Review of Environmental Factors Multi-program - Category B

Critical Watermain Renewal T40-S01, Flinders Street, Surry Hills

1 Determination

This Review of Environmental Factors Multi-program - Category B (Category B REF) is to be read in conjunction with the Review of Environmental Factors Multi-program pipeline and related infrastructure replacement, repair and upgrades (Multi-program REF) (May 2023). Together both documents assess the potential environmental impacts of a critical watermain renewal at Flinders Street, Surry Hills. These documents were prepared under Division 5.1 of the ***Environmental Planning and Assessment Act 1979*** (EP&A Act), with Sydney Water both the proponent and determining authority.

The Sydney Water Project Manager is accountable for ensuring the proposal is carried out as described in this Category B REF and Multi-program REF. Additional environmental impact assessment may be required if the scope of work or work methods described in either the Multi-program REF or this Category B REF change significantly following determination.

Decision Statement

The main potential construction environmental impacts of the proposal include non-Aboriginal heritage, noise and vibration, traffic and access, and social and visual impacts. During operation, no impacts are expected. The proposal will not be carried out in a declared area of outstanding biodiversity value and is not likely to significantly affect threatened species, populations or ecological communities, or their habitats. Therefore, a Species Impact Statement (SIS) and/or Biodiversity Development Assessment Report (BDAR) is not required.

Given the nature, scale and extent of impacts and implementation of the mitigation measures outlined in this Category B REF and the Multi-program REF, the proposal is unlikely to have a significant impact on the environment. Therefore, we do not require an Environmental Impact Statement (EIS) and the proposal may proceed.

Certification

I certify that I have reviewed and endorsed this REF and, to the best of my knowledge, it is in accordance with the EP&A Act and the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation). The proposal has been considered against matters listed in section 171 (Appendix A) and the guidelines approved under section 170 of the EP&A Regulation. The information it contains is neither false nor misleading.

Prepared by:	Reviewed by:	Endorsed by:	Approved by:
[redacted]	[redacted]	[redacted]	[redacted]
Aaron Panozzo REF author Sydney Water Date: 27/06/2025	Sally Spedding Environment Assessment Team Manager Sydney Water Date: 27/06/2025	Ananta Mukherjee Senior Project Manager Sydney Water Date: 27/06/2025	Murray Johnson Senior Manager, Environment and Heritage Services Sydney Water Date: 11/07/2025

2 Proposal Summary

Table 1 Description of proposal

Aspect	Detailed description
Location	The proposal is in the roadway and footpath of Flinders Street, between Albion Street and Moore Park Road. The proposal is in the suburbs of Paddington and Surry Hills and in the City of Sydney Local Government Area (LGA). The proposed compound is at the corner of Oxford Street and Carrington Drive, Centennial Park, in Randwick LGA. The proposed compound is on Sydney Water land (Lot 1, DP 582822), adjacent to Centennial Park Reservoir WS0022. It is proposed to be used for activities such as site office, materials storage, pre-welding and pre-assembling pipes and shoring boxes, and stockpiling. A laydown area for storing materials and parking is proposed at the intersection of Moore Park Road and Greens Road, Paddington. Temporary storage in the construction corridor, within the traffic control setup for each shift (e.g. along a parking lane/bus lane on Flinders Street), may also be utilised. The proposal alignment and environmental constraints are shown in Figures 1-3.
Approved REF	Review of Environmental Factors Multi-program pipeline and related infrastructure replacement, repair and upgrades (Multi-program REF) (May 2023).
Proposal description	The proposal is part of the Critical Watermain Renewals program as detailed in the Multi-program REF. The proposal involves renewing 24 metres (m) of existing DN375 watermain at the South Dowling St and Flinders St intersection, installed in the early 1900s. The construction corridor is approximately 15 m wide. The proposed methodology includes: • site establishment: o Investigations e.g. potholing and soil sampling, compound setup, material deliveries, and installing traffic and environmental controls. • conventional pipeline lay: o saw cutting and excavating to a depth of 2.5 m at greatest and 1.5 m on average o preparing and welding pipes at the compound o transporting the pipes to site o conventional laying of 24 m of pipeline o removing traffic control and installing road plates over any open excavations (between each shift). • connection works: o connect new pipeline to existing water main along Flinders St

- ozone and pressure testing.

- site demobilisation:
  - backfilling and reinstating road pavement
  - demobilising site including resurfacing, and demobilising compound.

The following plant/equipment would be used:

- excavators (1 x 35t and 1 x 5t)
- rock hammers for 35t and 5t excavator
- skip bins
- concrete saws
- generators
- jackhammers
- tip trucks
- air compressors
- light vehicles
- plate compactors
- vacuum truck
- concrete agitator trucks
- street sweepers
- compactor.

Proposal timing

Construction is expected to be outside of standard construction hours for activities on Flinders St. The proposal will occur from July to November 2025. The proposed work schedule is up to 4 nights a week excluding weekends and public holidays.

The compound would be used during both day and night hours for the activities described above. The laydown area is expected to be used for parking outside of road occupancy licence (ROL) times, with equipment moved to site from the laydown area during the ROL time.

Figure 1. Location of proposal

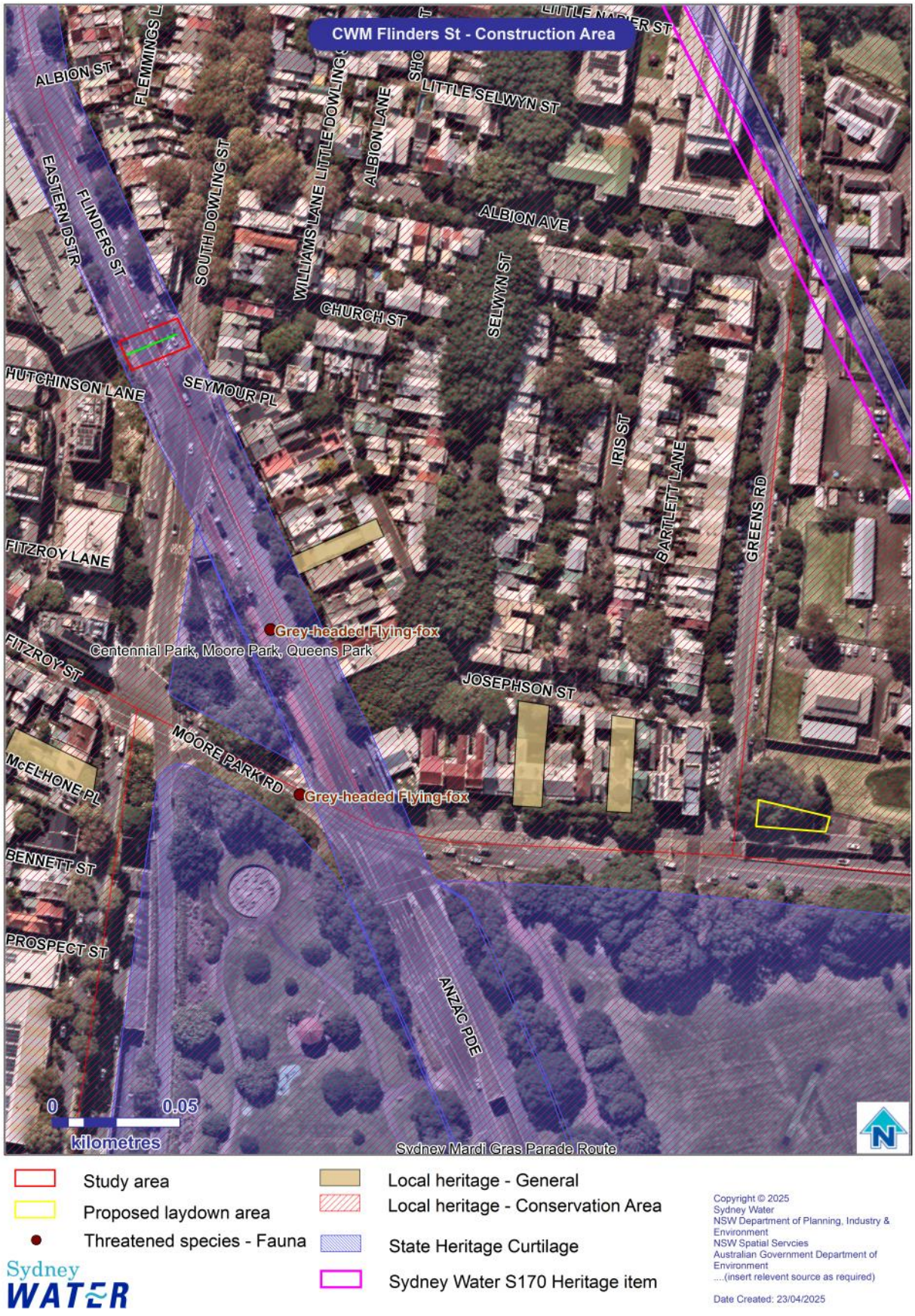


Figure 2 Study area – environmental constraints

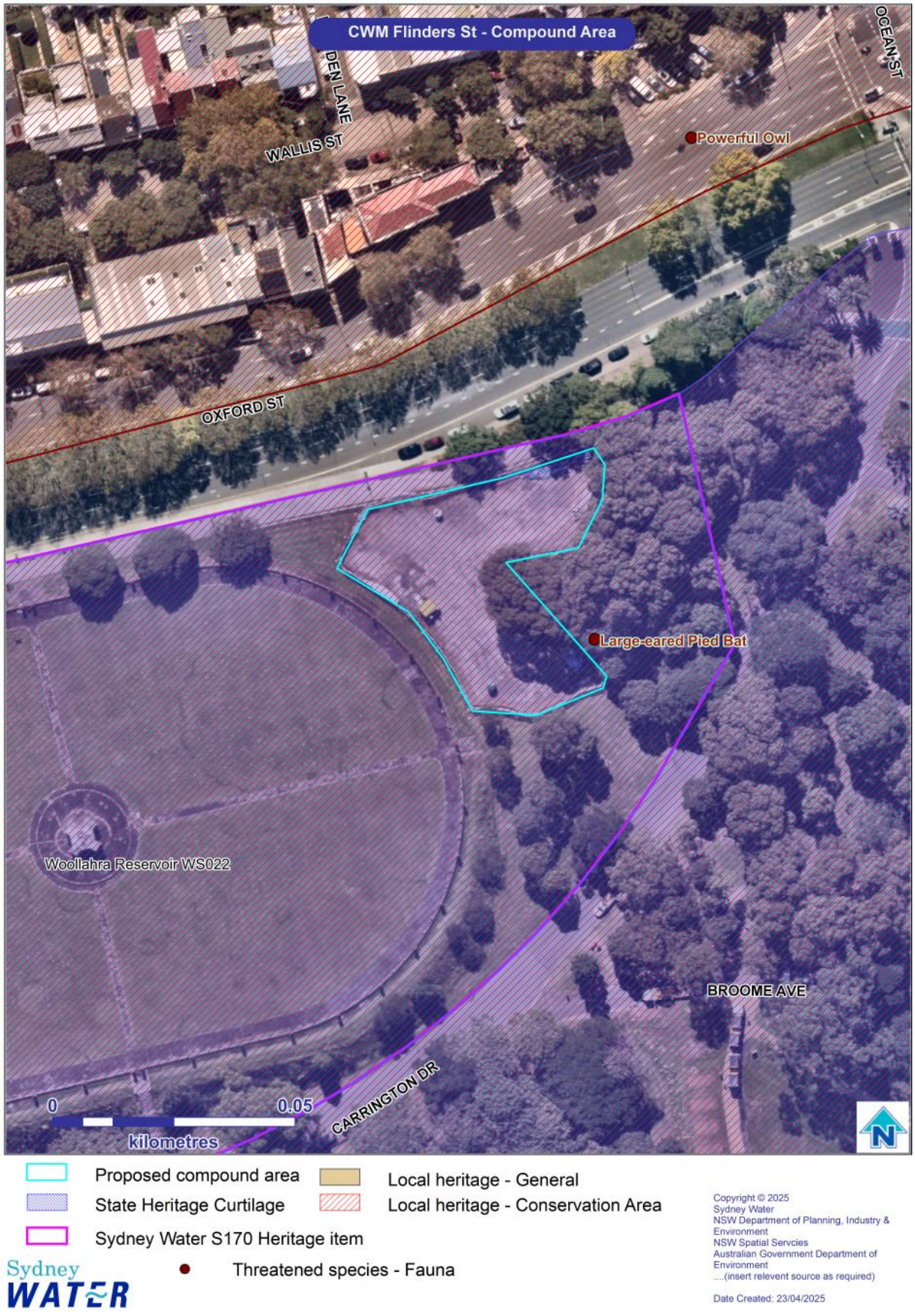


Figure 3. Proposal compound – environmental constraints

3 Consultation

Sydney Water must consult with councils and other authorities for work in sensitive locations or where the work may impact other agencies' infrastructure or land. This requirement is specified in the State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP).

Consultation has commenced with Transport for NSW (TfNSW) for traffic and access aspects. Centennial Parklands have been consulted as part of the s65a of the ***Heritage Act (1977)*** (see heritage section below).

Both City of Sydney Council and Randwick Council have been notified of the proposed works. Formal consultation in accordance with the State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP) has been undertaken on 16 April 2025 under s2.10(e) of TISEPP (see Appendix B). Responses from both authorities have been confirmed and no additional information or recommendations were included. Consultation with councils will continue during construction to ensure traffic and community impacts are well managed.

4 Legislative requirements

There are additional legislative requirements beyond those already assessed in the Multi-program REF.

Table 2 Consideration of additional environmental legislation relevant to the proposal

Legislation	Additional considerations
Heritage Act (1977)	The Heritage Act protects, amongst other things, places, buildings, infrastructure, movable objects, landscapes and precincts, of State or local heritage significance. There are two State Heritage listings that may be impacted by the proposal. A section 65A approval was obtained under the Heritage Act to allow for an extension to compound operations on Woollahra Reservoir (I03). A site-specific exemption (section 57) was completed for the Sydney Mardi Gras Parade Route (02068). Refer to section 5 for more detail.

5 Additional environmental impacts and mitigation measures

The tables below list the additional environmental impacts that could result from the proposal and the additional mitigation measures. All other environmental impacts and mitigation measures identified in the Multi-program REF remain the same and will be incorporated into the Contractor's Construction Environmental Management Plan (CEMP).

Table 3 Environmental impacts table

Aspect	Additional impacts	Additional mitigation measures
Topography, geology and soils	The proposal is within the road corridor, road verge, and previously cleared areas. No salinity or acid sulfate soils are mapped to occur. There are 2 contaminated sites mapped near the compound – Waverley Bus Depot about 240 m south-east, and former service	No additional mitigation measures required.

Aspect	Additional impacts	Additional mitigation measures
	station (20 Wallis Street) about 200 m north-west. Due to the distance from the proposal, no impacts from these sites are anticipated. No additional excavation or installation of hardstand is required for the compound or laydown area.	
Water and drainage	There are no mapped waterways within 1 km of the proposal. No flood mapping data is readily available for the compound location. The construction corridor may experience flooding during a 1-in-100-year flood event (Alexandra Canal Catchment Flood Study Model Update – ARR2019 Hydrology, WMA Water, 2020). Publicly available groundwater monitoring data indicates a groundwater level of between 4.57 m and 5.67 m near the construction corridor. Exposed soil or other materials within the construction corridor may travel offsite into nearby stormwater drains if not adequately managed. Groundwater is unlikely to be encountered. Dewatering of drinking water within the new pipelines during commissioning will be managed in accordance with Sydney Water's Water Quality Management During Operational Activities Policy (D0001667).	If the potential for intercepting groundwater is identified after the REF is determined, Sydney Water will obtain a groundwater Water Supply Works Approval. The Delivery Contractor is responsible for: • providing expert hydrogeological technical information to obtain the approvals • preparing a Dewatering Management Plan • complying with the conditions of the approvals (such as protecting water quality; minimising aquifer extraction volumes, monitoring extraction with flow meters and recording volumes).
Flora and fauna	There are no mapped native vegetation communities within 500 m of the proposal. There are scattered threatened fauna sightings near the proposal, including multiple Grey-headed Flying-foxes. There is a known camp of Grey-headed Flying-foxes within Centennial Park, about 2.25 km south-east of the construction corridor. No vegetation disturbance is required during construction or for use of the compound and laydown areas. Night works require lighting and will emit noise. Potential impacts from lighting can be managed by the mitigation measures in the Multi-program REF. Noise at the compound (closest to the potential Grey-headed Flying-fox foraging areas) will not include impulsive sounds, which have the potential to	No additional mitigation measures required.

Aspect	Additional impacts	Additional mitigation measures
	be most impactful. No impact to vegetation, or to any threatened fauna, is expected, and potential impacts can be managed by the proposed mitigation measures.	
Heritage	Aboriginal heritage There are no known Aboriginal heritage items within 200 m of the proposal. Excavation for the proposal will be in existing disturbed areas (roadway and footpath). The proposed compound has already been established, and minimal additional ground disturbance is expected during setup and demobilisation. The likelihood of finding any previously unknown archaeological items is negligible. Non-Aboriginal heritage – background The proposed alignment, compound, and laydown area are all within the curtilage of multiple heritage listed items or areas. There are multiple heritage listed items within the study area nearby the construction corridor (refer Figure 2): • State Heritage Register item 02068 – Sydney Mardi Gras Parade Route • Sydney LEP 2012 item C50 – Paddington Urban Conservation Area • Sydney LEP 2012 item C59 – Bourke Street North Conservation Area. The proposal is also adjacent to multiple individually listed local heritage buildings along the southbound side of Flinders St (refer Figure 2). Other items in the area which are not listed under any legislation include: • Sandstone kerb is present at the intersection of Albion Street and Flinders Street, within the Bourke Street North Conservation Area. • Tram tracks are also known to be present under Flinders Street. Mitigation measures have been recommended based on Sydney Water heritage advice to minimise disturbance where possible. ***Compound*** The compound is within the curtilage of the following heritage items: • State Heritage Register (SHR) item 01320 – Centennial Park Reservoir WS001	Additional mitigation measures. For tram tracks: • minimise their disturbance (only excavate what is necessary and as little as possible) • prepare a basic photographic record of any uncovered sections of tram tracks and their location on a map. Copies can be sent to Sydney Water's heritage team and the relevant local council. For sandstone kerb: • The sandstone kerb is to be carefully removed, numbered, and re-instated. • If there are any additional impacts beyond temporary removal and replacement of the sandstone kerb (e.g. one of the blocks breaks), it is recommended to consult with Sydney Water heritage team to provide targeted advice depending on the situation.

Aspect	Additional impacts	Additional mitigation measures
	• Section 170 register item 4573704 – Centennial Park Reservoir No 1 WS0022 • Randwick LEP 2012 item C1 – North Randwick Conservation Area • Randwick LEP 2012 item I03 – Woollahra Reservoir WS022. ***Laydown area*** The laydown area is within the curtilage of the Sydney LEP 2012 item C49 – Victoria Barracks Conservation Area. It is adjacent to the Commonwealth Heritage listed item Victoria Barracks Precinct. Non-Aboriginal heritage – potential impacts ***Study area*** Advice was sought from Sydney Water's A/Lead Heritage Advisor in August 2024 on impacts to the heritage items within the footprint, as well as the sandstone kerb and tram tracks. Excavation for the new pipe will directly impact the sandstone kerb and tram tracks. The preference is for the sandstone kerb to be carefully removed, numbered, and re-instated. This is expected to have a minor or inconsequential impact on the heritage value of the heritage conservation area the kerb is within. The tram tracks are likely required to be partially removed. The tram tracks are not considered relics, and their locations are generally known. Mitigation measures have been included to minimise any impact. Potential impacts to the locally listed conservation items are considered inconsequential because these areas are considered significant for the architectural potential of their buildings and the Victorian style subdivision patterns. The proposal will have no impact on the adjacent buildings or streetscape patterns. The heritage significance of the Sydney Mardi Gras Parade Route relates to its historical, social, and cultural significance. A site-specific exemption (section 57 exemption under the ***Heritage Act 1977***) determined that the proposed works would not impact the significance of this heritage item as it relates to the cultural and intangible historic value of the space (refer Appendix D). Although the proposed works involve excavation, they are for the purpose of renewal of existing Sydney Water infrastructure in a previously disturbed environment and can be performed under this exemption. Therefore, impacts to the significance of the State Heritage item are not anticipated. ***Compound area***	For Mardi Gras Parade Route: • The Mardi Gras Parade Route close to the proposal should be protected by physical barriers, exclusion zones etc. • All project team members, including contractors, should be informed about the heritage significance of the site as part of the general site induction package. The induction would identify why the Sydney Mardi Gras Parade Route is significant, the contractors' statutory obligations relating to heritage and the protection methods to be used during construction to prevent accidental damage during construction. • Coordinate with TfNSW on any traffic or safety measures required for the Mardi Gras Parade setup (e.g. specific road plates to be used, non-working times, etc). • An unexpected finds Protocol should be observed during any ground disturbance

Aspect	Additional impacts	Additional mitigation measures
	A section 65A approval (refer Appendix E) under the ***Heritage Act 1977*** has been completed for the purpose of compound operations at Woollahra Reservoir to extend the time of the original section 60 application. A Statement of Heritage Impact (SoHI) was completed to inform the section 65A to determine the potential impact. Potential impacts to the state heritage item are considered negligible and temporary as the nature of the activities are not anticipated to change from that assessed in the original section 60 application. The space would be used for material storage, parking and preparation works consistent with those that are currently occurring at this location. ***Laydown area*** Potential impacts to the locally listed conservation item are considered inconsequential because the conservation area (the area outside of the buildings) is considered significant for its archaeological potential. The use of the laydown area would be limited to temporary fencing, storage, and parking and would not include any excavation or vegetation disturbance.	works to ensure that, should any material of possible heritage significance be discovered, work should stop in the vicinity and the Sydney Water's heritage team be immediately contacted for advice.
Noise and vibration	The following section provides a summary of the Noise and Vibration Assessment (NVA) prepared by AECOM (2025) (refer to Appendix C). The nearby receivers are mostly residential receivers. **Construction Noise** Background noise levels for the proposal were obtained using long term unattended noise monitoring as well as attended noise monitoring. These determined the background noise levels for two Noise Catchment Areas (NCAs). NCA1 is the area around the construction corridor on Flinders St and NCA2 is the area surrounding the compound area. Table 3.1 includes the background noise levels and the levels at which sleep disturbance could occur for each NCA.	Apply the mitigation measures set out in Appendix C.

Table 3.1 Background noise and sleep disturbance

Area	Background noise level (L_{A90}), dB(A)	Sleep disturbance criteria (Screening level)	$L_{A1(1\ minute)}$, dB(A) (Awakening reaction)
NCA1	45	60	65
NCA2	41	56	65

Aspect	Additional impacts	Additional mitigation measures

Table 3.2 outlines the noise management levels (NMLs) for residential receivers in each noise catchment area.

Table 3.2 Construction noise management levels

NCA	Construction NML $L_{Aeq, 16min}$, dB(A)			
	Standard hours (RBL + 10)	Outside standard hours (RBL + 5)		Highly noise affected
	Day	Evening	Night	
NCA 1	67	61	50	75
NCA 2	65	59	46	

Construction Scenarios

Construction scenarios were determined based on the likely noisiest construction scenarios with an additional scenario for compound activities:

- scenario 1 – excavation
- scenario 2 – installation, backfilling and reinstating road pavement
- scenario 3 – stockpiling and transferring waste
- scenario 4 – compound operation.

Details for the construction scenarios are outlined further in Appendix C.

Construction noise impacts

Construction noise levels at the identified receivers have been assessed against night-time NMLs. Night time NMLs have been used as construction works on Flinders St will only take place at night (refer section 2). The level of impact may change depending on the final construction methodology.

Table 3.3 presents the number of buildings where construction noise levels exceed the NMLs for night-time construction hours.

Aspect	Additional impacts	Additional mitigation measures

Table 3.3 Night time construction noise results

Scenario	Number of residences exceeding NMLs				Highly affected > 75 dB(A)
	1-5 dB	6-15 dB	16-25 dB	> 25 dB	
1	32	70	19	10	10
2	30	41	8	3	3
3	30	41	8	3	3
4	27	22	1	-	-

Figures showing the potentially impacted residences are in Appendix C.

The results of the construction noise assessment show that construction noise levels are predicted to exceed residential NMLs during night-time construction hours during all scenarios. Typically, the noise levels will be within the 'noticeable/clearly audible' exceedance at receivers (1-5 dB and 6-15 dB levels). However, some residential receivers will experience moderately intrusive and highly intrusive noise levels, (16-25 dB and >25 dB levels). 10 residential receivers are expected to be 'highly noise affected'. No non-residential receivers are likely to be affected.

It is noted that the exceedances are representative of worst-case scenarios when plant/equipment is closest to each receiver. Noise levels will be lower than predicted for significant portions of the duration of the works.

Construction vibration impacts

Vibration intensive works may include the use of rock hammers attached to excavators. The minimum working distances for off-site receivers are shown in Table 3.4, which is based on recommendations of the TfNSW ***Construction Noise and Vibration Strategy***. If these minimum working distances are complied with no adverse impacts from vibration intensive works are likely in terms of human response or cosmetic damage.

Aspect	Additional impacts	Additional mitigation measures
	Table 3.4 Minimum safe working distances <table><tr><th rowspan="2">Plant</th><th rowspan="2">Rating / description</th><th colspan="2">Cosmetic damage</th><th rowspan="2">Human response</th></tr><tr><th>Residential / commercial</th><th>Heritage</th></tr><tr><td>Small hydraulic hammer</td><td>300 kg hammer attached to 5 to 12t excavator</td><td>2 m</td><td>5 m</td><td>7 m</td></tr><tr><td>Medium hydraulic hammer</td><td>900 kg hammer attached to 12 to 18t excavator</td><td>7 m</td><td>12 m</td><td>23 m</td></tr><tr><td>Large hydraulic hammer</td><td>1,600 kg hammer attached to 18 to 34t excavator</td><td>22 m</td><td>34 m</td><td>73 m</td></tr></table> Based on the expected construction activities, works are not likely to occur within the minimum safe working distances. If vibration intensive works are required, the recommended mitigation measures would ameliorate any potential impacts.	
Waste and hazardous materials	Standard construction waste streams are expected to be generated, including road base and fill material, redundant pipes, and general compound waste. Construction waste would be transported to the Oxford Street compound for temporary storage, or directly to a facility licenced to accept the waste.	No additional mitigation measures required.
Traffic and access	The study area is on Flinders Street, a state road managed by Transport for NSW (TfNSW). The laydown area is accessed from Moore Park Road, a regional road. The compound is accessed from Oxford Street, a state road. There are bus lanes along Flinders Street northbound and part of Flinders Street southbound within the construction corridor, which revert to parking lanes outside of peak hour. There are footpaths on both sides of all these roads. The area also supports cyclists, for example to enter the compound on Oxford St requires crossing a dedicated bicycle lane. The wider study area is also serviced by bus routes operating within the construction corridor, with some services overlapping with proposed construction times. Light vehicles, heavy vehicles (e.g. trucks) and equipment (e.g. excavators) will be required every shift. Construction will require lane closures. At this stage, no full road closures are expected. Work will need to be performed in accordance with ROLs. Flinders Street is a busy road and links Oxford Street with Moore Park Road and Anzac Parade, and night-time ROLs are expected (likely 10pm to 4am, up to 4 nights a week). These lane closures will move	Additional mitigation measures: • Continue engagement with TfNSW on ROL timings. • If kerbside parking is removed during construction, consult with the road owner/ manager on potential alternative parking locations. • Engage with council on impacts to footpaths, cycle

Aspect	Additional impacts	Additional mitigation measures
	laterally across the road as works linearly progress along the alignment. Bus routes, pedestrians, and cyclists will all be delayed or detoured while these lane closures are in place. Kerbside parking may be unavailable during construction on Flinders Street in areas either side of the study area, to allow for movement of live traffic. Access to properties either side of the study area may be impeded during construction with access to be managed by traffic control. Traffic impacts would be managed by a traffic management plan.	paths, any regional roads. • Consult with bus operators on any temporary bus stop relocations (if required). • Consult impacted residents regarding alternate access arrangements as needed.
Social and visual	The construction corridor is on a busy road which links the Sydney Central Business District and the Moore Park sporting complex and public recreation areas. No recreational areas would be directly impacted. Surrounding land use includes residential terrace houses, apartments, retail businesses and pubs. These pubs are likely to have opening hours that overlap with proposed construction times. Lane closures and any loss of parking may impact access to these pubs. Traffic and noise will likely impact sensitive receivers during construction. The Oxford Street compound is in an area that is otherwise largely grassed and vegetated. Potential visual impacts are minor as the site is relatively compact and surrounded on two sides by trees. Road users and visitors to the adjacent Centennial Park would only observe the area for a relatively short period of time as they move past the area. Use of this compound would not permanently block off any formalised footpaths, cycle paths, or walking tracks. The Moore Park laydown area would limit the space available for pedestrians and cyclists to move along the footpath, for the duration of construction. Potential social impacts relating to visual, access, noise and vibration can be managed by implementing the mitigation measures	Additional mitigation measures: • Engage with nearby affected receivers in accordance with the project-specific Community and Stakeholder Action Plan. Any concerns raised by the community would be responded to and addressed.

Table 4 Environmental mitigation measures

General	
1.2	Should the proposal change from this REF, no further environmental assessment is required provided the change: • remains within the construction corridor and assessed compound/laydown areas and has no net additional environmental impact or • is outside the construction corridor and assessed compound/laydown areas but: o reduces impacts to biodiversity, heritage or human amenity or o avoids engineering (for example, geological, topographical) constraints and o after consultation with any potentially affected landowners and relevant agencies. The Contractor must demonstrate in writing how the changes meet these requirements, for approval by Sydney Water's Project Manager in consultation with the environmental and community representatives.
1.11	Assign single person with accountability for coordinating communication and information flow across contractors and consultants and provide the contact details of this person in the Environmental Works Method Statement and/or CEMP.

6 Conclusion

This Category B REF outlines potential environmental impacts associated with noise and vibration, non-Aboriginal heritage, traffic and access, and social and visual changes as part of the critical watermain renewal at Flinders Street, Surry Hills. Any additional environmental impacts are considered minor and potential impacts can be mitigated through implementation of the measures outlined in this Category B REF and the Multi-program REF. The proposal is not likely to significantly impact the environment.

Publication Number: SW 169 04/26

Appendix A – Section 171 checklist

Section 171 checklist	REF finding
Any environmental impact on a community	There may be short-term and temporary impacts to the community from noise and visual changes, and traffic and access constraints. There will be environmental improvements by continuing to provide a reliable water service to the local community.
Any transformation of a locality	The proposal will not result in the transformation of a locality.
Any environmental impact on the ecosystems of the locality	The proposal will not result in environmental impacts to ecosystems of the locality. The proposal will lead to environmental improvements by ensuring a reliable water service is provided to all surrounding populations.
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality	The proposal will result in temporary visual impacts that could affect the aesthetic value of the area. However, the study area will be returned to its original state after construction has finished.
Any effect upon a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or any other special value for present or future generations	The proposal will only have a minor and temporary effect on nearby heritage items.
Any impact on the habitat of any protected animals (within the meaning of the ***Biodiversity Conservation Act 2016***)	The proposal will not have any impact on the habitat of protected animals.
Any endangering of any species of animal or plant or other form of life, whether living on land, in water or in the air	The proposal will not be endangering any species of animal, plant or other form of life, whether living on land, in water or in the air.
Any long-term effects on the environment	The proposal will not have any long-term impacts on the environment but will have a long-term benefit by continuing to provide a reliable and modern water service for the area.
Any degradation of the quality of the environment	The proposal will not cause the degradation of the quality of the environment.
Any risk to the safety of the environment	The proposal will not increase risk to the safety of the environment. The proposal may result in a temporary increase in traffic movements along Flinders St and surrounding residential roads. Consultation, signage and traffic management will mitigate this potential safety risk.

Section 171 checklist	REF finding
Any reduction in the range of beneficial uses of the environment	The proposal will not reduce the range of beneficial uses of the environment.
Any pollution of the environment	Environmental mitigation measures will mitigate the potential for the proposal to pollute the environment. No pollution of the environment is expected.
Any environmental problems associated with the disposal of waste	Waste disposal will be in accordance with the environmental mitigation measures, and no environmental problems associated with the disposal of waste are expected.
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply	The proposal will not increase demand on resources, that are, or are likely to become, in short supply.
Any cumulative environmental effect with other existing or likely future activities	The proposal will not have any cumulative environmental effect with other existing or likely future activities.
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions	The proposal will not have any impact on coastal processes or hazards, and coastal processes and coastal hazards will not have any impact on the proposal.
Any applicable local strategic planning statements, regional strategic plans or district strategic plans made under the EP&A Act, Division 3.1	There are no applicable strategic planning statements or plans, as the proposal forms part of a renewals program.
Any other relevant environmental factors.	The proposal has been assessed against the factors listed above, and there are no other relevant environmental factors to consider.

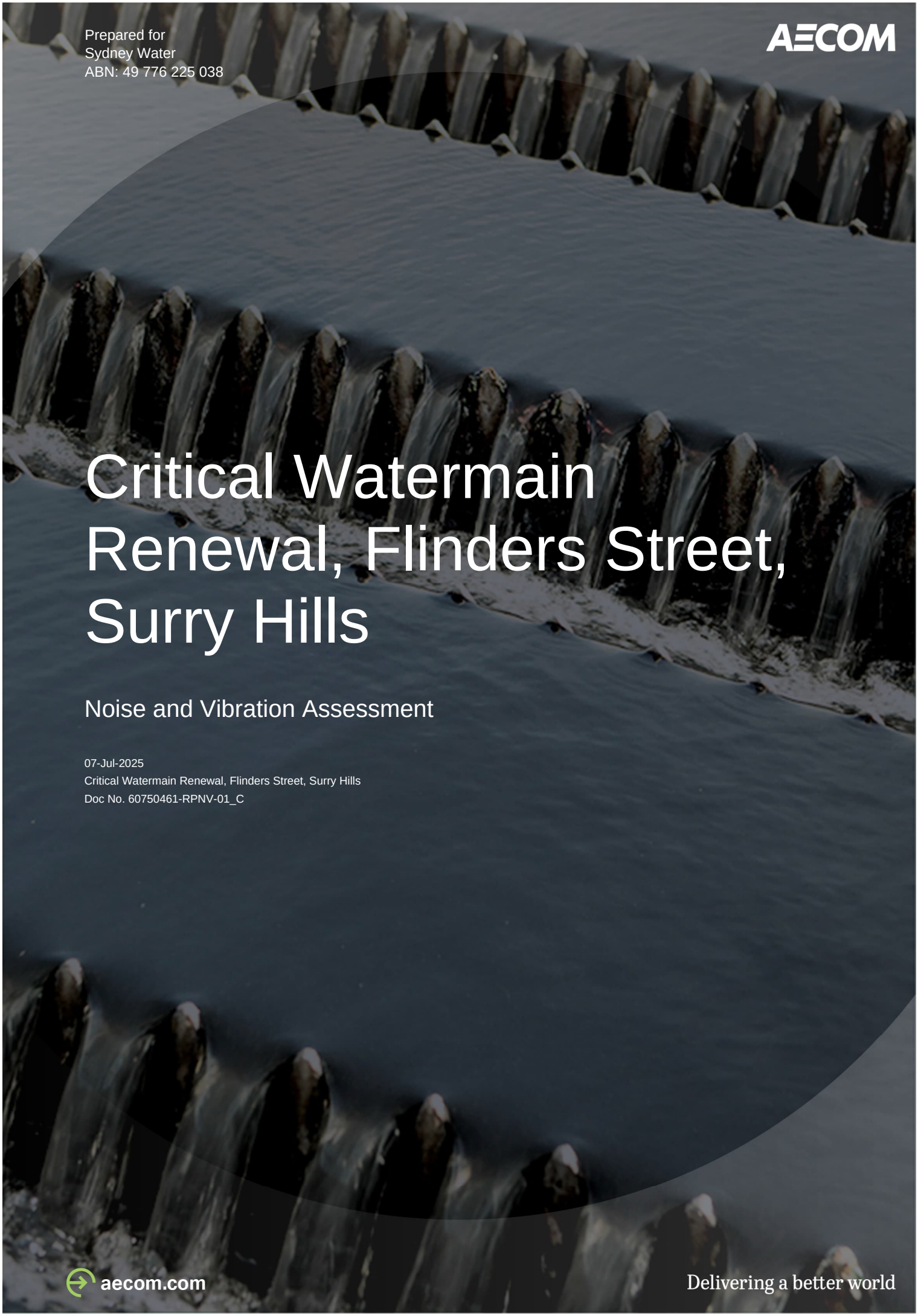
Appendix B – Consideration of TISEPP consultation

TISEPP section	Yes	No
Section 2.10, council related infrastructure or services – consultation with council		
Will the work:		
Potentially have a substantial impact on stormwater management services provided by council?		X
Be likely to generate traffic that will strain the capacity of the road system in the LGA?		X
Connect to, and have a substantial impact on, the capacity of a council owned sewerage system?		X
Connect to, and use a substantial volume of water from a council owned water supply system?		X
Require temporary structures on, or enclose, a public space under council's control that will disrupt pedestrian or vehicular traffic that is not minor or inconsequential?	X	
Excavate a road, or a footpath adjacent to a road, for which the council is the roads authority, that is not minor or inconsequential?		X
Section 2.11, local heritage – consultation with council		
Is the work likely to affect the heritage significance of a local heritage item, or of a heritage conservation area (not also a State heritage item) more than a minor or inconsequential amount?		X
Section 2.12, flood liable land – consultation with council		
Will the work be on flood liable land (land that is susceptible to flooding by the probable maximum flood event) and will works alter flood patterns other than to a minor extent?		X
Section 2.13, flood liable land – consultation with State Emergency Services		
Will the work be on flood liable land (land that is susceptible to flooding by the probable maximum flood event) and undertaken under a relevant provision*, but not the carrying out of minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance? * (e) Div.14 (Public admin buildings), (g) Div.16 (Research/ monitoring stations), (i) Div.20 (Stormwater systems)?		X
Section 2.14, development with impacts on certain land within the coastal zone– council consultation		
Is the work on land mapped as coastal vulnerability area and inconsistent with a certified coastal management program?		X
Section 2.15, consultation with public authorities other than councils		
Will the proposal be on land adjacent to land reserved under the ***National Parks and Wildlife Act 1974*** or land acquired under Part 11 of that Act***? If so, consult with DPE (NPWS).***		X
Will the proposal be on land in Zone C1 National Parks and Nature Reserves or on a land use zone that is equivalent to that zone? ***If so, consult with DPE (NPWS).***		X
Will the proposal include a fixed or floating structure in or over navigable waters? ***If so, consult TfNSW.***		X
Will the proposal be on land in a mine subsidence district within the meaning of the ***Coal Mine Subsidence Compensation Act 2017***? ***If so, consult with Subsidence Advisory NSW.***		X
Will the proposal be on land in a Western City operational area specified in ***the Western Parkland City Authority Act 2018,*** Schedule 2 and have a capital investment value of $30 million or more? ***If so, consult the Western Parkland City Authority***.		X
Will the proposal clear native vegetation on land that is not subject land (i.e. non-certified land)? ***If so, notify DPE at least 21 days prior to work commencing. (Requirement under s3.24 Chapter 3 Sydney Region Growth Centres - of the SEPP (Precincts – Central River City) 2021).***		X

Appendix C – Noise and Vibration Assessment

Prepared for
Sydney Water
ABN: 49 776 225 038

AECOM



Critical Watermain Renewal, Flinders Street, Surry Hills

Noise and Vibration Assessment

07-Jul-2025
Critical Watermain Renewal, Flinders Street, Surry Hills
Doc No. 60750461-RPNV-01_C

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Critical Watermain Renewal, Flinders Street, Surry Hills

Noise and Vibration Assessment

Client: Sydney Water

ABN: 49 776 225 038

Prepared by

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Table of Contents

Executive Summary

A construction and operational Noise and Vibration Impact Assessment (NVIA) has been completed for the proposed critical watermain (CWM) renewal along Flinders Street in Surry Hills, NSW.

Nearby noise and vibration sensitive receivers were identified. Attended and unattended noise measurements were completed to characterise the existing noise environment. The measured noise levels were used to establish operational criteria and construction noise management levels.

Construction impacts

The construction works are expected to be completed during the night-time period (10:00pm to 4:30am) due to a restricted road occupancy licence (ROL). Construction work packages have been developed in consultation with Sydney Water and the proposed equipment has been detailed within this report. Construction noise impacts were assessed at all nearby residential and other noise sensitive receivers.

Construction noise

The predicted construction noise levels are expected to exceed the construction noise management levels at the closest noise residential receivers during all construction scenarios. Construction mitigation measurements have been recommended to manage the construction noise.

Construction vibration

Minimum working distances have been provided that allow for compliance with the construction vibration criteria. It is not considered likely that works would occur within the minimum working distances. If, however, vibration intensive works are required within these minimum working distances, mitigation measures to control excessive vibration have been outlined.

Construction traffic

Construction traffic noise is expected to comply with the Road Noise Policy.

1.0 Introduction

1.1 Background information

AECOM Australia Pty Ltd (AECOM) has been commissioned by Sydney Water to undertake a Noise and Vibration Impact Assessment of the construction of the proposed critical watermain (CWM) renewal along Flinders Street in Surry Hills (the Proposal).

This project is part of the CWM renewal program and includes the renewal of the existing DN200, DN375 and DN500 watermains located between Albion Street and Moore Park Road. These watermains were installed in the early 1900s and are in a state of disrepair. Sydney Water is preparing a Review of Environmental Factors (REF) under Division 5.1 of the ***Environmental Planning and Assessment Act 1979***.

1.2 Scope

The scope of this Noise and Vibration Impact Assessment is to:

- Establish the existing background noise levels in the vicinity of the Proposal
- Establish construction noise management levels and vibration limits applicable to the Proposal
- Predict construction noise and vibration levels at nearby residential and other sensitive receivers due to the Proposal
- Assess road traffic noise arising from additional traffic generation as a result of the construction and operation of the Proposal and if necessary, recommend management and mitigation measures.
- Review the potential impacts of construction noise and vibration in relation to identified sensitive sites. Determine, in principle, mitigation measures if required including silencing treatment of mechanical and mobile plant, management of mechanical and mobile plant, community consultation and/or other noise mitigation and management measures

1.3 Policies and Guidelines

The following policies and guidelines are relevant for this assessment:

- ***Management Procedure SWEMS0056***, Sydney Water
- ***Interim Construction Noise Guideline*** (ICNG), Department of Environment and Climate Change, 2009
- ***Assessing Vibration: A Technical Guideline*** (AVATG), Department of Environment and Conservation, 2006
- ***NSW Road Noise Policy*** (RNP), Department of Environment, Climate Change and Water, 2011
- ***Noise Policy for Industry*** (NPfI), Environment Protection Authority, 2017
- ***Industrial Noise Policy (INP),*** Environment Protection Authority, 2000
- ***Construction Noise and Vibration Strategy (Public Transport Infrastructure)*** (CNVS-PTI), Transport for NSW, 2023
- DIN Standard 4150: Part 3 1999 ***Structural Vibration in Buildings - Effects on Structures***, 1999
- British Standard 7385: Part 2 1993 ***Evaluation and Measurement of Vibration in Buildings***, 1993
- British Standard 6472: Part 1 2008 ***Evaluation of Human Exposure to Vibration in Buildings***, 2008
- Australian Standard AS 2436-2010, ***Guide to noise and vibration control on construction, demolition and maintenance sites***, 2010

- British Standard 5228: Part 1 2009 ***Code of practice for noise and vibration control on construction and open sites***, 2009 (supplemented by the 2014 amendment accompanying the standard).

Definitions for acoustic terminology used within this report can be found in Appendix A.

1.4 Proposed works

The location of the proposed works is shown in Figure 1. Excavation, installation, backfilling, reinstating road pavement, and stockpiling and transferring waste material will be required at the construction location in Figure 1. The laydown compound is also shown in Figure 1. The construction location, the laydown compound and the main compound are shown in Figure 2.

1.5 Proposed construction hours

Road occupancy licences (ROL) are likely to be granted for the following periods: Monday to Thursday 10:00pm until 4:30am. As work is not permitted outside of these hours, the intent is to complete the works across these four shifts each week. Based on these construction hours the works are likely to be undertaken from July until November 2025.

Figure 1 Study area

Figure 2 Construction area and compound locations

2.0 Existing Acoustic Environment

2.1 Site description

The Proposal site is located within mainly suburban environments. The closest residential receivers are located approximately 5 m away from the proposal site.

The location of the pipeline is shown below in Figure 3.

Figure 3 Noise catchment areas

2.1.1 Heritage items

No known Aboriginal heritage items such as rock shelters or structures are located in the vicinity of the pipeline. Centennial Park is a heritage conservation area and includes 60 local heritage listed items (I97-I156) listed in the Sydney Local Environmental Plan 2012 Schedule 5. In addition, Durham Hall at 5-13 Hutchinson Street is state heritage listed (I1560) in the LEP. However, this project is unlikely to impact these due to the distance between vibration intensive works and these receivers.

2.2 Noise measurement methodology

Long term unattended and short term attended measurements were undertaken to establish the existing ambient and background noise environment at potentially affected receivers.

2.2.1 Unattended noise measurement methodology

Long term unattended noise monitoring was conducted at two locations between 1 April and 14 April 2025. One noise logger was placed within each NCA at a representative location at the properties indicated in Table 1. The noise loggers were calibrated prior to and after the monitoring period with a drift in calibration not exceeding ± 0.5 dB.

All the acoustic instrumentation employed during the noise measurements comply with the requirements of "***AS IEC 61672.1-2004 Electroacoustics - Sound level meters - Specifications***" and were within their current National Association of Testing Authorities, Australia (NATA) certified in-calibration period (i.e. calibration in the last two years).

Table 1 Noise monitoring details

Logger[1]	NCA	Location	Model	Serial number
NL1	1	362 South Dowling Street, Paddington	Rion NL52	01043455
NL2	2	82 Wallis Street, Woollahra	Rion NL52	00164394

In accordance with the EPA's NSW ***Noise Policy for Industry***, noise monitoring affected by adverse weather conditions or extraneous noise events was excluded from the monitoring data. The ***Noise Policy for Industry*** advises that data may be affected where adverse weather, such as wind speeds higher than 5 m/s or rain, occurs. Weather data were acquired from the Bureau of Meteorology's Sydney Observatory Hill weather station (station number 066214).

The loggers measured the noise levels over the sample period and then determined L_{A1}, L_{A10}, L_{A90}, and L_{Aeq} levels of the noise environment. The $L_{A1,}$ L_{A10} and L_{A90} noise levels are the levels exceeded for 1%, 10% and 90% of the measurement period respectively. The L_{A90} is taken as the background level. The L_{A1} is indicative of the maximum noise levels due to individual noise events such as the pass-by of a heavy vehicle. The L_{Aeq} level is the equivalent continuous sound level and has the same sound energy over the sample period as the actual noise environment with fluctuating sound levels.

The L_{A90} noise levels were analysed to determine a single assessment background level (ABL) for each day, evening and night period in accordance with the ***Noise Policy for Industry*** for each monitoring location. The ABL is established by determining the lowest ten-percentile level of the L_{A90} noise data acquired over each period of interest. Table 2 presents individual ABLs for each day's assessment periods. The background noise level or rating background level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual ABLs determined over the entire monitoring period.

2.2.2 Attended noise measurement methodology

Attended noise measurements were conducted at the two unattended monitoring locations on 1 April 2025 during the daytime. Each measurement was conducted over a 15-minute period. Weather conditions were clear on the days of monitoring, with moderate winds.

Attended noise measurements were conducted using Brüel & Kjær Type 2270 sound level meter. The sound level meter used is designated as a Class 1 instrument and has accuracy suitable for laboratory and field use. The sound level meter was calibrated before and after the measurements with a no drift in calibration exceeding ±0.5 dB.

All the acoustic instrumentation employed during the noise measurements comply with the requirements of "***AS IEC 61672.1-2004 Electroacoustics - Sound level meters - Specifications***" and were within their current National Association of Testing Authorities, Australia (NATA) certified in-calibration period (i.e. calibration in the last two years).

2.3 Noise measurement results

2.3.1 Unattended noise measurement results

Table 2 presents the existing overall representative L_{Aeq} ambient noise level and the background L_{A90} noise levels for the day, evening and night-time periods, in accordance with the ***Noise Policy for Industry.*** The overall representative L_{Aeq} noise levels were determined by logarithmically averaging each assessment period for the entire monitoring period.

In total 14 days of logging were completed, however some periods of noise logging were excluded due to adverse weather. The data were processed in accordance with Fact Sheet B of the ***Noise Policy for Industry***.

The results for each day and the graphical noise logging results are presented in Appendix B.

Table 2 Existing background (L_{A90}) and ambient (L_{Aeq}) noise levels

Logger No.	L_{A90} background rating noise level, dB(A)			Log average noise (ambient) L_{Aeq} levels dB(A)		
	Day[1]	Evening[1]	Night[1]	Day[1]	Evening[1]	Night[1]
NL1	57	56	45	69	69	66
NL2	55	54	41	63	63	58

Notes:

1. ***Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays & Public Holidays. Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday & Public Holidays. Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays & Public Holidays.***

2.3.2 Attended noise measurements

The results of the attended noise monitoring are presented in Table 3. The daytime measurements indicated that residential receivers are generally affected by road traffic noise.

Table 3 Attended noise measurements

Logger No.	Date	Time	L_{Aeq} dB(A)	L_{A90} dB(A)	Comments
NL1	01/04/2025	10:35 AM	69	60	Clear sky, windy, leaves rustling. Cars passing by 70-74 dB(A). Truck passing by 76 dB(A). Dominated by road traffic noise on South Dowling Street and Flinders Street.
NL2	01/04/2025	11:23 AM	65	60	Clear sky, windy. Cars on Oxford Street 64-65 dB(A). Truck passing along Oxford Street 72 dB(A). Car pass by on Wallis Stret 65-66 dB(A). Dominated by road traffic noise on Oxford Street.

2.4 Noise catchment areas

Noise catchment areas (NCA) are used to group residential receivers within a similar noise environment and define appropriate construction NMLs. Two NCAs have been determined for the Project and are defined in Table 4.

Table 4 Noise Catchment Areas

NCA	Description of NCA	L_{A90} background rating noise levels used
1	Receivers that will be predominantly affected by the CWM construction works.	Measured L_{A90} noise levels for NL1
2	Receivers that will be predominantly affected by compound operation noise to the west of the construction works.	Measured L_{A90} noise levels for NL2

3.0 Construction Noise and Vibration Criteria

3.1 Construction activity noise criteria

The potential risk of adverse impact of construction noise on a receiver is determined by the extent of its emergence above the existing background noise level, the duration of the event and the characteristics of the noise.

The ***Interim Construction Noise Guideline*** is a NSW Government document that sets out ways to deal with the impacts of construction noise on residences and other sensitive land uses. It presents assessment approaches tailored to the scale of the construction project and identifies practices to minimise noise impacts. As the proposed works are expected to continue for a period of more than three weeks and are within relatively close proximity to noise sensitive receivers, a quantitative assessment, based on 'reasonable' worst case construction scenarios, has been carried out for these works.

Noise levels resulting from construction activities are predicted at nearby noise sensitive receivers (e.g. residences, schools, hospitals, places of worship, passive and active recreation areas) are compared to the levels provided in the ***Interim Construction Noise Guideline***. Where an exceedance of the management levels is predicted the ***Interim Construction Noise Guideline*** advises that receivers can be considered 'noise affected' and the proponent should apply all feasible and reasonable work practices to minimise the noise impact. The proponent should also inform all potentially affected residents of the nature of the works to be carried out, the expected noise level and duration, as well as contact details should they wish to make a complaint.

Where construction noise levels at the receiver reach 75 dB(A) residential receivers are considered to be 'highly noise affected' and the proponent should, in consultation with the community, consider restrictions to the hours of construction to provide respite periods.

The construction noise management levels (NML) for the residential and other sensitive land uses are detailed in Section 3.1.1 and 3.1.2.

3.1.1 Residential receivers

Guidance for setting construction NMLs for residential receivers is summarised in Table 5.

Table 5 ICNG Residential noise management levels

Time of day	NML, $L_{Aeq,15min}$, dB(A)[1]	How to apply
Recommended standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2 of the ICNG.

Notes:

1. ***Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.***

Table 6 presents the NMLs applicable to residential receivers nearby to this development.

Table 6 Construction noise management levels – Residential receivers

Noise catchment area	Construction NML $L_{Aeq,15min}$, dB(A)			
	Standard hours (RBL + 10)	Outside standard hours (RBL + 5)		Highly affected noise level
	Day	Evening	Night	
NCA 1	67	61	50	75

NCA 2	65	59	46	

The ***Construction Noise and Vibration Guideline (Public Transport Infrastructure)*** sets out community perceptions of construction noise, dependent upon the level of exceedance of the RBLs and NMLs. These are presented in Table 7.

Table 7 Community perception of construction noise

Perception	dB(A) above RBL	dB(A) above NML – Standard hours	dB(A) above NML – Out of hours
Noticeable	5 – 10	0	0 – 5
Clearly audible	10 – 20	0 – 10	6 – 15
Moderately Intrusive	21 – 30	11 – 20	16 – 25
Highly Intrusive	> 30	> 20	> 25

3.1.2 Non-residential receivers

Table 8 presents the NMLs applicable to other noise sensitive receivers such as educational facilities and places of worship and to commercial receivers.

Table 8 Construction noise management levels – Other receivers

Land use	Noise management levels, $L_{Aeq,15min}$ (applies when properties are in use)
Education (classrooms at schools and other educational institutions and childcare centres)	External noise level 55 dB(A)[1]
Medical (hospital wards and operating theatres)	External noise level 55 dB(A)
Places of worship	External noise level 55 dB(A)[1]
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 60 dB(A)
Community centres	External noise level 55 dB(A) [2]
Commercial premises (including offices, retail outlets)	External noise level 70 dB(A)
Industrial premises	External noise level 75 dB(A)

Notes:

1. ***Based on an internal noise level of 45 dB(A) outlined in the Interim Construction Noise Guideline, where a conservative estimate of 10 dB has been assumed between internal and external noise levels.***
2. ***Based on the design sound level for "Municipal buildings – Function spaces" from AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors. A conservative estimate of 10 dB has been assumed between internal and external noise levels.***

3.1.3 Sleep disturbance criteria

The ***Interim Construction Noise Guideline*** requires a sleep disturbance analysis where construction works are planned to extend over more than two consecutive nights. The L_{A1} noise levels and number of expected L_{A1} noise events should be predicted in order to determine the likelihood of potential sleep disturbance.

The EPA recommends that to minimise the risk of sleep disturbance during the night-time period (10.00 pm to 7.00 am), the $L_{A1(1\ min),}$ noise level outside a bedroom window should not exceed the $L_{A90\ (15\ minute)}$ background noise level by more than 15 dB. If this screening criterion is found to be exceeded then a more detailed analysis must be undertaken and include the extent that the maximum noise level exceeds the background noise level and the number of times this is likely to happen during the night-time period.

Sleep disturbance research presented in the ***Road Noise Policy*** concludes that ***'Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions'***. Therefore, given that an open window provides approximately 10 dB in noise attenuation from outside to inside, external noise levels of 60-65 dB(A) are unlikely to result in awakening reactions.

Based on the measured background noise levels during the night, the sleep disturbance criteria for the nearest noise sensitive residential receivers are presented in Table 9.

Table 9 Sleep disturbance criteria

Area	Background noise level (L_{A90}), dB(A)	Sleep disturbance criteria, $L_{A1(1\ minute)}$, dB(A)	
		Screening level	Awakening reaction
NCA 1	45	60	65
NCA 2	41	56	65

3.2 Construction traffic noise criteria

To assess noise impacts from construction traffic an initial screening test should be undertaken by evaluating whether existing road traffic noise levels would increase by more than 2 dB(A), in line with the ***Road Noise Policy***. Where the predicted noise increase is 2 dB(A) or less, then no further assessment is required. However, where the predicted noise level increase is greater than 2 dB(A), and the predicted road traffic noise level exceeds the road category specific criterion then noise mitigation should be considered for those receivers affected. The ***Road Noise Policy*** does not require assessment of noise impact to commercial or industrial receivers.

Flinders Street and Oxford Street provide the main access roads to the site. These roads are classified as sub-arterial roads and are listed in Table 10. The external noise criteria are applied one metre from the external façade of an affected building.

Table 10 Roads used by construction traffic

Road	Type	Residential receivers	Estimated existing Annual Average Daily Traffic (AADT)
Flinders Street	Sub Arterial	Yes	> 27,000
Oxford Street	Sub Arterial	Yes	> 59,000

3.3 Construction vibration criteria

The relevant standards/guidelines for the assessment of construction vibration are summarised in Table 11.

Table 11 Standards/guidelines used for assessing construction vibration

Item	Standard/guideline
Structural damage	German Standard DIN 4150 – Part 3 – Structural Vibration in Buildings – Effects on Structures (DIN 4150)
Human comfort (tactile vibration) [1]	***Assessing Vibration: A Technical Guideline*** (AVATG)

Note 1: This document is based upon the guidelines contained in British Standard 6472:1992, "Evaluation of human exposure to vibration in buildings (1-80 Hz)". This British Standard was superseded in 2008 with BS 6472-1:2008 "Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting" and the 1992 version of the Standard was withdrawn. Although a new version of BS 6472 has been published, the Environment Protection Authority still requires vibration to be assessed in accordance with the 1992 version of the Standard at this point in time.

Vibration, at levels high enough, has the potential to cause damage to structures and disrupt human comfort. Vibration and its associated effects are usually classified as continuous, impulsive or intermittent as follows:

- continuous vibration continues uninterrupted for a defined period and includes sources such as machinery and continuous construction activities
- impulsive vibration is a rapid build up to a peak followed by a damped decay. It may consist of several cycles at around the same amplitude, with durations of typically less than two seconds and no more than three occurrences in an assessment period. This may include occasional dropping of heavy equipment or loading activities
- intermittent vibration occurs where there are interrupted periods of continuous vibration, repeated periods of impulsive vibration or continuous vibration that varies significantly in magnitude. This may include intermittent construction activity, impact pile driving, jack hammers.

3.3.1 Structural damage

At present, no Australian Standards exist for the assessment of building damage caused by vibration. The German standard (DIN 4150) provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are presented in Table 12. DIN 4150 states that buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage.

Table 12 DIN 4150: Structural damage safe limits for building vibration

Group	Type of structure	At foundation - Less than 10 Hz	At foundation - 10 Hz to 50 Hz	At foundation - 50 Hz to 100 Hz[1]	Vibration at the horizontal plane of the highest floor for all frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20 mm/s	20 to 40 mm/s	40 to 50 mm/s	40 mm/s
2	Dwellings and buildings of similar design and/or use	5 mm/s	5 to 15 mm/s	15 to 20 mm/s	15 mm/s
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order/heritage listed)	3 mm/s	3 to 8 mm/s	8 to 10 mm/s	8 mm/s

Notes:

1. At frequencies above 100 Hz, the values given in this column may be used as minimum values

3.3.2 Human comfort

The assessment of intermittent vibration outlined in the NSW EPA guideline As***sessing Vibration: A Technical Guideline*** (AVTG) is based on Vibration Dose Values (VDVs). The VDV accumulates the vibration energy received over the daytime and night-time periods.

Maximum and preferred VDVs for intermittent vibration arising from construction activities are listed in Table 13. The VDV criteria are based on the likelihood that a person would be annoyed by the level of vibration over the entire assessment period.

Table 13 Preferred and maximum vibration dose values for intermittent vibration (m/s$^{1.75}$)

Location	Daytime[1]		Night-time[1]	
	Preferred	Maximum	Preferred	Maximum
Critical areas	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes:

1. Day is defined as 7:00 am to 10:00 pm. Night is defined as 10:00 pm to 7:00 am

4.0 Construction Noise Assessment

4.1 Construction noise modelling scenarios

Table 14 provides a summary of the construction noise scenarios, including the proposed construction plant/equipment for each scenario and their associated sound power levels. The three noisiest construction scenarios were assessed, with an additional scenario to factor in the site compounds:

- Scenario 1 – Excavation
- Scenario 2 – Installation, backfilling and reinstating road pavement
- Scenario 3 – Stockpiling and transferring waste material
- Scenario 4 – Compound operation.

All scenarios were assessed as night-time construction work. All major construction work is expected to be completed as nightworks due to the ROLs.

Table 14 Equipment sound power levels

Phase	Construction stage	Equipment	SWL per unit, dB(A)
Scenario 1	Excavation	Excavators (1 x 35t and 1 x 5t)	99
		Rock hammers for 35t and 5t excavator	118[2]
		Skip bins	-
		Concrete saws	115[1,2]
		Generators	103
		Jackhammers	113[2]
		Tip trucks	110
		Air compressors	93
		Light vehicles	102
		Plate compactors	106
		Vacuum truck	109
Scenario 2	Installation, backfilling, and reinstating road pavement	Concrete agitator trucks	108
		Street sweepers	104
		Light vehicles	103
		Compactor	106
		Excavators (1 x 35t and 1 x 5t)	99
		Skip bins	-
		Generators	103
		Tip trucks	110
		Air compressors	93
Scenario 3	Stockpiling and transferring waste material	Excavators (1 x 35t and 1 x 5t)	99
		Skip bins	-
		Tip trucks	110
		Light vehicles	103
		Generators	103
Scenario 4	Compound operation	Truck delivery	103

Notes:

1. Sound powers are time weighted (i.e. expected utilisation percentage per 15 minute period) in accordance with the following:

a. Concrete saw – 33%

2. Equipment with special audible characteristics, likely to cause annoyance due to tonality, low frequency noise, impulsive or intermittent noise events. Penalty of +5 dB included in the sound power level.

4.2 Noise modelling methodology

Noise levels due to the construction activities shown in Section 4.1 have been predicted at nearby noise sensitive receivers using SoundPLAN Version 8.2 noise modelling software. The noise model was

created to represent 'reasonable' worst-case periods of construction works. The following features were included in the noise model:

- Ground topography
- Ground absorption and reflection
- Receivers
- Buildings
- Construction noise sources, each construction scenario was modelled as the loudest piece of equipment in that scenario.

Noise emissions from the construction sites have been modelled using an implementation of the CONCAWE propagation algorithm with neutral metrological conditions.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment. The acoustic shielding calculated in the model due to fixed building structures would also vary as the construction equipment moves around the site.

4.2.1 Construction modelling assumptions

The following assumptions have been made in modelling all construction noise scenarios:

- Plant/equipment is assumed to be operating at the Project area boundary at the closest point to each receiver, in order to present the worst-case scenario for each receiver. In reality, the plant/equipment would only be at the closest point to each receiver for limited periods
- Neutral atmospheric conditions, i.e. relatively calm, no wind.

4.3 Predicted construction noise levels

Construction noise levels at the identified residential and non-residential receivers have been assessed against the night-time NMLs. The level of impact may change depending on the final construction methodology.

Construction noise contours calculated at 1.5 m above ground level are presented in Appendix B.

Table 15 presents the construction noise modelling results for residential and non-residential receivers.

Table 15 Flinders Street CWM Construction Works – Night-time works

Scenario	Number of buildings where construction noise levels exceed the NMLs – night-time construction hours				Highly affected > 75 dB(A)
	1-5 dB	6-15 dB	16-25 dB	> 25 dB	
1 – Excavation	32	70	19	10	10
2 – Installation, backfilling and reinstating road pavement	30	41	8	3	3
3 – Stockpiling and transferring waste material	30	41	8	3	
4 – Compound operation	27	22	1	-	-

Table 16 Number of non-residential buildings where noise levels may exceed NMLs

Scenario	Exceedance of NML		
	1-10 dB	11-20 dB	> 20 dB
1 – Excavation	-	-	-
2 – Installation, backfilling and reinstating road pavement	-	-	-
3 – Stockpiling and transferring waste material	-	-	-
4 – Compound operation	-	-	-

The results above show construction noise levels are predicted to exceed residential NMLs during night-time construction hours during all construction scenarios. Typically, the noise levels will be noticeable/clearly audible at receivers, however some residential receivers will experience moderately intrusive and highly intrusive noise levels also. Around 10 receivers are likely to be 'highly noise affected'. No non-residential receivers are likely to be affected.

It is noted that the exceedances above are representative of when equipment is closest to each receiver, noise levels will be lower than predicted for significant portions of the CWM renewal works duration.

4.4 Construction traffic assessment

For works associated with the upgrade of the Flinders Street CWM, the number of construction heavy vehicle movements has been estimated to be an average of 2 heavy vehicles across the worst-case one-hour period. Vehicles would access the pipeline construction areas via Flinders Street and Oxford Street. Additional construction traffic volumes are considered to have little to no impact (less than 2 dB(A) increase) on existing traffic noise levels at residential receivers along these roads. As such no consideration of noise mitigation measures is required.

4.5 Construction vibration assessment

Vibration intensive works may include the use of rock hammers attached to excavators, and excavators.

The minimum working distances of these items of equipment from off-site receivers are shown in Table 17 which is based on recommendations of the TfNSW ***Construction Noise and Vibration Strategy*** (CNVS). If these minimum working distances are complied with no adverse impacts from vibration intensive works are likely in terms of human response or cosmetic damage.

Based on the indicative construction activities assessed for the Proposal, it is not considered likely that works would occur within the minimum working distances. If, however, vibration intensive works are required within these minimum working distances, mitigation measures to control excessive vibration would be implemented as outlined in Section 5.0.

Table 17 Minimum working distances of vibration intensive equipment to be used during the Proposal

Plant	Rating/ description	Cosmetic damage		Human response
		Residential/ commercial	Heritage	
Small Hydraulic Hammer	300 kg hammer attached to 5 to 12t excavator	2 m	5 m	7 m
Medium Hydraulic Hammer	900 kg hammer attached to 12 to 18t excavator	7 m	12 m	23 m
Large Hydraulic Hammer	1,600 kg hammer attached to 18 to 34t excavator	22 m	34 m	73 m

5.0 Mitigation Measures

5.1 Construction mitigation measures

5.1.1 Construction Environment Management Plan (CEMP)

The CEMP should include all reasonable and feasible safeguards to manage the noise emissions from the site and any complaints which may occur due to construction noise. The CEMP should include, the following:

- identification of nearby residences and other sensitive land uses
- description of approved hours of work
- description and identification of all construction activities, including work areas, equipment and duration
- description of what work practices (generic and specific) would be applied to minimise noise and vibration
- a complaints handling process
- noise and vibration monitoring procedures, including for heritage structures
- overview of community consultation required for identified high impact works.

Construction works should be planned and carried out during standard construction hours wherever possible. Table 18 presents the mitigation measures which should be considered as mitigation measures as part of the CEMP.

Table 18 Recommended construction mitigation measures

Action required	Safeguard details
Management measures	
Site inductions	All site inductions shall brief workers, contractors, and visitors on the neighbouring sensitive receivers (if applicable) and general noise safeguards and compliance obligations relating to the site.
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. All staff and contractors should take reasonable steps to ensure that noise from reactive work is minimised. Comply with the ***Noise Management Code of Behaviour*** for works outside of standard daytime hours.
Equipment procurement	Consideration should be given to purchasing goods which are noise efficient. Refer to Guidance Sustainable Procurement in Supply Contracts.

Action required	Safeguard details
Construction hours and scheduling	Work generating noise with special audible characteristics and/or vibration levels (including rock/jack hammering and concrete sawing) should be scheduled during less sensitive time periods and completed before midnight, if possible.
Construction respite period	Noise with special audible characteristics and vibration generating activities) may only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block. 'Continuous' includes any period during which there is less than a one-hour respite between ceasing and recommencing any of the work. No more than four consecutive nights of noise with special audible characteristics and/or vibration generating work may be undertaken in the same NCA over any seven-day period, unless otherwise approved by the relevant authority. A minimum respite period of three nights shall be implemented between periods of consecutive night works.
Source controls [1]	
Equipment selection	Quieter and less vibration emitting construction methods will be used where feasible and reasonable (e.g. rubber wheeled instead of steel tracked plant). Equipment will be regularly inspected and maintained to ensure it is in good working order.
Maximum noise levels	The noise levels of plant and equipment will have operating sound power or sound pressure levels that would meet the predicted noise levels.
Rental plant and equipment	Noise emissions will be considered as part of the selection process.
Use and siting of plant	Simultaneous operation of noisy plant within discernible range of a sensitive receiver will be avoided. The offset distance between noisy plant and adjacent sensitive receivers will be maximised. Plant used intermittently will be throttled down or shut down. Plant and vehicles will be turned off when not in use. Noise-emitting plant will be directed away from sensitive receivers where reasonable and feasible.
Plan works site and activities to minimise noise and vibration	Traffic flow, parking and loading/unloading areas will be planned to minimise reversing movements within the site. Truck drivers will be advised of designated vehicle routes, parking locations, acceptable delivery hours or other relevant practices (i.e. minimising the use of engine brakes, and no extended periods of engine idling).
Non-tonal reversing alarms	Non-tonal reversing beepers (or an equivalent mechanism) will be fitted and used on all construction vehicles and mobile plant regularly used on site and for extended work hours construction work.
Minimise disturbance arising from delivery of goods to construction sites	Loading and unloading of materials/deliveries will occur as far as possible from sensitive receivers. Delivery vehicles will be fitted with straps rather than chains for unloading, wherever possible.

Action required	Safeguard details
Silencers on mobile plant	Where possible noise from mobile plant will be reduced through additional fittings including: • Residential grade mufflers • Air parking brake engagement is silenced.
Construction related traffic	The speed of vehicles will be limited and the use of engine compression brakes limited. On-site storage capacity will be maximised to reduce the need for truck movements during sensitive times.
Vibration safe working distances	If vibration intensive equipment is to be used within the minimum working distances for cosmetic damage, as presented in Table 17, then a permanent vibration monitoring system should be installed.
Path controls [2]	
Shield stationary noise sources such as pumps, compressors, fans etc.	Stationary noise sources will be enclosed or shielded to the greatest extent possible whilst ensuring that the occupational health and safety of workers is maintained.
Shield sensitive receivers from noisy activities	The use of structures to shield residential receivers from noise such as the use of temporary noise barriers or curtains (where practicable). These barriers are typically hung from temporary site fencing.
Reporting and resolving noise complaints	
Report and manage noise complaints	Report and manage noise complaints in accordance with the Sydney Water ***Complaint Procedure.***
Complaints entered into the Customer Relationship Management	All complaints should be entered into the Customer Relationship Management (CRM) system including the customers' details. The complaint then needs to be assigned to the appropriate area for action. If staff are not familiar with CRM, the complaint should be reported to their direct manager and phone calls transferred to the Customer Contact Centre.
Investigated complaints	All noise complaints are to be investigated and rectified as soon as possible (e.g. amending work practices, implementing additional reasonable and feasible mitigation measures etc). Resolution of the complaint concludes with the customer being advised of actions taken to rectify issue. Noise monitoring should be considered when investigating complaints to understand if construction noise is consistent with the predictions in the noise assessment.
Works notification	Where complainant locations are likely to be affected by future works, project notifications would be provided no less than seven days before works are undertaken.
Community engagement	
Community engagement	Seek community views on the proposed work methodology via community meetings, websites and social media or any appropriate method. Community engagement must be carried out allowing sufficient time to ensure that views can be incorporated. The community engagement can be undertaken as part of the general environmental communications plan.
Community notification	Community notification would be undertaken for night-time works, not less than one week prior to commencing night work.
Noise complaint analysis	

Action required	Safeguard details
Reviewed complaints	Noise complaints are to be reviewed at least every 6 months in accordance with the Sydney Water ***Noise Management Procedure (SWEMS0056)***.
Report complaints and improvements	Complaints are to be reported and managed in accordance with the Sydney Water ***Noise Management Procedure (SWEMS0056)***.
Vibration monitoring	
Vibration monitoring	If vibration intensive equipment is to be used within the minimum working distances for cosmetic damage, as presented in Table 17, then a vibration monitoring system should be installed.

Notes:

1 – Source controls are applied 'at the source' i.e. directly applied to plant and equipment to reduce noise and/or vibration from the work site.

2 – Path controls are applied in the path between the source and the receiver to reduce noise and/or vibration from the work site eg barriers, site shed placement

6.0 Conclusions

A construction Noise and Vibration Impact Assessment has been completed for the proposed CWM renewal along Flinders Street in Surry Hills. These works are required to repair the existing DN200, DN375 and DN500 watermains which were installed in the early 1900s.

Nearby noise and vibration sensitive receivers were identified. Attended and unattended noise measurements were completed to characterise the existing noise environment. The measured noise levels were used to establish operational criteria and construction noise management levels.

The construction works are expected to be undertaken during night-time only (10:00pm to 4:30am) due to a restricted road occupancy licence. Construction work packages have been developed in consultation with Sydney Water and the proposed scenarios and equipment have been detailed within this report. Construction noise impacts were assessed at all nearby residential and other noise sensitive receivers.

The predicted construction noise levels are expected to exceed the construction noise management levels at the closest noise sensitive receivers during all construction scenarios.

Exceedances are predicted for the construction of the Flinders Street CWM. Construction mitigation measurements have been recommended to manage the construction noise impacts for the works.

Minimum working distances have been provided that allow for compliance with the construction vibration criteria. It is not considered likely that works would occur within the minimum working distances. If, however, vibration intensive works are required within these minimum working distances, mitigation measures to control excessive vibration have been outlined.

Appendix A

Acoustic Terminology

Appendix A Acoustic Terminology

Sound power level	The total sound emitted by a source.
Sound pressure level	The amount of sound at a specified point.
Decibel [dB]	The measurement unit of sound.
A Weighted decibels [dB(A)]	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:

0dB(A)	Threshold of human hearing
30dB(A)	A quiet country park
40dB(A)	Whisper in a library
50dB(A)	Open office space
70dB(A)	Inside a car on a freeway
80dB(A)	Outboard motor
90dB(A)	Heavy truck pass-by
100dB(A)	Jackhammer/Subway train
110 dB(A)	Rock Concert
115dB(A)	Limit of sound permitted in industry
120dB(A)	747 take off at 250 metres

Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high-pitched sound and a low frequency to a low-pitched sound.
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.
L_{max}	The maximum sound pressure level measured over the measurement period.
L_{min}	The minimum sound pressure level measured over the measurement period.
L_{10}	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L_{10}.

L_{90}	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L_{90}.
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.
Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L_{90} sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
Day	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
Evening	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
Night	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
Noise catchment area [NCA]	The noise environment at each of the sensitive receivers within a noise catchment area is considered to be similar to the unattended monitoring location within that NCA.
Assessment background level [ABL]	The overall background level for each day, evening and night period for **each day** of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the **entire length** of noise monitoring.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 ***"Acoustics – Glossary of terms and related symbols"***, the EPA's ***Noise Policy for Industry*** and the EPA's ***Road Noise Policy***.

Appendix B

Noise Logging

Noise Logger Report

362 South Dowling Street, Paddington

Item	Information
Logger Type	Rion NL52
Serial number	01043455
Address	362 South Dowling Street, Paddington
Location	Bottom Balcony
Facade / Free Field	Facade
Environment	Clear sky, windy, leaves rustling. Cars passing by 70-74 db(A). Truck passing by 76 dB(A). Dominated by road traffic noise on South Dowling Street and Flinders Street.

Measured noise levels

Logging Date	$L_{Aeq,day}$ 7am-6pm	$L_{Aeq,evening}$ 6pm-10pm	$L_{Aeq,night}$ 10pm-7am	ABL Day 7am-6pm	ABL Eve 6pm-10pm	ABL Night 10pm-7am	$L_{Aeq,15hr}$ 7am-10pm	$L_{Aeq,9hr}$ 10pm-7am
Tue Apr 1 2025	-	69	66	-	-	-	69	66
Wed Apr 2 2025	70	70	64	57	54	-	70	64
Thu Apr 3 2025	69	68	65	57	54	43	69	65
Fri Apr 4 2025	70	68	67	59	56	44	70	67
Sat Apr 5 2025	70	68	66	-	59	46	70	66
Sun Apr 6 2025	67	70	66	51	53	46	68	66
Mon Apr 7 2025	70	70	64	57	54	45	70	64
Tue Apr 8 2025	70	72	63	57	-	-	70	63
Wed Apr 9 2025	70	68	67	-	56	-	69	67
Thu Apr 10 2025	69	68	65	58	56	44	69	65
Fri Apr 11 2025	70	69	67	58	58	45	69	67
Sat Apr 12 2025	68	67	65	54	57	47	68	65
Sun Apr 13 2025	68	67	66	52	53	46	68	66
Mon Apr 14 2025	70	-	65	-	-	-	70	65
Summary	**69**	**69**	**66**	**57**	**56**	**45**	**69**	**66**

Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

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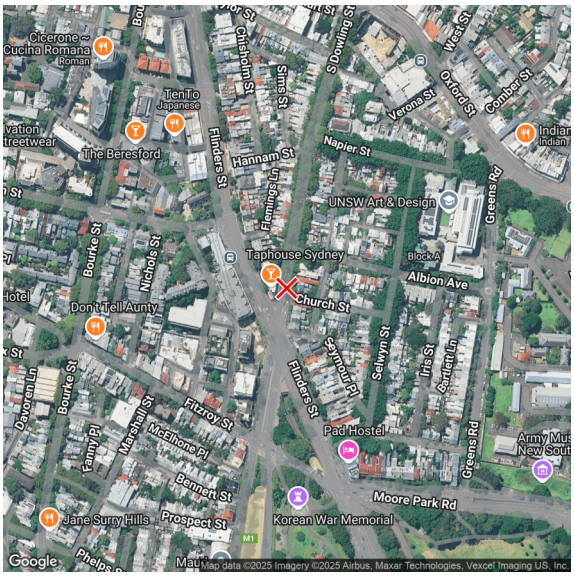	

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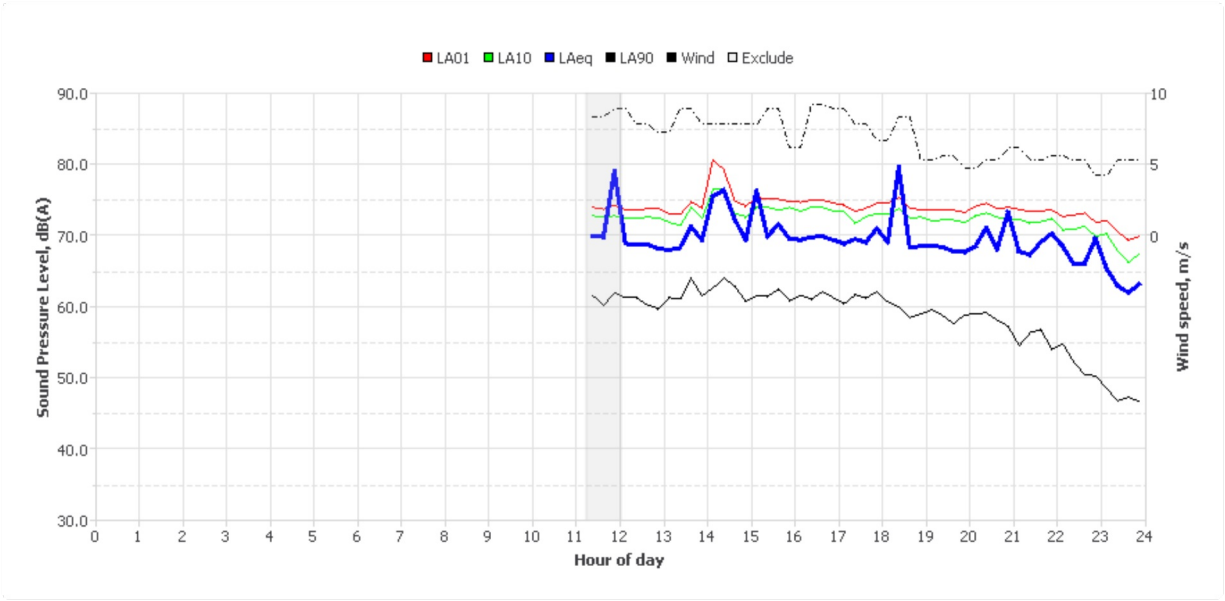

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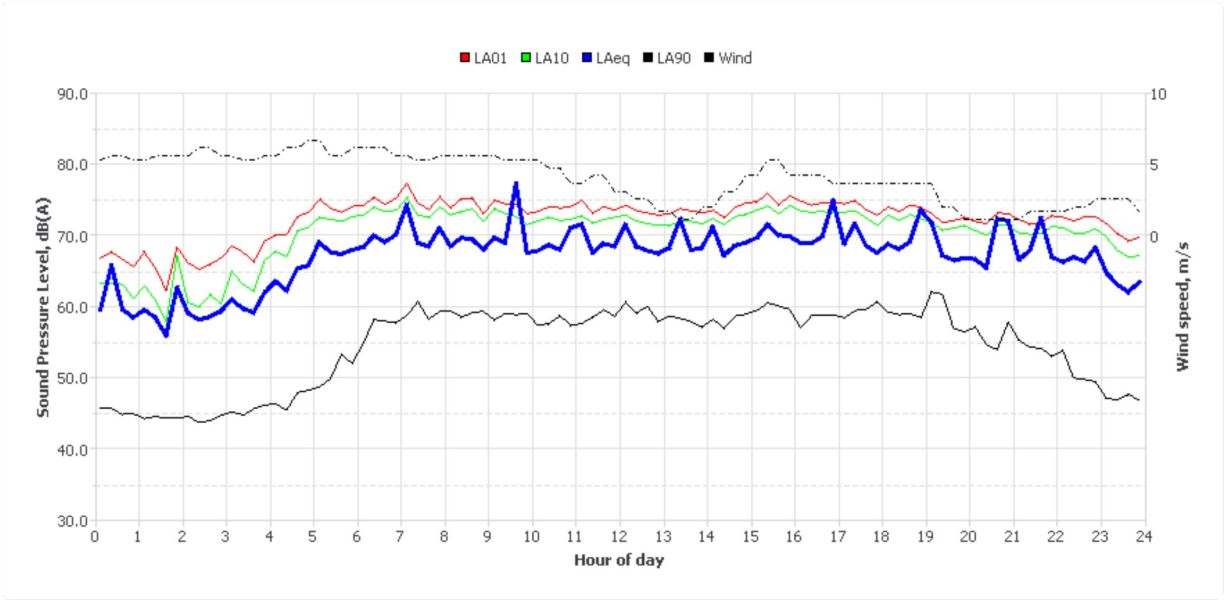

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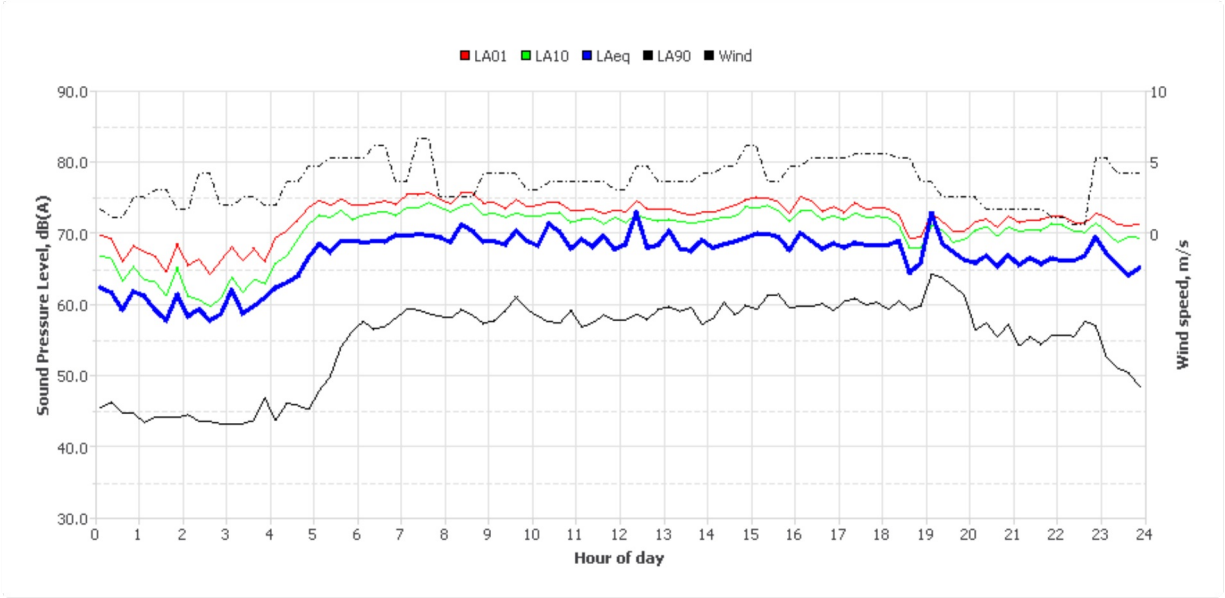

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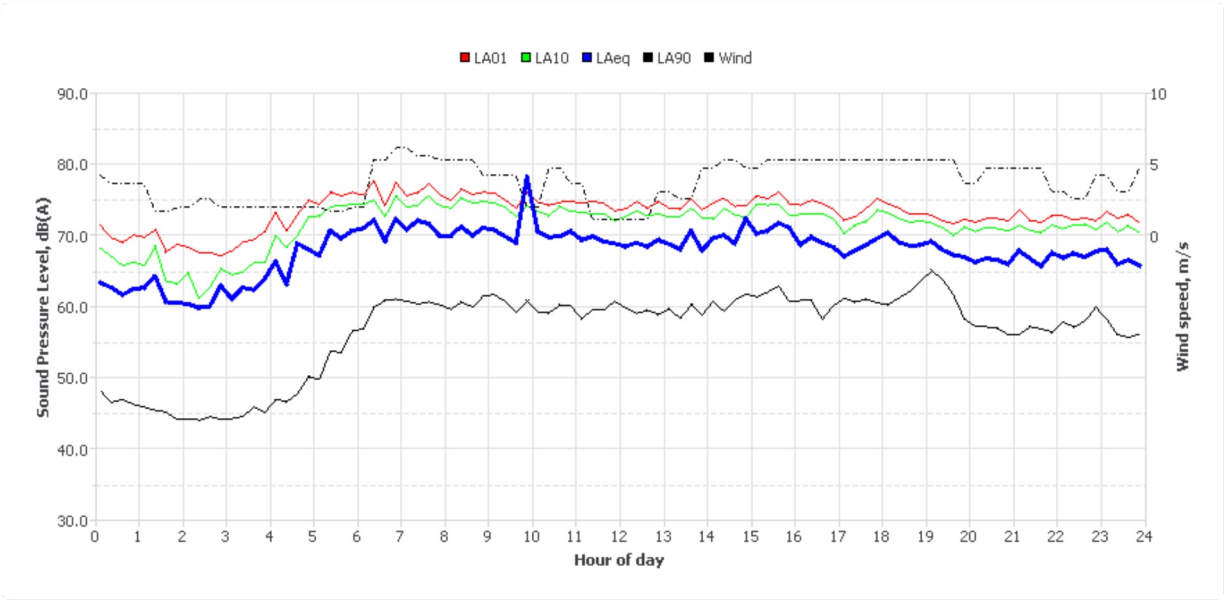

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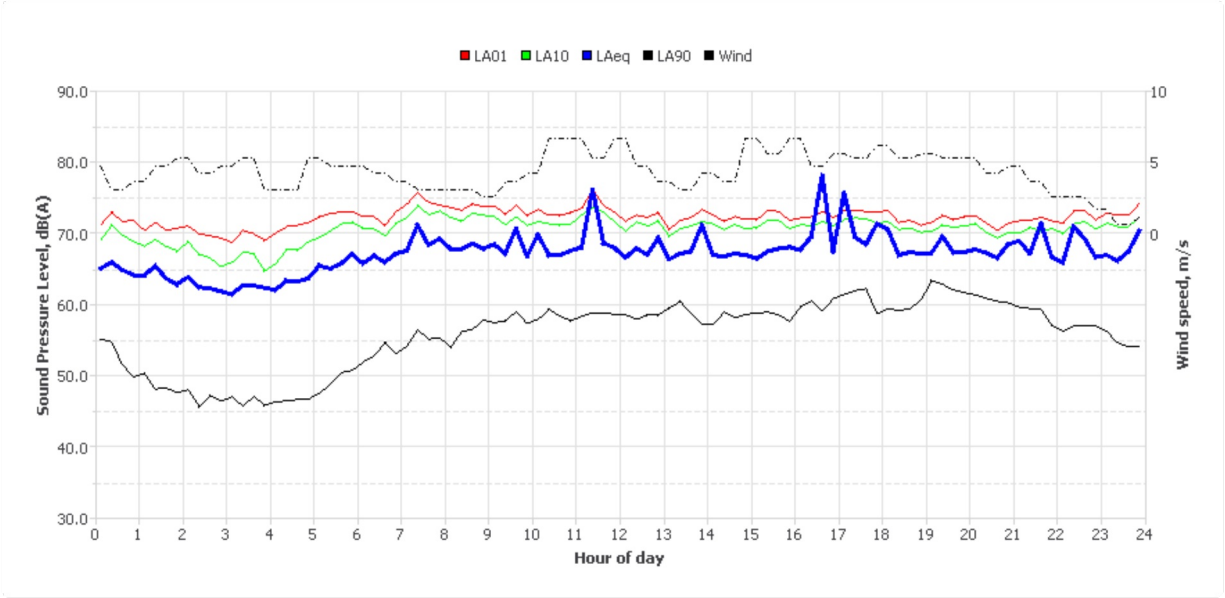

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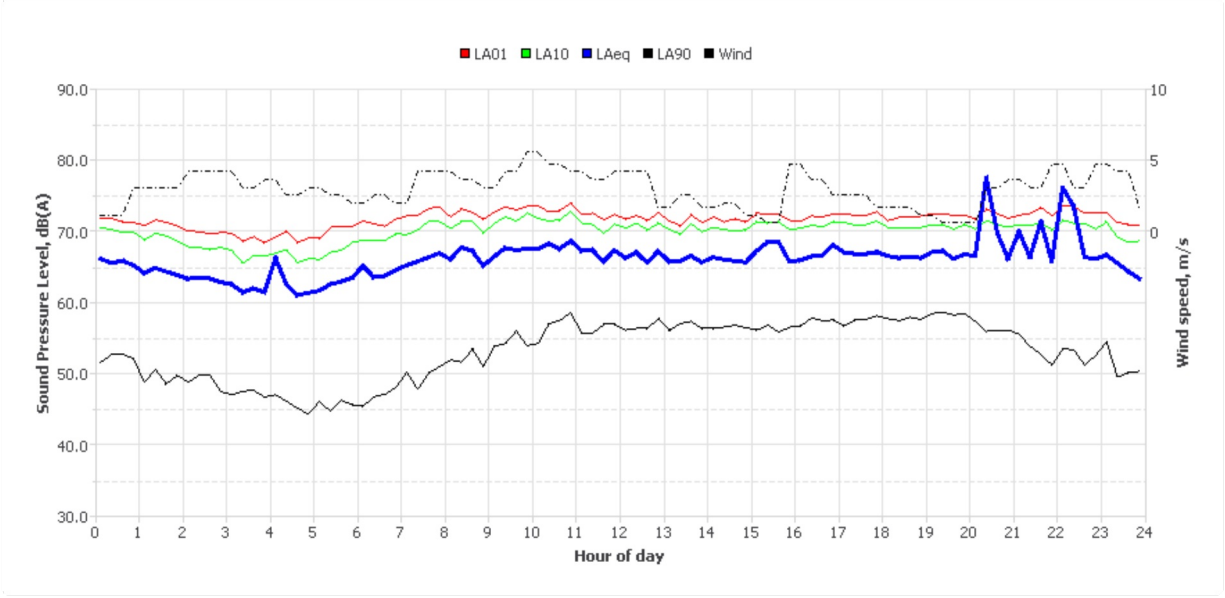

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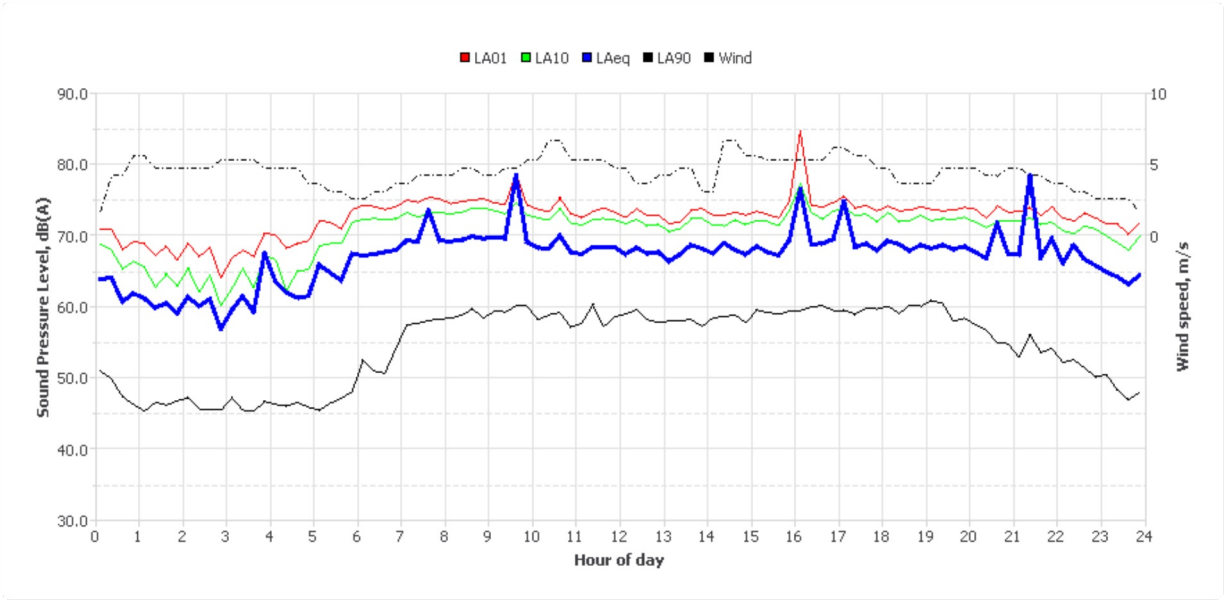

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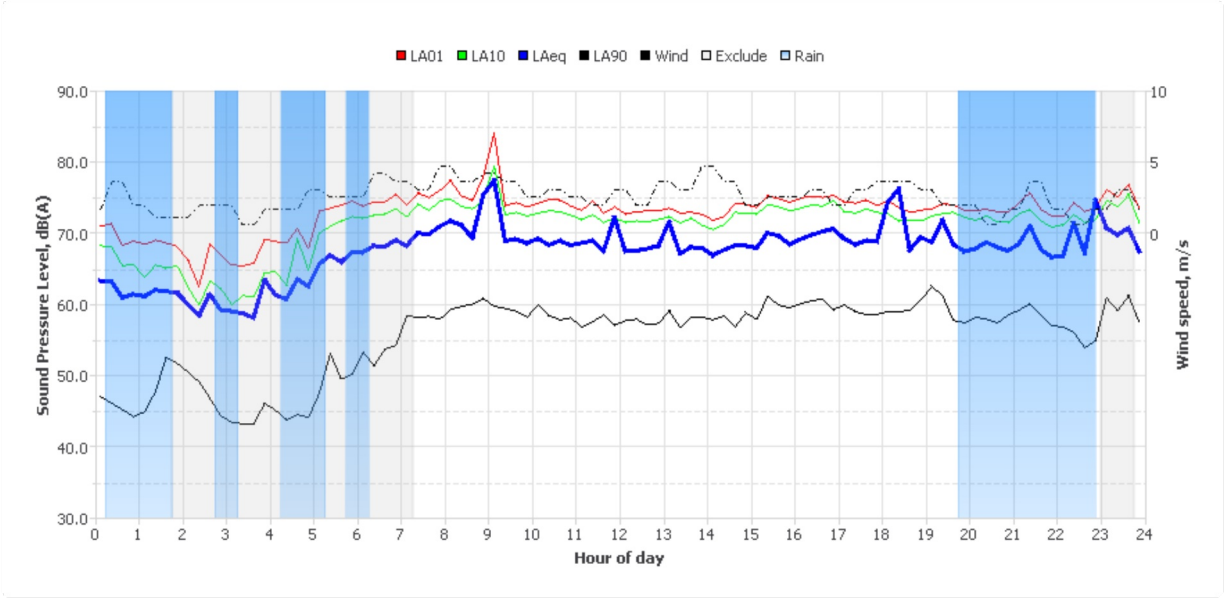

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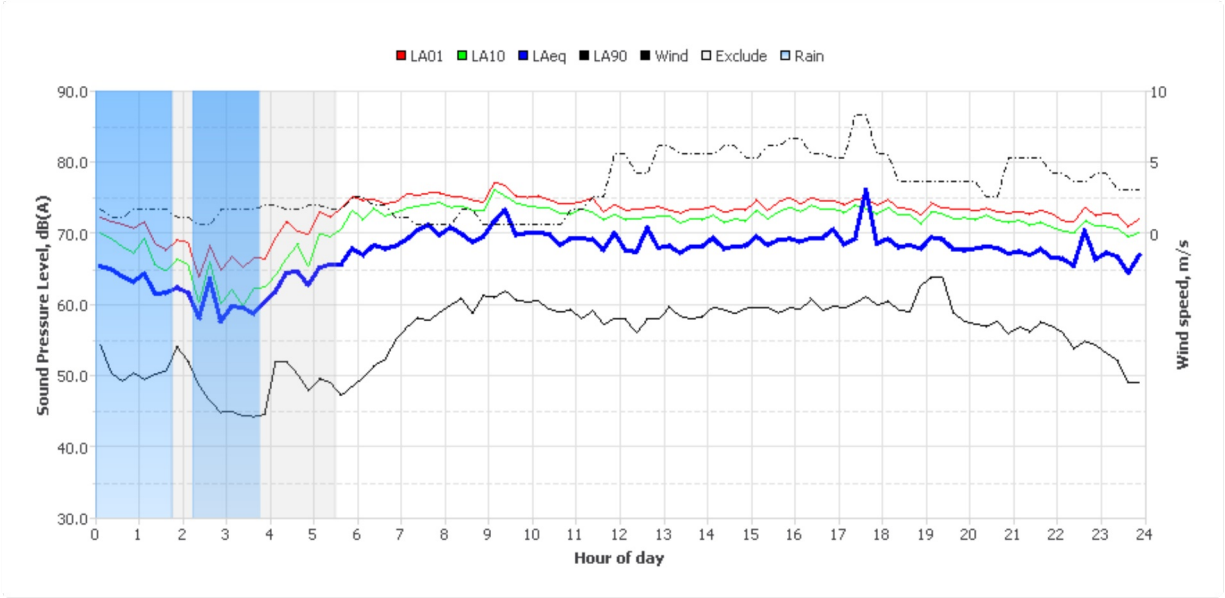

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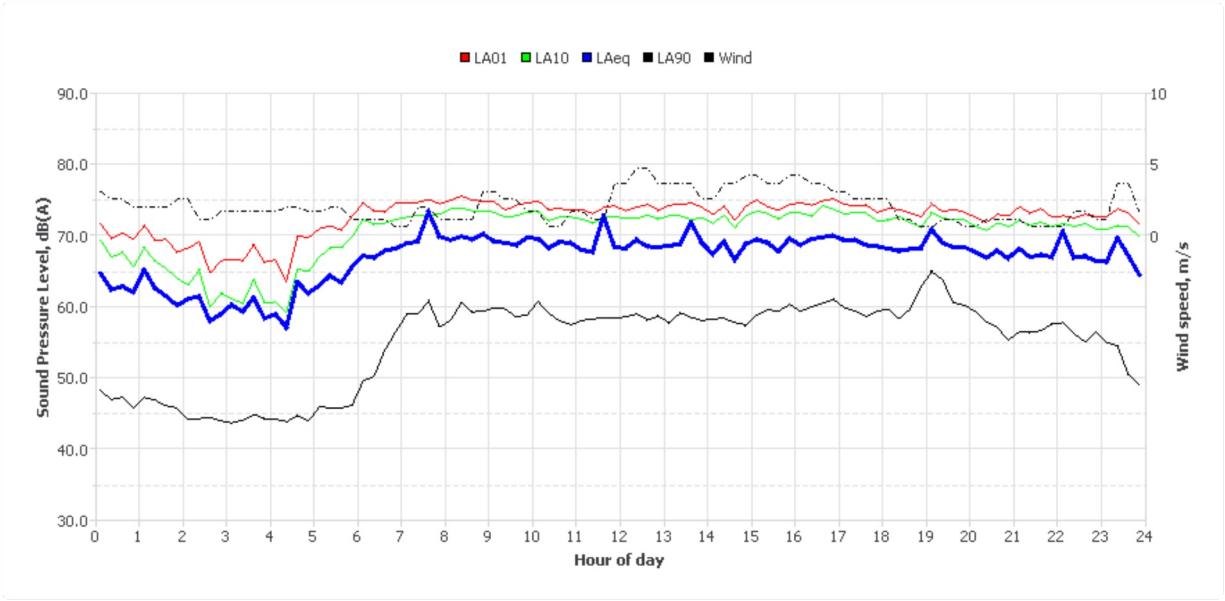

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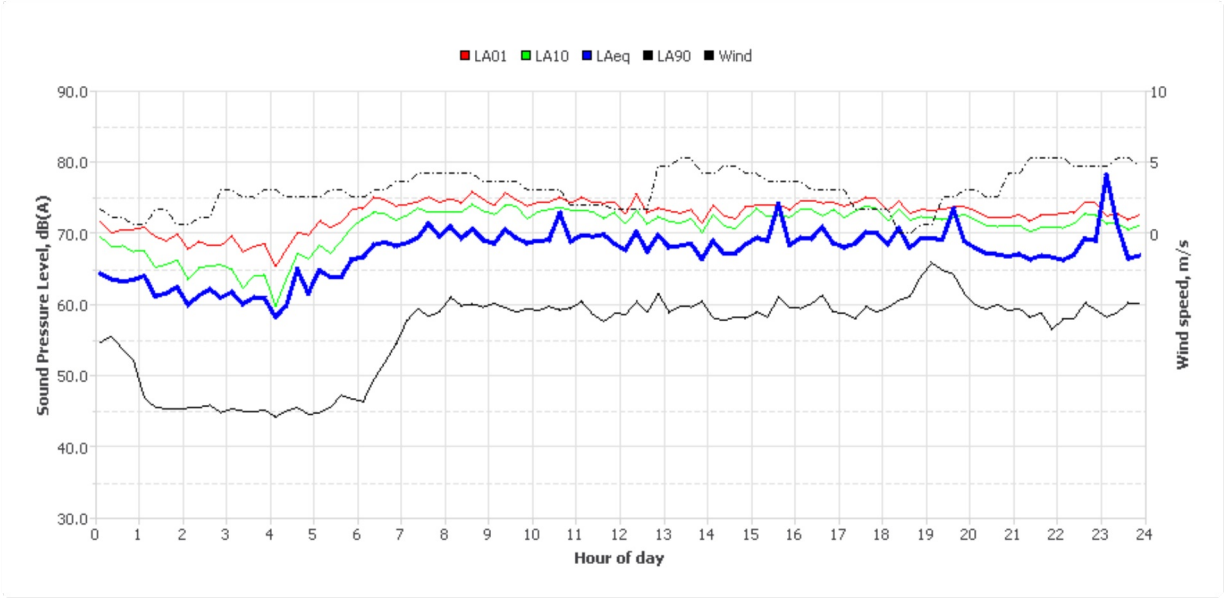

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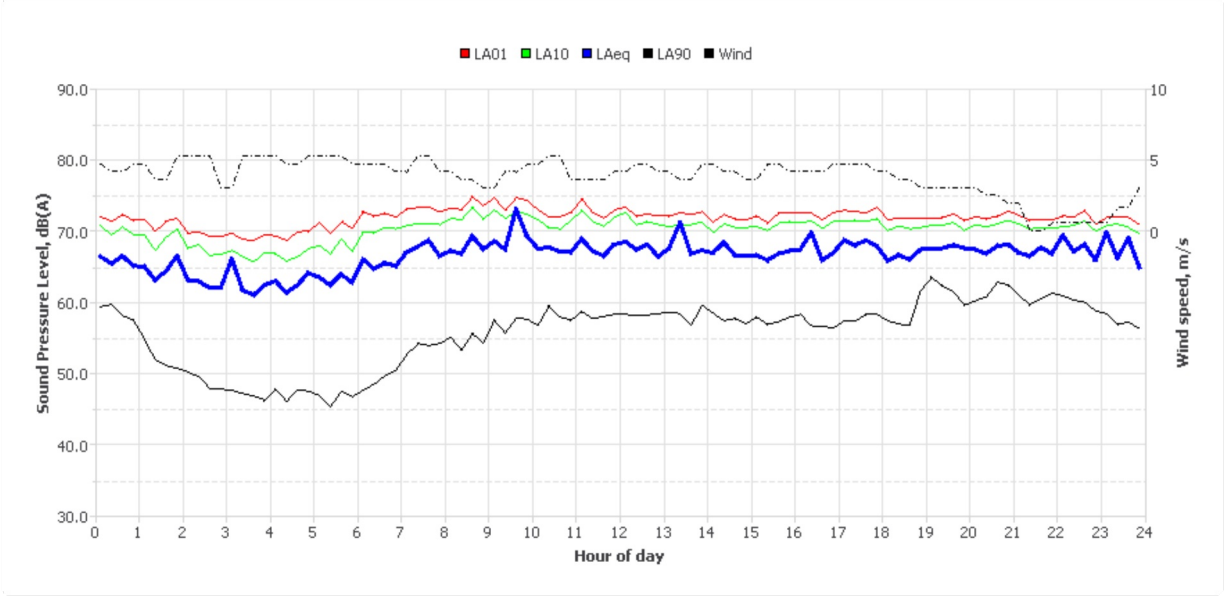

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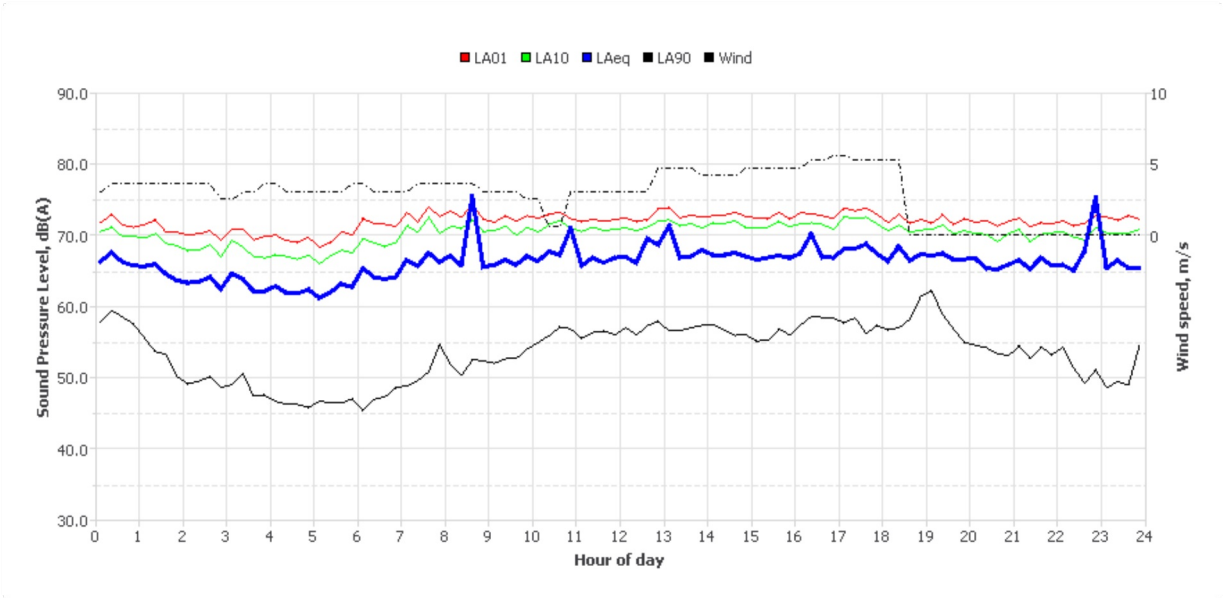

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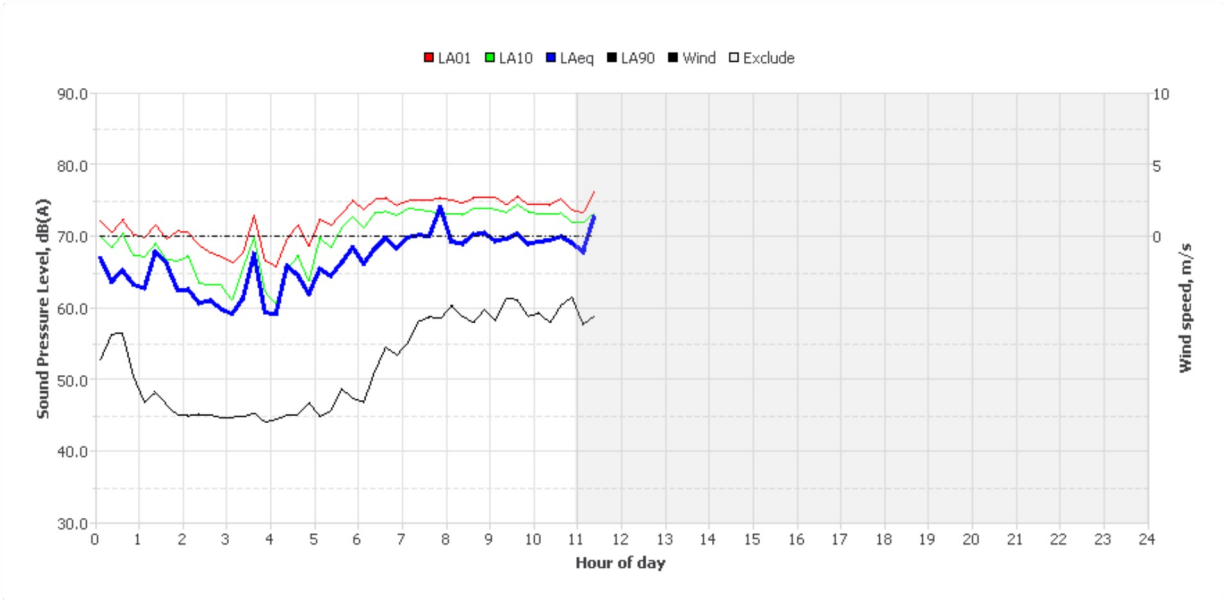

Noise Logger Report

82 Wallis Street, Woollahra

Item	Information
Logger Type	Rion NL52
Serial number	164394
Address	82 Wallis Street, Woollahra
Location	Bottom Balcony
Facade / Free Field	Facade
Environment	Clear sky, windy. Cars on Oxford Street 64-65 dB(A). Truck passing along Oxford Street 72 dB(A). Car pass by on Wallis Stret 65-66 dB(A). Dominated by road traffic noise on Oxford Street.

Measured noise levels

Logging Date	$L_{Aeq,day}$ 7am-6pm	$L_{Aeq,evening}$ 6pm-10pm	$L_{Aeq,night}$ 10pm-7am	ABL Day 7am-6pm	ABL Eve 6pm-10pm	ABL Night 10pm-7am	$L_{Aeq,15hr}$ 7am-10pm	$L_{Aeq,9hr}$ 10pm-7am
Tue Apr 1 2025	-	62	59	-	-	-	62	59
Wed Apr 2 2025	63	63	57	55	54	-	63	57
Thu Apr 3 2025	63	63	58	55	54	35	63	58
Fri Apr 4 2025	63	62	59	55	54	38	62	59
Sat Apr 5 2025	62	62	59	-	54	41	62	59
Sun Apr 6 2025	62	63	58	52	52	41	62	58
Mon Apr 7 2025	62	62	57	55	54	41	62	57
Tue Apr 8 2025	64	64	55	55	-	-	64	55
Wed Apr 9 2025	64	63	60	-	55	-	64	60
Thu Apr 10 2025	63	63	57	55	55	35	63	57
Fri Apr 11 2025	64	63	59	55	54	36	63	59
Sat Apr 12 2025	63	62	59	55	55	43	63	59
Sun Apr 13 2025	62	62	58	51	53	41	62	58
Mon Apr 14 2025	63	-	55	-	-	-	63	55
Summary	**63**	**63**	**58**	**55**	**54**	**41**	**63**	**58**

Note: Results denoted with '-' do not contain enough valid data for a value to be calculated. The data has been excluded either manually or automatically as a result of adverse weather conditions.

Logger Location	Logger Deployment Photo
	

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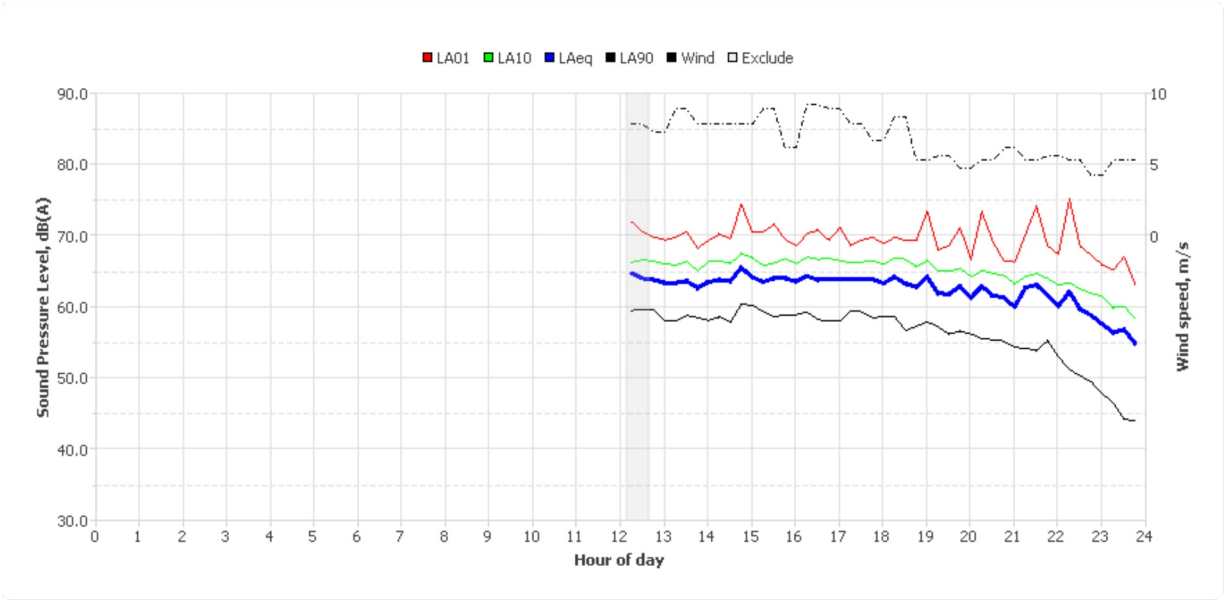

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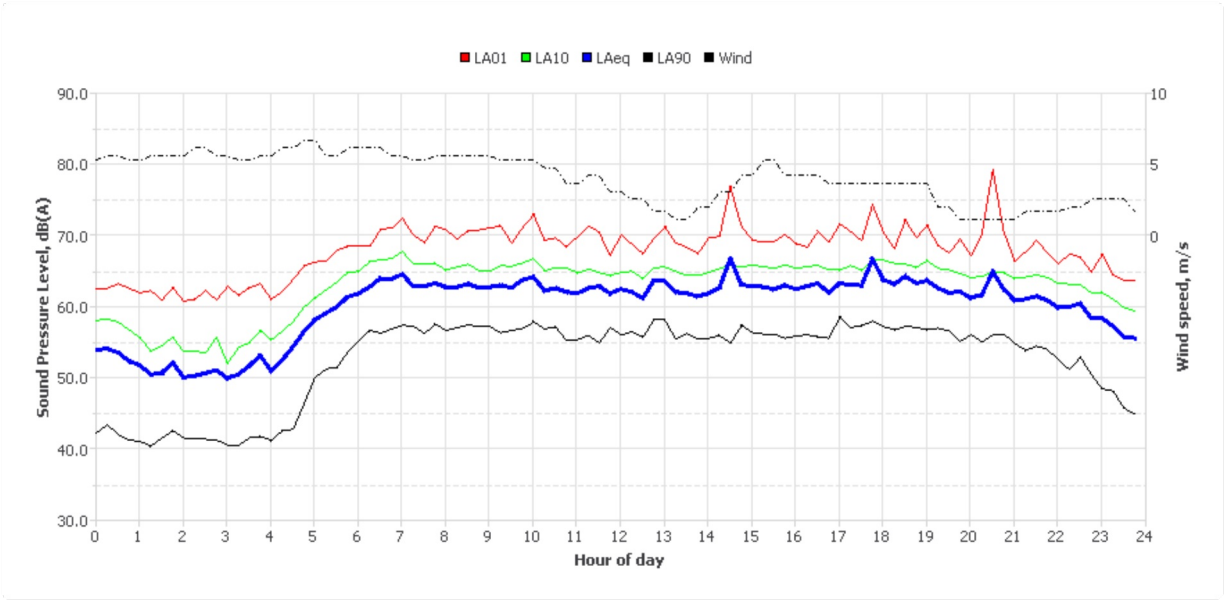

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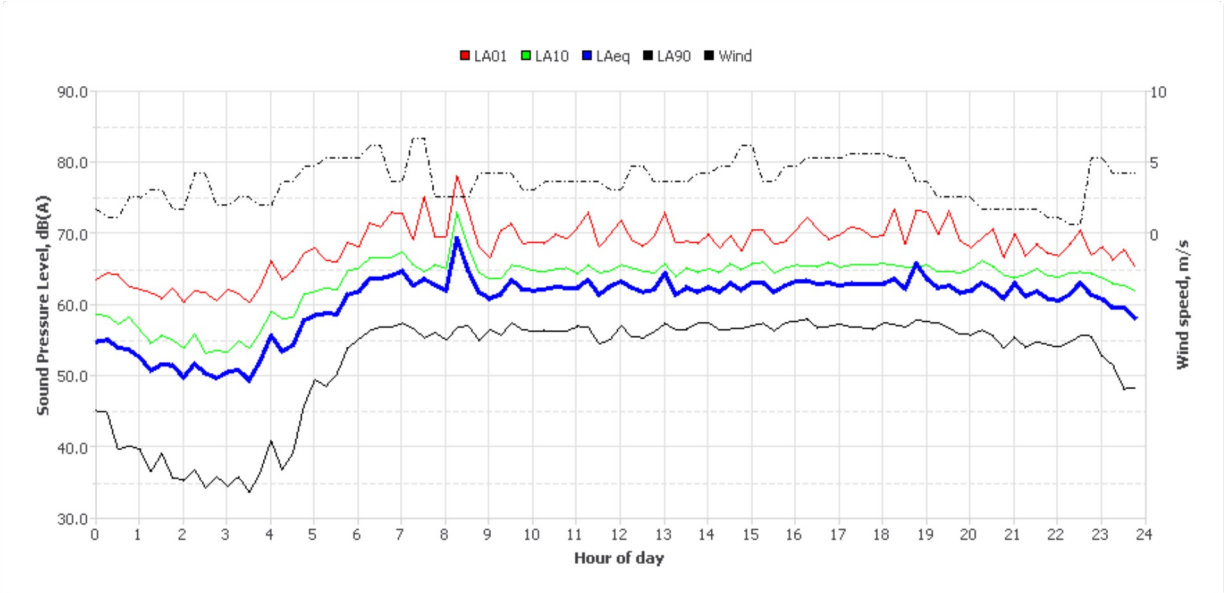

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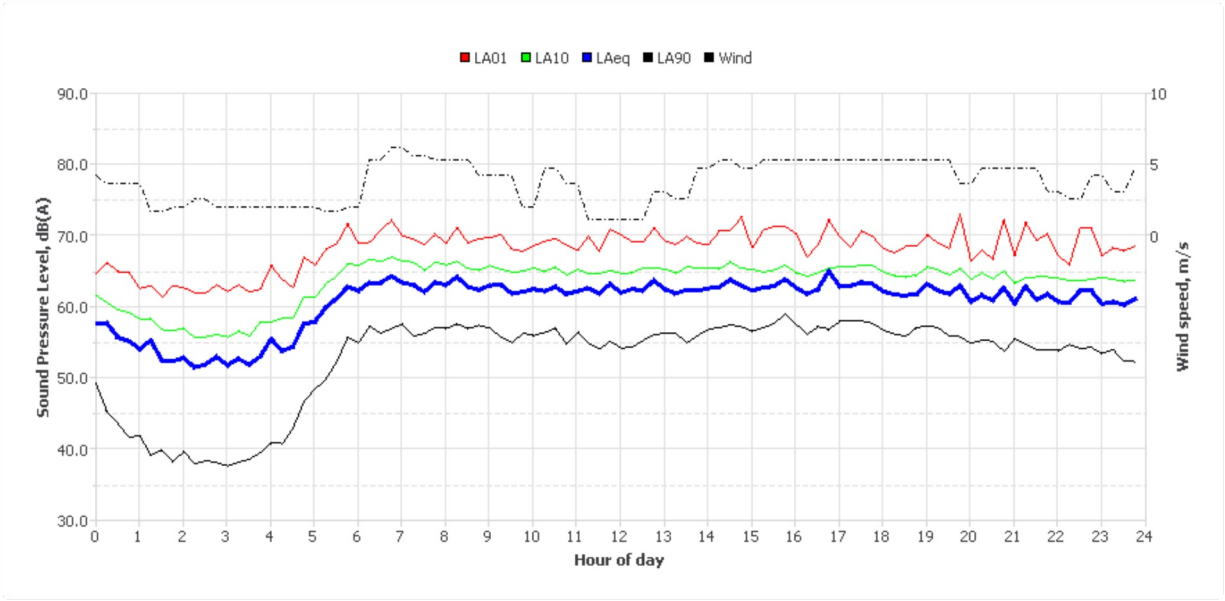

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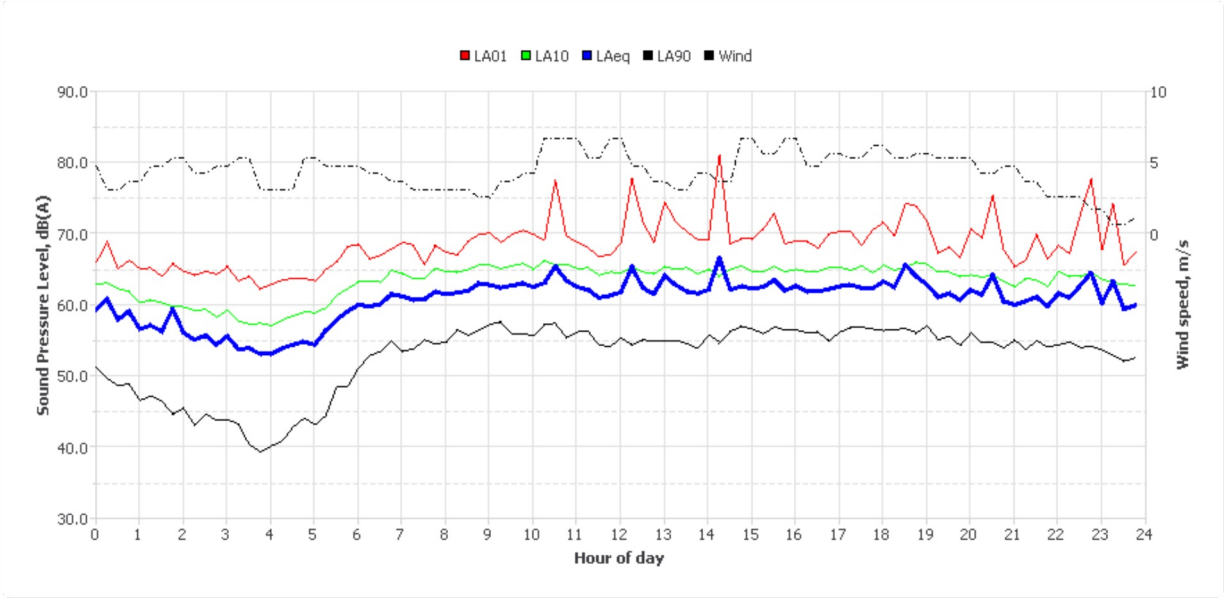

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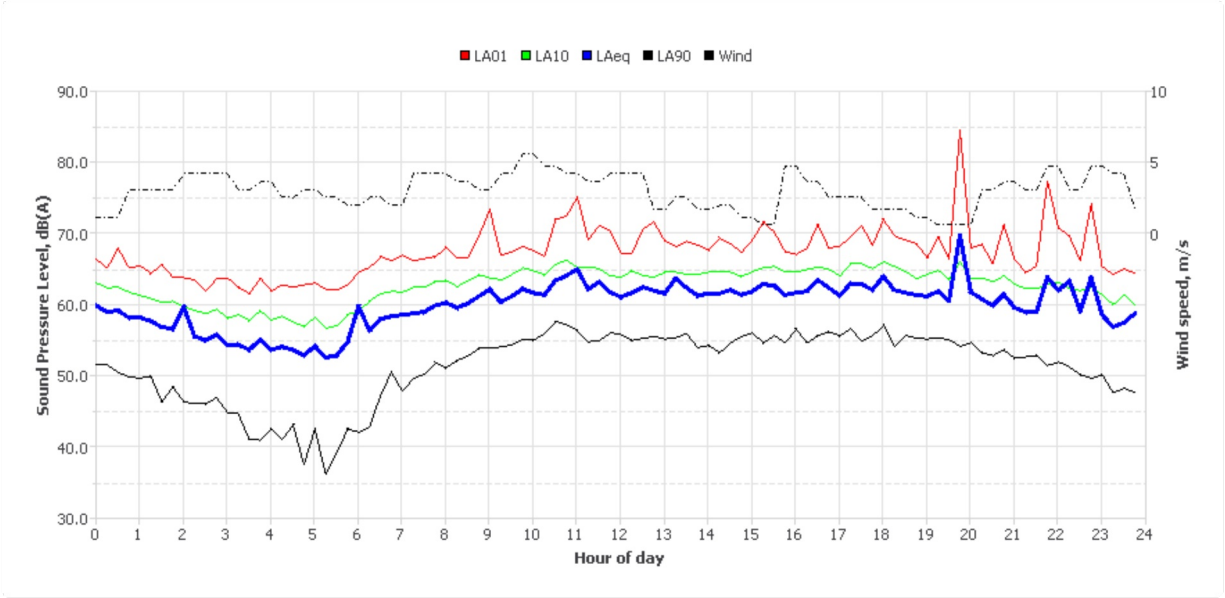

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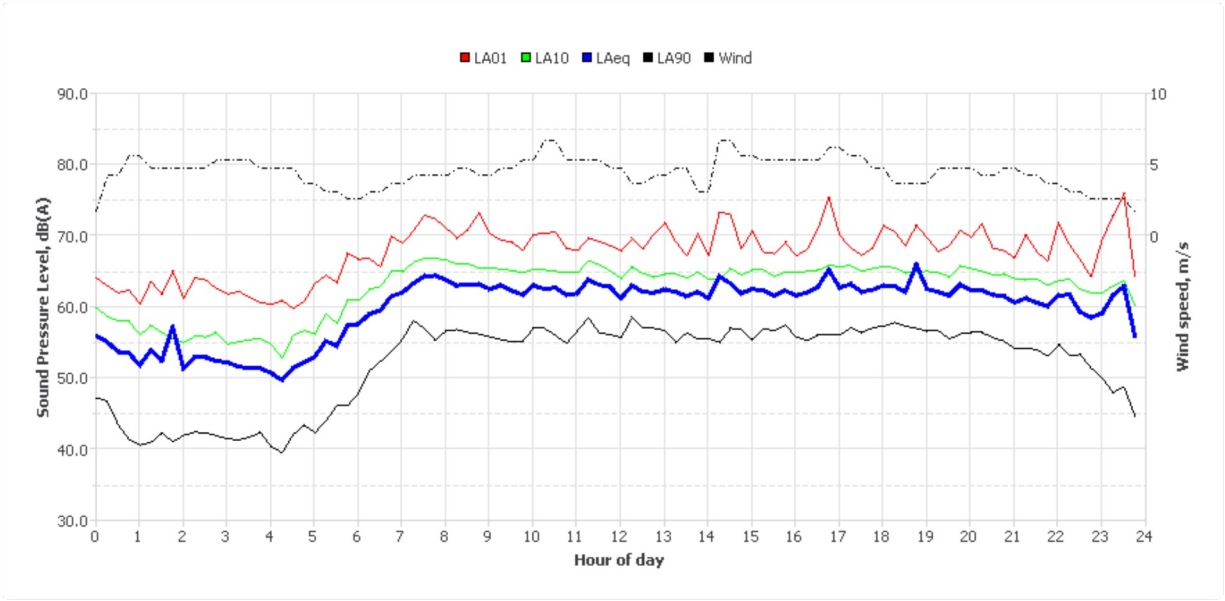

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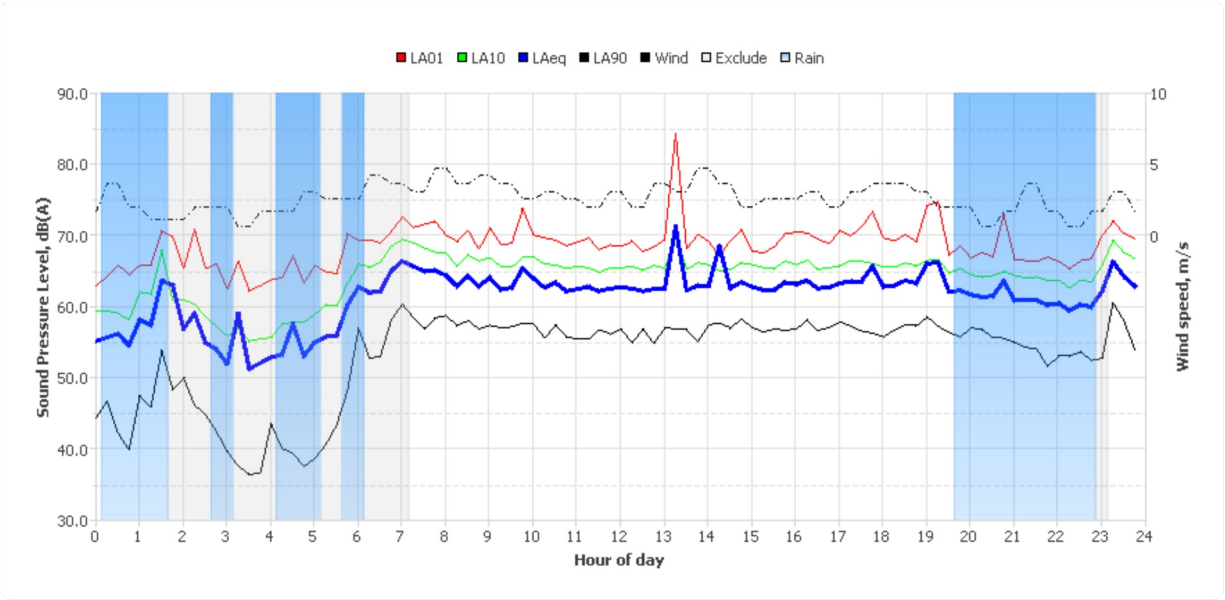

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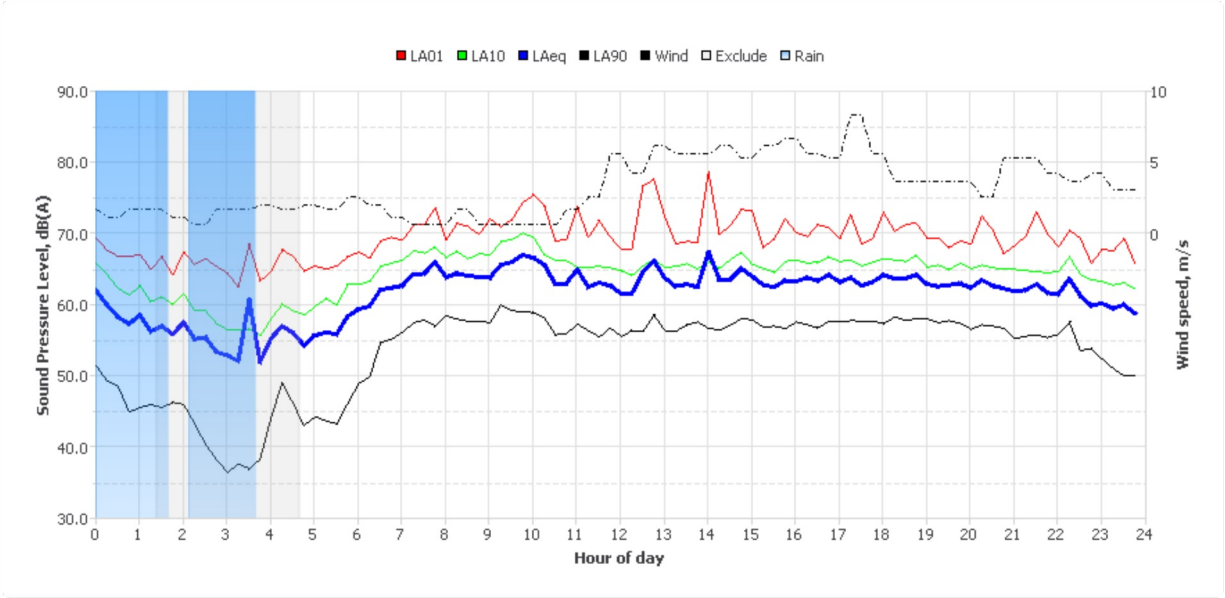

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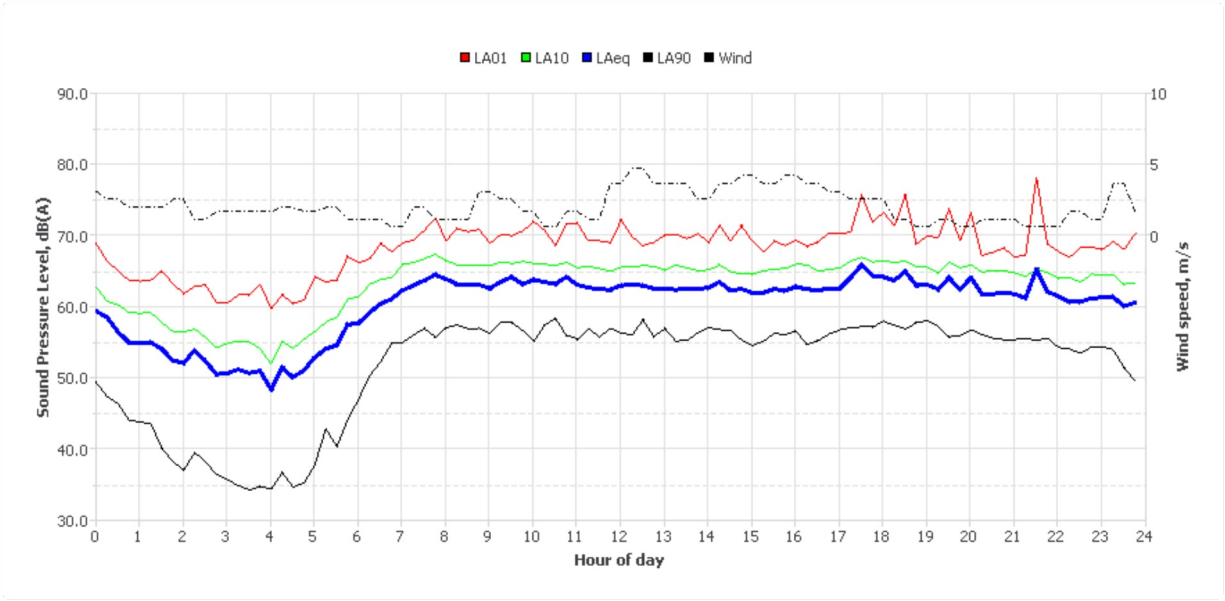

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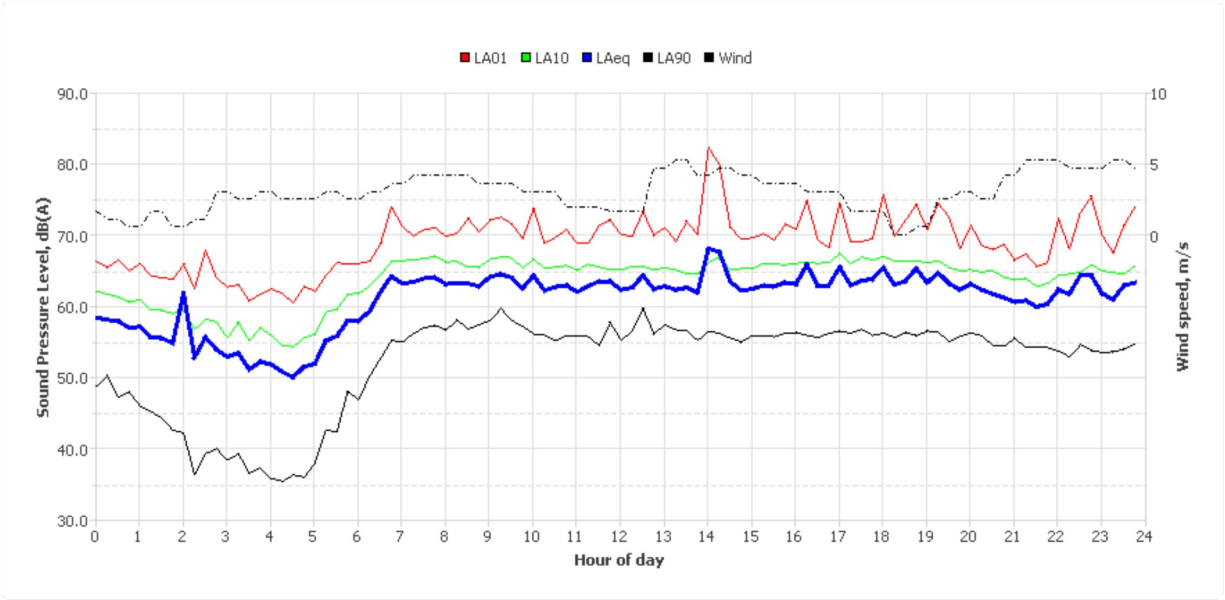

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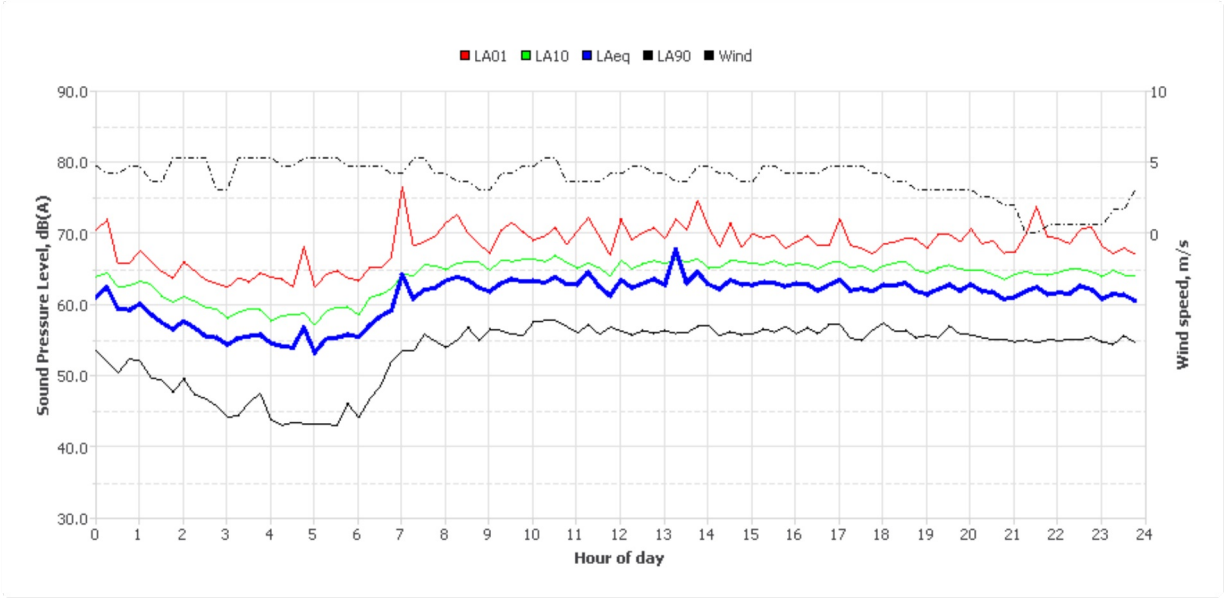

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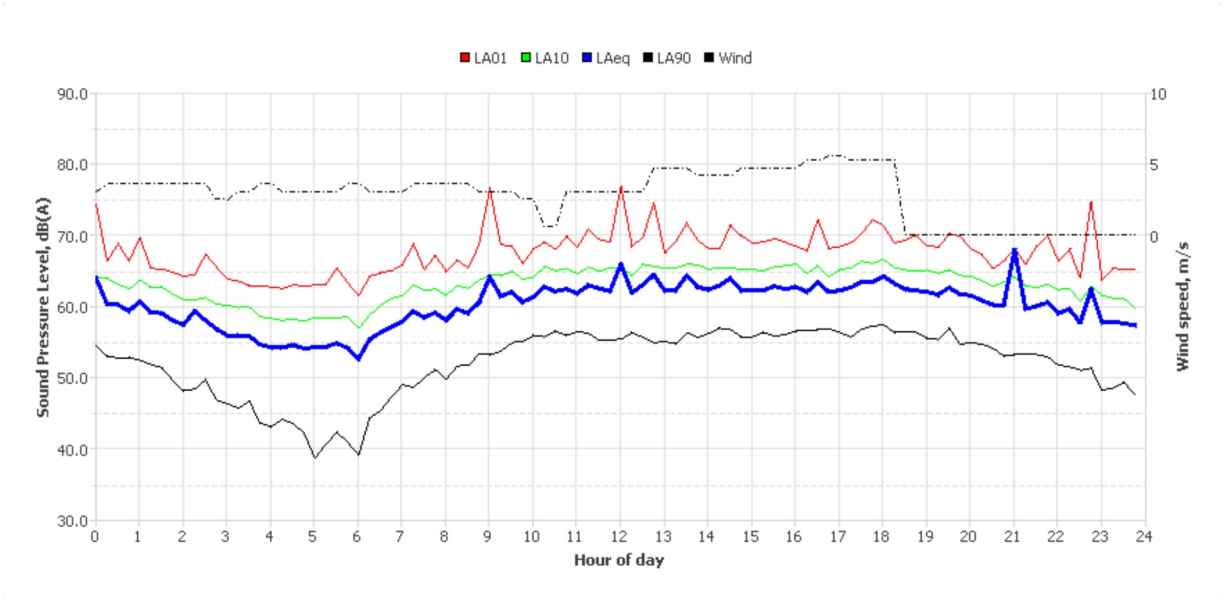

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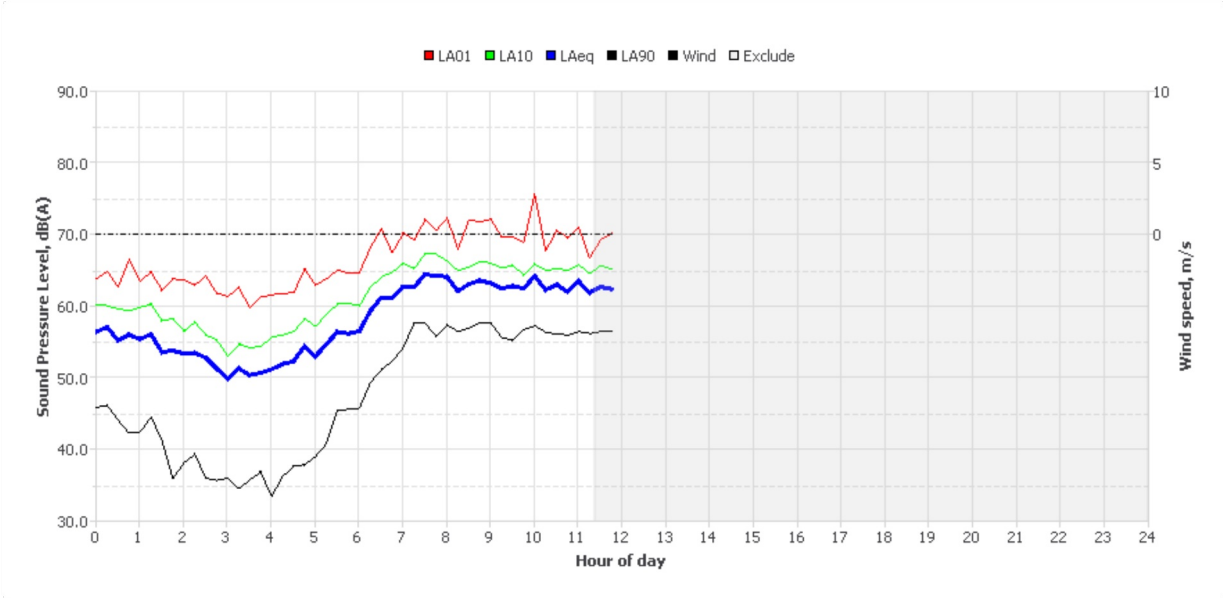
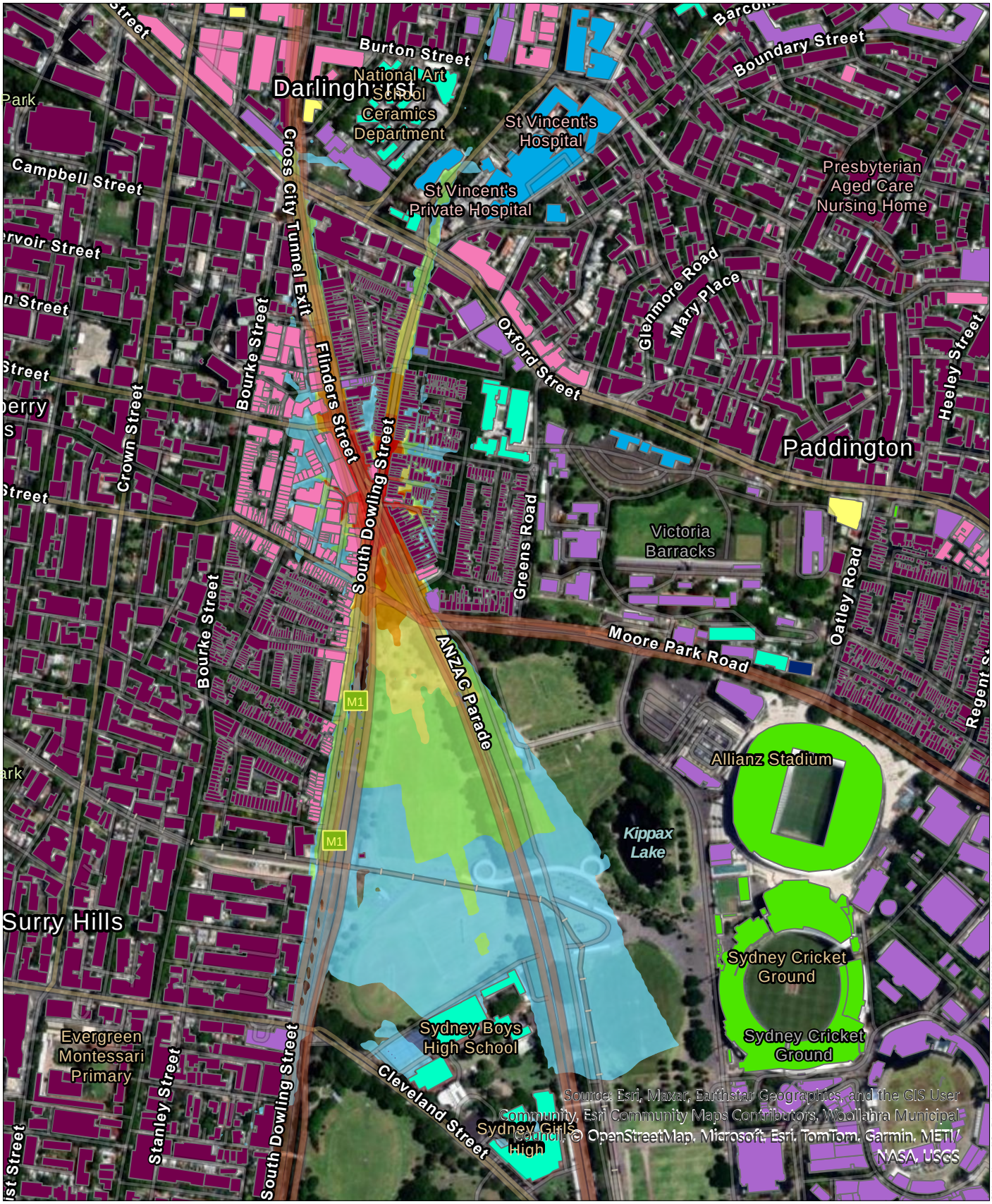


Appendix C

Construction Noise Contour Plots



Flinders Street CWM - Construction Contours
Scenario 1 - Excavation

Usage

- Residential
- Commercial
- Mixed Use
- Education
- Active Recreation
- Medical
- Place of Worship

- Child Care
- Community
- Industrial

Predicted Noise Level $L_{Aeq,15min}$ dB(A)

45-50 | 50-55 | 55-60 | 60-65 | 65-70 | >70

N

0 100 200 Meters

AECOM

Source: Nearmap 2025.

Flinders Street CWM - Construction Contours
Scenario 2 - Installation, backfilling and reinstating

Usage

- Residential
- Commercial
- Mixed Use
- Education
- Active Recreation
- Medical
- Place of Worship
- Child Care
- Community
- Industrial

Predicted Noise Level $L_{Aeq,15min}$ dB(A)

45-50 | 50-55 | 55-60 | 60-65 | 65-70 | >70

N

0 100 200 Meters

AECOM

Source: Nearmap 2025.

Flinders Street CWM - Construction Contours
Scenario 3 - Stockpiling and transferring waste material

Usage

- Residential
- Commercial
- Mixed Use
- Education
- Active Recreation
- Medical
- Place of Worship
- Child Care
- Community
- Industrial

Predicted Noise Level $L_{Aeq,15min}$ dB(A)

45-50 | 50-55 | 55-60 | 60-65 | 65-70 | >70

N

0 100 200 Meters

AECOM

Source: Nearmap 2025.

Appendix D – Section 57 exemption

Section 57 Exemption Record

Standard Section 57 Exemption

Project: Critical Water Mains Renewal – Flinders Street, Darlinghurst

1. Purpose

This document has been prepared as a record of the heritage impact assessment undertaken for proposed works to a heritage item listed on the NSW State Heritage Register, in accordance with **Standard Exemptions** under Section 57(2) of the ***Heritage Act 1977*** in Government Gazette No 262, 17 June 2022.[1]

2. Heritage Context

The proposed works relate to the heritage item described as ***Sydney Mardi Gras Parade Route***, which is listed on the NSW Heritage Register as **Item #02068**, and comprises the roads and public open spaces along Oxford Street, Flinders St and Anzac Parade, including Taylor Square and the former Darlinghurst Police Station.

The current Statement of Significance for the heritage item is included hereunder:

> ***The Sydney Mardi Gras Parade Route along lower Oxford Street, Flinders Street and Anzac Parade within Moore Park has state heritage significance for its historic, associative, research, representative and rarity values, as the focus and the evolving site of Sydney's Mardi Gras parades from their beginning in 1978. These streets represent a window into alternative Sydney subcultures, a landscape where political protests, cultural festivals, shops, services and celebration of diversity have been made the most public, over decades. The Mardi Gras Parades build on a longer history of major public parades along Oxford Street, formerly South Head and Old South Head Road.***
>
> ***The corridor of space along these streets leading from Hyde Park South to Moore Park and the Hordern Pavilion and Hall of Industries where post-Mardi Gras-parade dance parties have been held since 1982 is known beyond Australia as the face of Queer Sydney and Australia, a beacon of tolerance, resilience, political activism and gradual community acceptance and celebration. As a public platform for reclaiming public space by formerly oppressed minorities, this trio of roads takes on a different meaning and purpose at least once a year, as the site of the Mardi Gras Parades.***
>
> ***Sydney Gay and Lesbian Mardi Gras is one of Australia's most famous and well-loved events, bringing tens of thousands of visitors to Sydney to join in celebrations.***
>
> ***The former Darlinghurst Police Station is of state heritage significance as the place where protesters at the original Mardi Gras were arrested and locked up in 1978. This over-reaction and harsh***

[1] https://gazette.nsw.gov.au/gazette/2022/6/2022-262.pdf

treatment led to the ongoing and growing Mardi Gras Parades and ongoing community and political activism, which continues.

The Oxford Street section of the route has state historic significance as part of possibly the oldest highway in Australia and one of the oldest major roads in New South Wales, which connected the settlement at Sydney Cove with the Signal Station or Lookout Post at South Head from 1790, quickly grew as an artery and an asset, militarily, commercially and recreationally. Oxford Street was, if not the birthplace, one of the most productive nurseries of mod-Oz restaurant food.

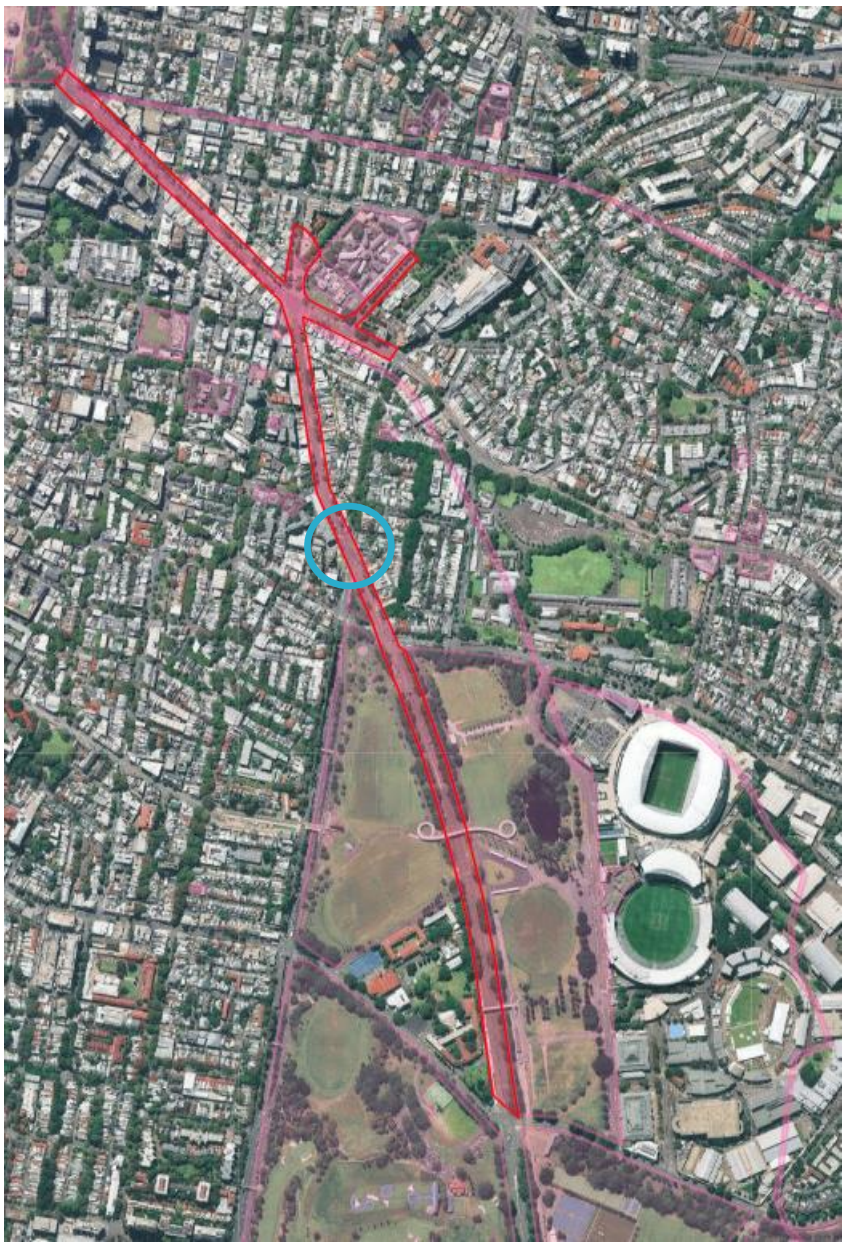
The Sydney Mardi Gras Parade Route has historic associations with a range of individuals and groups responsible for road construction, widening and boulevarding, resumption and rebuilding, design of the former Darlinghurst Police Station and LGBTIQA+ activism from the 1970s to today.

The route has social and cultural values at state level for its nineteenth century roles in connecting city, coast and beaches, later increasing urbanisation and evolution as population waves came and went, diversification and increasing sophistication in the late twentieth century.

The route has research potential at state level to inform cultural studies and social history around LBGTIQA+ gender and diverse communities, migration and working class history, town planning history and more.

Sydney Mardi Gras Parade Route is both rare as the singular site in New South Wales that saw public protests begin and accelerate seeking equal human rights, reformed legislation, community organisations and support for LBGTIQA+ communities, and is representative at state level of an early colonial road (in fact two, counting Anzac Parade and Flinders Street as a second), a Victorian High Street with a rich Edwardian and Victorian array of architecture and mix of land uses and services

An extract of Sydney Water's GIS Spatial system is included below, showing the location and curtilage of the subject heritage item.



Above: Extract of heritage map showing the Sydney Mardi Gras Parade Route, outlined in red. The location of the proposed works is shown circled in blue.

3. Proposal

The proposal is part of the Critical Watermain Renewals program as detailed in the Multi-program REF.

The proposal involves renewal of existing DN375 and DN500 watermains installed in the early 1900s.

The proposed methodology for stage 1 includes:

- ***Site establishment:***
- ***Investigations e.g. potholing and soil sampling compound setup, material deliveries, and installing traffic control.***
- ***Convention Lay:***

- ***saw cutting and excavations to a depth of 2.5 metres at greatest and 1.5 metres on average for conventional lay***
- ***preparing and welding pipes at the compound***
- ***transporting the pipes to site***
- ***conventional lay of 24m of DN200 SCL cross connection between the DN300 CICL and DN150 CICL mains at the South Dowling St and Flinders St intersection***
- ***removing traffic control and installing road plates over any open excavations (between each shift).***

- ***Connection works:***
  - ***upfront connection to existing DN375 main***
  - ***ozone and pressure works.***

(These works will facilitate the isolation of the DN500 main during future slip lining works and also provide some Operational assistance in case the DN500 CICL leaks as this can be isolated more effectively and the new cross connection can assist in supplying the wider SW network).

- ***Site demobilisation:***
  - ***backfilling and reinstating road pavement***
  - ***demobilising site including completing all resurfacing, and demobilising compound (at end of construction).***

The location and extent of the proposed works are shown in the Figure in Appendix 1 below.

4. Approval Framework

The proposal is located within the curtilage of a heritage item listed on the NSW State Heritage Register, and therefore approval under the ***Heritage Act 1977*** is required. However, Standard, State-Agency and Site-specific Exemptions from the need to seek approval may be available. A complete list of the Standard Section 57 Exemptions is located here https://gazette.nsw.gov.au/gazette/2022/6/2022-262.pdf.

This proposal has been assessed against the specified activities and relevant standards of the Standard, State-Agency and Site-specific Exemptions issued under Section 57(2) of the ***Heritage Act 1977*** (Government Gazette No. 262, 17 June 2022) and has been found to meet the requirements for the following Standard Exemption:

- **Standard Exemption 3: Alteration to Non-Significant Fabric**

The following table provides a detailed assessment of the works against the Exemption criteria.

Table 1 Assessment of works against Standard Exemption 3.

Specified Activity / Relevant Standard	Discussion
Specified activities/ works: a) The alteration of an item involving the introduction of new fabric and/or the removal of non-significant fabric.	The works are for the installation of a cross-connection between two Critical Water Mains within the curtilage of the State Heritage Item. The works will be entirely through the road pavement with no permanent alteration to the road surface and will not have any substantive effect upon any significant fabric of the ***Sydney Mardi Gras Parade Route*.**
b) The specified activities/ works must not impact the heritage significance of the item.	Complies. As above: The works will occur in a trench to be excavated in the roadway within the statutory curtilage, with the road made good after the pipe is laid. It will not have any substantive effect upon any significant fabric of the ***Sydney Mardi Gras Parade Route*.**
c) Significant fabric of the item must not be impacted.	Complies. No significant fabric of the ***Sydney Mardi Gras Parade Route*** will be impacted by the proposed works. The works will occur in the roadway of Flinders Street within the statutory curtilage but will not have any substantive effect upon any significant fabric.
d) Relics must not be impacted.	Complies. Excavation is proposed within a long-established roadway but no relics are likely to be impacted by the proposed works. The roadway has been established since the early nineteenth century and has never been subject to building works, apart from the various pavements for the roadway. An Unexpected Finds Protocol will be implemented for the excavation works.
e) Work must not involve construction of extensions or additions where these may impact the item's setting, views to or from the item, obscure existing significant fabric, impact relics and/or impact significant landscape layout, landscape elements or vegetation.	Complies. The proposed works will not impact the setting or views to or from the ***Sydney Mardi Gras Parade Route.*** The proposed works will not obscure existing significant fabric or impact any relics. There will be no alteration to any significant landscape layout, landscape elements or vegetation.
f) The positioning and size of walls, windows and doors is not altered.	Complies. There will be no effect upon any significant built fabric relating to the ***Sydney Mardi Gras Parade Route.***
g) Significant finishes, surfaces (including flooring) and fixtures must not be impacted.	Complies. There will be no effect upon any significant built fabric relating to the ***Sydney Mardi Gras Parade Route.***
h) Any new fabric must be sympathetic to but can be distinguished from the appearance, composition, detailing, size, position and finish of existing fabric.	Complies. There will be no effect upon any significant built fabric relating to the ***Sydney Mardi Gras Parade Route.*** No new permanent fabric will be introduced above ground to the site and the temporary barriers will be removed at the end of the works.

Specified Activity / Relevant Standard	Discussion
i) Non-significant fabric must be identified as non-significant fabric in the listing on the State Heritage Register or the gazetted Interim Heritage Order, or a Conservation Management Plan, Conservation Management Strategy, Heritage Collections Plan, Archaeological Management Plan or Aboriginal Place Management Plan or identified as non-significant fabric in written advice prepared by a suitably qualified and experienced heritage professional before it can be removed.	Complies. Written advice has been provided by the Sydney Water Heritage Advisory Team.
j) Installation of new fabric must be in accordance with the policies of a Conservation Management Plan, Conservation Management Strategy, Heritage Collections Plan, Archaeological Management Plan or Aboriginal Place Management Plan or in written advice prepared by a suitably qualified and experienced heritage professional before installation.	Complies. Written advice has been provided by the Sydney Water Heritage Advisory Team.
k) Any new fabric must not impact setting or views to or from the item, obscure existing significant fabric or limit access to existing fabric for future maintenance.	Complies. The proposed works will not impact the setting or views to or from the ***Sydney Mardi Gras Parade Route.*** They will not obscure existing significant fabric or limit access to existing fabric for future maintenance.
l) Any new penetrations must be: i. limited in number; and ii. made through non-significant fabric or mortar joints only.	Complies. There will be no effect upon any significant built fabric relating to the ***Sydney Mardi Gras Parade Route.***
m) Any excavation must comply with Standard Exemption 8: Excavation relevant standards. Relevant Standards: Specified activities/ works: a) Excavation or disturbance of land that is: i. which occurs within an existing service trench, or ii. to carry out inspections or emergency maintenance or repair on underground utility services, or iii. to maintain, repair, or replace underground utility services to buildings, or iv. to maintain or repair the foundations of an existing building, or v. to expose survey marks, or iv. associated with feral animal/insect eradication. b) Removing contaminated soil. Relevant standards: c) Activities/ works must not disturb or remove any relics. d) Excavation must not compromise the structural integrity of any heritage structure or significant landscape elements. e) Activities/ works must not affect archaeological evidence, for example the archaeology of foundation trench deposits from the time of original construction. f) If an environmental assessment is required under Part 5 of the Environmental Planning and Assessment Act 1979 (NSW) in relation to “b) of the specified activities/works, the assessment must be undertaken prior to commencing any work to remove the contaminated soil	Complies. Excavation will occur within the State listed curtilage of the ***Sydney Mardi Gras Parade Route*** but will be confined to a narrow trench across the road pavement of Flinders Street. The excavations are for the repair and maintenance of the water reticulation network for the locality. No relics are likely to be impacted by the proposed works. The roadway has been established since the early nineteenth century and has never been subject to building works, apart from the various pavements for the roadway. An Unexpected Finds Protocol will be implemented for the excavation works.
n) Any new fabric must not exacerbate the decay of existing fabric or risk the destruction of existing significant fabric due to chemical incompatibility, vibration, percussion or explosive flammability	Complies. There will be no effect upon any significant built fabric relating to the ***Sydney Mardi Gras Parade Route.***

5. Conclusion & Recommendations

5.1 Conclusion

This assessment confirms that the proposed works located within the curtilage of the ***Sydney Mardi Gras Parade Route*** will not have any adverse impact on the significance of the heritage item and will comply with the relevant standards and specified activities of Standard Exemption No. 3. The works are therefore permissible without approval under Section 57(2) of the ***Heritage Act 1977***.

The works must be undertaken in accordance with the Specified Activities and Relevant Standards of the applicable Standard Exemption/s, and in accordance with any recommendations included in this assessment. This record meets the requirements for record keeping under Condition 10.

5.2 Recommendations

1. Elements of the ***Sydney Mardi Gras Parade Route*** in the vicinity of the works should be adequately protected during the works to prevent accidental damage. Protection measures could include physical barriers, exclusion zones or other methods as appropriate.

2. All project team members, including contractors, should be informed about the heritage significance of the site as part of the general site induction package. The induction would identify why the ***Sydney Mardi Gras Parade Route*** is significant, the contractors' statutory obligations relating to heritage and to protection methods to be used during construction to prevent accidental damage during construction works.

3. An Unexpected Finds Protocol should be observed during any ground disturbance works to ensure that, should any material of possible heritage significance be discovered, work should stop in the vicinity and the Sydney Water Heritage Advisory Team be immediately contacted for advice.

This Exemption assessment has been prepared by the following Sydney Water heritage advisor:

Tony Brassil

Acting Heritage Advisor

Sydney Water

05/06/2025

Appendix 1 Critical Water Mains Renewal – Flinders Street, Darlinghurst Plan

Study area

Conventional lay pipeline

Proposed laydown area

Sydney WATER

Date Created: 16/04/2025

Appendix E – Section 65A approval

28 May 2025

Melissa Navarro
Project Manager
Program Delivery
Sydney Water

Section 65A Approval for Continued Use of Centennial Park Reservoir Works Compound

Dear Melissa,

I refer to the proposal for continued use of the existing temporary works compound established adjacent to Centennial Park Reservoir No 1 (WS001) until December 2027. The compound is located within the curtilage of the Centennial Park Reservoir which is listed on the NSW Heritage State Heritage Register.

I have received an application from Sydney Water's heritage advisors under Section 65A of the Heritage Act 1977, to modify the previously approved Section 60 Approval (2017-18/s60/03). It is proposed to modify the existing Section 60 Approval to provide an extension of the approved timeframe for use of the compound until December 2027. Sydney Water has delegated authority under the Heritage Act 1977 to approve Section 65A applications (Government Gazette No. 252, 2023).

As delegate of the Heritage Council of NSW, I have considered the subject application, obtained a Statement of Heritage Impact from AECOM, and the advice of the Sydney Water heritage advisors (attached Section 65A application report). The modification application is consistent with the previous Sydney Water works compound application 2017-18/s60/03 and with the advice and recommendations of AECOM's independent heritage assessment dated 7 May 2025.

Approval is granted under the following conditions:

1. This approval grants permission for the continuation of use of the existing works compound to December 2027 only.

2. Works associated with the use of the existing compound must remain within the established compound boundaries – no physical extension of the works compound is approved.

3. Following cessation of use in December 2027 (or sooner as may be practicable), the existing works compound must be removed from site, and the landscape must be restored by Sydney Water in consultation with Centennial Parklands and in accordance

with the original approval conditions granted in 2017 under the Section 60 Approval. This must include post site contamination testing and returfing of the site to Centennial Parkland's satisfaction.

4. The relevant provision of Sydney Water's Environmental Management System (SWEMS009) must be followed should works result in unexpected finds at the site. In accordance with SWMS009, works should immediately stop, and Sydney Water's heritage team must be notified if;

   (a) relics are discovered which require notification under section 146 of the Heritage Act 1977; and / or,

   (b) any Aboriginal "objects" are discovered that require notification under section 89A of the National Parks and Wildlife Act 1974; and / or,

   (c) heritage objects, including possible human skeletal material (remains) are unexpectedly discovered.

Yours sincerely

Belinda Bright
Head of Engineering & Technical Support

(as Senior Manager Level 3 Delegate of the NSW Heritage Council on behalf of Sydney Water)