door[1]	Opening	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Floor	Concrete	0.02	0.02	0.02	0.02	0.03	0.04	0.05	0.05

Note 1: Open doors are modelled as fully absorptive inside the shed to stop reflections from this element contributing to internal noise levels.

Table F2 Acoustic Shed Transmission Loss Values

Internal Shed Element	Example Construction	Sound Reduction, R (dB)							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	Total R_w
Roof (Clyde/Westmead)	0.48 mm steel cladding with 55 mm Permastop building blanket (12 kg/m3)	10.0	13.0	17.0	22.0	27.0	2.0	26.0	25
Walls (Clyde)	51.0 mm SpeedWall panel (600kg/m3)	23.0	25.2	28.4	33.9	38.6	40.9	36.0	37
Walls & Box Cover (Westmead)	0.48mm Trimdek with 100mm Anticon HP 2.5	13.0	17.0	22.0	25.0	27.0	32.0	36.0	29
Open Door[1]	Opening	0	0	0	0	0	0	0	0

Note 1: Open doors are modelled as fully absorptive inside the shed to stop reflections from this element contributing to internal noise levels.

Sound power level data for the noisiest equipment used in the sheds was based on data from the Department for Environment Food & Rural Affairs (DEFRA) Noise Database For Prediction Of Noise On Construction And Open Sites and is shown in **Table F3**.

The below octave band data was adjusted based on the quantity of equipment and number of construction faces in each scenario.

Table F3 Noise Source Sound Power Level Spectra

Noise Source[1]	A-weighted Sound Power Level (dBA)						
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
Gantry Cranes	71.5	81.1	83.3	91.0	91.0	86.9	94.3
Loaders	81.9	91.0	97.5	107.9	108.1	103.3	95.1
Dump Trucks	65.8	90.8	98.8	106.9	103.8	100.8	97.8
Concrete Trucks	86.1	94.2	96.6	101.9	104.6	103.1	97.3
Telehandlers	73.2	81.9	84.5	89.8	90.8	86.1	80.8
Franna Cranes	71.5	81.1	83.3	91.0	91.0	86.9	94.3
Concrete Vibrators	78.5	86.7	88.2	95.0	100.4	95.6	88.9

Note 1: Octave band sound power level data based on DEFRA Noise Database.

ASIA PACIFIC OFFICES

ADELAIDE
60 Halifax Street
Adelaide SA 5000
Australia
T: +61 431 516 449

BRISBANE
Level 16, 175 Eagle Street
Brisbane QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CAIRNS
Level 1 Suite 1.06
Boland's Centre
14 Spence Street
Cairns QLD 4870
Australia
T: +61 7 4722 8090

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
Unit 5, 21 Parap Road
Parap NT 0820
Australia
T: +61 8 8998 0100
F: +61 8 9370 0101

GOLD COAST
Level 2, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Level 11, 176 Wellington Parade
East Melbourne VIC 3002
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE CBD
Suite 2B, 125 Bull Street
Newcastle West NSW 2302
Australia
T: +61 2 4940 0442

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Grd Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

SYDNEY
Tenancy 202 Submarine School
Sub Base Platypus
120 High Street
North Sydney NSW 2060
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TOWNSVILLE
12 Cannan Street
South Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

WOLLONGONG
Level 1, The Central Building
UoW Innovation Campus
North Wollongong NSW 2500
Australia
T: +61 2 4249 1000

AUCKLAND
Level 4, 12 O'Connell Street
Auckland 1010
New Zealand
T: 0800 757 695

NELSON
6/A Cambridge Street
Richmond, Nelson 7020
New Zealand
T: +64 274 898 628

WELLINGTON
12A Waterloo Quay
Wellington 6011
New Zealand
T: +64 2181 7186

SINGAPORE
39b Craig Road
Singapore 089677
T: +65 6822 2203