

SYDNEY METRO WEST EASTERN TUNNELLING PACKAGE

Detailed Noise and Vibration Impact Statement - Preliminary Works - Project Wide

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John Holland CPB Ghella Joint Venture

Sydney Metro West - ETP - Detail Noise & Vibration Impact Statement Preliminary Works (Rev 0).docx

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Compliance

Planning Approval (SSI 19238057)

No.	Requirement	Reference
D20	A detailed land use survey must be undertaken 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. The survey may be undertaken on a progressive basis but must be undertaken in any one area before the commencement of work which generates construction noise, vibration or ground-borne noise in that area. The results of the survey must be included in the Noise and Vibration CEMP Sub-plan required under Condition C5 of this schedule.	APPENDIX B
D21	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 2.2
D22	Except as permitted by an EPL, highly noise intensive work that results in an exceedance of the applicable NML at the same receiver must only be undertaken: (a) between the hours of 8:00 am to 6:00 pm Monday to Friday; (b) between the hours of 8:00 am to 1:00 pm Saturday; and (c) if continuously, then not exceeding three (3) hours, with a minimum cessation of work of not less than one (1) hour. For the purposes of this condition, 'continuously' includes any period during which there is less than one (1) hour between ceasing and recommencing any of the work.	Section 2.2
D23	Notwithstanding Conditions D21 and D22 of this schedule work may be undertaken outside the hours specified in the following circumstances: (a) Safety and Emergencies, including: (i) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or (ii) 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. On becoming aware of the need for emergency work in accordance with (a)(ii) above, the AA, the ER, the Planning Secretary and the EPA must be notified of the reasons for such work. The Proponent must use best endeavours to notify as soon as practicable all noise and/or vibration affected sensitive land user(s) of the likely impact and duration of those work. (b) Low impact, including: (i) construction that causes $L_{Aeq(15 \text{ minute})}$ noise levels: • no more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and • no more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s); and (ii) construction that causes $L_{AFmax(15 \text{ minute})}$ noise levels no more than 15 dB(A) above the rating background level at any residence; or (iii) construction that causes: • continuous or impulsive vibration values, measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), or • intermittent vibration values measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).	Section 2.2 Table 2.2 Table 2.2

No.	Requirement	Reference
	<p>(c) By Approval, including:</p> <p>(i) where different construction hours are permitted or required under an EPL in force in respect of the CSSI; or</p> <p>(ii) works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition D24 of this schedule; or</p> <p>(iii) negotiated agreements with directly affected residents and sensitive land user(s).</p> <p>(d) By Prescribed Activity, including:</p> <p>(i) tunnelling by tunnel boring machine (excluding cut and cover tunnelling and surface works) are permitted 24 hours a day, seven days a week; or</p> <p>(ii) delivery of material that is required to be delivered outside of standard construction hours in Condition D21 to directly support tunnelling activities, except between the hours 10:00 pm and 7:00 am to / from the Pyrmont construction site which could result in a sleep disturbance even for receivers in the proximity of Pyrmont Street, Edward Street, Union Street, Paternoster Row and Pyrmont Bridge Road; or</p> <p>(iii) haulage of spoil except between the hours of 10:00 pm and 7:00 am to / from the Pyrmont construction site; or</p> <p>(iv) work within an acoustic shed where there is no exceedance of noise levels under Low Noise Impact Work circumstances identified in (b) above, unless otherwise agreed by the Planning Secretary.</p> <p>Note: Tunnelling does not include station box excavation.</p>	Table 2.2
D24	An Out-of-Hours Work Protocol must be prepared before the approval of out-of-hours-work under Condition D23(c)(ii).	Refer to Sydney Metro West-OOHW-Protocol
D25	<p>All reasonable and feasible mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration criteria:</p> <p>(a) construction 'Noise affected' noise management levels established using the Interim Construction Noise Guideline (DECC, 2009);</p> <p>(b) vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure);</p> <p>(c) Australian Standard AS 2187.2 - 2006 "Explosives - Storage and Use - Use of Explosives" (for human exposure);</p> <p>(d) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions" (for structural damage); and</p> <p>(e) the vibration limits set out in the German Standard DIN 4150-3: Structural Vibration-effects of vibration on structures (for structural damage for structurally unsound heritage items).</p> <p>Any work identified as exceeding the noise management levels and / or vibration criteria must be managed in accordance with the Noise and Vibration CEMP Sub-plan.</p> <p>Note: The ICNG identifies 'particularly annoying' activities that require the addition of 5 dB(A) to the predicted level before comparing to the construction Noise Management Level.</p>	Section 4 Table 4.1
D26	<p>All reasonable and feasible mitigation measures must be applied when the following residential ground-borne noise levels are exceeded:</p> <p>(a) evening (6:00 pm to 10:00 pm) — internal LAeq(15 minute): 40 dB(A); and</p> <p>(b) night (10:00 pm to 7:00 am) — internal LAeq(15 minute): 35 dB(A).</p> <p>The mitigation measures must be outlined in the Noise and Vibration CEMP Sub-plan, including in any Out-of-Hours Work Protocol, required by Condition D24.</p>	Section 4 Table 4.1
D27	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 5.3.2

No.	Requirement	Reference
D28	Industry best practice construction methods must be implemented where reasonably practicable to ensure that noise levels are minimised around sensitive land user(s). Practices must include, but are not limited to: (a) use of regularly serviced low sound power equipment; (b) temporary noise barriers (including the arrangement of plant and equipment) around noisy equipment and activities such as rock hammering and concrete cutting; and (c) use of alternative construction and demolition techniques.	Section 5.3
D29	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 D25 and D26 at any residence outside construction hours identified in Condition D21, 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 document Section 1.3
D30	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 and updated as required if site conditions or activities change.	This document Section 1.3
D31	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.	APPENDIX C Section 6.2
D32	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 6.3.4
D33	The Proponent must seek the advice of a heritage specialist on methods and locations for installing equipment used for vibration, movement and noise monitoring at Heritage items. Note: The installation of noise and vibration equipment must not impact on the heritage value of the Heritage items.	Section 6.2.2 and 6.3.4
D34	Before conducting at-property treatment at any Heritage item identified in the documents listed in Condition A1, the advice of a suitably qualified and experienced built heritage expert must be obtained and implemented to ensure any such work does not have an adverse impact on heritage significance of the item.	Not required. See Table 5.5
D35	If a Heritage item is found to be structurally unsound (following inspection) a cosmetic damage criterion of 2.5 mm/s peak component particle velocity (from DIN 4150) must be applied.	Section 4 Table 4.1

No.	Requirement	Reference
D36	<p>All work undertaken for the delivery of the CSSI, including those undertaken by third parties (such as utility relocations), must be coordinated to ensure respite periods are provided. The Proponent must:</p> <ul style="list-style-type: none"> (a) reschedule any work to provide respite to impacted noise sensitive receivers so that the respite is achieved in accordance with Condition D37; or (b) consider the provision of alternative respite or mitigation to impacted noise sensitive receivers; and (c) provide documentary evidence to the AA in support of any decision made by the Proponent in relation to respite or mitigation. <p>The consideration of respite must also include all other approved Critical SSI, SSI and SSD projects which may cause cumulative and / or consecutive impacts at receivers affected by the delivery of the CSSI.</p>	Not required. See Table 5.5
D37	<p>In order to undertake out-of-hours work outside the work hours specified under Condition D21, appropriate respite periods for the out-of-hours work must be identified in consultation with the community at each affected location on a regular basis. This consultation must include (but not be limited to) providing the community with:</p> <ul style="list-style-type: none"> (a) a progressive schedule for periods no less than three (3) months, of likely out-of-hours work; (b) a description of the potential work, location and duration of the out-of-hours work; (c) the noise characteristics and likely noise levels of the work; and (d) likely mitigation and management measures which aim to achieve the relevant NMLs under Condition D26 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers). <p>The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour work must be provided to the AA, EPA and the Planning Secretary.</p> <p>Note: Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the RBL at any residence.</p>	Not required. See Table 5.5
D38	<p>The Proponent must identify all receivers at Pyrmont and Hunter Street Sydney CBD likely to experience internal noise levels greater than LAeq(15 minute) 60 dB(A) inclusive of a 5 dB penalty, if rock breaking or any other highly noise intensive activity likely to result in regenerated (ground-borne) noise or perceptible level of vibration is planned (including works associated with utility adjustments), between 7am and 8pm.</p> <p>Note: this condition does not override requirements for work hours as outlined in Conditions D21, D22 and D23 above.</p>	No receivers identified, see Section 5.2.1 and 5.2.2
D39	<p>The Proponent must consult with all receivers identified in accordance with Condition D38 with the objective of determining appropriate hours of respite so that construction noise (including ground-borne noise), does not exceed internal noise levels of:</p> <ul style="list-style-type: none"> (a) LAeq(15 minute) 60 dB(A) inclusive of a 5dB penalty if rock breaking or any other highly noise intensive activity likely to result in ground-borne noise or a perceptible level of vibration is planned between 7am - 8pm for more than 50 percent of the time; and (b) LAeq(15 minute) 55 dB(A) inclusive of a 5dB penalty if rock breaking or any other highly noise intensive activity likely to result in ground-borne noise or a perceptible level of vibration is planned between 7am – 8pm for more than 25 percent of the time, <p>Unless an agreement is reach with those receivers. This condition does not apply to noise associated with the cutting surface of a TBM as it passes under receivers.</p> <p>Note: this condition requires that noise levels be less than LAeq(15 minute) 60 dB(A) for a least 6.5 hours between 7am and 8pm, of which at least 3.25 hours must be below LAeq(15 minute) 55 dB(A). Noise equal to or above LAeq(15 minute) 60 dB(A) is allowed for the remaining 6.5 hours between 7am and 8pm.</p>	Not required, see Section 5.2.1 and 5.2.2

No.	Requirement	Reference
D40	<p>Notwithstanding Conditions D22 and D23, rock breaking and other particularly highly noise intensive activities for station shaft or cut and cover stations is not permitted outside of hours identified in Conditions D21, except at Hunter Street Sydney CBD; or</p> <p>(a) 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; or</p> <p>(b) where different construction hours are permitted or required under and EPL in force in respect of the construction; or</p> <p>(c) where an EPL is not required or in force, approved through an Out of Hours Work Protocol developed in accordance with Condition D24; or</p> <p>(d) construction that causes LAeq(15 minute) noise levels:</p> <p>(i) no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009); and</p> <p>(ii) no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses; and</p> <p>(iii) continuous or impulsive vibration values, measures at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006); and</p> <p>(iv) intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).</p>	Not required, see Section 5.2.1 and 5.2.2
D41	No blasting is permitted as part of this CSSI.	No blasting as part of preliminary works.

Revised Environmental Mitigation Measures

No.	Requirement	Reference
NV01	<p>Community preference for noise mitigation and management</p> <p>Where justified by the application of the Construction Noise and Vibration Standard, further engagement and consultation would be carried out in accordance with the Sydney Metro Overarching Community Communications Strategy with:</p> <ul style="list-style-type: none"> ▪ The affected communities to understand their preferences for mitigation and management measures ▪ 'Other sensitive' receivers such as schools, medical facilities, theatres, or places of worship to understand periods in which they are more sensitive to impacts. <p>Based on this consultation, appropriate mitigation and management options would be considered and implemented where feasible and reasonable to minimise the impacts.</p>	Not required, see Section 5.2 and 6.2.

No.	Requirement	Reference
NV02	<p>Alternative construction methodologies</p> <p>Alternative construction methodologies and measures that minimise noise and vibration levels during noise intensive work would be investigated and implemented where feasible and reasonable. This would include consideration of:</p> <ul style="list-style-type: none"> ▪ The use of hydraulic concrete shears in lieu of hammers/rock breakers ▪ Sequencing work 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 to minimise impacts from prolonged periods of noise intensive work ▪ 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 work sequencing/hours to minimise impacts during peak pedestrian times and/or adjoining neighbour outdoor activity periods. 	See Table 5.5 and Table 6.4
NV03	<p>Construction noise – respite periods</p> <p>Appropriate respite would be provided to affected receivers in accordance with the Sydney Metro Construction Noise and Vibration Standard. This would include consideration of impacts from utility and power supply work when determining appropriate respite periods for affected receivers.</p> <p>When determining appropriate respite, the need to efficiently undertake construction would be balanced against the communities' preferred noise and vibration management approach.</p>	See Table 2.2 and Sections 5.3.1 and 5.3.2
NV04	<p>Construction noise – out of hours work</p> <p>The use of noise intensive equipment at construction sites with 'moderate' and 'high' out of hours noise management level exceedances would be scheduled for standard construction hours, where feasible and reasonable. Where this is not feasible and reasonable, the work would be undertaken as early as possible in each work shift.</p>	Section 2.2 and Section 5.3.1
NV05	<p>Night-time noise impacts</p> <p>Where practicable, air brake silencers would be used on heavy vehicles that access construction sites multiple times per night or over multiple nights.</p>	See Table 5.5
NV06	<p>Night-time noise impacts</p> <p>Perimeter site hoarding would be designed with consideration of on-site heavy vehicle movements with the aim of minimising sleep disturbance impacts.</p>	See Table 5.5
NV07	<p>Noise emissions from equipment</p> <p>Long term construction site support equipment and machinery would be low noise emitting and suitable for use in residential areas, where feasible and reasonable. Examples include:</p> <ul style="list-style-type: none"> ▪ Low noise water pumps for use in water treatment facilities ▪ Low noise generators and compressors ▪ Low noise air conditioner units for use of amenities buildings. 	See Table 5.5 and APPENDIX C (Table C1)
NV08	<p>Acoustic sheds</p> <ul style="list-style-type: none"> ▪ Where acoustic sheds are installed, the internal lining and construction materials would be determined during later design stages to ensure appropriate attenuation is provided. This design of sheds would likely include the following considerations: All significant noise producing equipment that would be used during the night-time would be inside the shed, where feasible and reasonable ▪ Noise generating ventilation systems such as compressors, scrubbers, etc, would also be inside the shed and external air intake/discharge ports would be appropriately acoustically treated ▪ Acoustic shed doors would be kept closed during the night-time period, where feasible and reasonable. Where night-time vehicle access is required, the doors would be designed and constructed to minimise noise breakout. 	N/A

No.	Requirement	Reference
NV09	Ground-borne noise Feasible and reasonable measures would be implemented to minimise ground-borne noise where exceedances are predicted. This may require implementation of less ground-borne noise and less vibration intensive alternative construction methodologies.	N/A (no tunnelling works under this DNVIS)
NV10	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 work 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.	N/A (no cross passage excavation under this DNVIS)
NV11	Ground-borne noise – underground rockbreaking Activity specific Detailed and/or General Noise and Vibration Impact Statement (in accordance with the requirements of the Construction Noise and Vibration Standard) would be developed for rockbreaking in the tunnel and at cross passages, specifically addressing the activity where it is required between 22:00 – 07:00.	N/A (no tunnelling works under this DNVIS)
NV12	Construction traffic noise Further assessment of construction traffic would be completed during detailed design, including consideration of the potential for exceedances of the NSW Road Noise Policy base criteria (where greater than two dB increases are predicted). The potential impacts would be managed using the following approaches, where feasible and reasonable: <ul style="list-style-type: none"> On-site spoil storage capacity would be maximised to reduce the need for truck movements during sensitive times Vehicle movements would be redirected away from sensitive receiver areas and scheduled during less sensitive times The speed of vehicles would be limited, and the use of engine compression brakes would be avoided Heavy vehicles would not be permitted to idle near sensitive receivers. 	See Section 2.1.3
NV13	Construction vibration Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure (in consultation with a structural engineer) and vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure. For heritage items, the more detailed assessment would specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.	See Section 6, more specifically Section 6.2
NV14	Building condition surveys – construction vibration 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.	See Table 6.4
NV15	Cumulative construction noise impacts The likelihood of cumulative construction noise impacts would be reviewed during detailed design when detailed construction schedules are available. Co-ordination would occur between potentially interacting projects to minimise concurrent or consecutive work in the same areas, where possible. Specific mitigation strategies would be developed to manage impacts. Depending on the nature of the impact, this could involve adjustments to construction program or activities of Sydney Metro West or of other construction projects.	See Section 5.3.5

1 Introduction

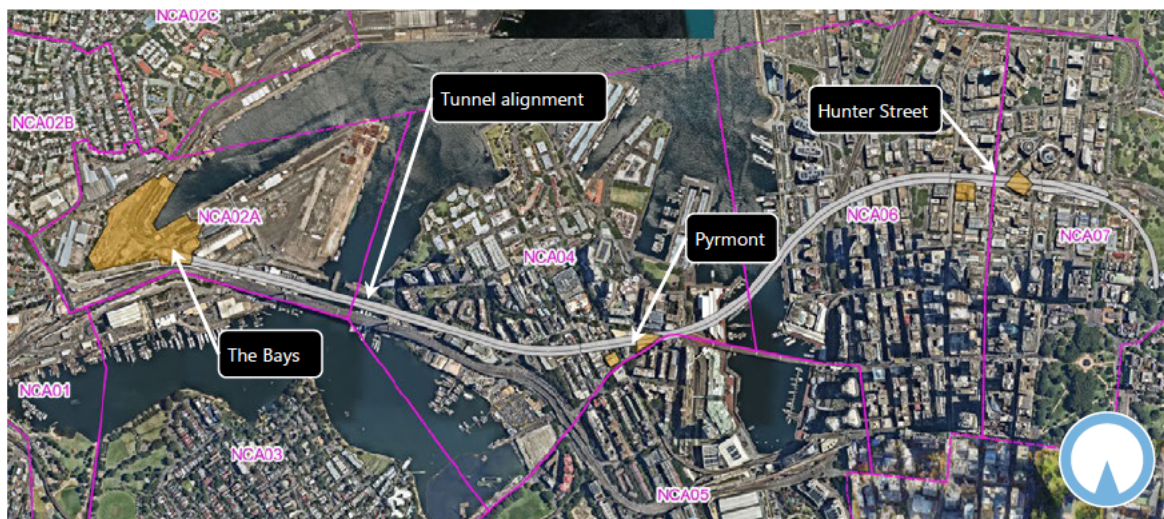
1.1 Purpose and application

This Detailed Noise and Vibration Impact Statement (DNVIS) has been prepared on behalf of John Holland CPB Ghella Joint Venture (JCG) in accordance with the Sydney Metro Construction Noise and Vibration Standard (CNVS)[1] for the construction of the Sydney Metro West – Eastern Tunnelling Project (ETP) Works. This DNVIS has been prepared to satisfy Planning Approval (SSI 19238057) Condition D29.

1.2 Overview

Sydney Metro West ETP is Stage 2 of the Sydney Metro West a new 24-kilometre metro line that will connect Greater Parramatta with the Sydney CBD via stations at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street (Sydney CBD). The Project includes all major civil construction work including station excavation (at the Pyrmont Station and Hunter Street Station (Sydney CBD) construction sites) and tunnelling between The Bays and Sydney CBD. An overview of the construction work locations for Sydney Metro West ETP is presented in Figure 1-1.

Figure 1-1: Overview of Sydney Metro West ETP construction work between The Bays and Sydney CBD



The aim of this assessment is to minimise the impact of construction noise and vibration on sensitive receivers and demonstrate compliance with relevant Conditions of Approval, the CSSI Stage 2 Environmental Impact Statement (EIS)[4] and the Revised Environmental Mitigation Measures (REMMs) included in the Submissions Report [5].

1.3 Detailed Noise and Vibration Impact Statement

DNVIS provide a quantitative noise and vibration assessment of activities and/ or locations where construction work will occur. They clarify details provided in the EIS Noise and Vibration technical Paper

[4], updated to include the more detailed information available at the detailed design and construction planning stage of the Project. This DNVIS is structured to meet the requirements of Condition of Approval D29 and the CNVS, including specific mitigation measures to be implemented for the duration of the assessed works, identified through consultation with affected sensitive land user(s).

This DNVIS provides a noise and vibration assessment of the ETP **Project-wide preliminary works** which include local area and utility works that are required to be completed within and outside of standard construction hours. Note that this DNVIS excludes the Hunter Street East preliminary works inside the acoustic shed, which have been assessed in a separate DNVIS (ref: TM372-02-1-06F01 SMW-ETP_DNVIS-HUN-E Preliminary). Project wide works that meet the **low impact** definition in the SSI 19238057 have been assessed in a separate DNVIS (ref: TM372-02-1-06F03 SMW-ETP_DNVIS-PWE Low Impact).

The works covered by this DNVIS will be undertaken in accordance with the Preliminary CEMP, following its approval or accompany a Low Impact Works Approval Form (SM-22-00552597) where the **low impact** definition in the SSI 19238057 is satisfied. Works that have not been completed prior to the commencement of construction will be completed under the CEMP.

1.4 Quality assurance

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Construction works and hours

2.1 Construction works addressed in this DNVIS

2.1.1 Location of works

The preliminary works assessed in this DNVIS include the local area and utility works (LAUW) that need to be undertaken outside standard construction hours across the Project. The extent of the out of hours works have been limited as much as practicable. Justification for out of hours work is provided in Section 2.2.1.

Figure 2-1, Figure 2-2 and Figure 2-3 following show the indicative locations of LAUW assessed in this DNVIS. The LAUW will be undertaken around Pyrmont Station and Hunter Street Station. Works required to establish the worksite at The Bays have been assessed in the Low Impact DNVIS. The Pyrmont Station includes a western worksite and an eastern worksite. The western worksite is located on the corner of Pyrmont Street and Pyrmont Bridge Road. The eastern worksite is located between Pyrmont Bridge Road, Union Street and Edward Street.

The Hunter Street Station includes a western worksite and an eastern worksite. The western worksite is located on the southern corner of George and Hunter Streets. The eastern worksite is located between Bligh Street, Hunter Street and O'Connell Street.

Figure 2-1: Preliminary Works – Project wide (Pymont Station precinct)

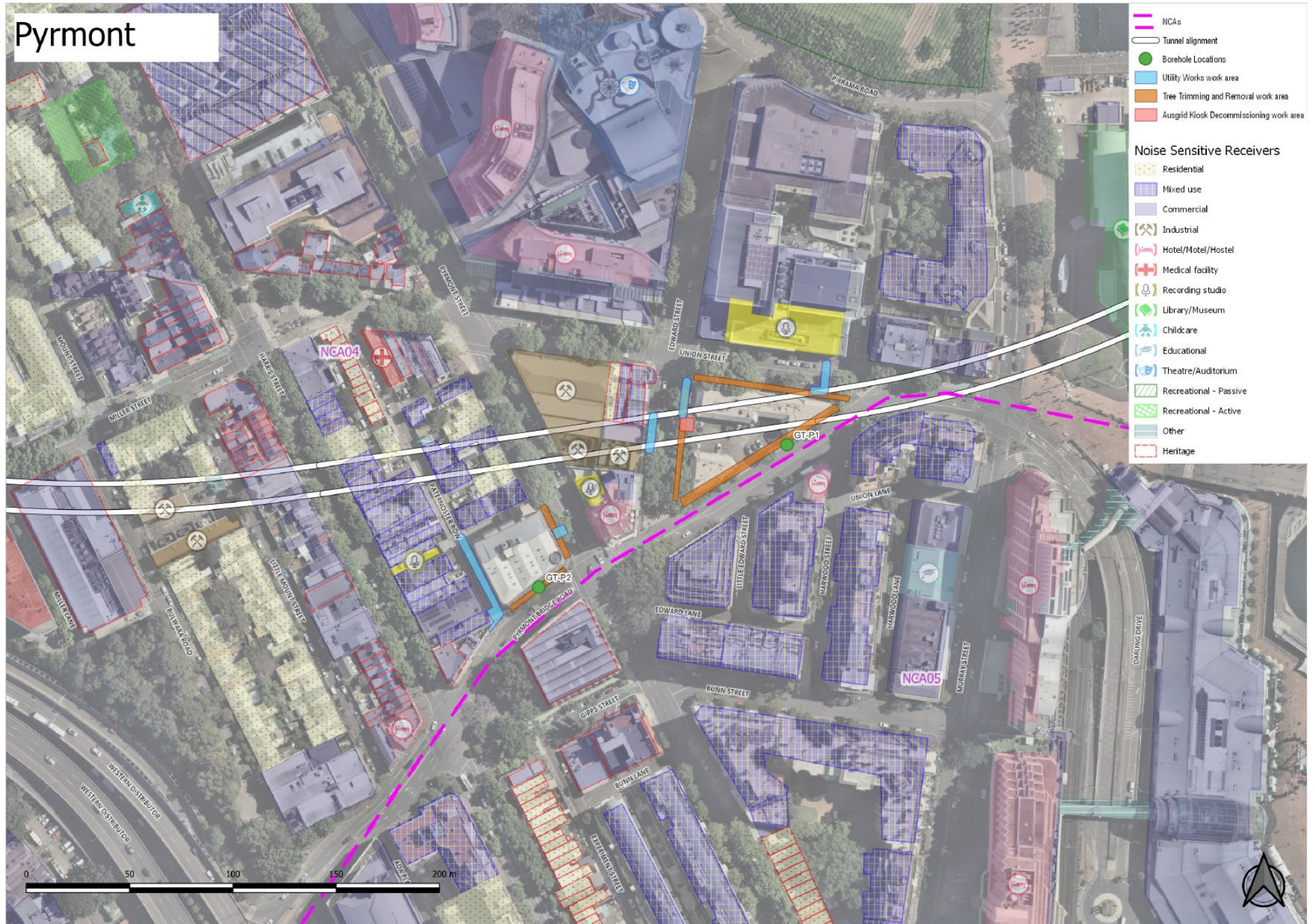


Figure 2-2: Preliminary Works – Project wide (Hunter Street Station precinct)

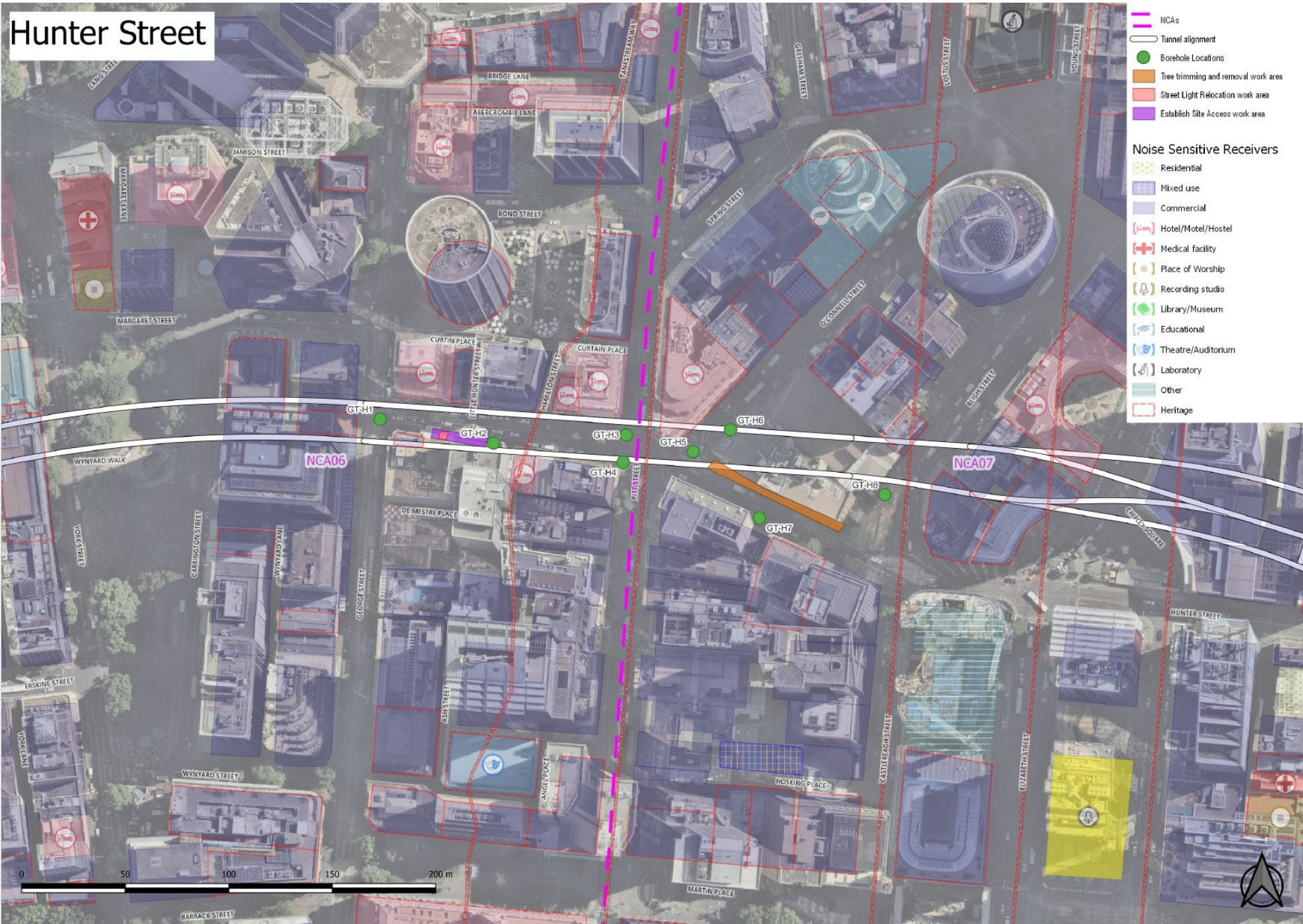
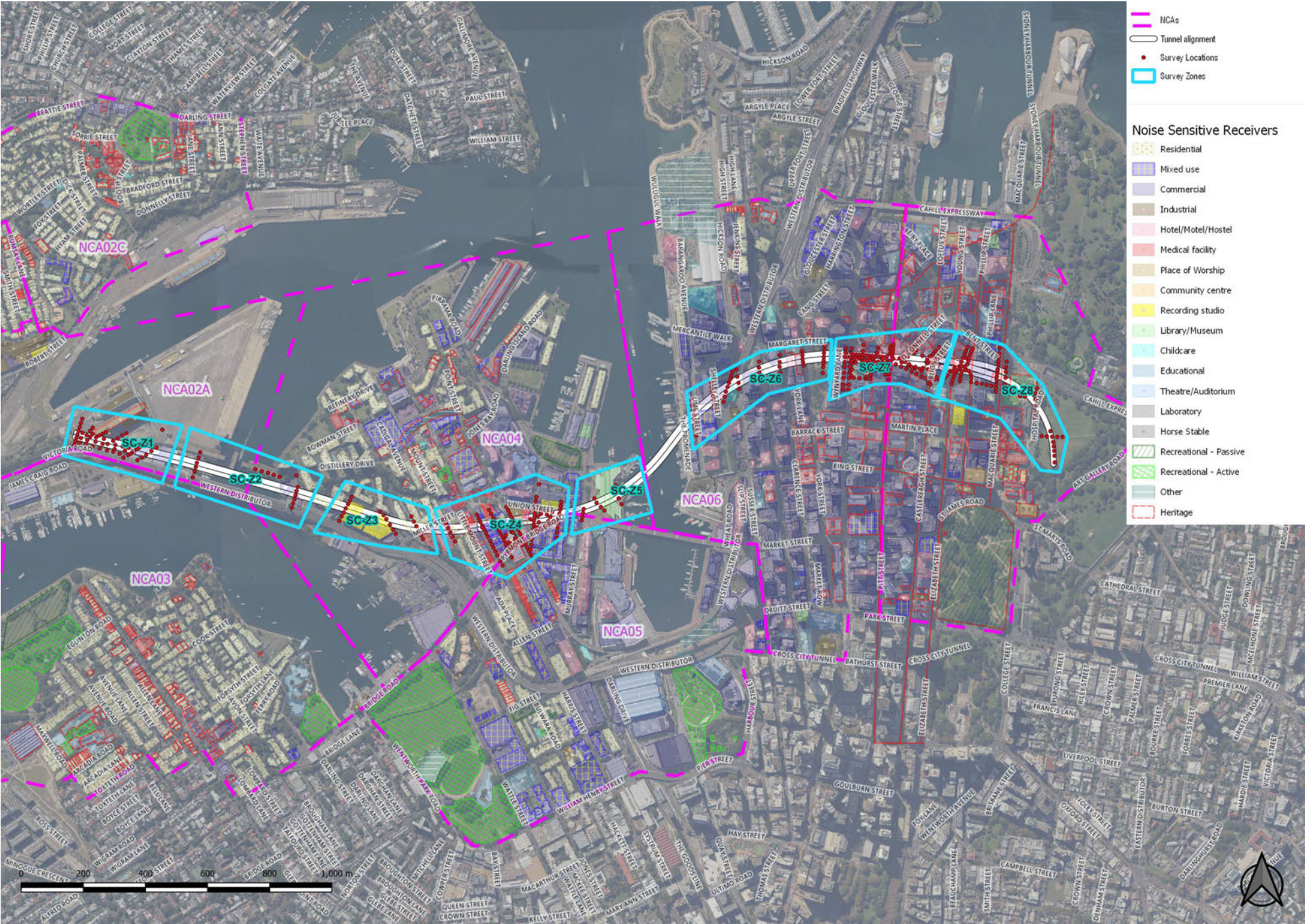


Figure 2-3: Preliminary Works - Project wide survey control work zones



2.1.2 Construction works

The Project-wide Preliminary Works are proposed to be undertaken outside standard construction hours, where the out of hours works (OOHW) are justified (see Section 2.2.1). The works are summarised in Table 2.1.

Table 2.1: Summary of construction works under this DNVIS

Worksite	Aspect	Construction hours	Indicative night works
Project wide	Survey control, instrumentation and monitoring including: - Installation of bench marks - Installation of optical survey targets	OOHW (D/E/N)	20 shifts
	Geotechnical drilling	OOHW (D/E/N)	48 shifts
Pymont West	Underground existing aerial cables, removing poles, replacing streetlights, and adjusting property connections along Paternoster Lane	OOHW (E/N)	5 shifts
	Utility works on Pymont Bridge Road and Pymont Street, including: - establishment of temporary construction services, - investigation and protection of existing assets, and - decommissioning of redundant assets	OOHW (E/N)	10 shifts
	Tree trimming and removal on Pymont Bridge Road, Pymont Street, and Paternoster Row	OOHW (E/N)	4 shifts
Pymont East	Decommissioning of Ausgrid kiosk to enable the demolition scope site	OOHW (E/N)	15 shifts
	Utility works/construction power supply	OOHW (E/N)	5 shifts
	Tree trimming and removal on Pymont Bridge Road, Union Street, and Edward Street	OOHW (E/N)	4 shifts
Hunter Street West	Relocate Street lighting pole to allow site access	OOHW (E/N)	3 shifts
	Establish site access to the Hunter Street West site from Hunter Street	OOHW (E/N)	6 shifts
Hunter Street East	Tree trimming and removal along Hunter Street	OOHW (E/N)	4 shifts

Notes: 'OOHW' means Out of Hours works, or work outside the standard construction hours (see Section 2.2)

'OOHW(D)' is the OOH 'Day' period, 1pm to 6pm Saturday; 8am to 6pm Sunday

'OOHW(E)' is the 'Evening' period, 6pm to 10pm Monday to Sunday

'OOHW(N)' is the OOH 'Night' period, 10pm to 7am Sunday/Monday to Thursday/ Friday; 10pm to 8am Friday/Saturday and Saturday/Sunday

A detailed summary of the construction activities assessed in this report is presented in Section 5.1 and in Table C.1 of APPENDIX C.

2.1.3 Construction traffic

When construction related traffic moves on the public road network, a different noise assessment methodology is appropriate as vehicle movements would be regarded as additional road traffic on public roads rather than as part of the construction site's activities.

Construction traffic associated with the preliminary works assessed in this report will be minimal, namely OOH deliveries of plant, equipment or materials. The vehicle movements would be via arterial roads or sub-arterial roads including Pyrmont Bridge Road, Pyrmont Street, Union Street, Cahill Expressway, Bent Street; O'Connell Street; Bridge Street; Loftus Street; Hunter Street and Macquarie Street.

Based on the proposed activities presented in Table C1 in APPENDIX C, the additional vehicle movements would not make a noticeable difference to traffic noise during the day and night periods. At night the total heavy vehicle movements is typically less than four per hour over the night period for any of the proposed OOH activities. The impact is assessed as negligible and has not been considered further in this report.

2.1.4 Ground-borne noise

The preliminary local area and utility works will be surface construction works. Due to the nature of surface works, airborne noise is expected to be much higher than ground-borne noise levels at the nearest sensitive receivers. On this basis, the potential impact of ground-borne noise from the proposed construction activities is expected to be negligible. Therefore, the risk of annoyance due to ground-borne noise is considered low and has not been addressed further in this DNVIS.

2.2 Construction Hours

Construction hours for the Project are outlined in Conditions of Approval D21, D22 and D23. Table 2.2 below consolidates the information provided in these Conditions regarding construction working hours for the Project.

Table 2.2: Working hours for construction worksites

CoA	Construction Activity ⁹	Monday to Friday	Saturday	Sunday / Public holiday
D21	Standard construction	07:00 to 1800	08:00 to 18:00	No work ¹
D22	Highly noise intensive works ²	08:00 to 18:00 (plus respite ²)	08:00 to 13:00 (plus respite ²)	No work ¹
D23(a)	Safety and emergency work ²	18:00 to 07:00	18:00 to 08:00	08:00 to 0:700
D23(b)	Low noise impact work ³	18:00 to 07:00	18:00 to 08:00	08:00 to 07:00
D23(c)	Works approved under an EPL or Out-of-Hours Work Protocol or through negotiated agreement with directly affected residents and sensitive land user(s)	18:00 to 07:00	18:00 to 08:00	08:00 to 07:00
D23(d)	Prescribed activity: ▪ Tunnelling and associated surface support works ⁴ ▪ Delivery of material to directly support tunnelling activities ⁵ ▪ Haulage of spoil ⁶ ▪ Work within an acoustic shed or enclosure ⁷ .	24 hours	24 hours	24 hours
D39	Rock breaking and other particularly highly noise intensive activities for station shaft or cut and cover stations at Hunter Street Sydney CBD ⁸	07:00 to 20:00 ⁸	07:00 to 20:00 ⁸	07:00 to 20:00 ⁸

CoA	Construction Activity ⁹	Monday to Friday	Saturday	Sunday / Public holiday
D39 and D40	Rock breaking and other particularly highly noise intensive activities for station shaft or cut and cover stations at Pyrmont ⁸	07:00 to 18:00 ⁸	08:00 to 18:00 ⁸	No work ¹

Notes:

1. No work unless permitted and approved.
2. Minimum respite from highly noise intensive works of not less than one (1) hour between each continuous block of works not exceeding three (3) hours.
3. Construction that causes $L_{Aeq(15 \text{ minute})}$ noise levels no more than 5dB(A) above the Rating Background Level (RBL) at any residence; and/or no more than the 'noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land user(s). Construction that causes continuous/impulsive/intermittent vibration values at the most affected residence, no more than the preferred values for human exposure to vibration, specified in Table 2.2 and Table 2.4 of the AVTG.
4. Tunnelling does not include station box excavation.
5. Except between the hours 10:00 pm and 7:00 am to / from the Pyrmont construction site which could result in a sleep disturbance event for receivers in the proximity of Pyrmont Street, Edward Street, Union Street, Paternoster Row and Pyrmont Bridge Road
6. Except between the hours of 10:00 pm and 7:00 am to / from the Pyrmont construction site
7. Where there is no exceedance of noise levels under Low Noise Impact Work circumstances identified in D23(b), unless otherwise agreed by the Planning Secretary
8. Respite provided by ensuring noise levels are less than $L_{Aeq(15 \text{ minute})}$ 60 dB(A) for at least 6.5 hours between 7am and 8pm, of which at least 3.25 hours must be below $L_{Aeq(15 \text{ minute})}$ 55 dB(A). Noise equal to or above $L_{Aeq(15 \text{ minute})}$ 60 dB(A) is allowed for the remaining 6.5 hours between 7am and 8pm.
9. Greyed out condition not applicable for preliminary works.

2.2.1 Justification for OOHW

The local area and utility works included in this DNVIS will most likely need a Road Occupancy Licence (ROL) for the closure of one or more lanes on the roads the works are within or adjacent to, including Pyrmont Bridge Road, Pyrmont Street, Union Street and Hunter Street to allow the works to be completed without high risk to construction personnel or public safety. A ROL is not likely to be issued during the hours specified in the Condition D21 (Table 2.1). Therefore, works may need to be undertaken outside of standard construction hours, as per Condition D23(a), (b) and (d).

All reasonable and feasible mitigation and management measures will be implemented to reduce noise from the works to within NMLs and these mitigation measures will be detailed in this DNVIS and in the Noise and Vibration Management Procedure or sub-plan (once approved).

These works will be undertaken through the Sydney Metro West Out of Hours Works Protocol [3] (OOHW Protocol) prepared for the project in accordance with Condition of Approval D24 or under the Environment Protection Licence (EPL) for works subject to an EPL.

2.2.2 Assessment periods

The standard hours and out of hours work (OOHW) periods for construction works are depicted in Table 2.3. The OOHW periods are further defined as OOHW Period 1 and 2, based on the CNVS [1].

Construction traffic is assessed over a fifteen-hour day period, between 7am and 10pm (typically standard hours plus OOHW Period 1) and a nine-hour night period, between 10pm and 7am (typically OOHW Period 2). This is consistent with the NSW Road Noise Policy [8] and the CNVS [1].

Table 2.3: Assessment periods

Day/ Time	12am – 1am	1am – 2am	2am – 3am	3am – 4am	4am – 5am	5am – 6am	6am – 7am	7am – 8am	8am – 9am	9am – 10am	10am – 11am	11am – 12pm	12pm – 1pm	1pm – 2pm	2pm – 3pm	3pm – 4pm	4pm – 5pm	5pm – 6pm	6pm – 7pm	7pm – 8pm	8pm – 9pm	9pm – 10pm	10pm – 11pm	11pm – 12am
Monday to Friday																								
Saturday																								
Sunday or Public Holiday																								

3 Existing environment

3.1 Land use survey

To assess and manage construction noise and vibration impact, a Land Use Survey has been undertaken to satisfy Condition D20. The Land Use Survey identifies existing land use and development along the Project alignment, including a mix of residential, commercial and industrial uses; along with other noise and vibration-sensitive businesses, such as Hotels, medical or dental surgeries and childcare facilities. At Pyrmont Station there are residential receivers surrounding the two worksites. Conversely, at Hunter Street Station the nearest residential receiver are at 16 O'Connell Street (Level 11-12 only) and 1 Hoskings Place, Sydney (approximately 200 metres away).

Heritage receivers have been identified in EIS [4] and in the land use survey.

The Land Use Survey is maintained in a Geographic Information System (GIS) established for the Project and was used in the preparation of this DNVIS. The land use at the time of issue of this DNVIS is identified on an aerial photograph in Figure 3-1 (and in APPENDIX B). The land use revision date is shown in the top left corner of the drawing.

3.2 Noise Catchment Areas

Further to the Land Use Survey, residential areas have been divided into Noise Catchment Areas (NCAs) based on those established in the Environmental Impact Statement (EIS) [4] for the project. NCAs group individual sensitive receivers by common traits, such as existing noise environment and location in relation to the ETP works. NCAs relevant to the Hunter Street East worksite are identified in Figure 3-1.

3.3 Baseline noise monitoring

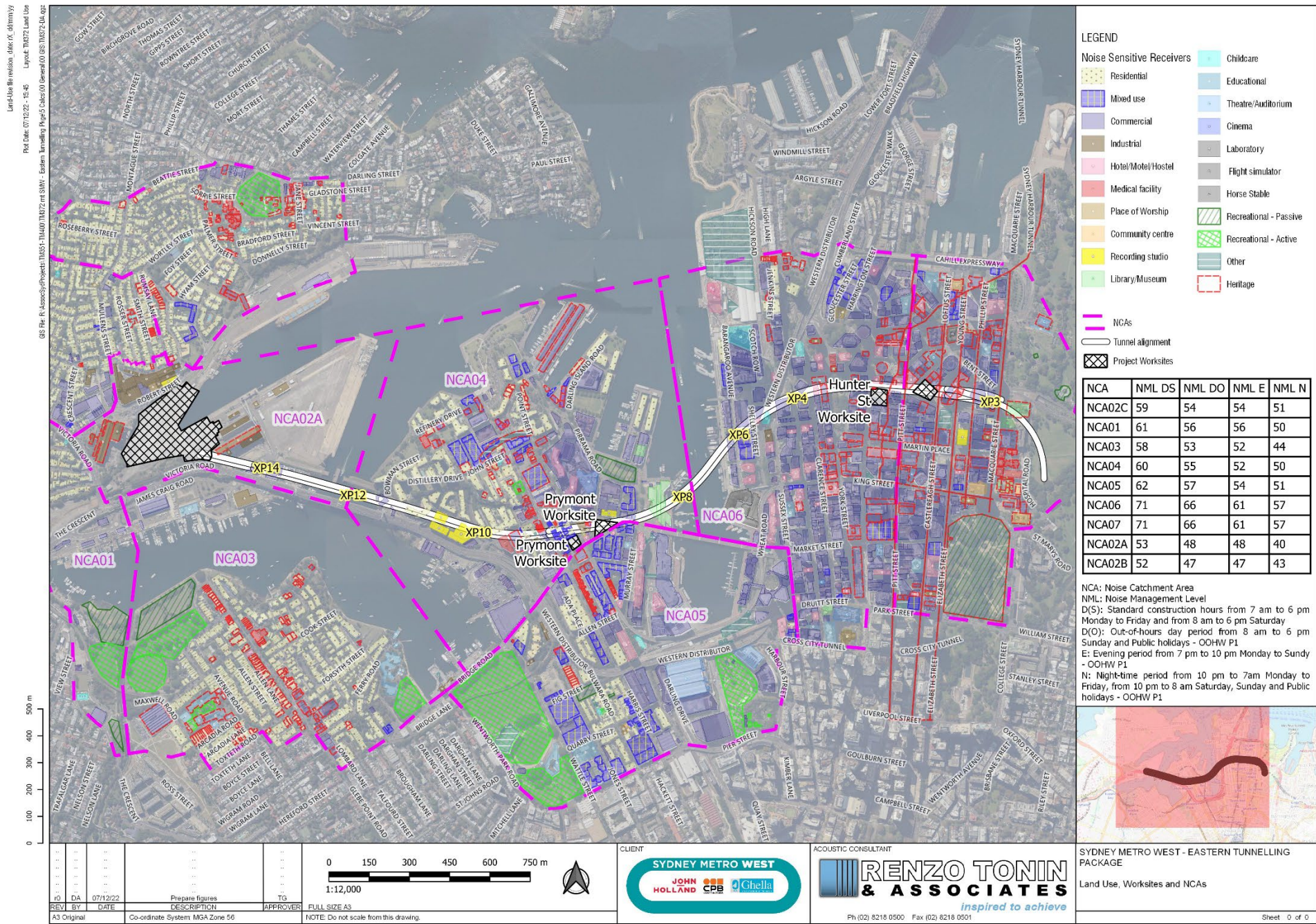
As part of the EIS process, baseline noise monitoring was conducted in Sydney CBD in 2015. The ambient noise monitoring locations were selected with reference to the procedures outlined in the NPfI (then the Industrial Noise Policy [10]). Noise monitoring was used to determine appropriate RBLs and ambient noise levels (L_{Aeq}) for each NCA. Noise monitoring was used to establish the Rating Background Level (RBL). The RBL represents the average minimum background sound level for each measurement period, averaged over the measurement days. The RBLs and average ambient noise levels for the day, evening and night assessment periods are summarised in Table 3.1 and in Table B.1 in APPENDIX B.

Table 3.1: Summary of baseline noise monitoring data from EIS

Construction work area	Monitor ID	Rating Background Noise (RBL) ¹			Ambient Noise Level (L _{Aeq} (15min)) ¹			Representative NCA
		Day ²	Eve ²	Ngt ²	Day ²	Eve ²	Ngt ²	
Pyrmont Station	B.04	50	47	45	56	50	47	NCA04
	B.05	52	49	46	61	59	56	NCA05
Hunter Street Station	B.06	61	56	52	66	62	63	NCA06, NCA07

Notes: 1. RBL and L_{Aeq} noise levels determined with reference to NPfI procedures
 2. Day is 7.00am to 6.00pm; Eve (evening) is 6.00pm to 10.00pm; Ngt (night) is 10.00pm to 7.00am

Figure 3-1: Noise Catchment Areas applicable to The Bays, Pyrmont and Hunter Street worksites



4 Construction noise and vibration objectives

Construction noise and vibration objectives are detailed in the CNVS Section 2. A summary of the objectives as applicable to the Hunter Street East worksite is provided in Table 4.1.

Table 4.1: Summary of construction noise and vibration objectives

Impact	Relevant guideline	Construction noise/ vibration objective
Airborne noise	NSW Interim Construction Noise Guideline (ICNG) [6] CNVS [1]	<p>Construction noise management levels (NMLs) for residential receivers are based on long-term noise logging conducted on behalf of Sydney Metro to quantify ambient noise levels for the EIS [3]. During standard construction hours, a highly affected noise objective of $L_{Aeq(15min)}$ 75dB(A) applies at all residential receivers.</p> <p>The NMLs for 'other' sensitive receivers are from the ICNG, as reported in Section 2.2 of the CNVS.</p> <p>Receivers are considered 'noise affected' where construction noise levels are greater than the noise management levels identified in Table B.1 of APPENDIX B.</p> <p>Where construction activities are tonal or impulsive in nature and are described in the ICNG as being particularly annoying, a +5dB(A) correction must be added to the activity noise.</p> <p>construction related activities that could exceed the NMLs shall be identified and managed in accordance with the noise and mitigation and management measures set out in Section 6.3.</p>
Sleep disturbance	Noise Policy for Industry (EPA 2017) [7] CNVS [1]	<p>Initial screening level</p> <ul style="list-style-type: none"> • $L_{AFmax} \leq 52$ dB(A) or $RBL + 15$ dB (whichever is greater); and/ or • $L_{Aeq,15min} \leq 40$ dB(A) or $RBL + 5$ dB (whichever is greater). Where noise events are found to exceed the initial screening level, further analysis will be made to identify: <ul style="list-style-type: none"> • the likely number of events that might occur during the night assessment period, and • Whether events exceed an 'awakening reaction' level of 55 dB(A) L_{AFmax} (internal) that equates to NML of 65 dB(A) externally (assuming open windows).
Ground-borne noise	NSW Interim Construction Noise Guideline (ICNG) [6] CNVS [1]	Receivers are considered 'ground-borne noise affected' where construction noise levels are greater than the noise management levels identified in Table B.2 of APPENDIX B.
Construction traffic	ICNG refers to the NSW Road Noise Policy (RNP) [8] CNVS [1]	<p>Construction traffic impact initial screening test:</p> <ul style="list-style-type: none"> • Traffic noise levels increase ≤ 2 dB(A) because of construction traffic <p>Where traffic noise levels increase by more than 2 dB(A):</p> <ul style="list-style-type: none"> • Freeway/arterial/sub-arterial road - 60 dB $L_{Aeq(15hour)}$ day and 55 dB $L_{Aeq(9hour)}$ night • Existing local road - 5 dB $L_{Aeq(1hour)}$ day and 50 dB $L_{Aeq(1hour)}$ night

Impact	Relevant guideline	Construction noise/ vibration objective
Vibration – disturbance to building occupants	NSW 'Environmental Noise Management Assessing Vibration: A Technical Guideline' (AVTG) [9] CNVS [1]	<p>To assess the potential for vibration impact on human comfort, an initial screening test will be done based on peak velocity units, as this metric is also used for the cosmetic damage vibration assessment. The initial screening test values are:</p> <ul style="list-style-type: none"> • Critical areas - 0.28 mm/s (day or night) • Residential buildings - 0.56 mm/s (16h day); 0.40 mm/s (8h night) • Offices, schools, educational institutions and places of worship - 1.10 mm/s (day or night) • Workshops - 2.20 mm/s (day or night). <p>If the predicted vibration exceeds the initial screening test, the total estimated Vibration Dose Value (i.e. eVDV) will be determined based on the level and duration of the vibration event causing exceedance as detailed in Section 2.3.1 of the CNVS and Section 2.4 of the AVTG.</p>
Vibration – structural damage to buildings	British Standard BS 7385-2:1993 'Evaluation and measurement for vibration in buildings'[13] German Standard DIN 4150-3: 2016-12, Structural vibration - Effects of vibration on structures [14] CNVS [1]	<p>A conservative vibration damage screening level (peak component particle velocity) per receiver type is detailed in Section 2.4 of the CNVS and outlined below:</p> <ul style="list-style-type: none"> • Reinforced or framed structures: 25.0 mm/s • Unreinforced or light framed structures: 7.5 mm/s. <p>Heritage buildings and structures found to be structurally unsound (following inspection) would adopt a more conservative vibration damage screening level (peak component particle velocity):</p> <ul style="list-style-type: none"> • Heritage structures (structurally unsound): 2.5 mm/s. <p>Where the predicted and/or measured vibration is greater than shown above, a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure will be completed to determine the applicable vibration limit.</p>

5 Construction airborne noise assessment

5.1 Noise prediction methodology

Assessment of airborne noise impacts from the construction works were determined by predicting noise levels using a Cadna-A computer noise model developed for this project. The Cadna-A noise model incorporates ground elevation contours, building heights, the built environment, and atmospheric conditions to predict the contribution of each noise source at identified sensitive receiver locations and allows for the prediction of the total noise from a worksite for the various construction stages.

Key details regarding the construction work locations, the likely plant and equipment, and hours of operation were informed by the Design and Construction Teams.

A summary of the noise model input parameters is detailed in Table 5.1.

Table 5.1: Summary of noise modelling parameters

Parameters	Inputs
Calculation method	ISO 9613-2:1996 implementing quality standard ISO 17534-1:2015
Location of noise sources	0.5m to 2m above the ground depending on the equipment or plant in use
Height of receivers	1.5m above ground level to represent 1.5m above ground floor level Additional 3m height for every additional floor assessed (i.e. 4.5m above ground for first floor, 7.5m for second floor etc.)
Ground topography	1m digital ground contours
Sound power levels of plant and equipment	Detailed in Table C.1 in APPENDIX C. Activity timing, number of plant and hours of operation also in Table C1.
Ground absorption	0.5
Noise barriers and screening	Noise barriers are being installed as part of these works and are therefore not included in the noise predictions. Existing buildings providing shielding to receivers has been included in the noise model.
Acoustic sheds/ enclosures	No acoustic sheds for Project-wide preliminary works.
Noise source corrections	Noise source penalty corrections have been applied in accordance with Section 4.5 of the NSW Interim Construction Noise Guideline (INCG).

The noise predictions in this report represent a realistic worst-case scenario when construction occurs at a works location close to residences and other sensitive receivers. At each receiver, noise levels will vary during the construction period based on:

- the position of equipment within the worksite and distance to the receiver;
- the construction activities being undertaken;
- the noise levels of plant items and equipment
- temporary noise barriers/ construction hoarding/ acoustic sheds or enclosures.

Predicted noise levels presented in APPENDIX D are the maximum noise levels for each building. Actual noise levels will often be less than the predicted levels presented in this report.

5.2 Predicted noise levels

Noise impacts during construction works have been predicted and compared to the noise management levels (NMLs). A receiver is considered construction noise affected when the predicted construction noise level is above the NML. Table 5.3 and Table 5.4 present a summary of the number of residential receivers and 'other sensitive receivers (respectively) likely to be noise affected by the proposed activities. The tables are colour coded to indicate how much the predicted noise level is above the NML and the corresponding perceived noise impact, based on the CNVS, as noted in Table 5.2.

Table 5.2: Key to the predicted construction noise results tables

Assessment	Time of day	Key			
L _{Aeq} (15min)	Standard hours ¹ or Outside standard hours	0-10 dB(A) above NML (green)	11-20 dB(A) above NML (yellow)	21-30 dB(A) above NML (orange)	>30 dB(A) above NML (purple)
Sleep disturbance	Night only	L _{Aeq,15min} above 40 dB(A) or RBL plus 5 dB, whichever is the greater (yellow)		L _{Amax} above 52 dB(A) or RBL plus 15 dB, whichever is the greater (purple)	

Notes: 1. Highly noise affected (HNA) which is greater than 75dB(A) during standard construction hours is shown with **Bold** text and applies to residential receiver buildings only.

Table 5.3 summarises the number of construction noise affected residential receivers (i.e. receivers where predicted L_{Aeq} noise levels construction works are above the NML) and the likely perceived noise impact. Table 5.4 presents the number of construction noise affected other sensitive receivers. Detailed predicted L_{Aeq} noise levels for all receivers in each NCA are presented in Table D.1 of APPENDIX D.

Table 5.3: Number of receiver buildings over the airborne noise management level (all NCAs) – residential receivers

Worksite	Construction activity	Assessment reference (For detail, refer to Table C1 in APPENDIX C)	Highly noise affected ^{2, 3}	Day (standard hours) ^{2, 3}				Day (outside standard hours) ^{2, 3}				Evening ^{2, 3}				Night ^{2, 3}				Sleep disturbance ^{2, 3}	
			L _{Aeq}	L _{Aeq}				L _{Aeq}				L _{Aeq}				L _{Aeq}				L _{Aeq}	L _{Amax}
			> 75 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	> 40 or RBL+5 dB(A)	> 52 or RBL+15 dB(A)
Project wide	Survey control, instrumentation, and monitoring	SC-Z1	1	0	0	0	0	4	3	0	0	5	3	0	0	8	4	0	0	12	4
		SC-Z2	2	0	0	0	0	16	8	0	0	17	11	0	0	24	11	1	0	36	12
		SC-Z3	9	0	0	0	0	8	9	4	0	12	7	6	0	22	5	8	0	35	16
		SC-Z4	78	0	0	0	0	85	74	46	0	96	52	59	0	102	53	58	0	213	133
	Geotechnical drilling	SC-Z5	5	0	0	0	0	1	9	2	0	5	5	2	0	6	4	3	0	13	7
		SC-Z6	12	0	0	0	0	22	10	3	0	14	9	2	0	14	9	2	0	25	12
		SC-Z7	33	0	0	0	0	15	19	11	0	21	15	6	0	21	15	6	0	42	23
		SC-Z8	11	0	0	0	0	9	6	6	0	6	9	3	0	5	10	3	0	18	13
		GT-P1	1	0	0	0	0	6	5	0	0	9	4	1	0	21	5	2	0	0	5
		GT-P2	0	0	0	0	0	23	10	0	0	24	10	4	0	44	14	7	0	0	10
		GT-H1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0
		GT-H2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0
		GT-H3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		GT-H4	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	0	0	0	0
		GT-H5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
		GT-H6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
		GT-H7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		GT-H8	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
		GT-H9	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0
Pymont West	Underground existing aerial cables, remove poles, replace streetlights, and adjust property connections along Paternoster Lane	UT-PW1	8 (12)	0	0	0	0	30 (58)	6 (21)	5 (5)	0	40 (57)	6 (33)	7 (7)	0	50 (64)	12 (45)	5 (6)	0	67(115)	14 (36)
	Utility works on Pymont Bridge Road and Pymont Street	UT-PW2	0 (4)	0	0	0	0	15 (21)	10 (16)	0 (4)	0	12 (48)	14 (13)	1 (12)	0	10 (72)	19 (13)	1 (15)	0	30 (100)	10 (20)
	Tree trimming and removal Pymont Street	TR-PW1	22 (20)	0 (61)	0 (7)	0	0	135 (111)	20 (16)	15 (16)	0	160 (161)	43 (37)	13 (13)	0	187 (190)	72 (63)	12 (14)	0	271 (267)	45 (91)
	Tree trimming and removal Pymont Bridge Road	TR-PW2	29 (23)	0 (70)	0 (17)	0	0	127 (115)	48 (46)	21 (19)	0	160 (159)	63 (59)	29 (24)	0	185 (189)	85 (74)	32 (32)	0	372 (295)	74 (114)
Pymont East	Decommissioning of Ausgrid kiosk to enable the demolition scope site	DA	2 (7)	0	0	0	0	6 (49)	2 (6)	2 (3)	0	3 (66)	7 (7)	2 (8)	0	12 (71)	8 (22)	2 (6)	0	22 (99)	4 (11)
	Utility works/ construction power supply on Union Street	UT-PE1	0	0	0	0	0	10 (3)	0 (10)	0	0	8 (16)	2 (9)	0 (1)	0	4 (38)	7 (6)	0 (4)	0	11 (48)	1 (10)
	Utility works/ construction power supply on Edward Street next to site	UT-PE2	1 (2)	0	0	0	0	8 (5)	1 (6)	1 (2)	0	4 (21)	4 (8)	2 (1)	0	6 (41)	4 (4)	2 (4)	0	12 (49)	2 (10)
	Utility works/construction power supply on Edward Street opposite site	UT-PE3	2 (2)	0	0	0	0	6 (5)	0 (6)	1	0	5 (6)	2 (5)	1 (1)	0	5 (13)	3 (5)	1 (2)	0	9 (20)	3 (9)
	Tree trimming and removal Union Street	TR-PE1	10 (10)	0 (29)	1	0	0	72 (68)	7 (5)	8 (9)	0	82 (84)	21 (12)	5 (6)	0	91 (84)	35 (29)	6 (5)	0	132 (118)	17 (40)
	Tree trimming and removal Edward Street	TR-PE2	9 (9)	0 (28)	0 (2)	0	0	85 (71)	6 (7)	5 (4)	0	86 (81)	19 (13)	7 (8)	0	111 (93)	37 (29)	7 (7)	0	155 (129)	15 (40)
	Tree trimming and removal Pymont Bridge Road	TR-PE3	9 (9)	0 (51)	0 (5)	0	0	85 (88)	22 (14)	5 (6)	0	81 (80)	43 (37)	10 (6)	0	140 (129)	67 (51)	10 (9)	0	257 (189)	30 (66)
Hunter Street West	Relocate Street lighting pole on Hunter Street to allow site access	RS	0	0 (1)	0	0	0	0 (1)	0	0	0	0 (2)	0	0	0	0 (2)	0 (1)	0	0	0 (3)	0
	Establish site access to the Hunter Street West site from Hunter Street	ES	0	0 (1)	0	0	0	0 (1)	0	0	0	0 (1)	0 (1)	0	0	1 (2)	0 (1)	0	0	1 (3)	0
Hunter Street East	Tree trimming and removal along Hunter Street	TR-HE	0	0	0	0	0	0 (6)	0	0	0	0 (12)	0 (2)	0	0	0 (18)	0 (6)	0	0	0 (24)	3 (3)

Note:

1.

Construction noise level cells are shaded based upon the predicted worst case NML exceedance in accordance with the key presented in Table 5.2.

2.

Highly noise affected applies to residential receivers, as per the ICNG.

3.

Values in brackets represent high noise impact scenario, including jackhammer, concrete saw, chainsaw, wood chipper (refer to Table C1 for 'HN' note). Value outside the brackets represents the typical scenario, which excludes high noise plant.

Table 5.4: Number of other sensitive receivers over the airborne noise management levels (all NCAs)

Stage	Construction activity	Assessment reference	Commercial ⁴				Childcare ⁴				Educational ⁴				Recreational ⁴				Places of worship ⁴				Hotel/Motel/ Hostel ⁴				Other ⁴				
			1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	1 – 10 dB(A)	11 – 20 dB(A)	21-30 dB(A)	> 30 dB(A)	
Project wide	Survey control, instrumentation, and monitoring	SC-Z1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	
		SC-Z2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
		SC-Z3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		SC-Z4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		SC-Z5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		SC-Z6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		SC-Z7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		SC-Z8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Geotechnical drilling	GT-P1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
		GT-P2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
		GT-H1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	
		GT-H2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	
		GT-H3	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	3	1	0	0	0	0	0	0	0	
		GT-H4	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	
		GT-H5	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	1	1	0	0	1	0	0	0	0	
		GT-H6	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	
		GT-H7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	
		GT-H8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	
		GT-H9	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	
Pymont West	Underground existing aerial cables, remove poles, replace streetlights, and adjust property connections along Paternoster Lane	UT-PW1	0	0	0	0	0	0	0	0	0	0	0	0	0	1 (1)	0	0	0	0	0	0	0	0	0	0	0 (1)	0	0	0	
	Utility works on Pymont Bridge Road and Pymont Street	UT-PW2	0	0	0	0	0 (1)	0	0	0	0	0	0	0 (1)	0	2 (1)	0	0	0	0	0	0	0	0	0	0	0 (1)	0	0	0	
	Tree trimming and removal Pymont Street	TR-PW1	0 (9)	0 (2)	0	0	4 (3)	0	0	0	0	0	3 (3)	0	0	0	0	1 (1)	0	0	0	0 (4)	0 (3)	0	0	2 (1)	0	0	0	0	
	Tree trimming and removal Pymont Bridge Road	TR-PW2	0 (4)	0 (3)	0 (1)	0	3 (3)	1 (1)	0	0	0	0	3 (3)	0	0	0	0	1 (1)	0	0	0	0 (4)	0 (3)	0 (1)	0	2 (1)	1 (1)	0	0	0	
Pymont East	Decommissioning of Ausgrid kiosk to enable the demolition scope site	DA	0	0	0	0	0	0	0	0	0	0	0	1 (1)	1 (1)	0 (1)	0	0	0	0	0	0	0	0	0	0 (2)	1	0	0	0	
	Utility works/ construction power supply on Union Street	UT-PE1	0	0	0	0	0 (1)	0	0	0	0	0	0	1 (1)	0 (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Utility works/ construction power supply on Edward Street next to site	UT-PE2	0	0	0	0	0 (1)	0	0	0	0	0	0	1 (1)	0 (1)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
	Utility works/ construction power supply on Edward Street opposite site	UT-PE3	0	0	0	0	0	0	0	0	0	0	0	1 (1)	0 (1)	0	0	0	0	0	0	0	0	0	0	0	1	0 (1)	0	0	
	Tree trimming and removal Union Street	TR-PE1	0 (7)	0 (5)	0 (1)	0	1 (1)	1 (1)	0	0	1 (1)	0	0	0	1 (1)	1 (1)	1 (1)	0	0	0	0	0 (3)	0 (1)	0 (2)	0	3 (3)	0	0	0	0	
	Tree trimming and removal Edward Street	TR-PE2	0 (8)	0 (3)	0 (2)	0	3 (3)	0	0	0	1	0	0	0	1 (1)	1 (1)	1 (1)	0	0	0	0	0 (3)	0 (3)	0 (1)	0	2 (2)	0	0	0	0	
	Tree trimming and removal Pymont Bridge Road	TR-PE3	0 (8)	0 (6)	0	0	0 (2)	0 (1)	0	0	0	0	0 (1)	0	0 (2)	0	0	0	0	0	0 (3)	0 (2)	0 (1)	0	0 (4)	0	0	0	0	0	
Hunter St West	Relocate Street lighting pole on Hunter Street to allow site access	RS	5 (5)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 (4)	2 (0)	2 (2)	3	0 (1)	0	0	0	0	0	
	Establish site access to the Hunter Street West site from Hunter Street	ES	3 (6)	0	0	0	0	0	0	0	1 (1)	2 (2)	0	0	0	0	0	0	0	0	0 (4)	2	3 (1)	4	0 (1)	0	0	0	0	0	
Hunter St East	Tree trimming and removal along Hunter Street	TR-HE	15 (16)	0	0	0	1 (2)	0	0 (1)	0	1 (6)	2 (1)	0 (2)	1	0	0	0	0	0 (4)	0	0	0	0	1 (12)	3 (2)	2 (1)	(5)	0	0	1	(1)

Note:

1.

Commercial, recreational and other sensitive receivers have been assessed against the respective NMLs (see Table B1 in APPENDIX B), and exceedances have been presented in the count table. ‘Other’ includes industrial receivers, television or recording studios. For more detail on specific impacts to receivers refer to Appendix D (Table D.1)

2.

Impacts only applicable when facility is in use.

3.

Highly noise affected does not apply to OSRs, as per the ICNG.

4.

Values in brackets represent high noise impact scenario, including jackhammer, concrete saw, chainsaw, wood chipper (refer to Table C1 for ‘HN’ note). Value outside the brackets represents the typical scenario, which excludes high noise plant.

5.2.1 Standard construction hours

The results summarised in Table 5.3 and Table 5.4 show that residential and other sensitive receivers are expected to be construction noise affected by the preliminary works at Pyrmont during standard construction hours. Receivers may experience internal noise levels greater than $L_{Aeq(15 \text{ minute})}$ 60 dB(A) inclusive of a 5 dB penalty, during the preliminary works at Pyrmont when the works are located close to the receiver.

The results summarised in Table 5.3 and Table 5.4 show that there will be construction noise affected residential and other sensitive receivers, mainly commercial receivers, and some hotel receivers may be construction noise affected by the Hunter Street Station preliminary works. Several commercial receivers may experience internal noise levels greater than $L_{Aeq(15 \text{ minute})}$ 60 dB(A) inclusive of a 5 dB penalty during the preliminary works at Hunter Street when the works are directly adjacent to the premise. Once the work activity is completed, the works will move to a new location and construction noise levels will be lower at the receiver.

Mitigation and management measures to reduce construction noise levels towards the standard construction hours NML are summarised in Section 5.3.

5.2.2 Out of hours work

The results summarised in Table 5.3 and Table 5.4 show that there will be construction noise affected residential and other sensitive receivers, including hotels, where the survey control works are undertaken outside standard construction hours project wide. However, the works at each location will take up to approximately half an hour then moved to a new location and construction noise levels will be lower at the receiver. Also, some survey prisms will be installed with glue and will not require the use of power hand tools, incurring a 10dB(A) reduction compared to the predicted results. Therefore, the risk of adverse complaints by sensitive receivers regarding the survey control works is low.

The results summarised in Table 5.3 and Table 5.4 show that there will be construction noise affected residential receivers where preliminary works are undertaken outside standard construction hours around the Pyrmont Station worksites. Several other sensitive receivers, should they be occupied, are expected to be construction noise affected by the preliminary works at Pyrmont.

The results summarised in Table 5.3 and Table 5.4 show that one residential receivers may be construction noise affected by the preliminary works at Hunter Street West outside standard construction hours during high impact works.

There are several residential receivers that may be noise affected during tree trimming works around the Hunter Street East worksite. These receivers will not experience internal noise levels greater than $L_{Aeq(15 \text{ minute})}$ 60 dB(A) inclusive of a 5 dB penalty between 6pm and 8pm. Several other sensitive receivers, should they be occupied, are expected to be construction noise affected by the preliminary works at Hunter Street. Of note are up to three Hotels which are identified as construction noise affected during the street lighting pole relocation and site access establishment on Hunter Street adjacent to the Hunter

Street West worksite; and tree trimming and removal along Hunter Street adjacent to the Hunter Street East worksite. Residential premises that are mechanically ventilated and have facade treatment to reduce internal noise levels will mostly comply with the NMLs.

Mitigation and management measures to reduce construction noise levels towards the standard construction hours NML are summarised in Section 5.3.

5.2.3 Sleep disturbance

The results summarised in Table 5.3 show that there are residential receivers expected to experience construction noise levels above the sleep disturbance criteria by the works at Pyrmont.

At Hunter Street the street lighting pole relocation and site access establishment on Hunter Street adjacent to the Hunter Street West worksite are not predicted to exceed the initial screening level for sleep disturbance at residential receivers.

The tree trimming and removal works along Hunter Street adjacent to the Hunter Street East worksite are predicted to exceed the initial screening level for sleep disturbance. This is based on residential receivers with windows open, which is unlikely in the Sydney CBD. Residential premises that are mechanically ventilated and have facade treatment to reduce internal noise levels will mostly comply with the sleep disturbance criteria. Where feasible the tree trimming works during the night period will be conducted with electric chainsaws to reduce the impacts on receivers.

5.3 Noise mitigation and management

5.3.1 High noise impact activities

The Project-wide preliminary works assessed in this DNVIS are principally local area and utility work that are required to be undertaken outside standard construction hours, as justified in Section 2.2.1. The requirement to provide respite periods for highly noise intensive work in accordance with D22 does not apply outside standard construction hours.

The implementation of noise mitigation measures, including temporary noise screens and construction methodology outlined in the following sections and summarised in Table 5.5 will reduce high noise impacts from the preliminary works and reduce the likelihood of triggering sleep disturbance events.

5.3.2 Consultation with affected receivers

JCG has commenced consultation with potentially affected stakeholders including Councils, business and residential receivers. The consultation is focused on specific mitigation and management measures applicable to the works at this worksite. These measures may include minimising high noise impact works during night time hours; limiting night time works in individual locations to no more than two consecutive nights; scheduling high noise impact works around sensitive periods where feasible and reasonable; offers of movie or dinner vouchers; alternative accommodation offers. Details of completed

consultation is recorded in the Sydney Metro Stakeholder Management System, Consultation Manager. A summary of the consultation program is provided below:

- Consultation with relevant community members on preliminary works, including local area and utility works, site establishment, and preliminary works.

Consultation with noise affected receivers identified in APPENDIX D to ensure additional mitigation measures are provided (if required, refer to Section 5.3.4). Following community consultation, JCG will endeavour to provide between two weeks and one month's notice for any 24-hour tunnel excavation. JCG is committed to undertake noise and vibration monitoring proactively and in response to complaints.

5.3.3 Noise control and management measures

Noise mitigation and management measures to reduce potential noise impacts will be implemented during the preliminary construction works, where reasonable and feasible. In accordance with the ICNG and consistent with the CNVS, feasible noise mitigation measures are those work practices or measures to reduce noise that are capable of being put into practice or of being engineered and are practical to build given project constraints such as safety and maintenance requirements. Reasonable noise mitigation measures are those feasible noise mitigation measures that are considered reasonable in the circumstances, based on a judgement that the overall noise benefits outweigh the overall adverse social economic and environmental effects, including the cost of implementing the measure. To make such a judgement, consideration is to be given to noise level impacts, duration of impacts, noise mitigation benefits, cost effectiveness of noise mitigation and community views.

Table 5.5 outlines the noise control measures that would be implemented on site during the preliminary construction works, where feasible and reasonable.

Table 5.5 Site noise control measures

Control measure	Description of the control measure	Feasible mitigation test	Deemed feasible?	Reasonable mitigation test	Deemed reasonable?	Adopted?	Justification and commentary
At source control measures							
Site planning and layout	<p>Locate noise-generating activities away from sensitive receivers, where practicable.</p> <p>Plan traffic flow, parking, loading/unloading, and other vehicle movements to keep vehicles away from sensitive receivers where possible and to minimise reversing movements.</p> <p>Plan survey control works such that marks directly adjacent to residential receivers are installed before midnight, where practicable.</p>	Limited capacity to do this for local area utility works.	Yes	<ul style="list-style-type: none"> - Potential benefit of 5-10 dB(A). - Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Outweighs the identified social, economic and environmental effects. 	Yes	Yes	There is limited capacity apply this on local area and utility works, but this will be applied where practicable.
Noise control kits	<p>Plant that is brought to site for works should meet the sound power limits identified in Table C1 of this assessment. Where plant are above limits then the plant may require installation of 'noise control kits' to comply with the noise limits in this assessment. Such 'noise control kits' comprise:</p> <ul style="list-style-type: none"> • high performance 'residential-grade' exhaust mufflers, • additional engine cowling / enclosure lined inside with sound absorbent industrial-grade foam, and • air intake and discharge silencers / louvres. 	<p>This measure could be feasibly implemented.</p> <p>Subject to availability for each equipment item.</p>	Yes	<ul style="list-style-type: none"> - Potential benefit of 5-10 dB(A). - Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Outweighs the identified social, economic and environmental effects. - Deemed to be cost effective. - Outweighs the identified social, economic and environmental effects. 	Yes	Yes, subject to noise testing on site	The need to fit 'noise control kits' onto the identified plant, will be confirmed once each plant item is tested prior to its regular use on site, or alternative the plant will be swapped for lower noise plant.
Limit equipment in use	Only the equipment necessary during each stage of the works will be used.	This measure could be feasibly implemented.	Yes	<ul style="list-style-type: none"> - Sufficient noise reduction could be achieved at enough receivers. - Outweighs the identified social, economic and environmental effects. <p>Cost effectiveness to be determined on a case-by-case basis.</p>	Yes	Yes	Excess equipment will be avoided where it is not needed for the works and where it is reasonable to do without it.
Timing of equipment in use	<p>Where practicable, activities and plant will be scheduled/limited as outlined in Table C1 (APPENDIX C) of this assessment</p> <p>For example, for OOHW</p> <ul style="list-style-type: none"> - tree trimming, branches would be stacked in dump trucks for off-site mulching and disposal to reduce impacts at night - tree trimming, petrol chainsaws (if required) would be limited to before midnight, where practicable - limit all high noise activities (concrete saw, jackhammer etc) to before midnight, where practicable. 	This measure is not feasible for all works as there is limited time for works to be completed under ROL (or similar).	Not for all works	<ul style="list-style-type: none"> - Sufficient noise reduction could be achieved at enough receivers and cost effective etc, - Note that some of the OOHW are unavoidable due to the high risk to construction personnel or public safety triggering ROL. 	Not for all works	Not for all works	Where practicable, the timing of works would be managed to reduce noise levels during more sensitive periods (i.e. after 10pm and after 12am). Noisy plant that supports LAUW, but does not require OOH operation (e.g. woodchipper would be limited to day use only within the worksite or off site, where practicable), providing a 5-15 dB reduction in noise levels.

Control measure	Description of the control measure	Feasible mitigation test	Deemed feasible?	Reasonable mitigation test	Deemed reasonable?	Adopted?	Justification and commentary
Limit activity duration	Any equipment not in use for extended periods shall be switched off. For example, heavy vehicles should switch engines off when not in use.	This measure could be feasibly implemented.	Yes	- Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Outweighs the identified social, economic, and environmental effects.	Yes	Yes	Equipment that is not directly needed for works at a given time will be switched off.
Equipment selection	Use quieter and less noise/vibration emitting construction methods where feasible and reasonable, for example replace petrol chainsaws with electric chainsaws where practicable, would provide a 10dB reduction in construction noise levels).	This measure could be feasibly implemented. To be determined on a case-by-case basis.	Yes	- Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Outweighs the identified social, economic, and environmental effects.	Yes	Yes	Project team shall review plant and equipment on a case-by-case basis and find opportunities to use items with lower noise/vibration impacts.
Truck movements	Where practicable, avoid the use of park air brakes at night. Set up relevant traffic management measures to minimise the use of air brakes when leaving site. Air brake silencers are to be correctly installed and fully operational for any heavy vehicles (as per CNVMP). Minimise unnecessary acceleration on site and avoid vigorous slamming of truck doors.	This measure could be feasibly implemented.	Yes	- Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Outweighs the identified social, economic, and environmental effects.	Yes	Yes	There are only limited truck movements associated with the preliminary works. Nonetheless, drivers will be reminded to drive responsibly, especially when accessing and departing the work area.
Non-tonal reversing alarms	Alternative reverse alarms, such as 'quackers' will be installed on all vehicles & mobile plant regularly used on site and on all vehicles & mobile plant required for OOHW.	This measure could be feasibly implemented.	Yes	- Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Outweighs the identified social, economic, and environmental effects.	Yes	Yes	Project team will mandate use of non-tonal reversing alarms on equipment.
Path mitigation measures							
Noise barriers or temporary noise screens	Construction works generating noise levels above NMLs should utilise temporary noise screens (e.g. Echo-barrier, FlexShield or similar) to provide noise screening. The screen should be located around work areas as close as possible to the plant to ensure adequate shielding of the plant to receivers.	This measure is generally feasible, provided there is sufficient space to complete the works.	Yes, where there is sufficient space	- Potential benefit of 5-10 dB(A). - Sufficient noise reduction could be achieved at enough receivers. - Deemed to be cost effective. - Safety can be compromised if the workspace is too small or adjacent to busy road	Yes, where safe to do so	Yes, as noted	Temporary noise screens will be utilised on OOHW wherever is safe and practicable to do so.
Enclosures	Temporary enclosures containing key stationary noise-generating activities and/or items such as generators. The enclosure may be incorporated into the plant design (e.g. generator housing) or built on site, such as an 'acoustic tent', i.e. a structure hung with temporary noise screens (e.g. Echo-barrier, FlexShield or similar).	This measure could be feasibly implemented. Limitations as per temporary noise screens above.	Yes	- Potential benefit of 10-20 dB(A). - Sufficient noise reduction could be achieved at enough receivers. - Could be cost effective, where this is incorporated into the plant design (e.g. generator housing)	Yes, where safe to do so	Yes, as noted	Temporary enclosures will be utilised on OOHW wherever is safe and practicable to do so.
At-receiver							
At-property treatments	Design and installation of architectural treatments to sensitive receiver buildings to reduce internal noise levels to key rooms.	Not relevant to this project.	No	- Sufficient noise reduction could be achieved at enough receivers. - Short term OOHW will be managed - Not cost effective.	No	No	Short term OOHW will be managed In accordance with the CNVS and this DNVIS.

Control measure	Description of the control measure	Feasible mitigation test	Deemed feasible?	Reasonable mitigation test	Deemed reasonable?	Adopted?	Justification and commentary
Noise management measures							
Site inductions & Toolbox Talks	All employees, contractors and subcontractors will receive a Project induction. The environmental component may be covered in toolboxes and should include (but is not limited to): <ul style="list-style-type: none"> • location of nearest sensitive receivers • relevant project specific and standard noise and vibration mitigation measures; • permitted hours of work; • OOHW Procedure and Form • construction employee parking areas. 	This measure could be feasibly implemented.	Yes	Routine task for project team.	Yes	Yes	Inductions and toolbox talks will continue to be conducted for the project.
Community consultation - disseminating information	Provide information to community of construction activity and potential impacts.	This measure could be feasibly implemented.	Yes	Routine task for project team.	Yes	Yes	Updates will be distributed regularly for the duration of the project.
Community consultation - active communication with nearby sensitive receivers	Seek feedback from community to identify more sensitive times of the day, or particularly sensitive days. An example is identifying when student exams (such as Higher School Certificate exams, end of semester exams) will take place.	This measure could be feasibly implemented.	Yes	Routine task for project team.	Yes	Yes	Project team shall proactively contact nearby sensitive receivers, particularly those which may have special requirements (e.g. recording studios).
Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.	This measure could be feasibly implemented.	Yes	Routine task for project team.	Yes	Yes	Project team shall monitor site behaviour and advise supervisors if issues arise or additional behavioural practices are needed.
Noise monitoring	Noise monitoring to be conducted at key locations to quantify noise impacts at sensitive receivers.	This measure could be feasibly implemented.	Yes	Deemed to be cost effective. Outweighs the identified social, economic and environmental effects.	Yes	Yes	Noise monitoring shall be carried out as detailed in this assessment.
Update DNVIS	Regular updates of the DNVIS to account for changes in noise and vibration management strategies.	This measure could be feasibly implemented.	Yes	Can be reasonably undertaken by project team where required.	Yes	Yes	Updates to the DNVIS will be carried out where required and will be reviewed regularly.

Control measure	Description of the control measure	Feasible mitigation test	Deemed feasible?	Reasonable mitigation test	Deemed reasonable?	Adopted?	Justification and commentary
Provision of respite evenings and nights	<p>Respite evenings and nights will be provided in accordance with the CNVS.</p> <p>Where after all reasonable and feasible noise mitigation measures have been implemented there are still receivers noise affected during the OOHW period, preliminary works will be programmed to ensure that works and activities do not result in noise levels exceeding NMLs at the same noise sensitive receivers on more than:</p> <ul style="list-style-type: none"> • 2 consecutive evenings and/or nights at any time; and • 3 evenings and/or nights per week; and • 10 evenings and/or nights per month. <p>Furthermore, high noise impact works will be completed before 12:00 am (midnight) where reasonable and feasible.</p>	This measure could be feasibly implemented and updated to reflect EPL conditions, if required.	Yes	Works would be able to be undertaken at night, with respite achieved at enough receivers on nights where works are not undertaken. Deemed to be cost effective. Outweighs the identified social, economic, and environmental effects.	Yes	Yes	Works will be planned to minimise consecutive nights of works affecting the same sensitive receiver.
Respite coordination	Consult with proponents of other construction works in the vicinity of the worksite and take reasonable steps to coordinate works to minimise cumulative impacts of noise and vibration and maximise respite for affected sensitive receivers (e.g. aligning respite evenings).	This measure could be feasibly implemented, if required.	Yes	Sufficient noise reduction could be achieved at enough receivers. Deemed to be cost effective. Outweighs the identified social, economic and environmental effects.	Yes	Yes	Respite coordination shall be conducted with neighbouring projects.
Implement additional management measures	Identify and implement additional management measures outlined in this assessment.	This measure could be feasibly implemented.	Yes	Consistency with CNVS	Yes	Yes	Additional management measures to be identified on a case-by-case basis and with consideration of the standard mitigation and management measures outlined in this report.

5.3.4 Additional management measures

Section 5 of the CNVS directs that in instances where, after the application of all reasonable and feasible mitigation and management measures (refer to Section 5.3.2), the $L_{Aeq(15\text{minute})}$ airborne construction noise levels are still predicted to exceed the NMLs, additional management measures can be applied to further limit the risk of annoyance from construction noise. The CNVS suggests the Project should consider implementing additional management measures such as:

- **Alternative accommodation (AA)** options may be provided for residents living close to construction works that are likely to incur unreasonably high impacts over an extended period of time (more than 2 consecutive days). Alternative accommodation will be determined on a case-by-case basis.
- **Monitoring (M)** of noise or vibration may be conducted at the affected receiver(s) or a nominated representative location where it has been identified that specific construction activities are likely to exceed the relevant noise or vibration objectives. Monitoring can be in the form of either unattended logging or operator attended surveys. The purpose of monitoring is to inform the relevant personnel when the noise or vibration goal has been exceeded so that additional management measures may be implemented.
- **Individual briefings (IB)** are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project.
- **Letter box drops (LB)** in the form of a newsletter produced and distributed to the local community via letterbox drop or email via the project mailing list. The newsletter will provide an overview of current and upcoming works across the project and other topics of interest. The objective is to engage, inform and provide project-specific messages. Advanced warning of potential disruptions (e.g. traffic changes or noisy works) can assist in reducing the impact on the community.
- **Project specific respite offers (RO)** provide residents subjected to lengthy periods of noise or vibration respite from an ongoing impact.
- **Phone calls and emails (PC)** detailing relevant information about construction works would be made to identified noise or vibration affected stakeholders within 7 days of proposed work to provide tailored advice and the opportunity for stakeholders to provide comments on the proposed work and specific needs etc.
- **Specific notifications (SN)** would be letterbox dropped or hand distributed to identified stakeholders no later than 7 days ahead of construction activities that are likely to exceed the noise objectives. This form of communication is used to support periodic notifications, or to advertise unscheduled works.

The steps to be carried out to determine the additional management measures to be implemented are identified in Figure 5-1.

Figure 5-1: Additional airborne noise management measures

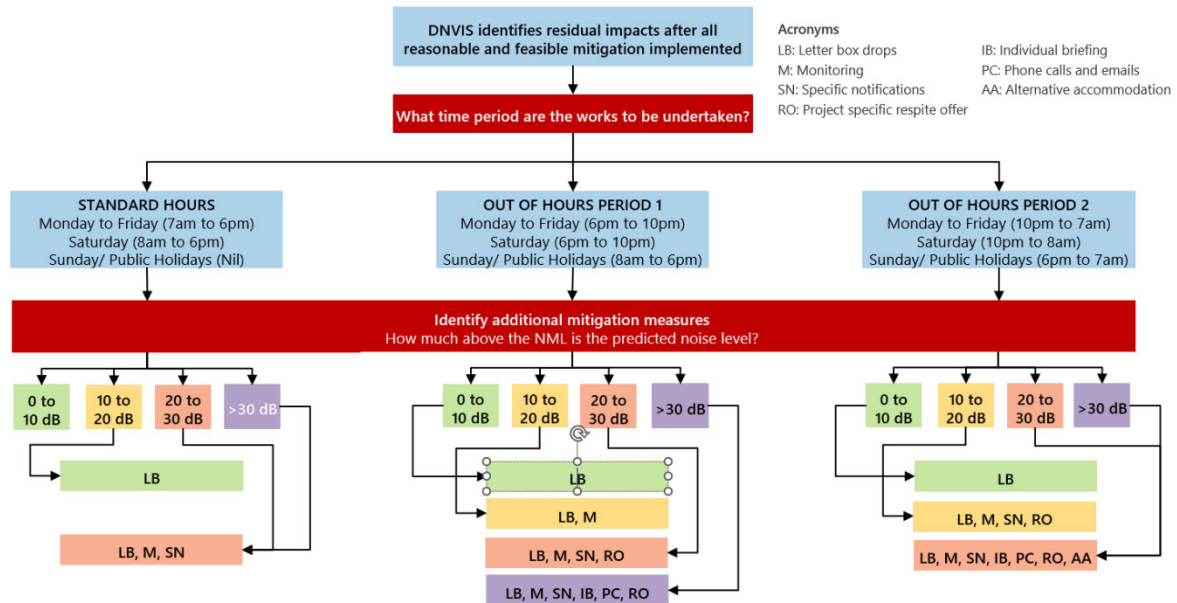


Figure 5-1 presents a summary of the additional management measures applicable for construction activities where, after application of all reasonable and feasible mitigation options, construction noise levels are still above the NMLs.

Prior to the commencement of preliminary works, receivers identified in APPENDIX D.3 will be notified to advise that noise from the works may at times be audible. All potentially impacted receivers will be kept informed of the nature of works to be carried out, the expected noise levels and duration, as well as be given appropriate enquiries and complaints contact details (see Section 5.3.7).

5.3.5 Managing site specific activities and cumulative noise impacts (Gatewave)

This DNVIS has established the overall impacts associated with the proposed works. A 3D construction noise and vibration management tool (Gatewave, www.gatewave.com.au) is being developed specifically for the ETP Works to allow specific work areas and activities to be assessed as construction works progress. It also allows cumulative noise impact from other aspects of the Project or, where relevant noise from other construction projects, to be assessed and managed in accordance with relevant Indicative condition.

Gatewave will be used regularly to plan, assess and manage works progressively.

Gatewave incorporates ground elevation contours, building heights, the built environment and atmospheric conditions to predict construction noise in accordance with the International Standard ISO 9613-2:1996 implementing quality standard ISO 17534-1:2015. All sensitive receivers identified by the land use survey are integrated into the Gatewave tool.

5.3.6 Attended noise monitoring

Attended noise monitoring is to be undertaken to verify that noise levels resulting from construction works are in accordance with the levels predicted in this report, subject to obtaining the property owner/occupier's consent to access the property (where required). Noise monitoring will be completed in publicly accessible areas on or near the nominated receivers, typically at ground floor level. Where, following community consultation, specific sensitive receivers are identified for additional monitoring, access to the property will be sought through the Stakeholder and Community Relations team.

Table 5.6: Nominated verification monitoring locations

	NCA	Nominated receiver address
	NCA04	206 HARRIS STREET PYRMONT
	NCA04	125 PYRMONT STREET PYRMONT
	NCA04	63 EDWARD STREET PYRMONT
	NCA05	1-9 PYRMONT BRIDGE ROAD PYRMONT
	OSR_HTL	2 HUNTER STREET SYDNEY
Attended	OSR_HTL	15-17 HUNTER STREET SYDNEY
Attended	OSR_HTL	30 HUNTER STREET SYDNEY

APPENDIX D.3 identifies the activities where monitoring should be carried out for each NCA.

Noise monitoring should follow the procedures outlined in the Noise and Vibration Monitoring Program required by Condition C14 and the CNVS. The Noise and Vibration Monitoring procedures are included in the Preliminary CEMP. Note that monitoring at all properties may be undertaken from the property boundary to limit any inconvenience to property owners. Monitoring should be undertaken at a minimum of two of the most affected locations nominated in Table 5.6.

5.3.7 Complaints handling

Noise complaints received and responded to will be managed in accordance with the JCG Community Communication Strategy prepared under Condition D52 and the Overarching Community Communications Strategy.

Sydney Metro operate a 24-hour construction complaints line. Enquiries/ complaints may also be received through the project email mailbox (sydneymetrowest@transport.nsw.gov.au) or through the complaints hotline (1800 612 173).

6 Construction vibration impacts

6.1 Vibration assessment methodology

6.1.1 Vibration intensive activities

From the plant and equipment listed in APPENDIX C, the site establishment activities with dominant vibration generating plant and equipment include:

Table 6.1: CEMP vibration intensive activities/ works

Project-wide	Survey control, instrumentation, and monitoring	Nil
	Geotechnical drilling	Yes
Pymont West	Underground existing aerial cables, removing poles, replacing streetlights, and adjusting property connections along Paternoster Lane	Yes
	Utility works on Pymont Bridge Road and Pymont Street	Yes
	Tree trimming and removal on Pymont Bridge Road, Pymont Street and Paternoster Row	Nil
Pymont East	Decommissioning of Ausgrid kiosk to enable the demolition scope site	Yes
	Utility works/ construction power supply	Yes
	Tree trimming and removal on Pymont Bridge Road, Union Street, and Edward Street	Nil
Hunter Street West	Relocate Street lighting pole to allow site access	Yes
	Establish site access to the Hunter Street West site from Hunter Street	Yes
Hunter Street East	Tree trimming and removal along Hunter Street	Nil

Potential vibration generated to receivers is dependent on separation distances, the intervening soil and rock strata, dominant frequencies of vibration, and the receiver structure. The recommended minimum working distances for vibration intensive plant in Table 6.2 are taken from a database of vibration levels measured at various sites or obtained from other sources (e.g. BS5228-2:2009). They are not specific to the Project works as final vibration levels are dependent on many factors including the actual plant used, its operation and the intervening geology between the activity and the receiver.

Potential impacts are identified by determining the buildings/ structures likely to be within the recommended minimum working distances, taking into consideration the vibration intensive plant in use, location of works and distance to nearest affected receiver buildings/ structures.

6.1.2 Minimum working distances for vibration intensive plant

Site specific minimum working distances for vibration significant plant items must be measured on site where plant and equipment is likely to operate close to or within the recommended minimum working distances for cosmetic damage (Table 6.2).

Table 6.2: Minimum working distances (m) for managing vibration impact

Vibration sensitive receiver	Minimum working distances for vibration intensive plant, m		
	Concrete saw	Jackhammer	Truck mounted drill rig
Structural damage to buildings			
Reinforced or frame structures (Line 1) ¹	1	1	1
Screening criteria - non-heritage structures ^{1,2}	1	2	3
Screening criteria - heritage structures ^{1,2}	2	3	6
Disturbance to building occupants			
Critical areas ^{4,7}	15	25	30
Residences - Day	10	15	20
Residences - Night	10	20	20
Offices ^{6,7}	5	10	10
Workshops ⁷	5	5	10

Notes: 1. Initial screening test criteria reduced by 50% due to potential dynamic magnification in accordance with BS7385.
2. In accordance with NVMP, a site inspection should determine whether a heritage structure is structurally unsound.
3. Minimum working distances are in 5m increments only to account for the intrinsic uncertainty of this screening method. Jackhammers/ plate compactors are likely to have minimum working distances smaller than 5 m.
4. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring.
5. Daytime is 7 am to 10 pm; Night-time is 10 pm to 7am.
6. Examples include offices, schools, educational institutions, and place of worship.
7. Applicable when in use.

6.2 Vibration assessment

The numbers of buildings which are likely to be vibration impacted are shown in Table 6.3. More detailed results are provided in APPENDIX E, which presents the vibration impact for nearby receivers over aerial photographs that also show the work areas and the land uses.

Table 6.3: Number of buildings within minimum working distances for vibration impact

	Number of buildings within minimum working distances		
	Concrete saw	Jackhammer	Truck mounted drill rig
Structural damage to buildings			
Reinforced or frame structures (Line 1) ¹	0	0	0
Screening criteria - non-heritage structures ^{1,2}	0	0	0
Screening criteria - heritage structures ^{1,2}	0	0	1
Disturbance to building occupants			
Critical areas ^{2,7}	0	2	0
Residences - Day	0	7	7
Residences - Night	0	13	7
Offices ^{4,7}	0	1	3
Workshops ⁷	0	0	0

Number of buildings within minimum working distances			
Concrete saw	Jackhammer	Truck mounted drill rig	

- Notes:
1. Site inspection should determine structural conditions of all potentially vibration affected buildings
 2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring.
 3. Daytime is 7 am to 10 pm; Night-time is 10 pm to 7am.
 4. Examples include offices, schools, educational institutions, and place of worship.
 5. Applicable when in use.

6.2.1 Structural damage

Buildings/ structures have been identified as within the conservative screening minimum working distance for vibration impact (see Table 6.3 for details). The risk of vibration impact on these items is dependent on the location of vibration intensive plant item relative to the identified structures. Site investigation will be undertaken to identify the actual location of the vibration intensive activities (i.e. drilling works) and confirm whether the identified structures will be within the minimum working distance.

The predicted vibration levels for nearby buildings and structures are expected to be below the corresponding vibration criteria for structural damage. As a result, the risk of structural damage is considered low for vibration intensive works associated with the Project-wide preliminary works.

Where plant is required to operate within minimum working distances, works will be paused and the construction methodology will be revised to ensure the vibration intensive plant only operates outside the minimum working distance. An alternative method will be applied within the minimum working distance. Alternatively, vibration monitoring is recommended to determine site specific minimum working distances and/or verify that vibration levels achieve compliance with the structural damage objectives.

If the monitoring above identifies that vibration is likely to exceed the structural damage objectives, and an alternative construction method is not feasible, the works will be postponed and completed as construction works under the CEMP.

The risk of impact on these items is dependent on the location of works to the structures. If works are found within minimum working distances, vibration monitoring would be undertaken as outlined in Section 6.3.4 and the PCEMP.

6.2.2 Heritage structures

The following heritage structures are identified within the minimum working distance for the conservative screening limit for cosmetic damage for 'unsound' heritage structures:

- 27 O'Connell Street (Radisson Blu Plaza Hotel), where the drill rig is required to operate within 6 metres of the structure during the initial demolition: Hazmat investigation and structural investigation.

Where this is confirmed as true (see Section 6.2.1 regarding site investigation and review of works), a building condition report should be undertaken on these buildings to assess whether they are 'structurally unsound'.

If the buildings are found to be structurally unsound, vibration monitoring and review of construction methodology should be undertaken as outlined in Section 6.2.1. Works near the heritage structures would be managed to ensure the vibration intensive activities (i.e. truck-mounted drill rig) will only occur outside the minimum working distances. This may require use of alternative construction methodologies such as use of a smaller drill rig.

6.2.3 Human annoyance

The assessing vibration guideline [7] notes that inside dwellings, adverse comments often arise when occupants can perceive (feel) vibration, particularly when the vibration arises from a source located outside their home (or outside their control) and assume that the vibration has the potential to damage their building or contents. However, it is noted that vibration levels required to cause minor cosmetic damage are typically 10 x higher than levels that will cause disturbance to building occupants. Many building occupants assume that building damage is occurring when they feel vibration or observe rattling of loose objects, however the level of vibration at which people perceive vibration or at which loose objects may rattle is far lower than vibration levels that can cause damage to structures.

At properties near the worksite, it is possible that the nearest receivers will be able to feel vibration levels when vibration-generating equipment is being utilised. Properties where vibration levels may be above the vibration disturbance goals in Table 4.1 and there is a probability of adverse comment are shown in Table 6.3. It is important to note that human comfort levels are much lower than vibration levels likely to result in property damage and people therefore may be disturbed by vibration with no potential to result in property damage. More detailed results are presented in APPENDIX E.

As can be noted from Table 6.3, nearby sensitive properties are expected to experience vibration levels above the screening limit for human annoyance. The above assessment is based on vibration-generating equipment being operating constantly at the closest location to nearby receivers. When vibration-generating equipment operates further from the closest point, the predicted vibration levels will reduce along with the probability of adverse comment.

Attended vibration measurements are proposed to be carried out proactively and in response to vibration complaints. If measurement results indicate events above the vibration objectives for human annoyance, vibration control and management measures will be provided to reduce vibration impact (see Section 6.3).

After applying all feasible and reasonable vibration mitigation measures, if vibration monitoring still identifies that measured vibration levels are above the relevant vibration criteria for human annoyance, appropriate additional management measures should be considered (see Section 6.3.3).

6.3 Vibration mitigation measures

6.3.1 Consultation with affected receivers

JCG has commenced consultation with potentially affected stakeholders including Councils, business and residential receivers. The consultation is focussed on specific mitigation and management measures applicable to the works. These measures may include minimising works during night time hours that generate vibration; limiting night time works in individual locations to no more than two consecutive nights; scheduling works around sensitive periods where feasible and reasonable; offers of movie or dinner vouchers; alternative accommodation offers. Details of completed consultation is recorded in the Sydney Metro Stakeholder Management System, Consultation Manager. A summary of the consultation program is provided below:

- Consultation with relevant community members on preliminary works, including local area and utility works, site establishment, and preliminary works.
- Consultation with affected receivers identified in APPENDIX D to ensure additional mitigation measures are provided (if required, refer to Section 6.3.3).

Following community consultation, JCG will endeavour to provide between two weeks and one month's notice for any 24-hour tunnel excavation. JCG is committed to undertake noise and vibration monitoring proactively and in response to complaints.

It is noted that no properties are identified as at risk of exceeding the screening criteria for cosmetic damage, therefore no consultation is required to satisfy Condition D31. As noted in Section 6.2.2 a building condition report should be undertaken on 27 O'Connell Street (Radisson Blu Plaza Hotel to assess whether it is 'structurally unsound'.

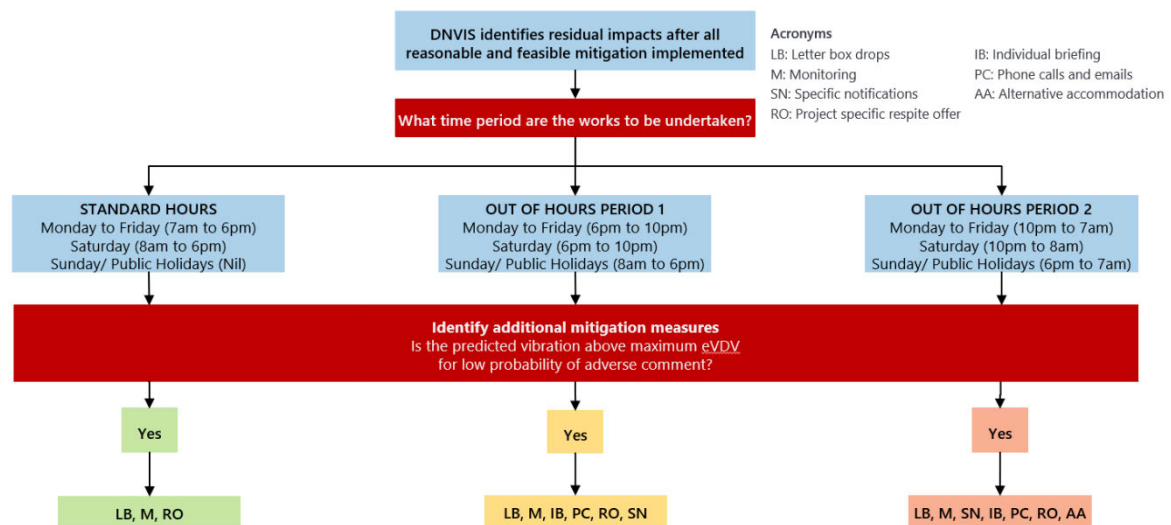
6.3.2 Vibration control and management measures

Vibration management measures are provided in Table 6.4 to minimise vibration impact from construction activities to the nearest affected receivers and to meet the relevant human comfort vibration and structural damage limits.

6.3.3 Additional management measures

After applying all feasible and reasonable mitigation measures identified in Table 6.4, if vibration monitoring at representative locations still exceeds relevant vibration objectives for human annoyance, the appropriate additional management measures, based on the CNVS [1], presented in Figure 6-1, should be provided.

Figure 6-1: Additional vibration mitigation measures



6.3.4 Vibration monitoring

The assessment found that the nearest buildings and structures are unlikely to experience vibration levels above the limit for structural damage. Therefore, the likelihood of vibration generated structural damage caused by the preliminary works is low to negligible. Vibration monitoring is not required.

Vibration monitoring on heritage structures is not required, except as noted in Section 6.2.2 in relation to the 27 O'Connell Street (Radisson Plaza Hotel). Advice of a heritage specialist on methods and locations for installing equipment used for vibration monitoring is not required.

Attended vibration monitoring is to be undertaken to determine and verify site specific minimum working distances for cosmetic damage and human annoyance, where plant or equipment is required to operate within the minimum working distances identified in Table 6.2, or in response to vibration complaints, as noted in Appendix E.2.

Table 6.4: Site vibration control measures

Control measure	Description of the control measure	Feasible mitigation test	Deemed feasible?	Reasonable mitigation test	Deemed reasonable?	Adopted?	Justification and commentary
Construction Planning							
Building condition surveys	Undertake building dilapidation surveys on all buildings located at least within the minimum working distances established for cosmetic damage prior to commencement of activities with the potential to cause property damage (see Section 6.1).	Yes	Yes	Deemed to be cost effective. Outweighs the identified social, economic and environmental effects.	Yes	Yes	Buildings identified within the MWD for cosmetic damage will undergo building condition survey, to reduce the risk of cosmetic damage.
Community consultation	Implement community consultation measures – inform community of construction activity & potential impacts – inform community that the level of vibration at which people perceive it, or at which loose objects may rattle, is far lower than the level at which minor cosmetic damage is expected to occur	Yes	Yes	Routine task for project team.	Yes	Yes	Updates will be distributed regularly for the duration of the project.
Site specific vibration monitoring	Where vibration intensive works are confirmed to be within the minimum working distances identified in Table 6.2, site specific vibration monitoring would be undertaken as outlined in Section 6.3.4.	Yes	Yes	Routine task for project team.	Yes	Yes	Site specific minimum working distances would be determined from on-site measurements and risk of impact would be confirmed.
Alternative construction methodology	Where plant is required to operate within minimum working distances, works will be paused and the construction methodology will be revised to a less vibration intensive method.	Yes	Yes	Routine task for project team.	Yes	Yes	Construction methodology will be revised to ensure the vibration intensive plant only operates outside the minimum working distance
Construction hours and scheduling	Where feasible and reasonable, construction would be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels would be scheduled during less sensitive time periods.	Yes	Yes	Sufficient vibration reduction could be achieved at enough receivers.	Yes	No	Vibration intensive works causing exceedance of the vibration objectives at sensitive receivers are not proposed as part of the preliminary works.

6.3.5 Complaints handling

Vibration complaints received and responded to will be managed in accordance with the CEMP, the JCG Community Communication Strategy prepared under Condition D52 and the Overarching Community Communications Strategy. Each complaint shall be investigated and where vibration levels are established as exceeding the set limits, appropriate amelioration measures shall be put in place to mitigate future occurrences. Management measures may include modification of construction methods such as using smaller equipment and establishment of minimum working distances as mentioned above.

Sydney Metro operate a 24-hour construction complaints line. Enquiries/ complaints may also be received through the project email mailbox (sydneymetrowest@transport.nsw.gov.au) or through the complaints hotline (1800 612 173).

7 Impact classification

The CNVS requires that on completion of a DNVIS, the subjective classification of the noise (and vibration) impact is to be evaluated and documented as:

- Low Impact
- Moderate Impact
- High Impact.

The classifications are to be determined on a case-by-case basis with consideration of the items addressed in the table below and the requirements of SSI 19238057 Condition D23 (b) which defines Low impact.

Table 7.1: Impact classification for the preliminary works – Project-wide

No.	Impact item description	Analysis	Classification
1	The location of the works in relation to NSRs with consideration of noise attenuation features such as noise barriers including topographical features (earth-mounds), buildings, dividing fences etc (distance of works from sensitive receiver(s)).	Majority of NSRs close to the Hunter Street Station worksites are commercial receivers. Majority of the NSRs close to the Pyrmont Station worksites are mixed use residential and commercial receivers.	Moderate
2	The type and sensitivity of the NSRs: - Low Impact: e.g. Commercial buildings/ Scattered Residential (low density) - Moderate Impact: e.g. Standard residential (typical density) - High Impact: e.g. Residential home for the elderly/high density unit blocks/ persistent complainers/ residents deemed to have "construction noise fatigue".	Commercial receivers and four hotels near the Hunter Street Station worksites. Two recording studios, one hotel and residential receivers located close to the Pyrmont Station worksites.	Moderate to High
3	Land use zoning and planning amenity objectives for the area.	Commercial and mixed land use	Low to moderate
4	Construction and architectural design of impacted building, particularly the presence of any existing noise mitigation including that provided under a Noise Abatement Program or required by the ISEPP, Council DCP or other planning instrument.	Multi-storey commercial and hotel receivers with sufficient facade attenuation at Hunter Street Station worksites. At the Pyrmont Station worksites there is a mix of commercial, hotel and multi-storey residential and mixed-use residential receivers with additional facade attenuation. Single occupancy residential or older multi-storey residential are assumed to be standard construction with no extra noise mitigation.	Low to high
5	Existing ambient levels.	Moderate to high existing ambient noise levels during daytime ($L_{Aeq(15min)}$ 71 dB(A)); evening ($L_{Aeq(15min)}$ 61 dB(A)); and night ($L_{Aeq(15min)}$ 57 dB(A)) at Hunter Street. Moderate existing ambient noise levels during daytime ($L_{Aeq(15min)}$ 56 dB(A)); evening ($L_{Aeq(15min)}$ 50 dB(A)); and night ($L_{Aeq(15min)}$ 47 dB(A)) at Pyrmont.	Low

No.	Impact item description	Analysis	Classification
6	The extent of noise exceedance above Noise Management Level.	Mitigation measures including temporary noise barriers will be implemented to reduce noise from the works, where reasonable and feasible. Impacts at Pyrmont moderate to high due to proximity of residential receivers to the works. OOHW impacts at Hunter Street Station would be low as commercial receivers are likely to be unoccupied and hotel receivers typically have adequate façade attenuation. Note that the level of impact would not be continuous as the location of construction activity will vary as the works progress. Works will be programmed to ensure respite nights for receivers, as required by the CNVS.	Moderate
7	The likelihood for potential sleep disturbance (as described in the NPfI).	Residential receivers near the work zone are likely to experience construction noise levels above the sleep disturbance criteria at Pyrmont. No residential receivers are likely to experience construction noise levels above the sleep disturbance criteria at Hunter Street. Hotel receivers with sufficient facade attenuation to minimise likelihood of sleep disturbance.	Low to Moderate
8	The type of and intensity of noise emitted from works (i.e. tonal or impulsive): - Lower Impact: No high noise and/or vibration intensive activities - Moderate Impact: Short/intermittent high noise and/or vibration intensive activities - High Impact: Prolonged high noise and/or vibration intensive activities.	The proposed works consist of 'typical impact', with limited high noise and/or vibration intensive activities such as concrete sawing or jackhammering. All reasonable and feasible measures will be applied to minimise noise and vibration impacts. High noise activities will be completed before midnight, where reasonable and feasible. All works are typically short term, as noted in Table 2.1.	Low to Moderate
9	The duration of any OOHW required.	Most OOHW works will be undertaken in less than 6 shifts.	Moderate
10	The time frames for any OOHW: - Lower Impact: 6.00 pm till 10.00 pm weekdays 1.00 pm till 10.00pm Saturdays 8.00 am till 6.00 pm Sundays or Public Holidays. - Moderate Impact: 10.00 pm to 7.00 am Weekday Nights 10.00 pm to 8.00 am Saturdays. - High Impact: 6.00 pm to 7.00 am Sundays and Public Holidays.	Some assessed preliminary works are required to be OOHW due to the requirement for road closures. Where reasonable and feasible works would be limited to 10pm, although road closures in Pyrmont and the Sydney CBD may not commence until after 9pm. High noise works will be completed before midnight, where reasonable and feasible to reduce the likelihood of sleep disturbance.	Moderate
11	As a result of noise classification and/or the noise level exceedances at sensitive receivers provided by the DNVIS report, appropriate reasonable and feasible noise mitigation is to be adopted and implemented. For sites where works are predicted to significantly exceed noise goals and impact on receivers for a significant period of time, additional reasonable and feasible noise mitigation measures such as those outlined in Section 5 of the CNVS would be considered if practical to reduce the noise levels and impact on sensitive receivers.	Mitigation measures outlined in Section 5.3 and 6.3 will be implemented to manage and reduce impacts from preliminary works.	Low

Review of the overall noise impact of the Project-wide preliminary works is considered **low to moderate**. Some of the preliminary works outside standard construction hours were found to, at times, exceed the NMLs. This impact is short term in nature and will be managed through the mitigation and management measures outlined in Section 5.3, including suitable community notification regarding potential impacts from the works. Mitigation measures will be implemented to reduce noise levels with the aim of achieving the NMLs and limit the overall noise impact to **low**. Where this is not feasible or reasonable, residual impacts will be managed as outlined in Section 5.3.4.

Properties at risk of vibration impact have been identified through the conservative screening process set out in the CNVS [1]. Vibration significant works will be managed in accordance with Section 6.3. The overall vibration impact of the Project-wide preliminary works is considered **low**.

8 Conclusion

In conclusion, construction works associated with the Project-wide preliminary works have been described in this DNVIS to identify potential environmental risks associated with construction noise and vibration. Construction noise and vibration objectives have been established consistent with the indicative condition allocations for the Project and the EIS.

Construction airborne noise

The predicted noise levels indicate nearby residential and other sensitive receivers are expected to experience construction noise levels above the corresponding NMLs during standard construction hours and outside standard construction hours. Noise mitigation and management measures, including noise monitoring requirements, have been presented in Section 5.3 to aid in providing additional noise reduction benefits with the aim of achieving the NMLs and managing residual impacts where the NMLs are unable to be achieved.

Construction ground-borne noise

The Project-wide preliminary works will be surface construction works. Due to the nature of surface works, airborne noise is expected to be much higher than ground-borne noise levels at the nearest sensitive receivers. On this basis, the potential impact of ground-borne noise from the proposed construction activities is expected to be negligible and the risk of annoyance due to ground-borne noise is considered low.

Construction vibration

The risk of structural damage from the Project-wide preliminary works have been assessed as low, as the predicted vibration levels are expected to be below the corresponding vibration criteria for cosmetic damage. A building condition report should be undertaken on 27 O'Connell Street (Radisson Plaza Hotel) to assess whether it is 'structurally unsound', as outlined in Section 6.2.2.

Sensitive receivers located close to vibration significant preliminary works (namely drilling and jack hammering) may experience vibration levels above the screening limit for human annoyance.

Vibration mitigation and management measures, including vibration monitoring requirements, have been presented in Section 6.3 to reduce the risk of damage to buildings near the worksites and to manage human annoyance from construction vibration.

Construction traffic

The predicted noise impacts are assessed as low and generally within the minimum requirements in the CNVS.

Impact classification

The overall noise and vibration impact of the Project-wide preliminary works is considered **moderate**.

References

- [1] Sydney Metro Construction Noise and Vibration Standard Version 4.3 (SM-20-00098866) – 4 November 2020
- [2] Transport for NSW Construction Noise and Vibration Strategy (ref: ST-157/4.1) April 2019
- [3] Sydney Metro West Out-of-hours Work Protocol (in progress)
- [4] SLR Consulting Australia Pty Ltd 2021 Sydney Metro West - Major civil construction between The Bays and Sydney CBD - Technical Paper 2: Noise and Vibration October 2020
- [5] Sydney Metro 2022 Sydney Metro West – Submissions Report - Major civil construction between The Bays and Sydney CBD
- [6] Department of Environment and Climate Change 2009 NSW Interim Construction Noise Guideline (ICNG)
- [7] Environment Protection Authority 2017 NSW Noise Policy for Industry (NPfI)
- [8] Department of Environment, Climate Change and Water 2011 NSW Road Noise Policy (RNP)
- [9] Department of Environment Conservation NSW 2006 Assessing Vibration; a technical guideline
- [10] Environment Protection Authority 2000 NSW Industrial Noise Policy (INP)
- [11] British Standard BS 6472-2008, Evaluation of human exposure to vibration in buildings (1-80Hz)
- [12] Australian Standard AS 2187.2-2006 Explosives - Storage and Use - Use of Explosives
- [13] British Standard BS 7385 Part2-1993, Evaluation and measurements for vibration in buildings Part 2
- [14] German Standard DIN 4150-3: 2016-12, Structural vibration - Effects of vibration on structures, December 2016
- [15] ASHRAE Applications Handbook (SI) 2003, Chapter 47 Sound and Vibration Control, pp47.39-47.40
- [16] Australian Standard 2834-1995 Computer Accommodation, Chapter 2.9 Vibration, p16
- [17] Australian Standard AS/NZS 2107:2000 *Acoustics - Recommended design sound levels and reverberation times for building interiors*

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

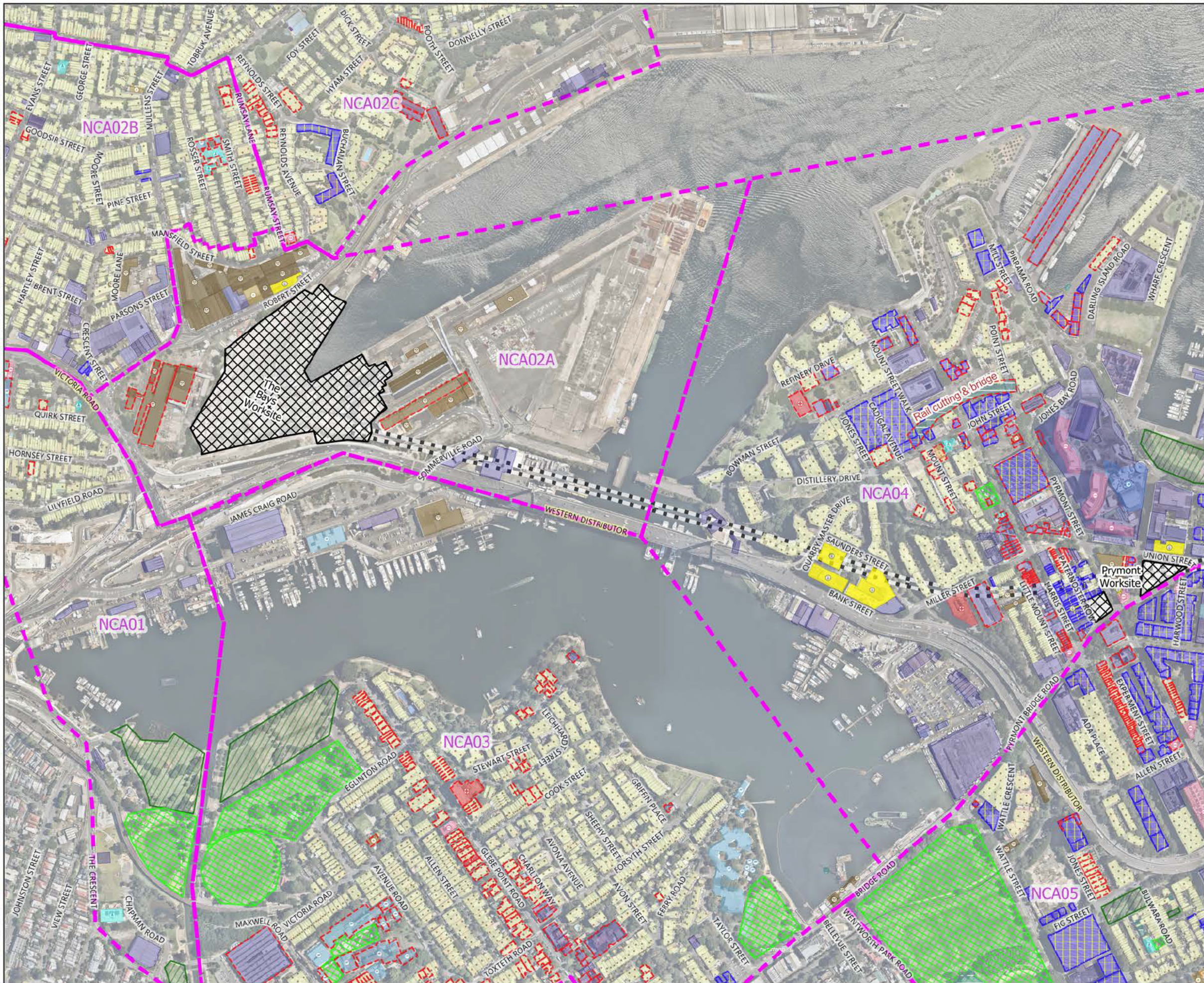
Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Attenuation	The reduction in the level of sound or vibration.
AVTG	Assessing Vibration – a technical guideline (DEC 2006)
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
CNVS	Construction Noise and Vibration Standard (Sydney Metro 2021)
Indicative condition	Condition of Approval
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
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

DP&E	NSW Department of Planning and Environment
ECRTN	Environmental Criteria for Road Traffic Noise (EPA 1999)
EIS	Environmental Impacts Statement
EPA	NSW Environment Protection Authority
Feasible and reasonable	Consideration of best practice taking into account the benefit of proposed measures and their technological and associated operational application in the NSW and Australian context. Feasible relates to engineering considerations and what is practical to build. Reasonable relates to the application of judgement in arriving at a decision, taking into account mitigation benefits and cost of mitigation versus benefits provided, community views and nature and extent of potential improvements.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
GIS	Geographic Information System
ICNG	Interim Construction Noise Guideline (DECC, 2009)
INP	NSW Industrial Noise Policy (EPA, 2000)
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.
L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
MWD	Minimum Working Distance
NCA	Noise Catchment Areas
NML	Noise management levels
NSR	Noise Sensitive Receivers
OEH	Office of Environment and Heritage
OOHW	Out-of-Hours Works – work completed outside of standard construction hours
PPV	Peak Particle Velocity
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L _{eq} sound levels over any period of time and can be used for predicting noise at various locations.
RNP	NSW Road Noise Policy (DECCW 2011)

Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level (SPL)	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level (SWP)	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Standard construction hours	Hours during which construction work is permitted by the Indicative condition.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Sensitive receivers and noise management levels

B.1 NCAs and sensitive receiver identification



LEGEND

- Noise Sensitive Receiver**
- Residential
 - Mixed use
 - Commercial
 - Industrial
 - Hotel/Motel/Hostel
 - Medical facility
 - Place of Worship
 - Community centre
 - Recording studio
 - Library/Museum
 - Childcare
 - Educational
 - Theatre/Auditorium
 - Cinema
 - Laboratory
 - Flight simulator
 - Animal Enclosure
 - Recreational - Passive
 - Recreational - Active
 - Other
 - Heritage
- Project NCAs**
- Project Worksites**
- Tunnel Alignment**

NCA	NML DS	NML DO	NML E	NML N
NCA01	61	56	56	50
NCA02A	53	48	48	40
NCA02B	52	47	47	43
NCA02C	59	54	54	51
NCA03	58	53	52	44
NCA04	60	55	52	50
NCA05	62	57	54	51

NCA: Noise Catchment Area
NML: Noise Management Level
D(S): standard construction hours from 7 am to 6 pm Monday to Friday and from 8 am to 6 pm Saturday
D(O): out-of-hours day period from 8 am to 6 pm Sunday and Public holidays - OOHW P1
E: evening period from 6 pm to 10 pm Monday to Sunday - OOHW P1
N: night-time period from 10 pm to 7 am Monday to Friday, from 10 pm am to 8 am Saturday, Sunday and Public holidays - OOHW P2



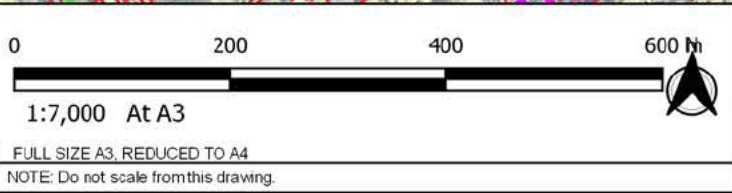
SYDNEY METRO WEST – EASTERN TUNNELLING PACKAGE

Landuse, Worksites and NCAs

REV	BY	DATE	DESCRIPTION	APPROVER
r4	SS	19/01/23	Updated Landuse	TG
r3	SS	12/12/22	Labeling specific Heritage	TG
r2	SS	23/11/22	OSR Corrections	TG
r1	SS	16/11/22	Update Landuse	TG
r0	SS	23/06/22	Prepare figures	TG

A3 Original

Co-ordinate System: MGA Zone 56



CLIENT

JOHN HOLLAND **CPB** **Ghella**

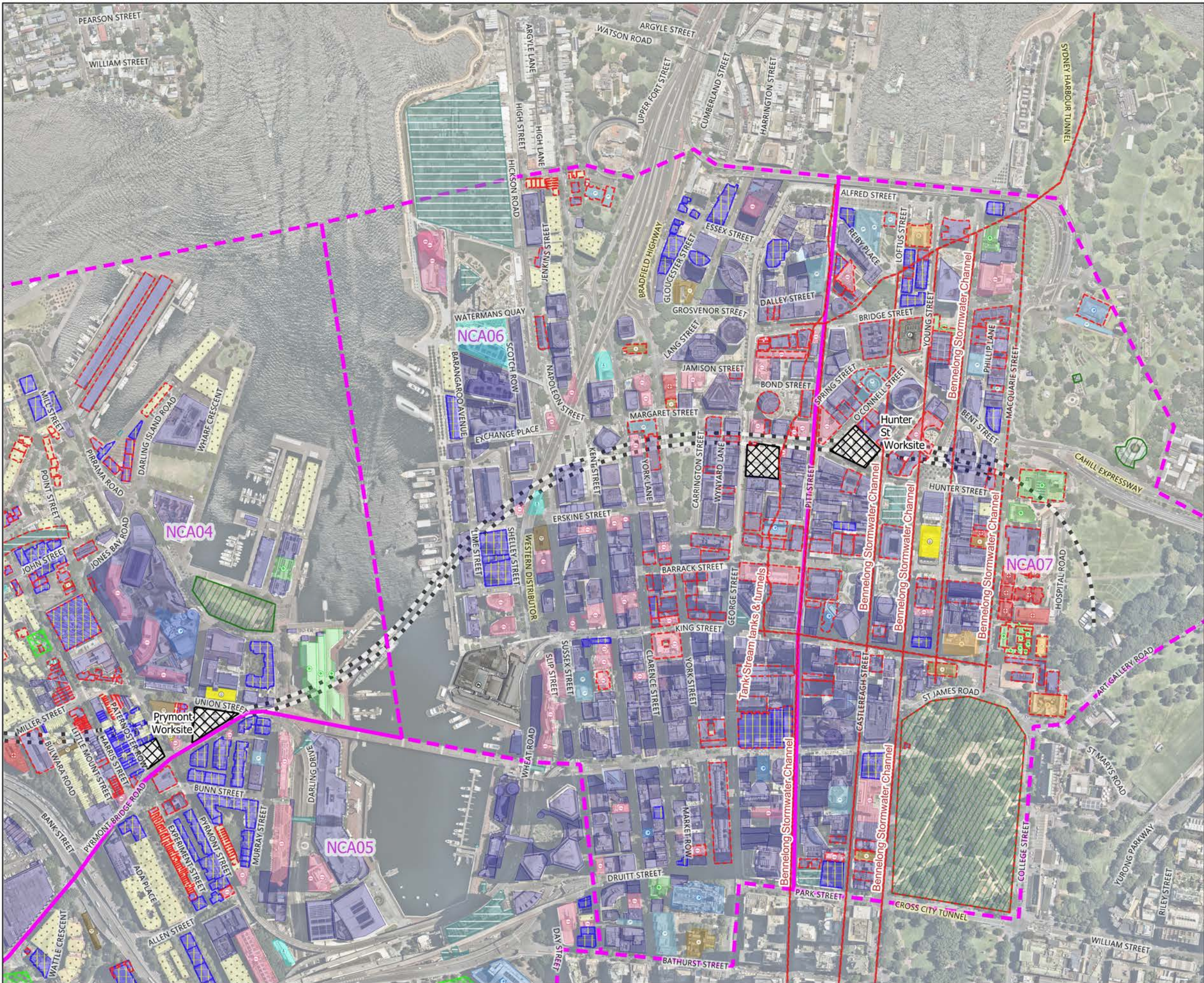
CONTRACTORS

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LEGEND

- Noise Sensitive Receiver**
- Residential
 - Mixed use
 - Commercial
 - Industrial
 - Hotel/Motel/Hostel
 - Medical facility
 - Place of Worship
 - Community centre
 - Recording studio
 - Library/Museum
 - Childcare
 - Educational
 - Theatre/Auditorium
 - Cinema
 - Laboratory
 - Flight simulator
 - Animal Enclosure
 - Recreational - Passive
 - Recreational - Active
 - Other
 - Heritage
- Project NCAs**
- Project Worksites**
- Tunnel Alignment**

NCA	NML DS	NML DO	NML E	NML N
NCA04	60	55	52	50
NCA05	62	57	54	51
NCA06	71	66	61	57
NCA07	71	66	61	57

NCA: Noise Catchment Area
NML: Noise Management Level
D(S): standard construction hours from 7 am to 6 pm Monday to Friday and from 8 am to 6 pm Saturday
D(O): out-of-hours day period from 8 am to 6 pm Sunday and Public holidays - OOH P1
E: evening period from 6 pm to 10 pm Monday to Sunday - OOH P1
N: night-time period from 10 pm to 7 am Monday to Friday, from 10 pm am to 8 am Saturday, Sunday and Public holidays - OOH P2



SYDNEY METRO WEST – EASTERN TUNNELLING PACKAGE

Landuse, Worksites and NCAs

REV	BY	DATE	DESCRIPTION	APPROVER
r4	SS	19/01/23	Updated Landuse	TG
r3	SS	12/12/22	Labeling specific Heritage	TG
r2	SS	23/11/22	OSR Corrections	TG
r1	SS	16/11/22	Update Landuse	TG
r0	SS	23/06/22	Prepare figures	TG

0	200	400	600 m
1:7,000 At A3			
FULL SIZE A3, REDUCED TO A4			
NOTE: Do not scale from this drawing.			

CLIENT

JOHN HOLLAND **CPB** **Ghella**

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B.2 NCAs and noise management levels

Table B1: Noise Sensitive Receivers and Construction Noise Management Levels (airborne noise)

PRELIMINARY WORKS - PROJECT WIDE

NCA	Receiver Type	Reference RBL	Existing Noise Levels, dB(A)			Airborne NMLs based on ICNG (external)							Sleep Dist. L _{Amax}		Comments	
			RBL Day	RBL Evening	RBL Night	LAeq_D	LAeq_E	LAeq_N	NMLD(S)	NMLD(O)	NMLE	NMLN	NMLMS	L _{Aeq} (15min)		L _{AFmax}
Residential receivers																
NCA01	Predominantly Residential	B.02	51	51	45	57	57	54	61	56	56	50	53	50	60	Nearest worksite
NCA02A	Predominantly Residential	B.01	43	43	35	56	54	47	53	48	48	40	44	40	52	The Bays.
NCA02B	Predominantly Residential	B.40	42	44	38	54	53	48	52	47	47	43	45	43	53	The Bays.
NCA02C	Predominantly Residential	B.35	49	49	46	54	51	49	59	54	54	51	53	51	61	The Bays.
NCA03	Predominantly Residential	B.03	48	47	39	59	58	51	58	53	52	44	49	44	54	The Bays.
NCA04	Predominantly Residential	B.04	50	47	45	56	50	47	60	55	52	50	53	50	60	Pyrmont
NCA05	Predominantly Residential	B.05	52	49	46	61	59	56	62	57	54	51	54	51	61	Pyrmont
NCA06	Predominantly Residential	B.06	61	56	52	66	62	63	71	66	61	57	62	57	67	Hunter Street
NCA07	Predominantly Residential	B.06	61	56	52	66	62	63	71	66	61	57	62	57	67	Hunter Street
ICNG 'Other sensitive' receivers (NML applicable when in use)																
Classrooms at schools and other educational institutions									65	65	65	65	65	-	-	Source: ICNG, assuming a conservative façade loss of 20 dB(A) in CBD
Hospital wards and operating theatres									65	65	65	65	65	-	-	Source: ICNG, assuming a conservative façade loss of 20 dB(A)
Places of worship									55	55	55	55	55	-	-	Source: ICNG, assuming a conservative façade loss of 10 dB(A)
Passive recreation areas (e.g. area used for reading, meditation)									60	60	60	60	60	-	-	Source: ICNG
Active recreation areas (e.g. sports fields)									65	65	65	65	65	-	-	Source: ICNG
Commercial premises (including offices and retail outlets)									70	70	70	70	70	-	-	Source: ICNG
Industrial premises									75	75	75	75	75	-	-	Source: ICNG
Non-ICNG 'Other sensitive' receivers (GBNML applicable when in use)																
Hotel - daytime and evening									70	70	70	70	70	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum', assuming 20 dB(A) facade loss
Hotel - night-time									60	60	60	60	60	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum', assuming 20 dB(A) facade loss for standard hotels; 30 dB(A) facade loss for luxury hotels (e.g. Radisson)
Café/ Bar/ Restaurant									60	60	60	60	60	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum', assuming 10 dB(A) facade loss
Childcare centre (indoor sleeping areas)									55	55	55	55	55	-	-	Source: CNVS Section 2.2.1, assuming a conservative façade loss of 10 dB(A)
Childcare centre (play areas)									65	65	65	65	65	-	-	Source: CNVS Section 2.2.1
Public Building									60	60	60	60	60	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum', assuming 10 dB(A) facade loss
Studio building (music recording studio)									45	45	45	45	45	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum', assuming 20 dB(A) facade loss
Studio building (film or television studio)									50	50	50	50	50	-	-	Source: AS2107 'maximum', assuming 20 dB(A) facade loss
Theatre/ Auditorium									50	50	50	50	50	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum', assuming 20 dB(A) facade loss
Notes:	D(S): standard construction hours from 7 am to 6 pm Monday to Friday and from 8 am to 6 pm Saturday								N: night-time period from 10 pm to 7 am Monday to Friday, from 10 pm am to 8 am Saturday, Sunday and Public holidays - OOHW P2							
	D(O): out-of-hours day period from 8 am to 6 pm Sunday and Public holidays - OOHW P1								MS: morning shoulder period from 5 am to 7 am Monday to Friday, from 6 am to 8 am Saturday, Sunday and Public holidays - OOHW P1							
	E: evening period from 6 pm to 10 pm Monday to Sunday - OOHW P1															

Table B2: Noise Sensitive Receivers and Construction Noise Management Levels (groundborne noise)

NCA	Receiver Type	Groundborne NMLs based on ICNG (internal)							Comments
		NMLDS	NMLDO	NMLE	NMLN	MS			
Residential receivers									
All	All residential receivers	(50)*	(50)*	40	35				Source: ICNG
*Human comfort vibration limit applies during the day. 50 dB(A) used as screening guideline.									
ICNG 'Other sensitive' receivers (NML applicable when in use)									
Classrooms at schools and other educational institutions		45	45	45	45	45	-	-	Source: ICNG
Hospital wards and operating theatres		45	45	45	45	45	-	-	Source: ICNG
Places of worship		45	45	45	45	45	-	-	Source: ICNG
Commercial premises (including offices and retail outlets)		50	50	50	50	50	-	-	Source: ICNG, assuming a conservative façade loss of 20 dB(A)
Industrial premises		55	55	55	55	55	-	-	Source: ICNG, assuming a conservative façade loss of 20 dB(A)
Non-ICNG 'Other sensitive' receivers (GBNML applicable when in use)									
Hotel - daytime and evening		50	50	50	50	50	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'
Hotel - night-time		40	40	40	40	40	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'
Café/ Bar/ Restaurant		50	50	50	50	50	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'
Childcare centre (indoor sleeping areas)		45	45	45	45	45	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'
Childcare centre (play areas)		55	55	55	55	55	-	-	Source: CNVS Section 2.2.1, assuming a conservative façade loss of 10 dB(A)
Public Building		50	50	50	50	50	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'
Studio building (music recording studio)		25	25	25	25	25	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'
Studio building (film or television studio)		30	30	30	30	30	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'
Theatre/ Auditorium		30	30	30	30	30	-	-	Source: CNVS Section 2.2.1 & AS2107 'maximum'
Notes:	D(S): standard construction hours from 7 am to 6 pm Monday to Friday and from 8 am to 6 pm Saturday		N: night period from 22:00 to 07:00 Monday to Friday, and from 22:00 to 08:00 Saturday, Sunday and Public holidays - OOHW P2						
	D(O): out-of-hours day period from 8 am to 6 pm Sunday and Public holidays - OOHW P1		MS: Morning shoulder from 05:00 to 07:00 Monday to Friday, and from 06:00 to 08:00 Saturday, Sunday and Public holidays - OOHW P2						
	E: evening period from 6 pm to 10 pm Monday to Sunday - OOHW P1								

APPENDIX C

Construction timetable/ activities/ management

C.1 Construction timetable/activities/equipment

Table C2-1: Construction timetable/ activities/ equipment

PRELIMINARY WORKS - PROJECT WIDE

Construction and/or Demolition Activity, Activity Equipment																	
Worksite	Activity/ Work Area	Assessment reference	Plant/ Equipment (as provided by client)	Day	Evening	Night	Timing of Activity		Sound Power Level (Lw re: 1pW) in Noise Model, dB(A)			High noise plant	Vibration intensive plant	Notes			
				7am - 6pm	6pm - 10pm	10pm - 7am	Start Date	Duration	L _{Aeq}	Penalty	L _{Amax}						
Project wide design survey and investigations	Survey control, instrumentation and monitoring including: - Installation of extensometers and piezometers - Installation of bench marks	SC-Z1 to SCZ8 (refer to Figure 2-3 for work areas)	Light vehicle	-	3 per hour	3 per hour			89	-	100	-	-				
			Hand tools	-	1	1			105	-	118	-	-				
			Lighting tower	-	1	1			99	-	102	-	-				
				-													
	Geotechnical drilling (locations shown on Figure C1)	GT-P1 to GT-P2 GT-H1 to GT-H9 (refer to Figure 2-1 and 2-3 for work areas)	Truck-mounted drill rig	-	1	1			106	-	116	-	X				
			Vacuum truck	-	1	1			107	-	111	-	-				
			Concrete core drilling machine	-	1	(1)			113	-	116	-	-	Where practicable, limit core drilling to before midnight.			
			Excavator w bucket	-	1	1			103	-	108	-	-				
			Site bogie	-	1	1			103	-	111	-	-				
Pymont West	Underground existing aerial cables, removing poles, replacing streetlights, and adjusting property connections along Paternoster Lane (indicative night works -5 shifts)	UT-PW1 to UT-PW2 (refer to Figure 2-1 for work areas)	Excavator w bucket	-	1	1			103	-	108	-	-	Utility night works.pdf			
			Rigid Truck	-	2 per hour	2 per hour			106	-	111	-	-				
			Powerpole crane truck	-	1	1			107	-	111	-	-				
			EWP / Scissor Lift	-	1	1			95	-	98	-	-				
			Compressor	-	1	1			102	-	103	-	-				
			Jackhammer	-	1	(1)			111	5	121	HN	X	Where practicable, limit jackhammering to before midnight.			
			Vacuum truck	-	1	1			107	-	111	-	-				
			Generator	-	1	1			94	-	95	-	-				
			Wacker Plate and plate compactor	-	1	1			108	-	110	-	X				
			Water cart	-	1	1			107	-	111	-	-				
			Hand tools	-	1	1			105	-	118	-	-				
			Excavator w bucket	-	1	1			103	-	108	-	-				
			Rigid Truck	-	2 per hour	2 per hour			106	-	111	-	-				
			EWP / Scissor Lift	-	1	1			95	-	98	-	-				
	Utility works on Pymont Bridge Road and Pymont Street, including: - establishment of temporary construction services, - investigation and protection of existing assets, and - decommissioning of redundant assets	UT-TR1 to UT-TR2 (refer to Figure 2-1 for work areas)	Compressor	-	1	1			102	-	103	-	-				
			Jackhammer	-	1	(1)			111	5	121	HN	X	Where practicable, limit jackhammering to before midnight.			
			Vacuum truck	-	1	1			107	-	111	-	-				
			Generator	-	1	1			94	-	95	-	-				
			Wacker Plate and plate compactor	-	1	1			108	-	110	-	X				
			Water cart	-	1	1			107	-	111	-	-				
			Excavator 25T w grabs and bucket	-	1	1			103	-	108	-	-				
			Chainsaw (Petrol)	-	(4)	(4)			116	5	120	HN	-	Where practicable, limit petrol chainsaw to before midnight.			
			Chainsaw (Electric)	-	4	4			106	-	111	-	-	Where practicable, replace petrol chainsaw with electric chainsaw			
			Truck & Wood Chipper	1	-	-			120	5	124	HN	-	Limit to day use only within the worksite to reduce sleep disturbance impact			
			Mobile Crane	-	1	1			104	-	108	-	-				
			Site bogie	-	2	2			103	-	111	-	-	Branches stacked in bogies for daytime and/ or off-site mulching			
			Lighting tower	-	1	1			99	-	102	-	-				
			Pymont East	Decommissioning of Ausgrid kiosk to enable the demolition scope site (indicative night works -15 shifts)	DA (refer to Figure 2-1 for work areas)	Excavator w bucket	-	1	1			103	-	108	-	-	
						Bogie trucks	-	1 per hour	1 per hour			106	-	111	-	-	
						Air Compressor	-	1	1			70	-	-	-	-	
Truck-mounted drill rig	-	1				1			106	-	116	-	X				
Vacuum truck	-	1				1			107	-	111	-	-				
Jackhammer	-	1				(1)			111	5	121	HN	X	Where practicable, limit jackhammering to before midnight.			
Generator	-	1				1			94	-	95	-	-				
Concrete core drilling machine	-	1				(1)			113	-	116	-	-	Where practicable, limit core drilling to before midnight.			
Concrete Saw	-	1				(1)			119	5	124	HN	X	Where practicable, limit concrete saw to before midnight.			
	-																
Utility works, including: - establishment of temporary construction services, - investigation and protection of existing assets, and - decommissioning of redundant assets	UT-PE1 to UT-PE3 (refer to Figure 2-1 for work areas)	Excavator w bucket		-	1	1			103	-	108	-	-				
		Rigid Truck		-	1	1			106	-	111	-	-				
		EWP / Scissor Lift		-	2	2			95	-	98	-	-				
		Compressor		-	2	2			102	-	103	-	-				
		Jackhammer		-	2	(2)			111	5	121	HN	X	Where practicable, limit jackhammering to before midnight.			
		Vacuum truck		-	2	2			107	-	111	-	-				
Wacker Plate and plate compactor		Generator	-	1	1			94	-	95	-	-					
		Wacker Plate and plate compactor	-	1	1			108	-	110	-	X					
		Water cart	-	1	1			107	-	111	-	-					
			-														

Table C2-1: Construction timetable/ activities/ equipment

PRELIMINARY WORKS - PROJECT WIDE

Worksite	Activity/ Work Area	Assessment reference	Plant/ Equipment (as provided by client)	Day	Evening	Night	Timing of Activity		Sound Power Level (Lw re: 1pW) in Noise Model dB(A)			High noise plant	Vibration intensive plant	Notes
				7am - 6pm	6pm - 10pm	10pm - 7am	Start Date	Duration	L _{Aeq}	Penalty	L _{Amax}			
	Tree trimming and removal - Pyrmont Bridge Road - Union Street - Edward Street	UT-TR1 to UT-TR3 (refer to Figure 2-1 for work areas)	Excavator 25T w grabs and bucket	-	1	1			103	-	108	-	-	
			Chainsaw (Petrol)	-	(4)	(4)			116	5	120	HN	-	Where practicable, limit petrol chainsaw to before midnight.
			Chainsaw (Electric)	-	4	4			106	-	111	-	-	Where practicable, replace petrol chainsaw with electric chainsaw
			Truck & Wood Chipper	2	-	-			120	5	124	HN	-	Limit to day use only within the worksite to reduce sleep disturbance impact
			Mobile Crane	-	1	1			104	-	108	-	-	
			Site bogie	-	2	2			103	-	111	-	-	Branches stacked in bogies for off-site mulching
			Lighting tower	-	1	1			99	-	102	-	-	
Hunter Street West	Relocate Street lighting pole on Hunter Street to allow site access (indicative night works -3 shifts)	RS (refer to Figure 2-2 for work areas)	Powerpole crane truck	-	1	1			104	-	108	-	-	
			EWP	-	1	1			95	-	98	-	-	
			Excavator with bucket	-	1	1			103	-	108	-	-	
			Hand tools	-	1	1			105	-	118	-	-	
			Concrete Saw	-	1	1			119	5	124	HN	X	
	Establish site access to the Hunter St West site from Hunter St (indicative night works -6 shifts)	ES (refer to Figure 2-2 for work areas)	Excavator 35t w bucket	-	2	2			103	-	108	-	-	
			Material Delivery Trucks	-	1 per hour	1 per hour			106	-	111	-	-	
			Labour	-	4	4			105	-	118	-	-	
			Concrete Trucks	-	1 per hour	1 per hour			108	-	111	-	-	
			Concrete Pump	-	1 per hour	1 per hour			103	-	107	-	-	
			Grader	-	1	1			113	-	121	-	-	
			Formwork and Reo crews	-	1	1			107	-	111	-	-	
			Paver (asphalting machine)	-	1	1			105	-	112	-	-	
			Concrete saw	-	1	(1)			119	5	124	HN	X	Where practicable, limit concrete saw to before midnight.
Hunter Street East	Tree trimming and removal	TR-HE (refer to Figure 2-2 for work areas)	Excavator 25T w grabs and bucket	1	1	1			103	-	108	-	-	
			Chainsaw (Petrol)	4	(4)	(4)			116	5	120	HN	-	Where practicable, limit petrol chainsaw to before midnight.
			Chainsaw (Electric)	4	4	4			106	-	111	-	-	Where practicable, replace petrol chainsaw with electric chainsaw
			Truck & Wood Chipper	2	-	-			120	5	124	HN	-	Limit to day use only within the worksite to reduce sleep disturbance impact
			Mobile Crane	1	1	1			104	-	108	-	-	
			Site bogie	1	1	1			103	-	111	-	-	Branches stacked in bogies for off-site mulching
			Lighting tower	-	1	1			99	-	102	-	-	

APPENDIX D **Construction noise impacts**

D.1 Predicted noise levels

The detailed predicted levels have been provided to JCG in a spreadsheet table to more adequately mitigate and manage potential noise impacts.

D.2 Number of receivers above NMLs

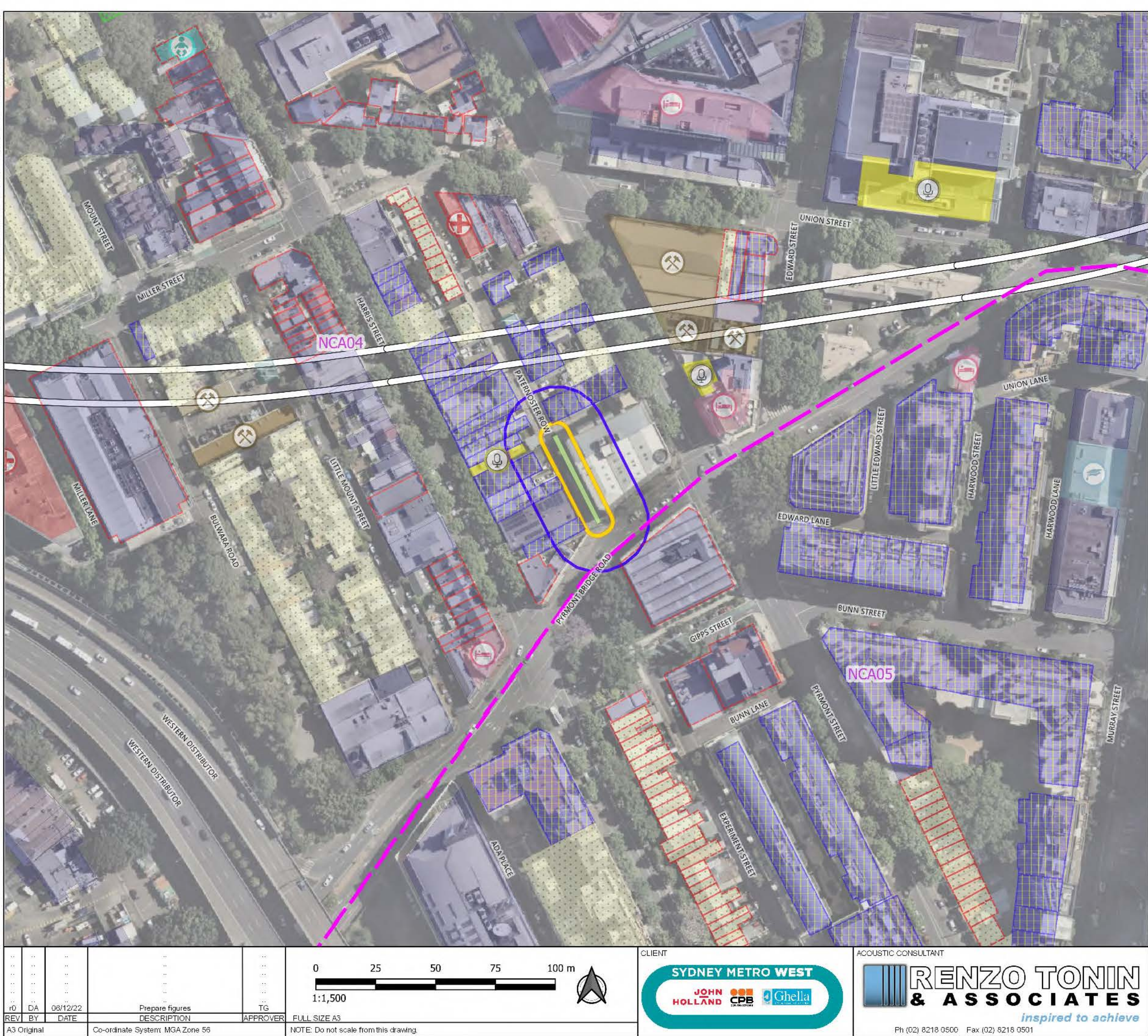
The number of exceedances has been provided to JCG in a spreadsheet table.

D.3 Additional management measures

The additional management measures have been provided to JCG in a spreadsheet table to more adequately mitigate and manage potential noise impacts.

APPENDIX E Construction vibration impacts

E.1 Minimum working distance for vibration impact



LEGEND

Noise Sensitive Receivers

	Residential		Childcare
	Mixed use		Educational
	Commercial		Theatre/Auditorium
	Industrial		Cinema
	Hotel/Motel/Hostel		Laboratory
	Medical facility		Flight simulator
	Place of Worship		Horse Stable
	Community centre		Recreational - Passive
	Recording studio		Recreational - Active
	Library/Museum		Other
			Heritage

Tunnel Alignment
 Work Area
 Receivers within MWD for cosmetic damage

MWD for cosmetic damage and human annoyance for Jackhammer

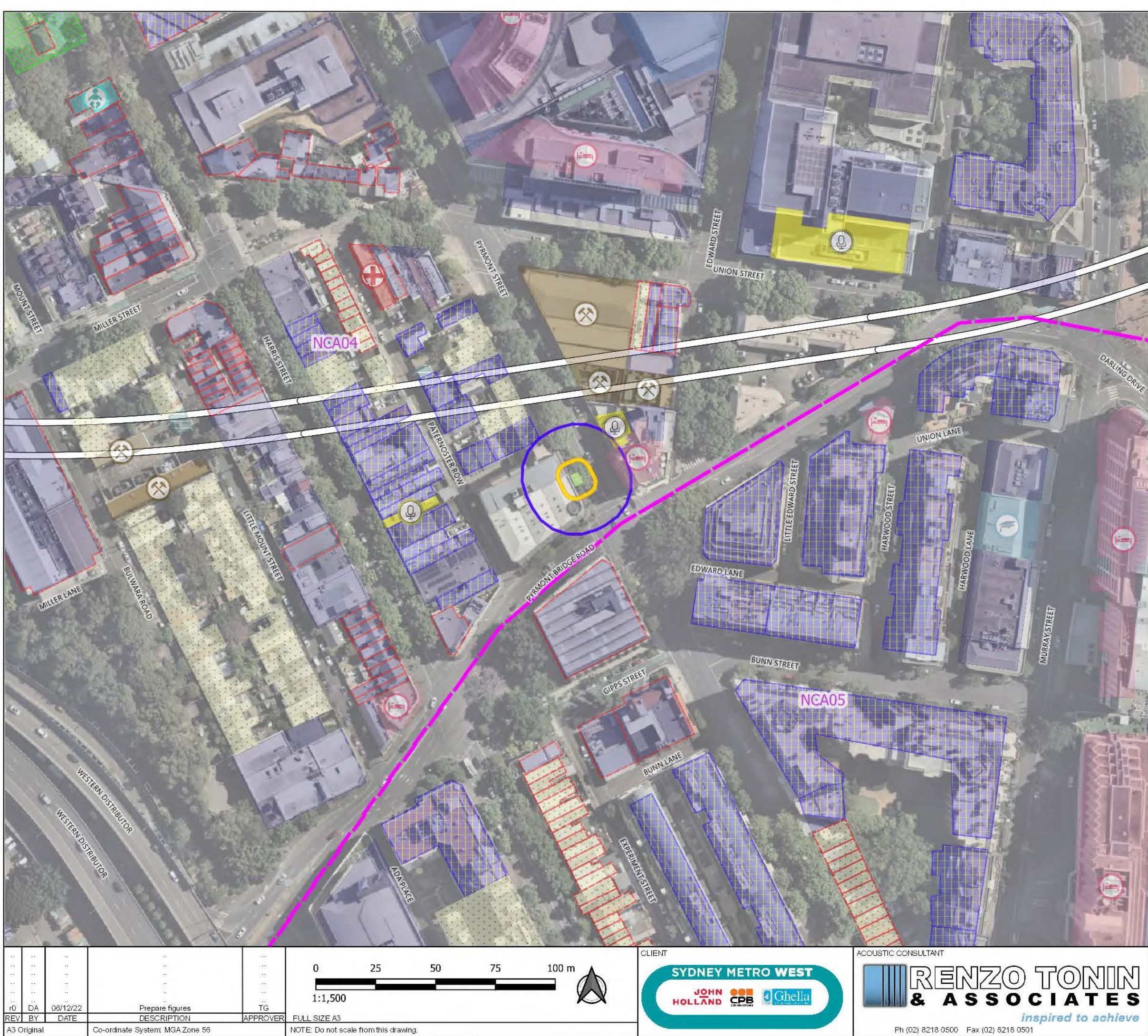
	Unreinforced structures (7.5mm/s ppv)
	Heritage structures (2.5mm/s ppv)
	Human annoyance - Residential (night)

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SYDNEY METRO WEST
Preliminary Works
MWD for Cosmetic Damage and Human Annoyance
Work Activity: Jackhammer

Sheet 1 of 4



LEGEND

Noise Sensitive Receivers

	Residential		Childcare
	Mixed use		Educational
	Commercial		Theatre/Auditorium
	Industrial		Cinema
	Hotel/Motel/Hostel		Laboratory
	Medical facility		Flight simulator
	Place of Worship		Horse Stable
	Community centre		Recreational - Passive
	Recording studio		Recreational - Active
	Library/Museum		Other
			Heritage

Tunnel Alignment

Work Area

Receivers within MWD for cosmetic damage

MWD for cosmetic damage and human annoyance for Jackhammer

- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (night)

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MWD for Cosmetic Damage and Human Annoyance	<i>inspired to achieve</i>
Work Activity: Jackhammer	Ph (02) 8218 0500 Fax (02) 8218 0501

0	25	50	75	100 m
1:1,500				

NOTE: Do not scale from this drawing.

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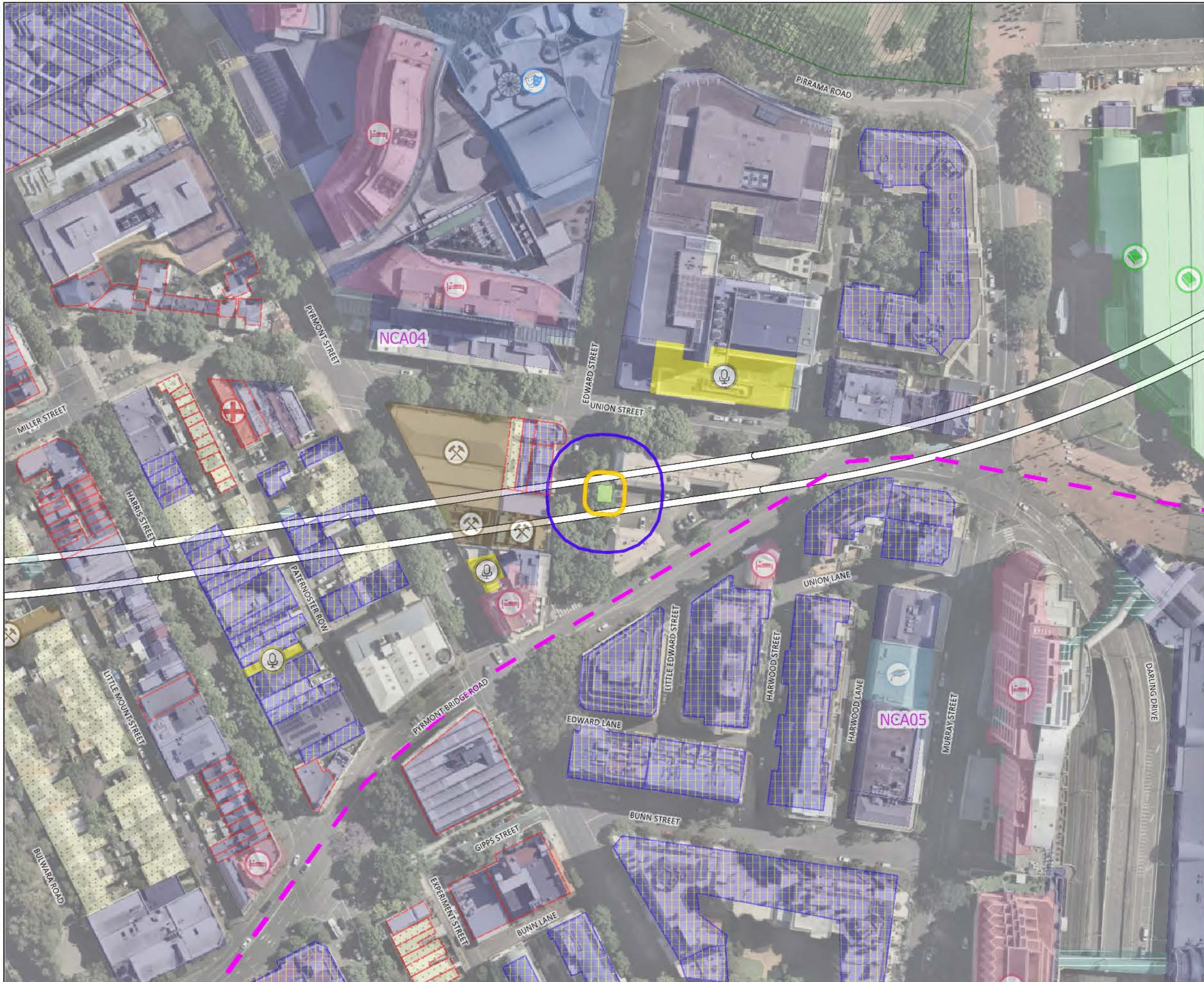
Sheet 2 of 4

300

200

100

0



LEGEND

- Noise Sensitive Receivers
- Residential
 - Mixed use
 - Commercial
 - Industrial
 - Hotel/Motel/Hostel
 - Medical facility
 - Place of Worship
 - Community centre
 - Recording studio
 - Library/Museum
 - Childcare
 - Educational
 - Theatre/Auditorium
 - Cinema
 - Laboratory
 - Flight simulator
 - Horse Stable
 - Recreational - Passive
 - Recreational - Active
 - Other
 - Heritage

- Tunnel Alignment
- Work Area
- Receivers within MWD for cosmetic damage
- MWD for cosmetic damage and human annoyance for Jackhammer
 - Unreinforced structures (7.5mm/s ppv)
 - Heritage structures (2.5mm/s ppv)
 - Human annoyance - Residential (night)



REV	BY	DATE	DESCRIPTION	APPROVER
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A3	Original		Co-ordinate System MGA Zone 56	

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1:1,500

NOTE: Do not scale from this drawing.

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Preliminary Works

MWD for Cosmetic Damage and Human Annoyance

Work Activity: Jackhammer

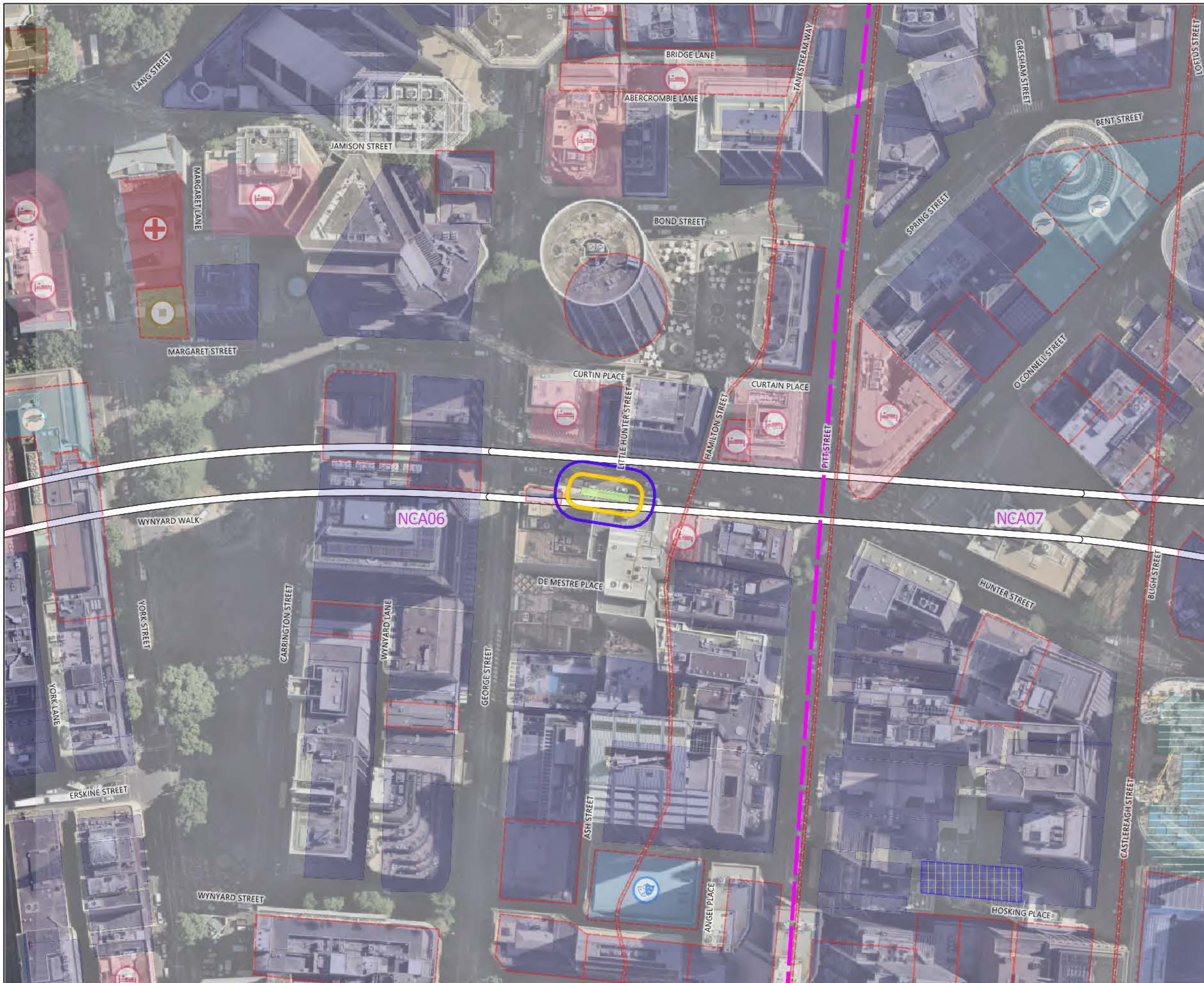
Sheet 3 of 4

300

200

100

0



LEGEND

- Noise Sensitive Receivers
- Residential
 - Mixed use
 - Commercial
 - Industrial
 - Hotel/Motel/Hostel
 - Medical facility
 - Place of Worship
 - Community centre
 - Recording studio
 - Library/Museum
 - Childcare
 - Educational
 - Theatre/Auditorium
 - Cinema
 - Laboratory
 - Flight simulator
 - Horse Stable
 - Recreational - Passive
 - Recreational - Active
 - Other
 - Heritage

- Tunnel Alignment
 - Work Area
 - Receivers within MWD for cosmetic damage
- MWD for cosmetic damage and human annoyance for Concrete Saw
- Unreinforced structures (7.5mm/s ppv)
 - Heritage structures (2.5mm/s ppv)
 - Human annoyance - Residential (night)



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A3 Original			Co-ordinate System MGA Zone 56	

0 25 50 75 100 m

1:1,500

NOTE: Do not scale from this drawing.

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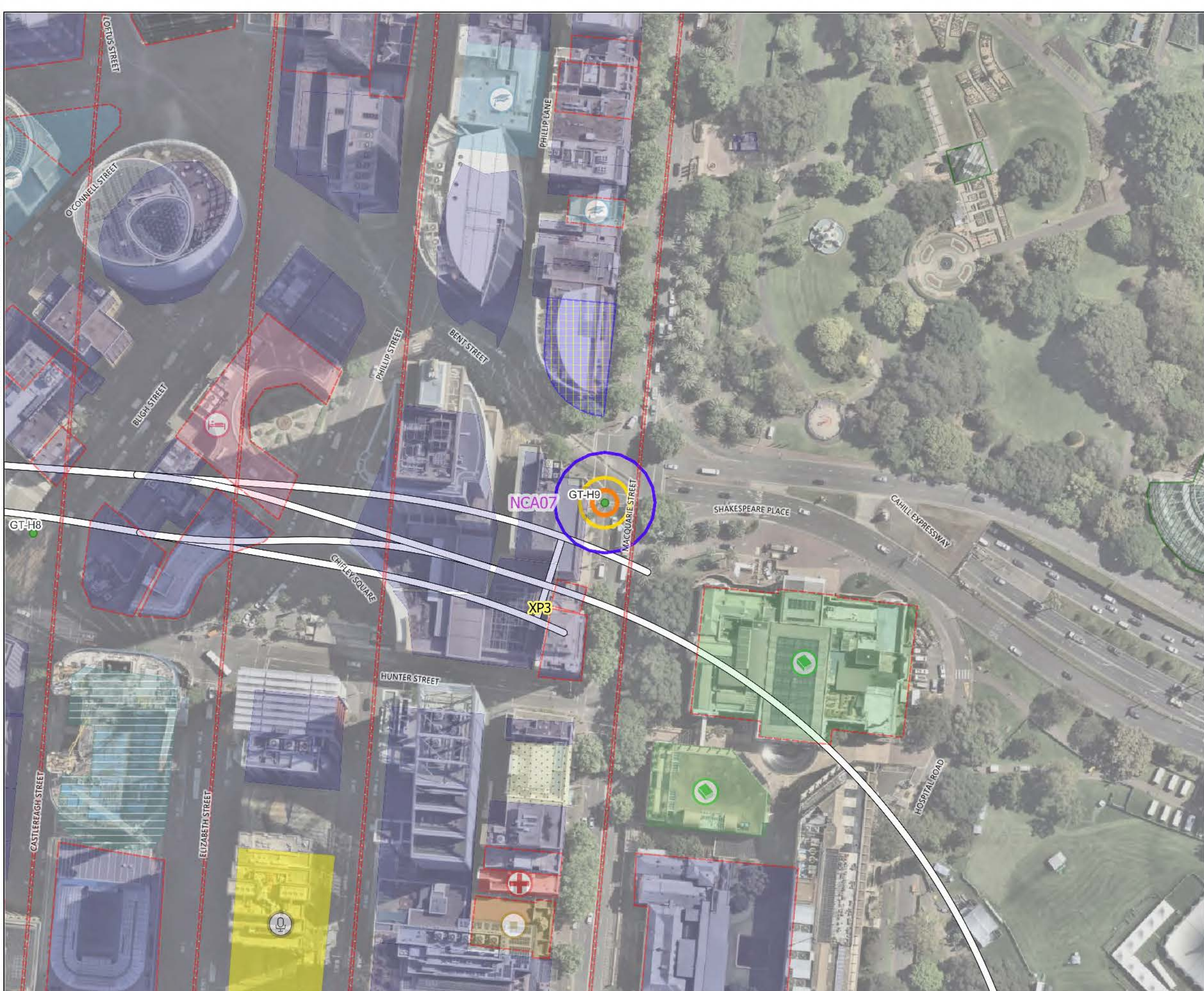
SYDNEY METRO WEST

Preliminary Works

MWD for Cosmetic Damage and Human Annoyance

Work Activity: Concrete Saw

Sheet 4 of 4



LEGEND

Noise Sensitive Receivers

	Residential		Childcare
	Mixed use		Educational
	Commercial		Theatre/Auditorium
	Industrial		Cinema
	Hotel/Motel/Hostel		Laboratory
	Medical facility		Flight simulator
	Place of Worship		Horse Stable
	Community centre		Recreational - Passive
	Recording studio		Recreational - Active
	Library/Museum		Other
			Heritage

Tunnel Alignment
 Work area
 Unreinforced structures (7.5mm/s ppv)
 Heritage structures (2.5mm/s ppv)
 Human annoyance - Residential (night)

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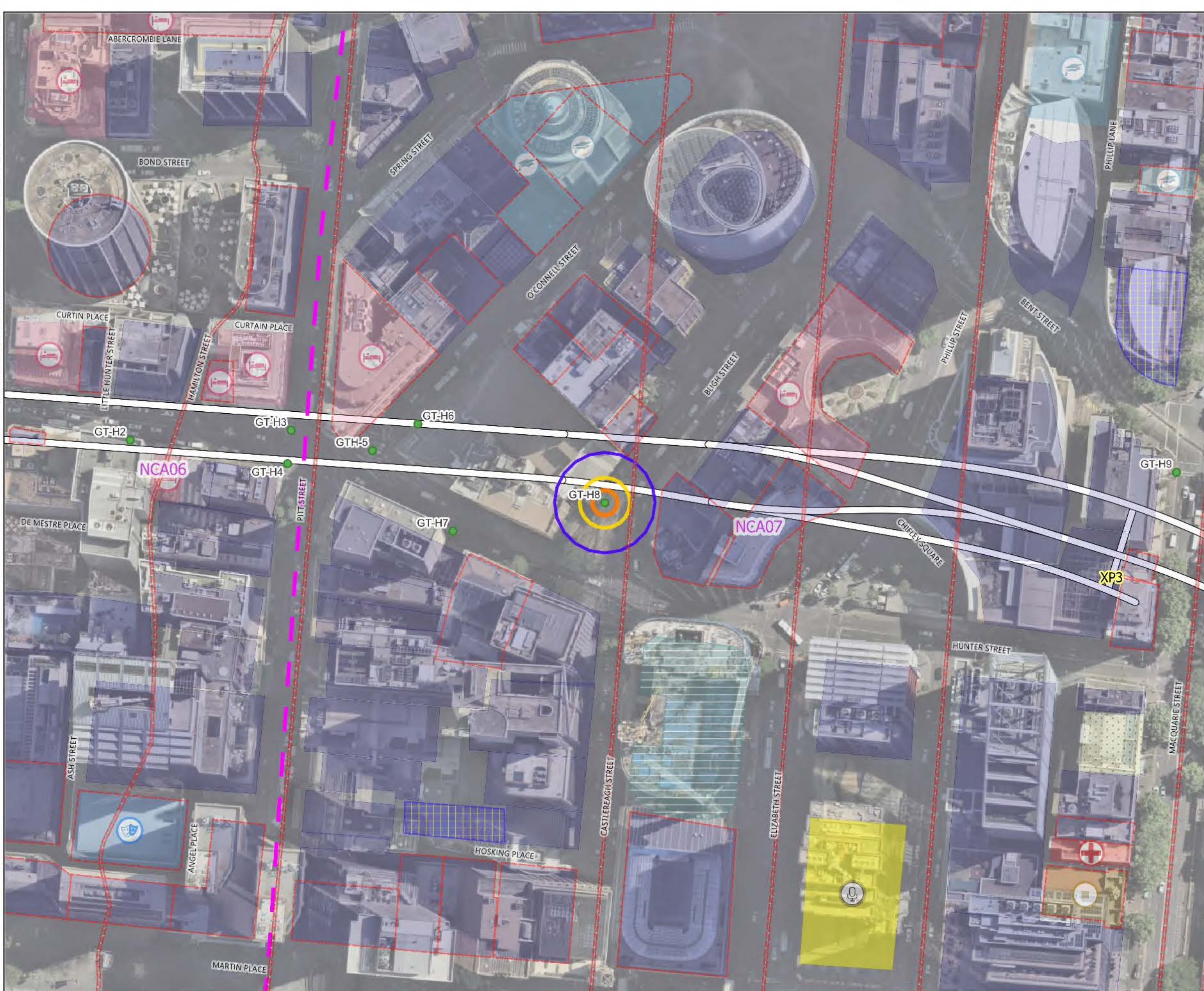
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SYDNEY METRO WEST
Preliminary Works

MWD for Cosmetic Damage and Human Annoyance
Work Activity: Truck-mounted drill

Sheet 1 of 11



LEGEND

Noise Sensitive Receivers

	Residential		Childcare
	Mixed use		Educational
	Commercial		Theatre/Auditorium
	Industrial		Cinema
	Hotel/Motel/Hostel		Laboratory
	Medical facility		Flight simulator
	Place of Worship		Horse Stable
	Community centre		Recreational - Passive
	Recording studio		Recreational - Active
	Library/Museum		Other
			Heritage

Tunnel Alignment

Work area

Unreinforced structures (7.5mm/s ppv)

Heritage structures (2.5mm/s ppv)

Human annoyance - Residential (night)

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Preliminary Works

MWD for Cosmetic Damage and Human Annoyance
Work Activity: Truck-mounted drill

Rev: 001

DA	08/12/22	Prepare figures	TG
REV	BY	DATE	DESCRIPTION

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Co-ordinate System: MGA Zone 56

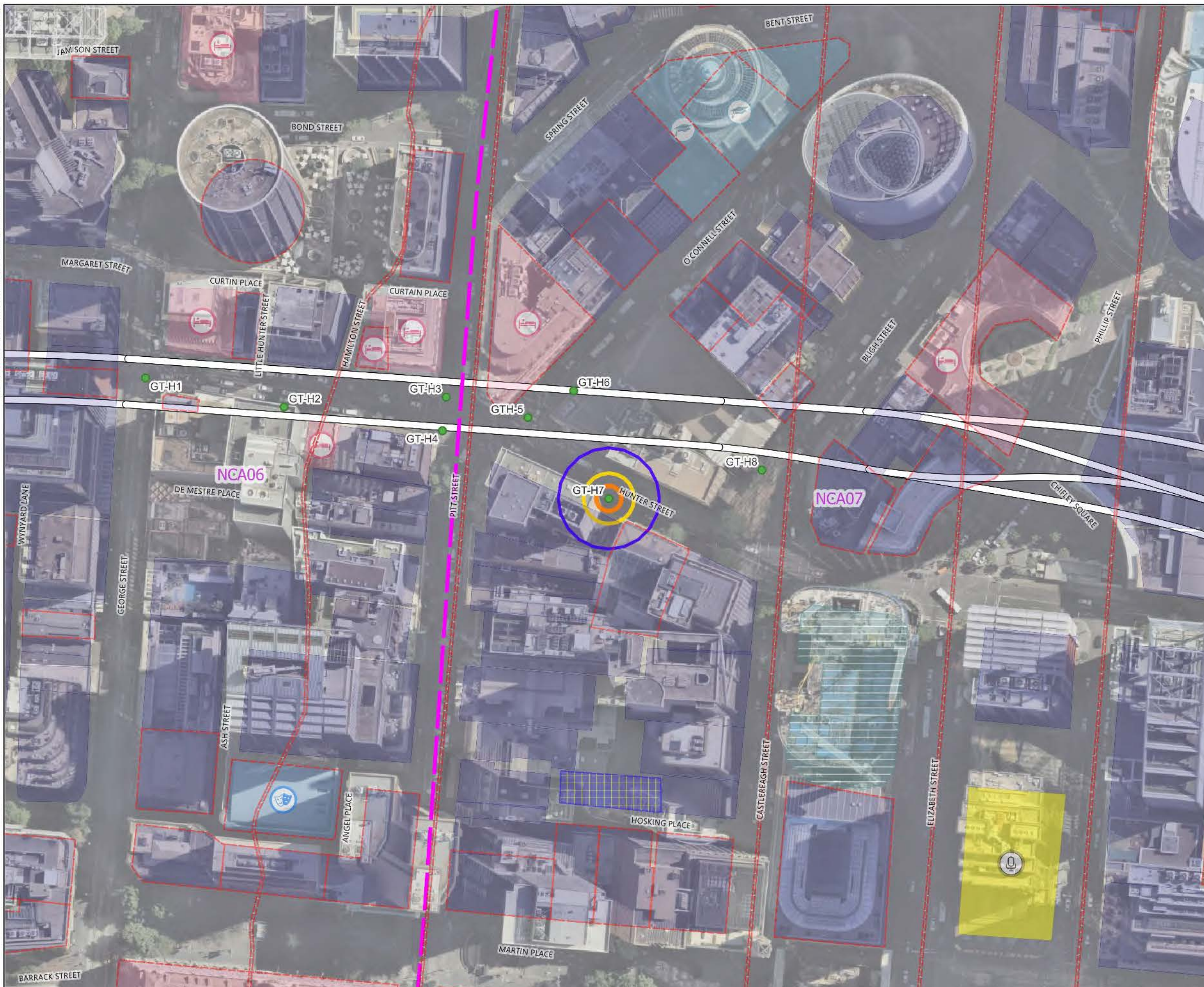
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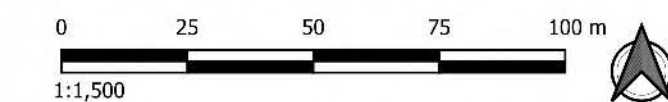
Sheet 2 of 11



- # LEGEND
- | | | | |
|---|---|---|------------------------|
| Noise Sensitive Receivers |  | Childcare | |
|  | Residential |  | Educational |
|  | Mixed use |  | Theatre/Auditorium |
|  | Commercial |  | Cinema |
|  | Industrial |  | Laboratory |
|  | Hotel/Motel/Hostel |  | Flight simulator |
|  | Medical facility |  | Horse Stable |
|  | Place of Worship |  | Recreational - Passive |
|  | Community centre |  | Recreational - Active |
|  | Recording studio |  | Other |
|  | Library/Museum |  | Heritage |
-
- | | |
|---|---------------------------------------|
|  | Tunnel Alignment |
|  | Work area |
|  | Unreinforced structures (7.5mm/s ppv) |
|  | Heritage structures (2.5mm/s ppv) |
|  | Human annoyance - Residential (night) |



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r0	DA	06/12/22	Prepare figures	TG
REV	BY	DATE	DESCRIPTION	APPROVE
A3 Original			Co-ordinate System: MGA Zone 56	



FULL SIZE A3

NOTE: Do not scale from this drawing

CLIENT	
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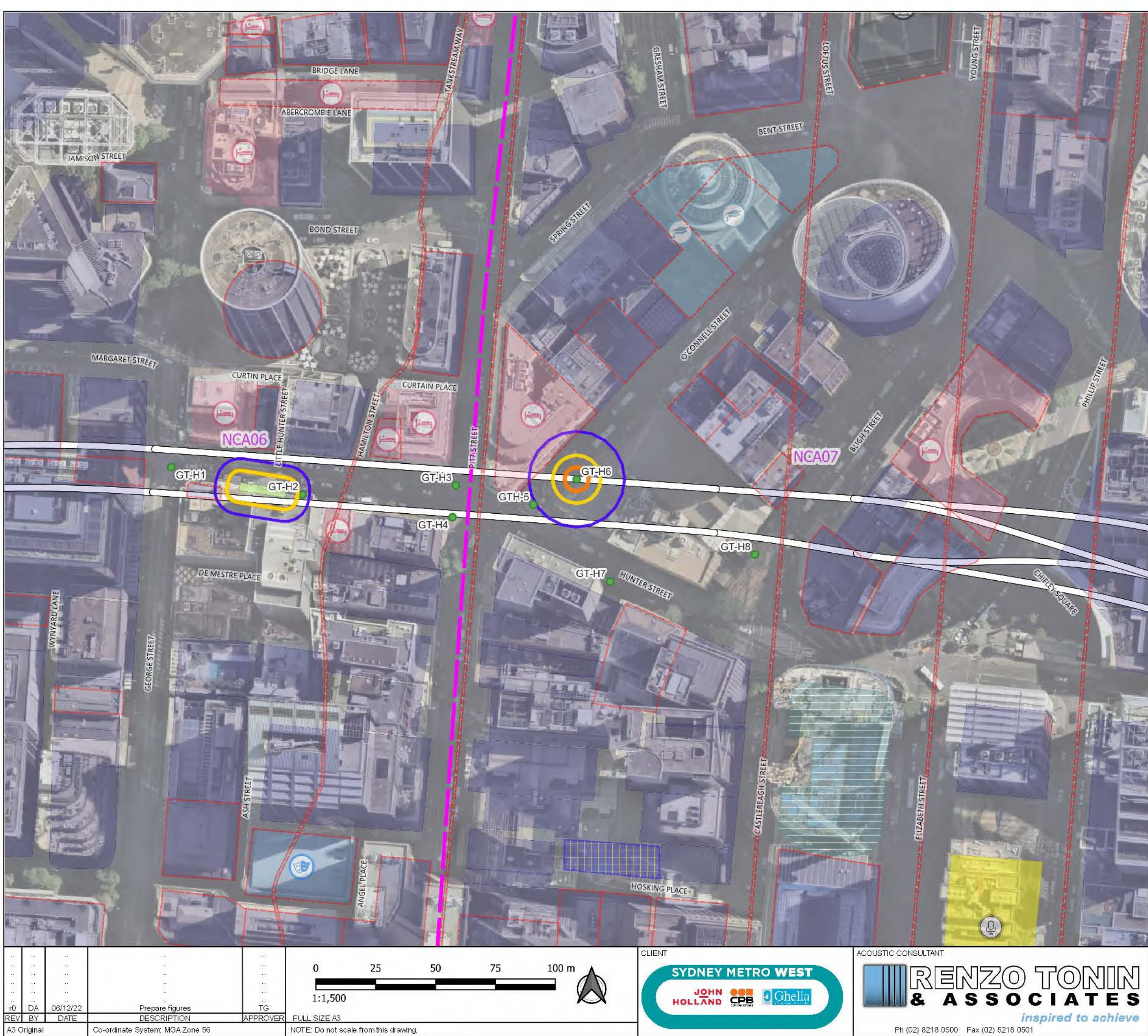


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SYDNEY METRO WEST Preliminary Works	
MWD for Cosmetic Damage and Human Annoyance Work Activity: Truck-mounted drill	



LEGEND

Noise Sensitive Receivers

Residential

Mixed use

Commercial

Industrial

Hotel/Motel/Hostel

Medical facility

Place of Worship

Community centre

Recording studio

Library/Museum

Childcare

Educational

Theatre/Auditorium

Cinema

Laboratory

Flight simulator

Horse Stable

Recreational - Passive

Recreational - Active

Other

Heritage

Tunnel Alignment

Work Area

MWD for cosmetic damage and human annoyance for Truck-mounted drill

Unreinforced structures (7.5mm/s ppv)

Heritage structures (2.5mm/s ppv)

Human annoyance - Residential (night)

Work area

Unreinforced structures (7.5mm/s ppv)

Heritage structures (2.5mm/s ppv)

Human annoyance - Residential (night)

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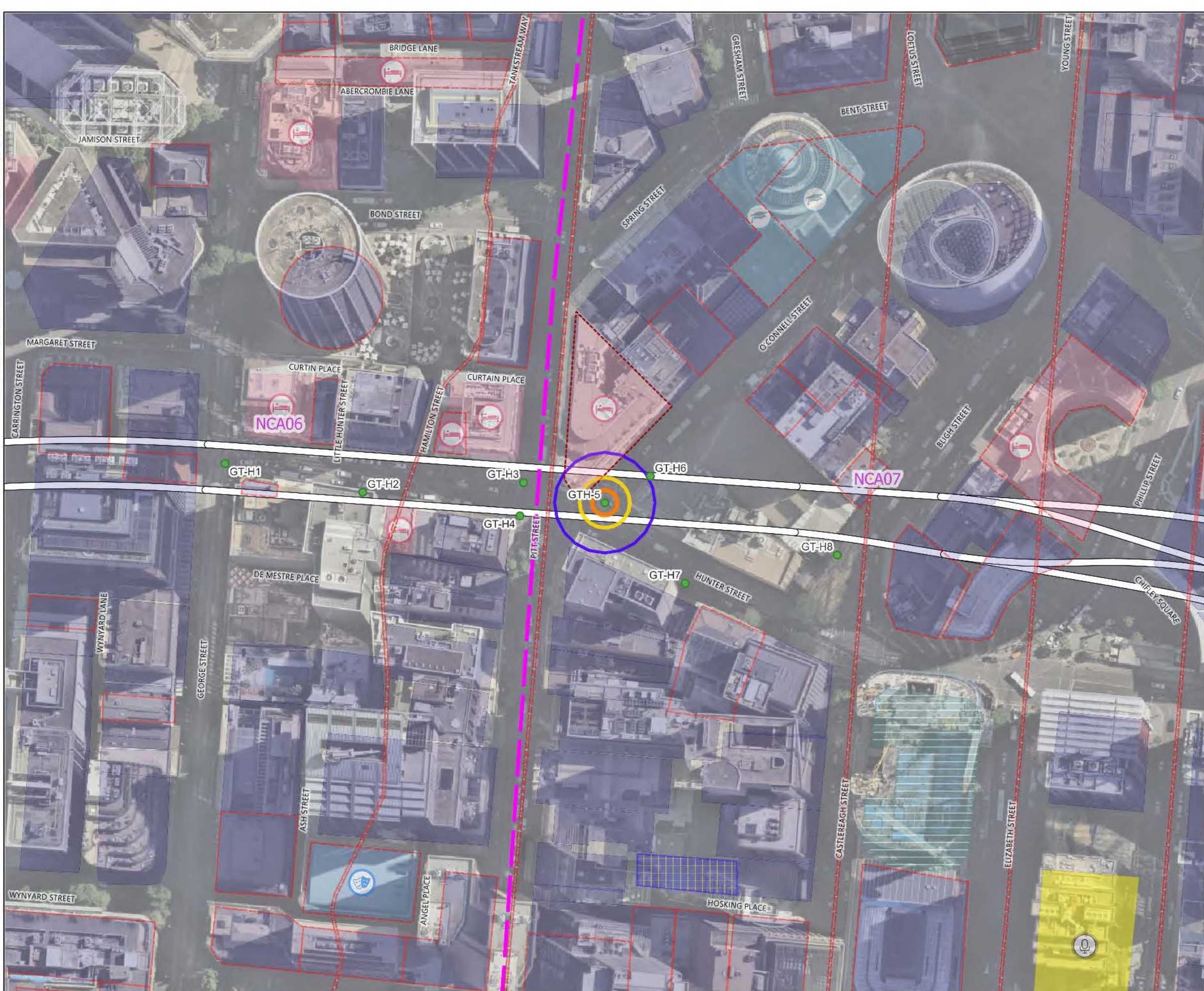
SYDNEY METRO WEST

Preliminary Works

MWD for Cosmetic Damage and Human Annoyance

Work Activity: Truck-mounted drill

Sheet 4 of 11



LEGEND

Noise Sensitive Receivers

Residential	Childcare
Mixed use	Educational
Commercial	Theatre/Auditorium
Industrial	Cinema
Hotel/Motel/Hostel	Laboratory
Medical facility	Flight simulator
Place of Worship	Horse Stable
Community centre	Recreational - Passive
Recording studio	Recreational - Active
Library/Museum	Other
	Heritage

Tunnel Alignment

Work area

Receivers within MWD for cosmetic damage

Unreinforced structures (7.5mm/s ppv)

Heritage structures (2.5mm/s ppv)

Human annoyance - Residential (night)

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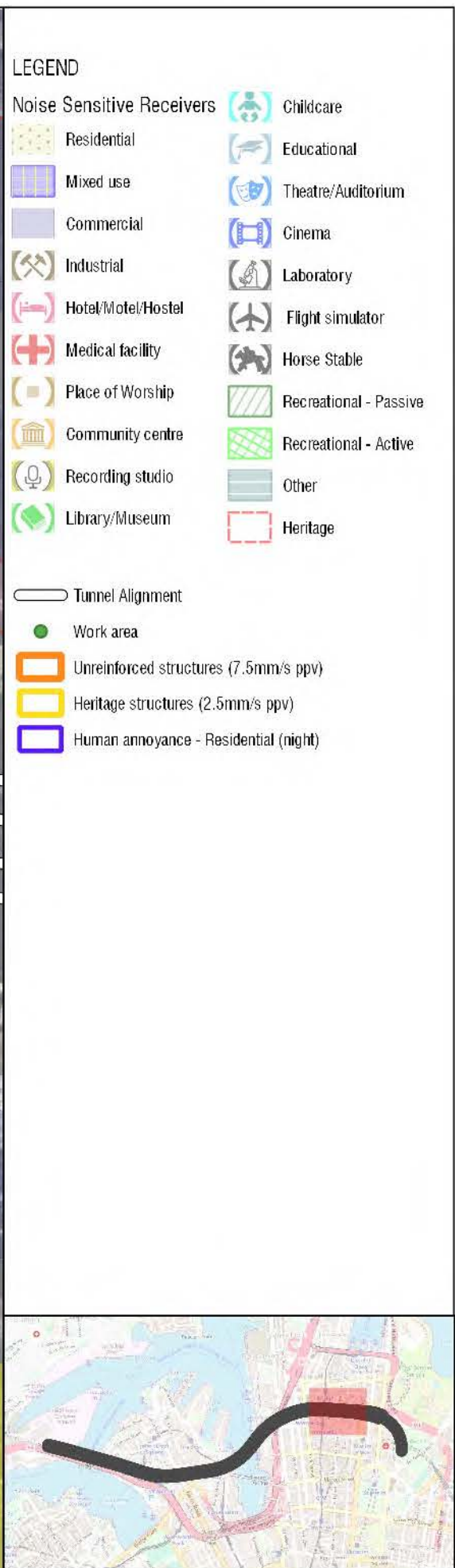
Preliminary Works

MWD for Cosmetic Damage and Human Annoyance

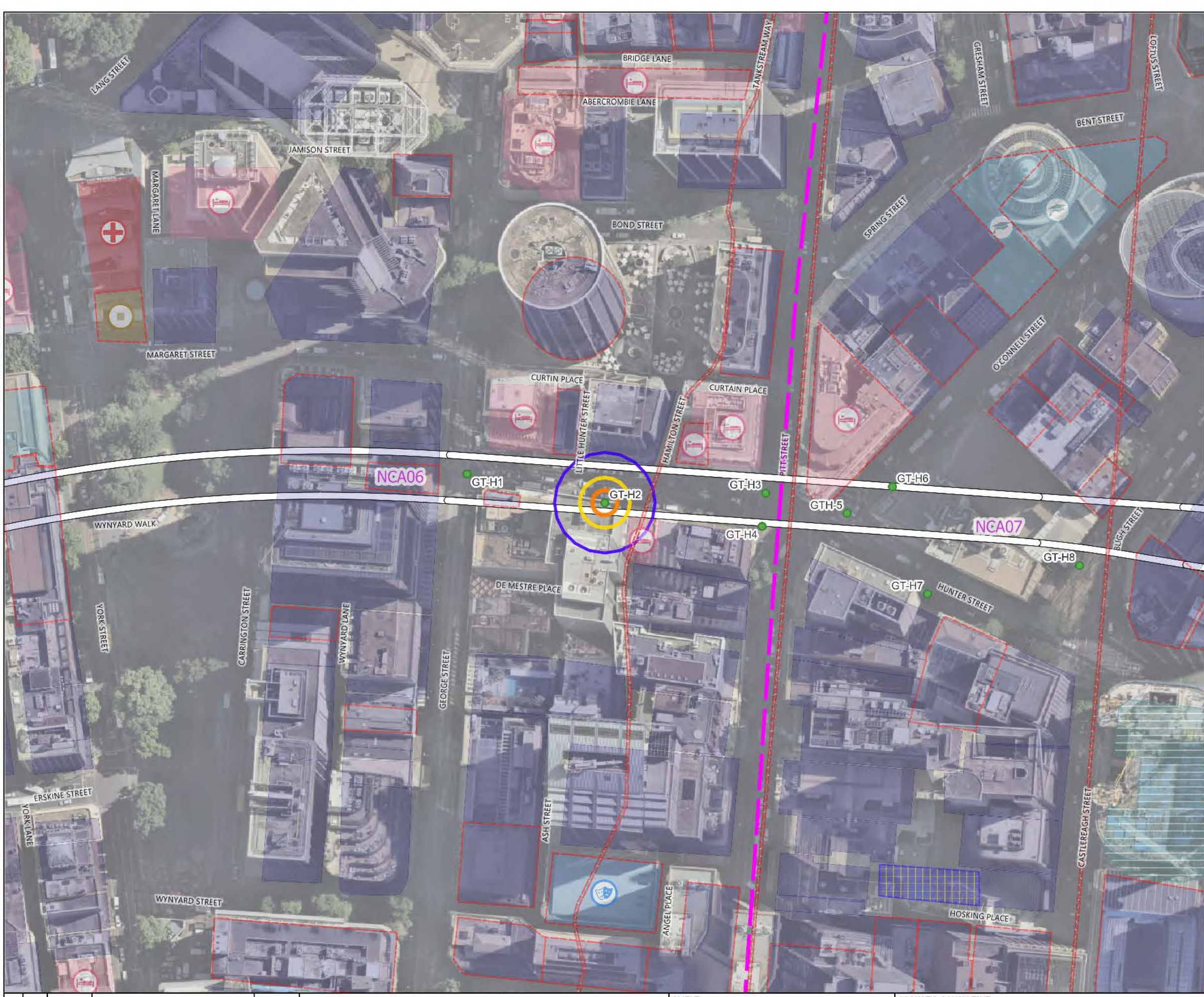
Work Activity: Truck-mounted drill

Sheet 5 of 11

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A3 Original			Co-ordinate System: MGA Zone 56		NOTE: Do not scale from this drawing.



<p>SYDNEY METRO WEST Preliminary Works</p> <p>MWD for Cosmetic Damage and Human Annoyance Work Activity: Truck-mounted drill</p>	<p>Sheet 6 of 11</p>
--	----------------------



LEGEND

Noise Sensitive Receivers

	Residential		Childcare
	Mixed use		Educational
	Commercial		Theatre/Auditorium
	Industrial		Cinema
	Hotel/Motel/Hostel		Laboratory
	Medical facility		Flight simulator
	Place of Worship		Horse Stable
	Community centre		Recreational - Passive
	Recording studio		Recreational - Active
	Library/Museum		Other
			Heritage

Tunnel Alignment

Work area

Unreinforced structures (7.5mm/s ppv)

Heritage structures (2.5mm/s ppv)

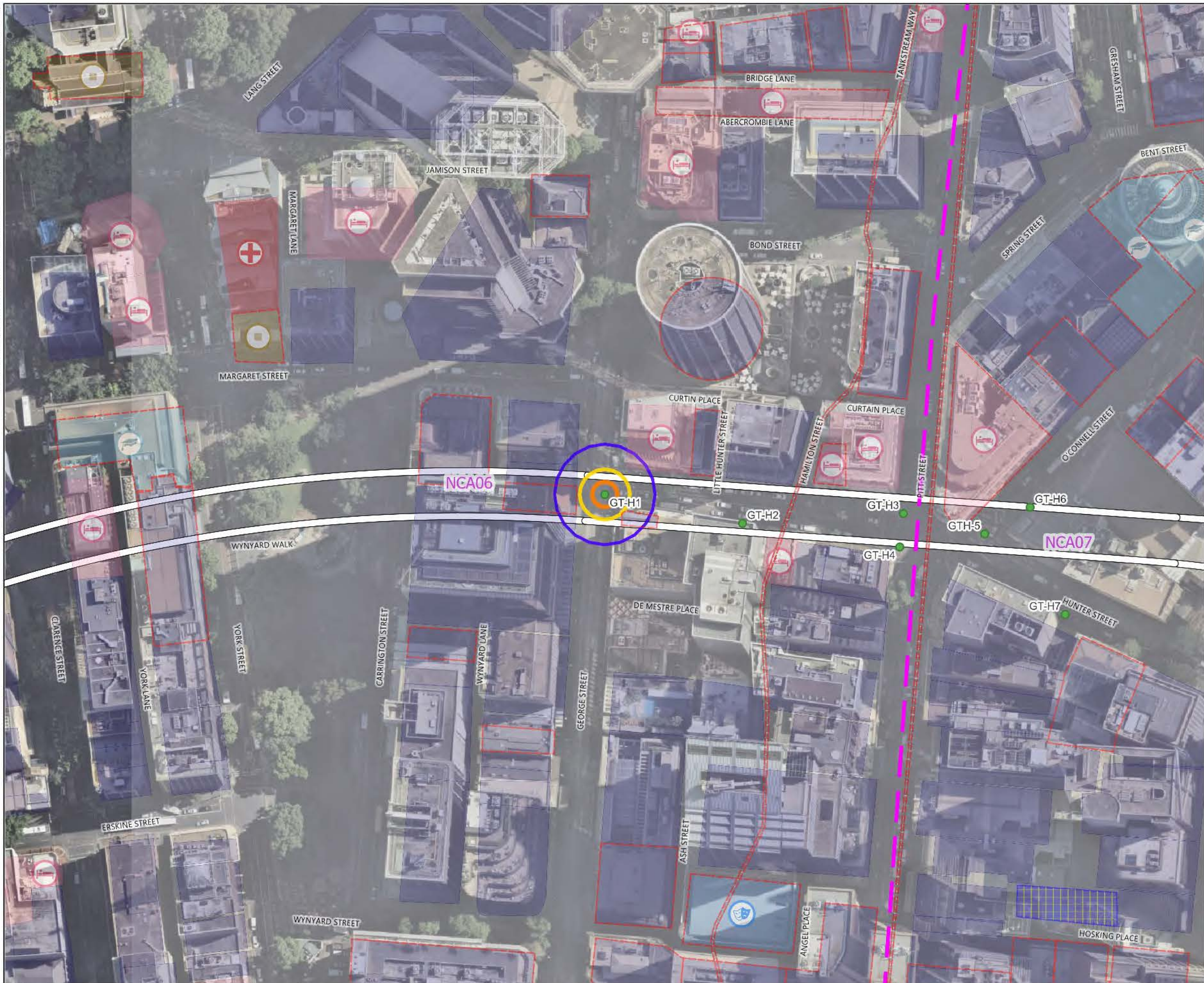
Human annoyance - Residential (night)

300

200

100

0



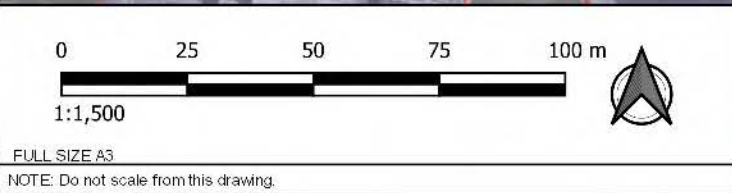
LEGEND

- Noise Sensitive Receivers
- Childcare
 - Educational
 - Theatre/Auditorium
 - Cinema
 - Laboratory
 - Flight simulator
 - Horse Stable
 - Recreational - Passive
 - Recreational - Active
 - Other
 - Heritage

- Tunnel Alignment
- Work area
- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)
- Human annoyance - Residential (night)



REV	BY	DATE	DESCRIPTION	APPROVER
r0	DA	08/12/22	Prepare figures	TG
A3 Original			Co-ordinate System MGA Zone 56	



CLIENT

SYDNEY METRO WEST

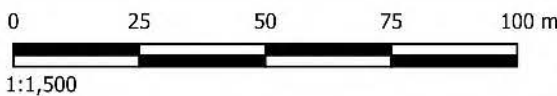
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Sheet 11 of 11

E.2 Attended vibration monitoring - nominated representative locations

Table 8.1: Attended vibration monitoring - nominated representative locations

Worksite	Plant item	Address	Vibration objectives	
			Cosmetic damage	Human annoyance ¹
Pymont Station	Jackhammer	65-67 Edward Street, Pymont	-	√
		190 Harris Street, Pymont	-	√
		192 Harris Street, Pymont	-	√
		194 Harris Street, Pymont	-	√
		196 Harris Street, Pymont	-	√
		198 Harris Street, Pymont	-	√
		200-202 Harris Street, Pymont	-	√
		204 Harris Street, Pymont	-	√
		206 Harris Street, Pymont	-	√
		210 Harris Street, Pymont	-	√
		212 Harris Street, Pymont	-	√
		26-28 Paternoster Row, Pymont	-	√
		102 Pymont Street, Pymont	-	√
		104 Pymont Street, Pymont	-	√
		125 Pymont Street, Pymont	-	√
		Truck-mounted drill rig	-	√
		11 Pymont Bridge Road, Pymont	-	√
Hunter Street Station	Truck-mounted drill rig	68 Pitt Street, Sydney	-	√
		97-99 Pitt Street, Sydney	-	√
		101-103 Pitt Street, Sydney	-	√
		27 O'Connell Street, Sydney	√ ²	√
		2 Hunter Street, Sydney	-	√
		15-17 Hunter Street, Sydney	-	√
		167 Macquarie Street, Sydney	-	√

Note: 1. Monitoring is required in the event of complaint in relation to vibration

2. Subject to building condition report, as noted in Section 6.2.2

ACOUSTICS ADVISOR ENDORSEMENT SYDNEY METRO WEST (SSI 19238057)

Review of	Eastern Tunnelling Package: Detailed Noise and Vibration Impact Statement (DNVIS) – Preliminary Works – Project Wide	Reviewed document reference:	TM372-02-1-06F01 SMW-ETP DNVIS-PWE Preliminary
Prepared by:	[REDACTED], Acoustics Advisor		Revision 0 dated 10 February 2023
Date of issue:	10 February 2023		

As approved Acoustics Advisor for the Sydney Metro West project, I have reviewed and provided comment on Revision r2 of the Detailed Noise and Vibration Impact Statement (DNVIS) for the Eastern Tunnelling Package Preliminary Works. The DNVIS was prepared by Renzo Tonin Associates on behalf of JCG, the contractor for Eastern Tunnelling Package works.

I am satisfied that Revision 0 has addressed my comments and endorse it for implementation with the following notes:

- Conditions D29 and D30 both require that DNVISs must “*include specific mitigation measures identified through consultation with affected sensitive land user(s)*”. The preliminary work documented in this DNVIS involves relatively short-term noise and vibration impacts; the logical “specific mitigation measure” is ongoing notification and communication with land users to inform them of upcoming work. JCG has confirmed that they will do this, so I am comfortable that this requirement of Conditions D29 and D30 is addressed.
- The project team has identified the recording studios at 102 Pyrmont Street as a noise and vibration sensitive business that is potentially affected by the project. This is unlikely during the preliminary works documented in this DNVIS but JCG has committed to finding early opportunities, such as during this work, to quantify and verify the way noise and vibration may affect this premises during future works, such as demolition and shaft excavation. This will inform specific mitigation measures (required by Conditions D29 and D30) and timetabling or other reasonable arrangements (required by Condition D27) for the future works.

On that basis I endorse Revision 0 of the DNVIS for implementation.

[REDACTED]

[REDACTED], Metro West Acoustics Advisor