Memorandum

To:	Snr Approvals Advisor (GLC)	**At:**	GLC
From:	Principal Acoustic Consultant (SLR)	**At:**	SLR Consulting Australia Pty Ltd
Date:	10 May 2024	**Ref:**	610.30644-M19-v1.0-20240510.docx
Subject:	Sydney Metro West WTP NVIA Settlement Marker Installation	**TB Number:**	SMWSTWTP-GLO-SWD-NV-PLN-000001

1 Introduction

SLR Consulting has been engaged by Gamuda & Laing O'Rourke Consortium (GLC) to provide noise and vibration advice in relation to the Sydney Metro West, Western Tunnelling Package. This Construction Noise and Vibration Impact Assessment (NVIA) has been prepared to assess potential noise and vibration impacts associated with settlement marker installation during approved project hours.

2 Overview of Proposed Work

Table 1 presents an overview of key information relevant to this NVIA. **Table 2** presents the Construction Scenarios and Equipment. The construction equipment and locations included in the assessment are based on information contained in the scope of works supplied on 17 April 2024 from the project team, and subsequent updates. Further detail of existing conditions, management levels and assessment methodology are outlined in the Detailed Noise and Vibration Impact Statement (DNVIS).

Table 1 Details of proposed work

Item	Description		
NVIA Reference	M19		
Works Type	Settlement Marker Installation		
Location	Westmead to Sydney Olympic Park		
Assessment Periods (refer CNVMP)	**Approved Project Hours (AH)**	**OOHW1 (Evening)**	**OOHW2 (Night)**
	Monday -Friday (7am – 6pm) Saturday (8am – 6pm) Sunday / Public Holidays (Nil)	Monday -Friday (6pm – 10pm) Saturday (6pm – 10pm) Sun. / P. Holidays (8am -6pm)	Monday -Friday (10pm – 7am) Saturday (10pm – 8am) Sun. / P. Holidays (6pm -7am)
Ambient Acoustic Environment at Nearest Receiver	The acoustical environment along the project alignment changes depending on the area of interest but is generally dominated by road traffic noise and 'urban hum'.		
Noise Modelling	ISO 9613:2 algorithm in SoundPLAN v8.2		
Results Presentation	Free field – no façade reflections		

Table 2 Construction Scenarios and Equipment

ID	Construction Scenario	Assessment Period	Total Lw (dBA)	Construction Equipment	Estimated utilisation per 15 min period
W.001	**Settlement Marker Installation**	Approved Hours (Day)	109	1 x Non-Destructive Digger (NDD) Truck	100%

Note 1: Individual Sound Power Levels (Lw) for key activities have been adopted from the DEFRA Noise Database, AS2436, TfNSW *Construction Noise and Vibration Strategy* and Sydney Metro *Construction Noise and Vibration Standard.*

Settlement marker locations where no impacts are predicted have been excluded from this report. Marker locations where impacts are predicted are shown in **Appendix A**. This assessment has been undertaken to determine if and where the Highly Noise Affected (HNA) management level has been exceeded during approved project hours.

3 Assessment Criteria

3.1 Noise Management Levels

The noise management levels (NMLs) for residential (**Table 3**) and other sensitive receivers (**Table 4**) have been adopted from the Construction Noise and Vibration Management Plan (CNVMP). Project-specific NMLs for residential receivers were determined for each Noise Catchment Area (NCA). During out-of-hours work (OOHW) the residential NML is determined as 5 dB above the Rating Background Noise level (RBL) (ie RBL + 5dB).

NMLs for other sensitive receivers have been adopted from the Interim Construction Noise Guideline (ICNG), Sydney Metro - Construction Noise and Vibration Standard (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 3 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)			
			Day	Day[1]	Evening	Night	Night
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

Table 4 NMLs for 'Other Sensitive' Receivers

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
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]
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.

3.2 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 *Assessing Vibration: a technical guideline* (AVTG) (DEC, 2006) provides criteria for intermittent vibration based on the Vibration Dose Value (VDV).
- 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 *Part 2-1993 Evaluation and measurement for vibration in buildings Part 2, BSI, 1993* and German Standard DIN 4150 *Part 3-2016 Structural vibration – Effects of vibration on structures, Deutsches Institute fur Normung, 1999*.
- 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 Sydney Metro *Construction Noise and Vibration Standard*.

Based on the equipment and activities identified for the settlement marker installation work vibration impacts are not expected for human comfort, structural/cosmetic damage or building contents. Given the limited potential for any vibration impacts to occur, no further assessment of construction vibration is required.

4 Assessment Findings

Noise modelling was conducted in accordance with the method outlined in the DNVIS. A summary of the number of buildings where NML exceedances were predicted for the various work scenarios is shown in **Table 6**. Maps of the predicted (worst-case) noise impacts are presented in **Appendix A**. It is noted that work will be undertaken during the approved hours for the project (daytime). Predicted noise levels in this assessment include the use of portable noise barriers, assuming a 5 dB reduction.

The assessment shows the predicted impacts based on the exceedance of the management levels, as per the categories in **Table 5**.

Table 5 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	

The noise impact maps in **Appendix A** present the worst-case predicted noise impacts (ie when work is occurring closest to each receiver). Recommendations are provided in **Section 5**.

Table 6 Construction Noise Assessment – Approved Hours

Work ID	Assessment Period	Exceedance Category Above NML	Number of Receivers with NML Exceedance									
			Residential Receivers									Other Sensitive Receivers
			Westmead		Parramatta	Clyde - Rosehill			Rosehill - Silverwater	Sydney Olympic Park		All NCAs
			NCA01	NCA02	NCA03	NCA04	NCA05	NCA06	NCA07	NCA08	NCA09	
W.001	Approved Hours (AH)	1-10 dB	1	7	2	21	15	-	3	-	-	13
		11-20 dB	-	5	-	2	1	-	2	-	-	5
		21-30 dB	-	-	-	-	-	-	-	-	-	-
		>30 dB	-	-	-	-	-	-	-	-	-	-
		HNA[1]	-	-	1[2]	1[3]	1[4]	-	-	-	-	n/a

Note 1: Highly noise affected, based on ICNG definition (i.e. predicted $L_{Aeq(15minute)}$ noise at residential receiver is 75 dBA or greater).

Note 2: HNA exceeded at nearest receiver to marker BXT-PTA1

Note 3: HNA exceeded at nearest receiver to marker BXT-CLJ1

Note 4: HNA exceeded at nearest receiver to marker BXT-CLY1

5 Conclusion and Recommendations

Noise emissions from the project have been predicted at the surrounding receivers. Worst-case noise levels are expected to exceed the noise management level (NML) by up to '11 - 20 dB' at the closest 'other sensitive' receivers and residential receivers. These predictions include the use of portable noise barriers, assuming a reduction of 5 dB.

A number of mitigation and management measures have been recommended below. Where feasible and reasonable these should be applied to the project to control and minimise the impacts during construction as far as practicable.

Consider the following recommendations (where feasible and reasonable) during commencement of each work area:

- Implement mitigation measures identified within the CNVMP and DNVIS.
- Implement additional mitigation measures identified within the CNVMP and DNVIS.
- Ensure the minimum sized equipment necessary to complete the work are used.
- Implement portable noise barriers around noise intensive activities (ie Non-Destructive Digger (NDD) Truck)
- Shut down plant and machinery, including vehicles when not in operation.

6 Consultation undertaken and mitigation undertaken

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

- Letterbox notification of the anticipated impact to all affected receivers in accordance with the AMMs of the CNVS and NVMP
- In addition to letterbox notification - door-knocking will be undertaken for receivers adjacent to markers BXT-WMD1 and BXT-PTA1 due to the effects of an ROL specifically in these areas.
- Temporary noise screens used around equipment, where appropriate.
- Specific mitigation measures identified through the consultation process will be implemented as is reasonable and feasible

APPENDIX A – NOISE IMPACT MAPS (APPROVED HOURS)

Figure A1 W.001: Settlement Marker Installation – NCA01-NCA02

Figure A2 W.001: Settlement Marker Installation – NCA03

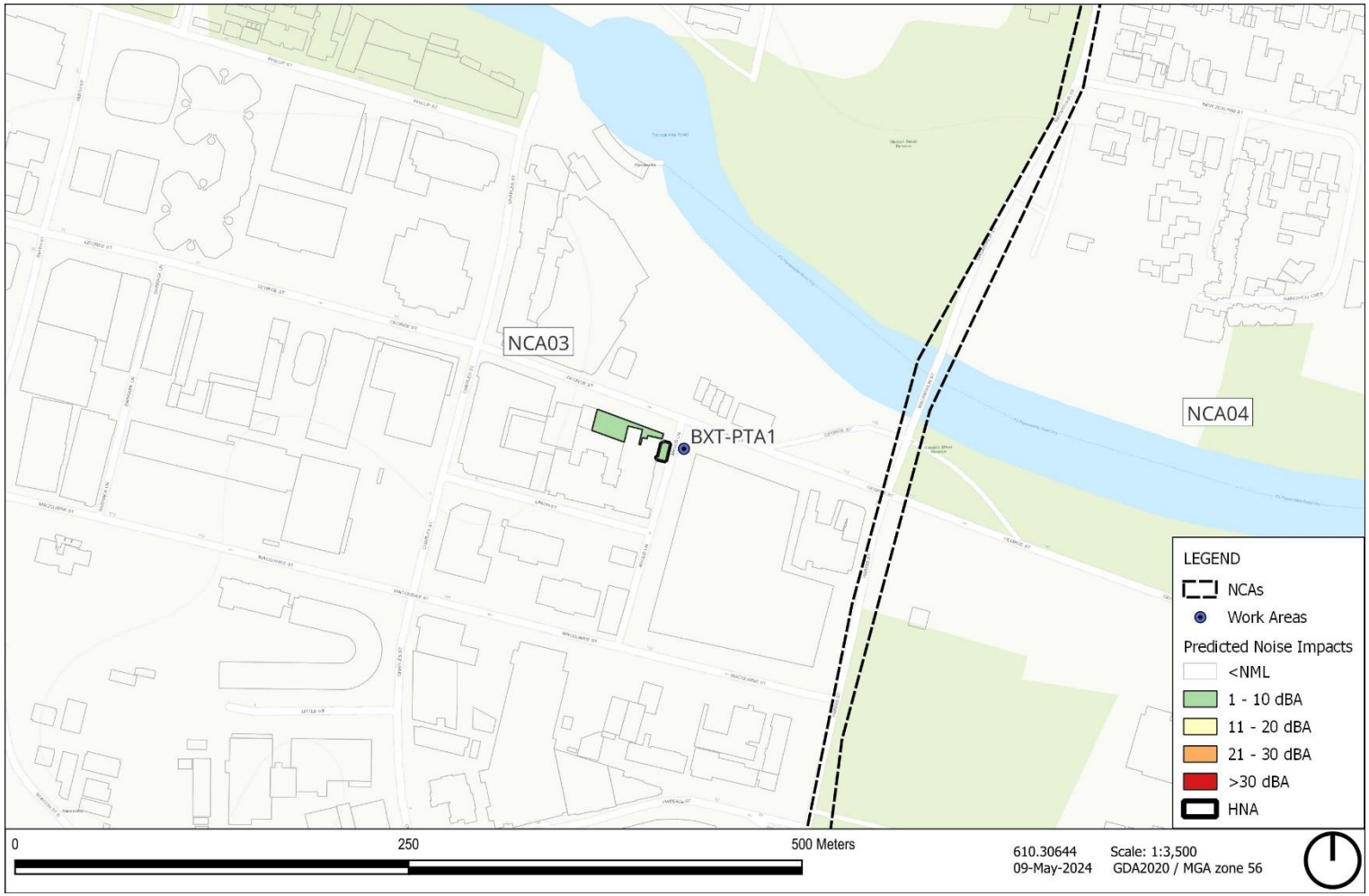

Figure A3 W.001: Settlement Marker Installation – NCA04

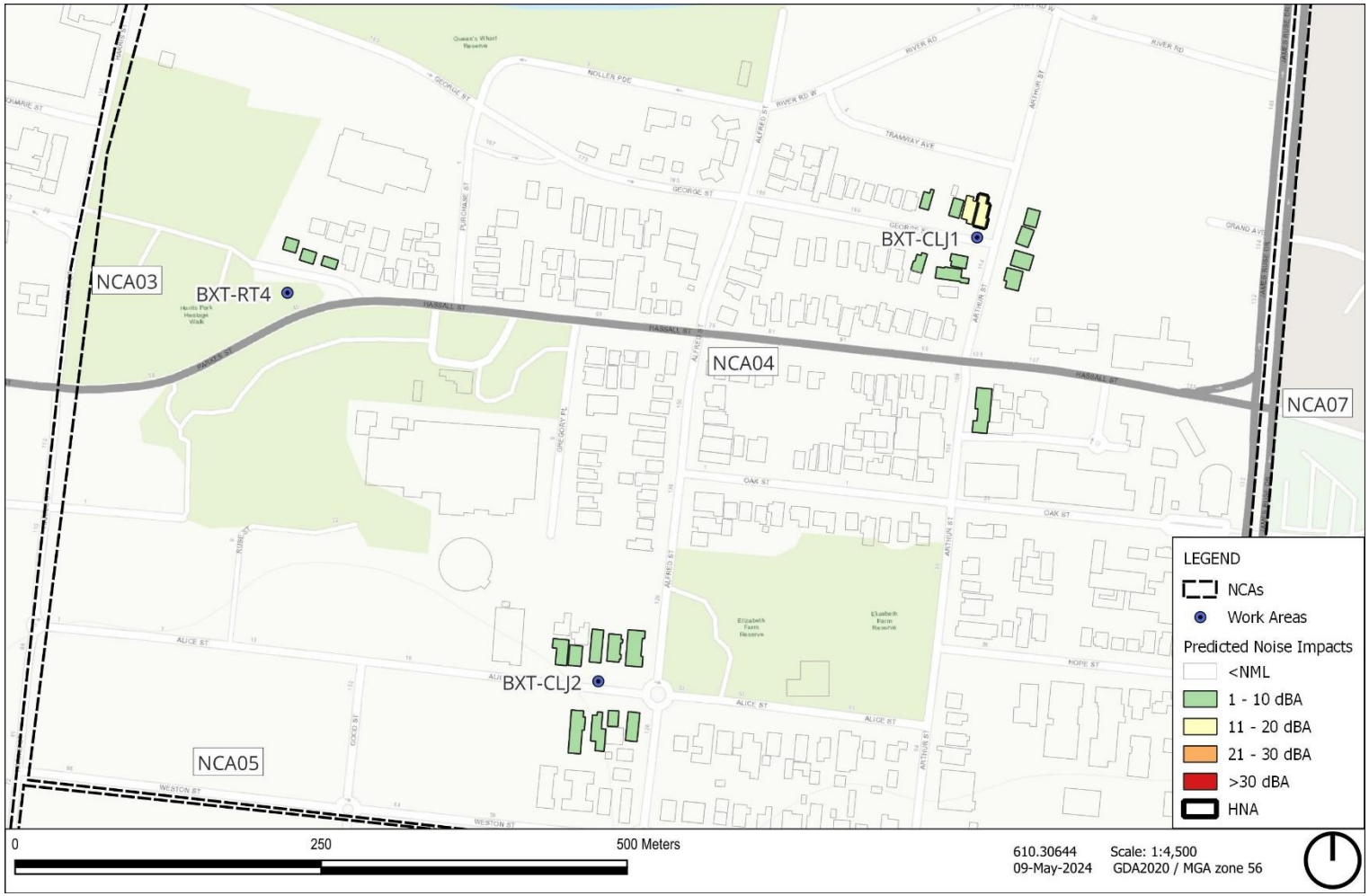

Figure A4 W.001: Settlement Marker Installation – NCA05

Figure A5 W.001: Settlement Marker Installation – NCA07

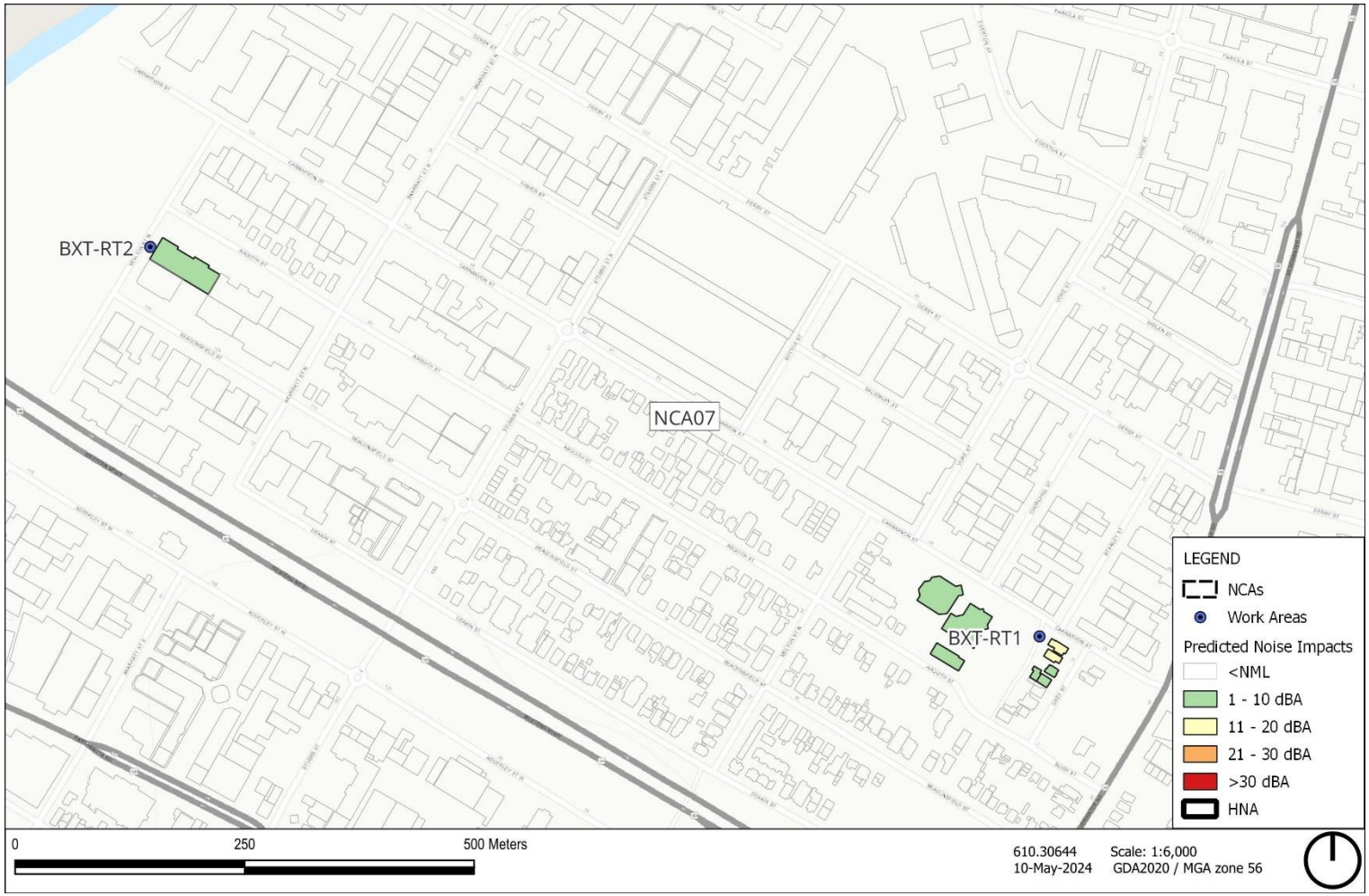

Figure A6 W.001: Settlement Marker Installation – NCA08