BESIX Watpac

NSW GOVERNMENT | sydney METRO



Barangaroo Station

Construction Environmental Management Plan

N217

BR COP

24 April 2025

Project overview

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25 Hickson Road
Barangaroo
NSW 2000

Project Commencement Date:
12 March 2021

BESIX Watpac State Division Address:
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SYDNEY
NSW 2000

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BESIX Watpac Approvals

Name	Role & Title	Signature	Date
[redacted]	Author / Planning & Environment Manager	[redacted]	24/04/2025
[redacted]	Reviewer / Project Manager	[redacted]	24/04/2025

Note: A controlled copy of the Construction Environmental Management Plan (CEMP) will be distributed to the Sydney Metro Principal's Representative, Environmental Representative (ER) and other nominated stakeholders, and it will be made available to all BR COP employees and subcontractors in soft copy format through the project document control system.

The CEMP associated sub-plans and procedures, when printed, will be uncontrolled and it will the responsibility of each user to confirm the currency of the plan through the project document control system.

Acronym and Definitions

Acronym	Term and/or Definitions
AA	Acoustic Advisor
AIA	Arboricultural Impact Assessment
ASS	Acid Sulfate Soils
ASSMP	Acid Sulfate Soils Management Plan
ARI	Average Rainfall Intensity
BDA	Barangaroo Development Authority (known as Infrastructure NSW)
BR-CODD	Barangaroo 'Construct Only Delivery Deed'
BR-COP	Barangaroo 'Construct Only Package' (also various documents refer to: BZZ Contractor / STME)
BW	BESIX Watpac
CAR	Corrective Action Request
CEMP	Construction Environmental Management Plan
CMP	Contract Management Plan
CoA	Conditions of Approval
CSG	Construction Safety Group
CTR	Compliance Tracking Report
CWQMR	Construction Water Quality Monitoring Report
DITP	Detailed Inspection and Test Plan
DPE	Department of Planning and Environment (formerly DPIE)
DPIE	NSW Department of Planning Industry and Environment (now DPE)
EIS	The Sydney Metro City and Southwest Chatswood to Sydenham Environmental Impact Statement dated 3 May 2016 submitted to the Secretary seeking approval to carry out the CSSI and as revised if required by the Secretary under the EP&A Act.
EMS	The BESIX Watpac certified Environmental Management System
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPA	NSW Environmental Protection Authority
EPL	Environmental Protection License
GS	General Specification
HMP	Heritage Management Plan
ICNG	*Interim Construction Noise Guideline*
INSW	Infrastructure New South Wales
KPI	Key performance Indicator
CNVMP	Construction Noise & Vibration Management Plan
N/A	Not applicable
PS	Particular Specification
SFAIRP	So Far As Is Reasonably Practicable (in terms of the RSNL, NSW)
SM	Sydney Metro - Sydney Metro (https://www.sydneymetro.info)
SME	Subject Matter Expert, a person with expert knowledge and competency in a specified subject or topic matter area.
SMP	Sustainability Management Plan

Acronym	Term and/or Definitions
SMCSW	Sydney Metro City & Southwest (the overall program of works, which Barangaroo Station is part of)
SWMS	Safe Work Method Statement
SMPSAQP	Spoil Management Plan Sampling, Analysis & Quality Plan
Sydney Metro	Transport for New South Wales (https://www.transport.nsw.gov.au)
TSE	Tunnel and Station Excavation Contractor
TTS	Tree Transplantation Specification
TWTP	Temporary Water Treatment Plant
UCLAFP	Unexpected Contaminated Land and Asbestos Finds Procedure
VAMP	Visual Amenity Management Plan
WDIA	Water Discharge Impact Assessment
WQMP	Water Quality Monitoring Program
WHS	Work Health and Safety
WTP	Water Treatment Plant

Terms and Definitions

Glossary	Definitions and Responsibilities
Aboriginal object	The same meaning as in the *National Parks and Wildlife Act 1974* (NSW)
Ancillary Facility	A facility established for construction of the project which will be decommissioned at the end of construction including and office and amenities compound, construction compound, materials crushing and screening plant, materials storage compound, maintenance workshop, testing laboratory and materials stockpile area.
Business Management Plan	the Business Management Plan required by the Project Planning Approval.
CEMP	Construction Environmental Management Plan
Contractor	Particular Specification (PS) must be read as a reference to the “BR Contractor” as defined in the BR-CODD
Contractors Activities	Particular Specification and General Specification must be read as a reference to the “BR Contractor’s Activities” as defined in the BR-CODD
Construction	The same meaning as in the CSSI Sydney Metro City & Southwest Chatswood to Sydenham Conditions of Approval (SSI 7400)
Crisis Event	an event that may have an impact on the community, commuters, environment, personnel or subcontractors or has attracted or can reasonably be expected to attract the attention of the media, the Minister for Transport, a local Member of Parliament, local Authority or the local community. This includes emergencies, incidents or crises unrelated to the Contractor’s Activities that may be deemed to be caused by the Contractor’s Activities due to locality.
Design Documentation	Means the “Final Design Documentation” as defined in the BR-CODD.
Emergency Event	A situation in which there is an unacceptable risk, to the health and wellbeing of occupants, staff, or the general public, which needs intervention by staff or emergency services to control, limit escalation, suppress or address the risk and return to normal operations.
Environmental Aspect	Element of an organisation’s activities, products or services that interacts or can interact with the environment (AS/NZS ISO 140001:2016)
Environmental Impact	Change to the environment whether adverse or beneficial, wholly or partly resulting from an organisation’s environmental aspects
Environmental Policy	Statement by an organisation on its intention and principles for environmental performance

Glossary	Definitions and Responsibilities
Incident	An occurrence or set of circumstances that causes, or threatens to cause, material harm to the environment, community or many member of the community, being actual or potential hard to the health and safety of human beings or to threatened species, endangered ecological communities or ecosystems that is not trivial
Inspection and Test Plan	Inspection and test plans prepared and implemented by the Contractor in accordance with the requirements in AS/NZS ISO 9001 Quality Management systems – Requirements.
Interface Contractors	Any contractor, consultant, artist, tradesperson or other person engaged by Sydney Metro that is carrying out ,or that will carry out Interface Work including: • TSE Contractor • TSOM Contactors • The Operator • LW Contractor • ETS Contractor
Interface Work	Any activities undertaken by an Interface Contractor which interface with or affect, or are affected by, the Contractor's Activities, the Project Works or the Temporary Works.
Non-Compliance	Failure to comply with the requirements of the Project Approval or any applicable license, permit or legal requirements.
Non-Conformance	Failure to conform to the requirements of project system documentation including this CEMP or supporting documentation
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
Relevant Council	City of Sydney
Secretary	Secretary of the NSW Department of Planning and Environment or nominee,
Sensitive receiver	Includes residences, educational institutions (including preschools, school, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), child care centres, passive recreation areas (including outdoor grounds used for teaching), active recreation area (including parks and sports grounds). Receivers that may be considered to be sensitive include commercial remises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping ground, restaurants, offices premises, and retail spaces and industrial premises, and others identified by the Secretary.
Staging Report	Sydney Metro City & Southwest Chatswood to Sydenham – Staging Report V7
Unexpected heritage Finds	A potential heritage item discovered unexpectedly (usually during construction) having the same meaning as in the CSSI Sydney Metro City & Southwest Chatswood to Sydenham Conditions of Approval (SSI 7400)

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Appendix O Unexpected Contaminated Land & Asbestos Finds Procedure

1. Introduction

1.1 CEMP Scope

BESIX Watpac was engaged by Sydney Metro to build the Barangaroo Station Construct Only Package (COP), forming part of the broader Sydney Metro City & Southwest Chatswood to Sydenham project. Most of the station box primary structure was completed by the Tunnel and Excavation Contractor (TSE), prior to Project commencement and BESIX Watpac completed the station fit-out and associated civil and landscaping works.

This Construction Environmental Management Plan (CEMP) has been prepared to document the company's environmental commitments, objectives, and procedures for the project.

The CEMP is structured to provide and address the following:

- A description of the Site and project scope;
- Establishing the environmental legal framework and objectives that the project will be operating under;
- A description of the standard approach of BESIX Watpac's environmental management system, including reporting and monitoring;
- An outline of roles and responsibilities for the project, including site staff and BESIX Watpac's management support teams;
- An outline of BESIX Watpac's Standard Operating Procedures (SOPs) address the standard controls against each of those environmental risks (Appendix F); and
- A project specific risk assessment that analyses the risks under each aspect, presenting the logic/research behind the findings or recommendations and accompanying management strategies, recommendations, or controls.

1.1.1 Site Location and Context

The Barangaroo Metro station is part of the Sydney Metro City & Southwest Chatswood to Sydenham project located between the future Victoria Cross and Martin Place stations as shown in Figure 1 below:

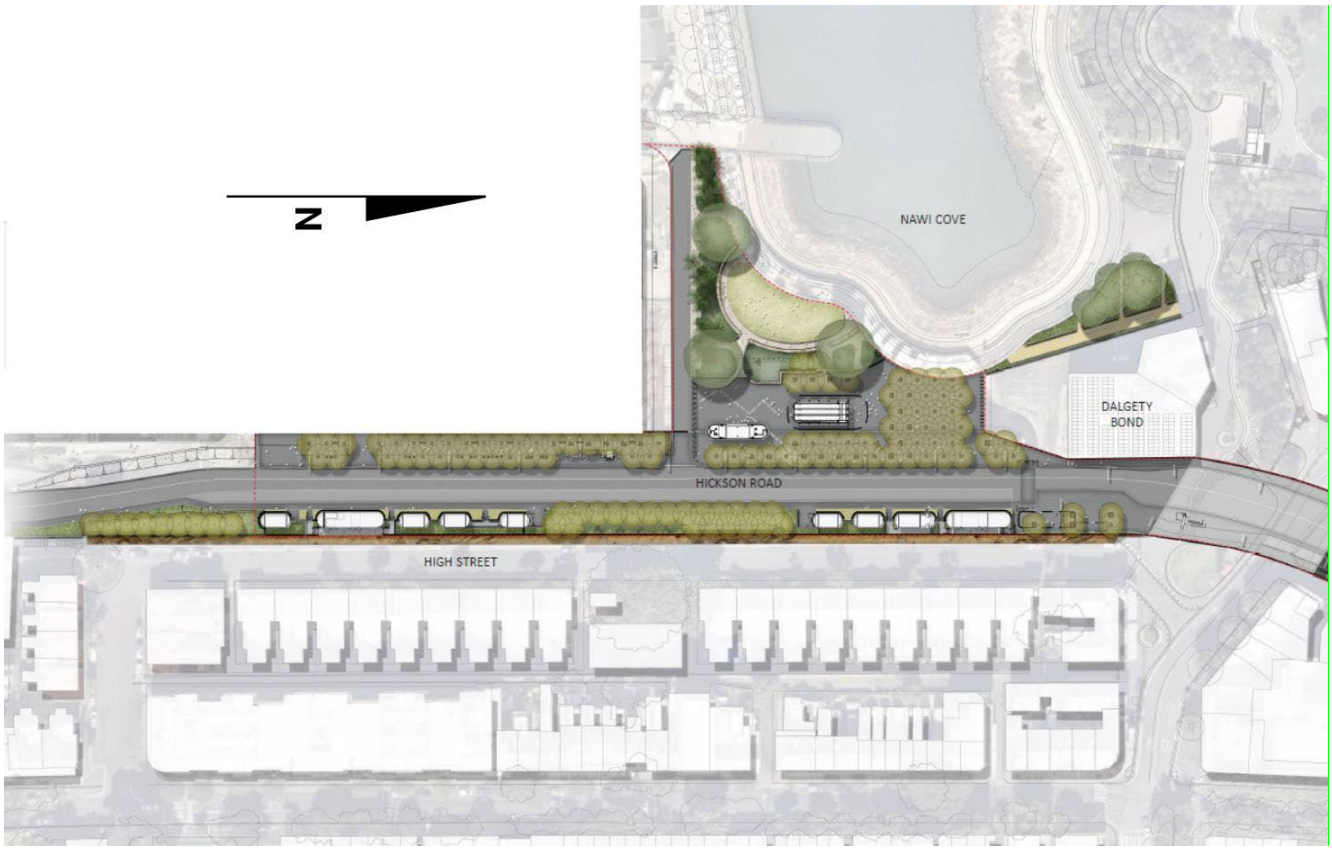
Figure 1 City & Southwest Project – Barangaroo Station Context



The project site is located North of the Barangaroo precinct below Hickson Road on the North Western edge of the Sydney CBD and adjacent to Nawi Cove as per

Figure 2. The station is the most northerly of the CBD stations.

Figure 2 Location of Barangaroo Station



1.1.2 Project Scope

The Project consisted of the following:

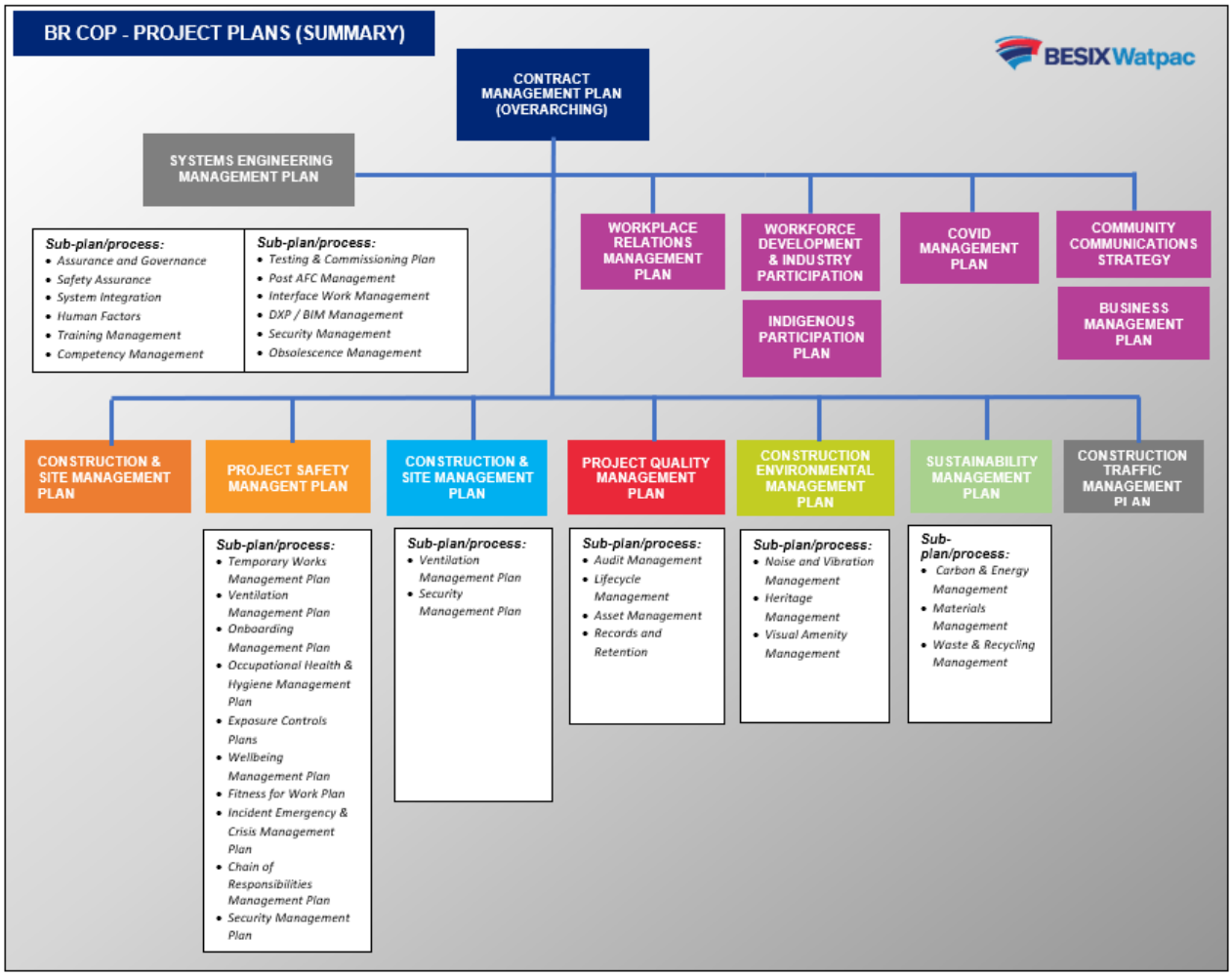
- Site establishment;
- Structural and civil completion works to the station box;
- Fit-out, testing and commissioning of the new metro station;
- Stormwater trunk mains works from Hickson road precinct to the existing pit at western end of the Site;
- Installation of a cooling water system within the Barangaroo cutaway and associated trenching and pipework including the connection of the system to an existing network of pipes in Sydney harbour. The operation of the cooling water system is not part of the scope of this CEMP;
- Hickson Road precinct works including road, footpath, cycleway, landscaping, street lighting, stormwater, utilities works and ventilation pod risers;
- Waterproofing, backfilling and surface reinstatement of the temporary northern (Hickson Road) shaft including removal of the acoustic shed; and,
- Staging and temporary works required to deliver the permanent works, including removal of the temporary Hickson Road bridge structure.

Construction activities included within the scope of this CEMP are detailed in Section 1.2 - Construction Activities and Site Establishment Plans are located in Appendix G.

1.1.3 Project Plans

This CEMP and its sub plans operate under the overarching contract plan as per Figure 3 below.

Figure 3 Project Management Plans



Further detail on sub plans to this CEMP can be found in Section 9.2 and are included Appendices C, D and E.

Table 5 from the Staging Report, which determines those requirements from each of the CEMF topics that are applicable to Barangaroo Metro Station, has been used to determine the content and structure of the Project Management Plans, Sub-Plans and Procedures. The structure of each plan, and how they respond to each CEMF topic, is summarised in Table 1.

Table 1 Staging Report TABLE 5 applicability to Barangaroo Metro Station

CEMF Environmental Management Category	Staging report applicability to Barangaroo Metro Station and how addressed:
Spoil	Part of the CEMP
Groundwater	Part of this CEMP
Traffic (CTMP)	Stand alone Construction Traffic Management Plan (CTMP)
Noise and Vibration sub-plan (CNVMP)	Sub-plan to this CEMP
Heritage Management sub-plan (HMP)	Sub-plan to this CEMP
Fauna & Flora / Biodiversity	Procedure in this CEMP
Soil & Water	Procedure in this CEMP
Air Quality	Procedure in this CEMP
Visual Amenity sub-plan (VAMP)	Sub-plan to this CEMP
Sustainability Management Plan (SMP)	Management plan separate to this CEMP
Materials	Sub-plan to the SMP
Carbon & Energy	Sub-plan to the SMP
Waste (and Recycling)	Sub-plan to the SMP

In addition, the following Conditions of Approval (CoA) apply for the preparation of the CEMP and associated sub-plans:

- CEMP – CoA C1;
- CNVMP – CoA C3;
- CHMP – CoA C3;
- VAMP – Section 3.4 of the CEMF; and,
- CTMP – CoA E85 and Section 3.4 of the CEMF.

1.2 Construction Activities

Works will be staged within a constrained site located relatively close to Sydney Harbour, other development works and nearby existing heritage structures.

Detailed work components are listed in Section 1.2.1 below.

Typical equipment on site is referred in Section 1.2.2.

1.2.1 Detail Construction Activities

The delivery of Barangaroo Station will involve the following detailed activities. As a generalisation, Civil works will have the greatest potential to impact the environment with the station fit-out and Interface contractors works posing less risk due to them taking place mostly underground within the existing concrete station shell. Nonetheless, all construction activities have been evaluated under the Environmental Risk Assessment – refer Section 3 and Appendix I.

There is expected to be a peak of 325 people on site and typically up to 50 No. x 19m truck movements and 50 No. delivery vehicle movements per day. Refer Construction Traffic Management Plan (CTMP) for details.

Table 2 Detailed Construction Activities

Component	Description of Work
Site Establishment	Establishment of a new site compound compromising temporary demountable site sheds, offices, toilets and showers, lunchrooms, change rooms, storage containers, rapid antigen testing and first aid sheds. Relocation of the existing TSE site compound for re-use by BESIX Watpac Establishment of site sheds, cranes, laydown areas, hoarding, refuelling areas and temporary ventilation. Continual operation of the on-site Water Treatment Plant (WTP) which discharges to Sydney Harbour.
Civil	Installation and maintenance of access routes within Site Relocation of stormwater trunk drainage Demolition and reinstatement of Hickson Road Staged road, lane and footpath movements Hickson Road Civil works, trenching of in ground services Demolition of perimeter capping beam and removal of steel girders, temp ramp Installation of waterproofing to station roof Closure and backfilling of northern shaft and removal of the temporary acoustic shed Diving within the harbour, including installation of stainless steel entry/exit cages and clearing of waterway entry/exits for the cooling water system Works to the existing main walkway, including 2x chambers works, installation of pipe work connectors Headland Park – build and fit out of cooling water seawater heat exchanger room, install pipes/systems, LV feeder cables and building services (mechanical, fire, lights etc) Headland to BR COP install supply/return chiller lines, LV feeder and control cables Landscaping (hard and soft), public plaza and precinct activation works Bicycle parking facilities Provisions for advertising, and public art Operation of the WTP and discharge into Sydney Harbour, including the relocation of the existing WTP, and Discharge into the harbour to de-water the western civil pit (bypassing the WTP).
Station Works	Construction of platform and over-track exhaust Temporary staging for installation of internal cladding and services fit out Internal equipment and lifting gantries All station fit-out, including cladding, façade and entrance canopy, lift canopy and stair and ventilation pods Fit out trades, building services, including long run escalators and lifts Fit out of existing plant and equipment rooms Construction of back of house cleaners and waste rooms Construction of public and staff toilets Installation of low-voltage electrical, earthing, fire, hydraulics, lighting and mechanical systems, including earthing and bonding as associated with works Installation of building management control system Provision of selected equipment and access provisions for Interface Contractors Installation of lifts and escalators Installation of signage and wayfinding, and Operation of the Basement 3 de-pressurisation pumps.
Electrical & Coms (including Interface Contractors works in station)	Provision of / installation of the following: • Signalling and train control systems • Traction Power system • Track and tunnel services • Platform Screen Doors • Sydney Metro central control system

Component	Description of Work
	• Sydney Metro communications system • Passenger information display systems • Public address systems • Audio frequency induction loop system • Sound system and intercom system for emergency purposes • Closed circuit television systems • Help Point systems • Electronic access control systems • Local area networks • UHF radio systems • UHF distributed antenna system • Train radio communication systems • Precise clocks system • Electronic access system • Fibre and copper backbone • High voltage power supply and distribution system • Tunnel Ventilation System • Tunnel ventilation nozzles, and • Electronic ticketing system (ETS)
Additional Works	Additional works may be required during the BR COP. These works may be changes to initially proposed methods or works that are outside the initially approved scope of works. These works will be subject to direction from Sydney Metro. Given the unknown nature of these works the process for undertaking these works will be: 1. An Environmental Work Method Statement will be compiled for the proposed works and the Environmental Risk Register will be updated; 2. The Environmental Work Method Statement will be reviewed by the Environmental Representative and Sydney Metro; and 3. BESIX Watpac will approve and issue the Environmental Work Method Statement prior to works commencing. Additional works that are outside the initial scope that are known to be required currently consist of: • Cleaning of the seawater cooling intake pipes and H01 storm water outlet; • Removal of the protective mesh and reinstatement of the Hickson Road Heritage Wall; • Potential Installation of Block 7 Water Treatment Plant to dewater surface water for reuse; and, • Removal of Block 7 hardstand and re-instatement to original condition,

1.2.2 Plant and Equipment

Plant and equipment to be utilised to undertake the project activities include:

Station Construction Works:

- Tower crane (Luffing crane, Liebherr 160 HC);
- Mobile cranes; (various as required and up to 500t);
- 25t Franna cranes;
- 10t telehandlers;
- Northern Shaft gantry crane (existing);
- Elevated work platform (Scissor lifts and boom lifts);
- Concrete agitator trucks;
- Concrete pump / placing boom;

- Handheld concrete vibrators;
- Delivery trucks - up to 19m articulated;
- Waste removal – short wheel based trucks/skip bins;
- Man and materials hoists (3 no.);
- Powered hand tools;
- Circular saw;
- Tile and brick saws;
- Ventilation fans;
- Generator;
- Lighting towers;
- Water treatment plant (outlined in SWMP);
- Water sump pumps, and
- Plate compactor and Wacker packer.

Civil Works:

- 5t, 14t, 30t excavators;
- Skid Steer;
- 3t double drum vibratory roller;
- 12t roller;
- Grader;
- Franna crane;
- 150t crawler crane (for demolition);
- 60t crawler crane with vibrating hammer (for sheet piling);
- Bogie 10 wheeler;
- Watercart;
- Sucker trucks; and,
- Concrete saws.

On site there was an existing water treatment plant (WTP), previously installed and operated by the Tunnel and Station Excavation (TSE) contractor that treats surface water and groundwater seepage into the station box. BESIX Watpac will continue the operation, maintenance, and water quality monitoring of the plant, including discharging water from the WTP into Sydney Harbour. Upon completion of the project the management of the WTP was handed over to Metro Trains Sydney (MTS) on 20/12/24, to maintain it during the operation of the Station. The quality of water on site will be monitored in accordance with the Water Quality Monitoring Program (WQMP) was concluded in Q4 2024.

1.2.3 Site Compounds

The Site compound and crib facilities that BESIX Watpac use for the purposes of carrying out construction, and to house the project work force, are the existing site compound and crib facilities that TSE established which have been supplemented with some additional temporary site accommodation that was delivered to the site. The location of the site compound is shown on the site establishment plans in Appendix G. As the establishment of the site compound was covered under *Sydney Metro C2S EIS Main Volume* section 7.10 (page 211 of Chapter 7), the compound is not considered to be an ancillary facility under the CoA. Any ancillary facilities that BESIX Watpac establish over and above the existing site compound will meet the requirements of CoA A16 to A20.

1.2.4 Summary Construction Activities with Key Environmental Risks

Key environmental risks, identified to satisfy CoA C2 (d), to be managed include:

- Minimisation of dust generated by demolition, stockpiling, construction of temporary access roads, minor civil works and backfilling to shafts;
- Prevention of surface and site water discharge mixing with stockpiles of soil from trench excavations and backfilling material (including contaminated material);
- Managing the risk of the project's proximity to Sydney Harbour and the potential for surface runoff contaminated with civil or excavation material to be discharged into the Harbour without being controlled or treated;
- Managing the dewatering of deep stormwater trenches (located below water table) and service trenches to the WTP for treatment and discharge to the harbour (in accordance with the Soil & Water Management Procedure);
- Managing surface water run off;
- Ensuring that there are no legislative breaches or non-compliances;
- Ensuring that the *NSW Water Quality Objectives* are met and there are no legislative breaches or non-compliances when discharging water from the WTP into Sydney Harbour;
- Managing unexpected finds of contaminated material and heritage artefacts in excavations for services;
- Managing noise and vibration, and especially out of hours noise, to meet regulatory limits and impact to sensitive receivers and the heritage listed Hickson Road wall; and
- Ensuring that demolition and construction works adjacent to the Hickson Road heritage wall, and the rectification works of the wall itself, do not adversely impact or damage the heritage wall.

The construction activities associated with the environmental risks identified above pose the key environmental risk associated with the project. Following these activities, construction activities will mainly be associated with the station fit out, the construction of station entry canopy and other minor structures above ground and landscape works. The environmental focus on these activities will be on impacts due to logistics and material handling such as noise and vibration, and the generation of waste.

A risk assessment has been undertaken to assess the environmental impact of construction activities as required by CoA C2(d) and this is presented in Section 9 and Appendix I (Risk Assessment). The risk assessment will be revised at 6 monthly intervals throughout the course of the works or should there be a substantial change to the scope of the works being undertaken under the Barangaroo COP.

1.2.5 Timing and Scheduling

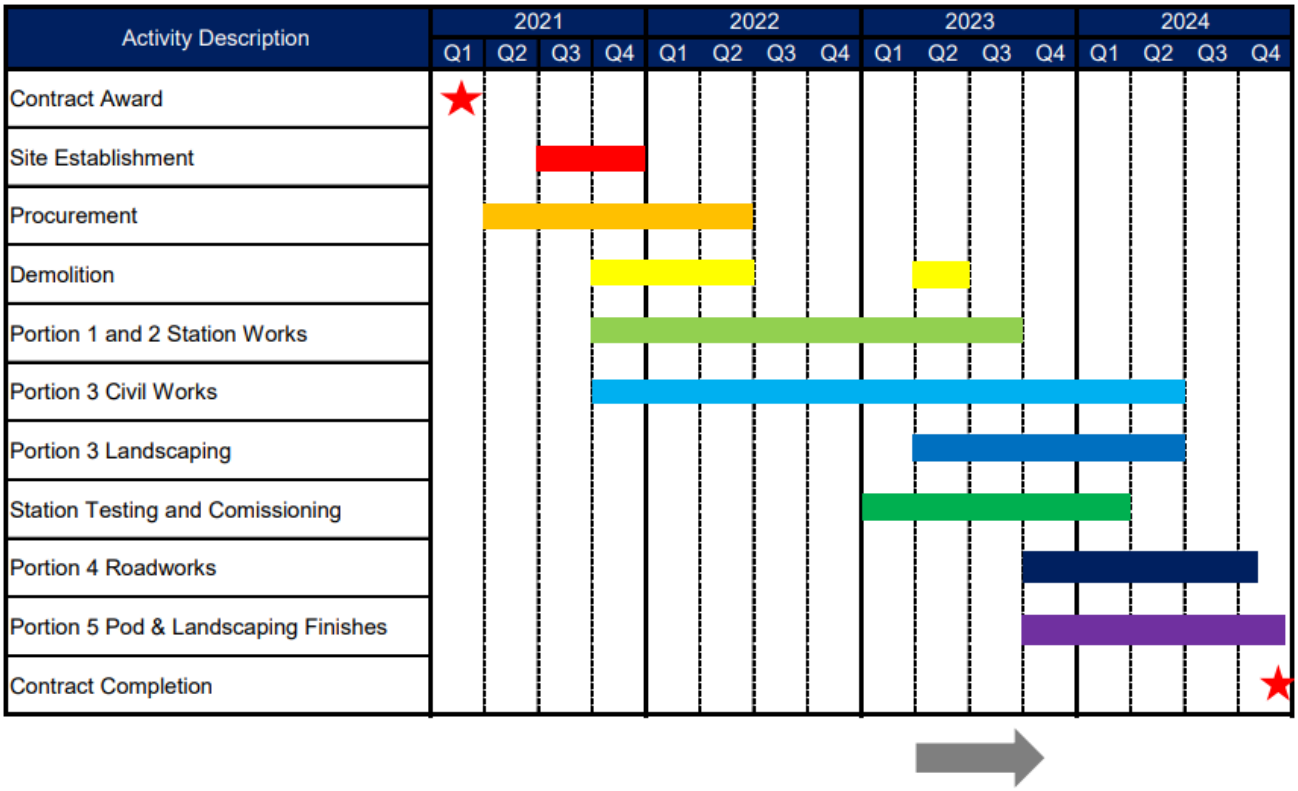
Site establishment commenced in Q3 2021, with works divided into separate portions. The majority of activities associated with demolition and structural works were completed by the end of Q3 2022. The majority of utility services works were carried out Q1 and Q2 2022.

Portion 2, comprising of station fit-out works and station utility works achieved substantial completion in Q4 2023 with the balance of work consisting of predominately defect rectification and handover activities carried out until the end of Q2 2024.

Portions 3, 4 and 5 comprise of external landscaping and public domain works split over three areas. Portion 3 comprising of the majority of landscaping works to the West of Hickson Road was completed at the end of Q2 2024. Portion 4 comprising primarily of the road works associated with the project was completed in Q4 2024 and Portion 5 comprising of the Pod and landscaping finishes east of Hickson Road was completed in Q4 2024.

In accordance with CoA C2(a) an indicative construction schedule is shown Figure 4 in below:

Figure 4 *Indicative Construction Schedule*



1.2.6 Construction Hours

Construction is generally proposed to be carried out during the standard construction hours of 7am to 6pm Monday to Friday and 8am to 6pm Saturdays in accordance with CoA E36.

In accordance with CoA E38 BESIX Watpac will implement the same respite periods as were agreed with the local community by the preceding TSE Contractor. Two noise respite periods will occur Monday to Friday between 09.30am – 10.30am and 12.30pm – 1.30pm. During these periods construction activities which generate significant noise will be ceased.

1.2.7 24 Hour Construction

In accordance with CoA E44, construction works may be undertaken outside of the standard working hours. Construction associated with the CSSI may be undertaken outside standard construction hours where those works have been described in CoA E48. Relevant activities for the Barangaroo Station include station and tunnel fit out activities under CoA E48(d) and haulage and delivery of spoil and materials, including the backfilling on the Northern Access Shaft under CoA E48(e).

Some construction activities will occur outside of standard working hours, including works approved under CoA E48 which is subject to CoA E47, and must be consistent with the requirements of the Sydney Metro City & Southwest Out of Hours Strategy Protocol. These activities will be approved via a Sydney Metro Out of Hours Work Application Form (9TP-FT-079), with approval required from the ER and endorsement by the AA prior to the commencement of any out of hours works. Where work is deemed to be 'high risk', approval is required from the Secretary.

1.2.8 Interface Contractors

Interface Contractors will comply with this CEMP and associated sub-plans and procedures whilst carrying out construction activities within the boundaries of the Site, when working underneath BESIX Watpac as the principal contractor. Any environmental management matters, non-conformances, monitoring, mitigation

measures or the like, relating to Interface Contractor activities will be addressed using the framework as outlined in this CEMP and associated sub-plans and procedures.

Once BESIX Watpac have handed over principal contractor responsibility of areas of the station to the Interface Contractors, such as the up and down trackways and the northern shaft to the Linewide Contractor, the Interface Contractors will operate under their own management plans when working in these areas. Any environmental matters, non-conformances, monitoring, mitigation measures or the like will be the responsibility of the Interface Contractors once an area has been handed over to them as the principal contractor.

The scope of works that BESIX Watpac have with the Interface Contractor Systems Connect (Linewide) (SCLW) and MTR (TSOM) is listed below and includes BESIX Watpac's responsibilities to facilitate Interface Contractors works. Principal Contractor transferred control of the northern shaft to SCLW following the completion of Portion 1A and 1B;

- Pumping and treating of groundwater from the northern shaft to the WTP including when SCLW are the Principal Contractor of the area;
- Construction of cable containment for SCLW and MTR;
- Fitout of Priority Rooms to Degree 2 completion including temporary doors and hardware;
- Provide access to priority rooms to allow Interface Contractors to complete their works;
- Remaining fitout of Priority Rooms to Degree 3 completion following completion of SCLW and MTR's works;
- Fire rating of Interface Contractors cables and containment;
- Support the installation, integration and commissioning of infrastructure and systems provided by Interface Contractors;
- Provide crib facilities for 125 Interface Contractor personnel;
- Cranage and vertical movement of plant and equipment;
- Storage points and laydown areas;
- Hoists for materials and personnel;
- Treatment of construction water from within the station box by the WTP;
- Drinking water and construction water;
- A location for hazardous chemical storage; and,
- Bins and off-site disposal of putrescible and construction waste.

Interface with the TSE contractor was limited to the handover of the Site at the completion of their works, and the commencement of BESIX Watpac's works and when the TSE contractor was provided with access to the Site to complete the TSE contactors defects under the supervision of BESIX Watpac.

Taking possession of the Site included taking possession of key plant and equipment required for the operation of the site known as 'Handover Items'. These handover items included the northern shaft acoustic shed crane, gantry crane, personnel hoist, the WTP and site dewatering pumps.

BESIX Watpac has engaged the existing supplier and operator of the WTP to continue with the management of the WTP. BESIX Watpac are not required to operate under an EPL, with water discharged from the WTP to the harbour in accordance with CoA E107 and the Water Discharge Impact Assessment (WDIA) detailed in the Soil and Water Management Procedure.

1.3 CEMP Purpose

This CEMP has been developed to meet the requirement of CSSI 7400 Planning Approval CoA A1 (as modified) of the project approval and as specified in the Staging Report, and to:

- Provide a single document (including required sub-plans) for managing environmental aspects of the project;
- Identify measures to protect the environment, and ensure compliance with environmental legislation;
- Encourage best practice environmental management through planning, commitment, and continuous improvement;
- Identify and control potential environmental risks associated with the respective works activities;
- Identify the potential for, and respond to, environmental incidents, accidents and emergency situations and take corrective action;
- Define roles and responsibilities for personnel;
- Ensure employees and subcontractors implement the CEMP;
- Facilitate consultation and communication with external stakeholders such as the local community and government agencies;
- Identify the need for, and facilitate obtaining additional approvals;
- Define environmental reporting requirements and evaluation of performance;
- Describe all monitoring procedures required to identify impacts on the environment as a result of the works and activities;
- Implement complaint reporting procedures and maintain records of complaints and responses to complaints; and,
- Establish and maintain programs and procedures for periodic CEMP audits to be carried out.

1.4 CEMP Context

The CEMP sets out how BESIX Watpac in their role as Principal Contractor will manage their activities for the project to reduce impacts to the environment in accordance with company environmental policy, legislation and planning Conditions of Approval (CoA).

This CEMP was prepared in accordance with:

- The relevant planning approvals and CoAs for the project including Revised Environmental Mitigation Measures (REMMs) - refer Section 1.6 and Appendix B;
- Applicable legislation and regulatory requirements - refer Section 2.1;
- Sydney Metro Construction Environmental Management Framework – Chatswood to Sydenham (CEMF). Refer Section 1.5 and Appendix H;
- Sydney Metro and BESIX Watpac's Environment and Sustainability Policies;
- Guideline for the Preparation of Environmental Management Plans (Department of Infrastructure, Planning and Natural Resources, 2004); and,
- Head Contract General & Particular Specifications – refer Appendix J (commercial in confidence).

This CEMP explains how BESIX Watpac will meet the environmental outcomes for the construction of the project. The CEMP comprises the main CEMP document, issue specific sub plans, activity specific standard operating procedures and site-based environmental control maps (ECMs).

In addition to the CEMP, the following sub-plans have been prepared, as set out in CoA C3, and as allocated in the Staging Report:

- Construction Noise and Vibration Management Plan (NVMP); and,
- Construction Heritage Management Plan (HMP).

The CEMP describes the relationship between other plans required by the contract and includes the requirements of the BESIX Watpac environmental management system (EMS) which is certified to ISO 14001:2015.

The CEMP must be endorsed by the ER as required by CoA C7 in advance of the submission of the Plan to the Secretary for approval under CoA C7. Construction will not commence until the CEMP and all CEMP sub-plans have been approved by the Secretary, including any minor amendments approved by the ER, or the AA in the case of the CNVMP.

1.5 CEMF Application

This document has been prepared to demonstrate compliance with the Sydney Metro Construction Environmental Management Framework (CEMF) as outlined in Appendix H. Adherence to the CEMF will be to a degree that is appropriate to each applicable state of construction / operation as outlined in Table 5 of the Staging Report.

1.6 Planning Approvals

Sydney Metro City and Southwest is classified as Critical State Significant Infrastructure (CSSI) under Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and *State Environmental Planning Policy (State and Regional Development) 2011*.

This project falls under the construction and operation of the section between Chatswood and the Sydenham dive site known as “CSSI_7400”. Approval was granted on 9 January 2017 followed by nine approved modifications:

- MOD 1 – Victoria Cross and Artarmon Substation (determined 18 October 2017)
- MOD 4 – Sydenham Station and Metro Facility South (determined 13 December 2017)
- MOD 2 – Central Walk (determined 21 December 2017)
- MOD 3 – Martin Place Metro Station (determined 22 March 2018)
- MOD 5 – Blues Point Acoustic Shed (determined 2 November 2018)
- MOD 6 – Administrative Changes (determined 21 February 2019)
- MOD 7 – Administrative Changes (determined 24 June 2020)
- MOD 8 – Blues Point Access Site (determined 25 November 2020)
- MOD 9 – Extension to standard construction hours (determined 30 June 2022)

BESIX Watpac is required to comply with CSSI_7400, including the modifications to this approval, to the extent required by Sydney Metro.

The environmental assessments relevant to the project, which have been referenced during the preparation of this CEMP are:

- Sydney Metro City & Southwest – Chatswood to Sydenham – Environmental Impact Statement (May 2016) – referred to as the (EIS); and,
- Sydney Metro City and Southwest – Submission and Preferred Infrastructure Report (SPIR). Dated October 2016.

EIS Technical Papers 1 to 9 reflect the assessment of environmental categories such as noise and vibration, contamination, groundwater, heritage and biodiversity. The EIS and SPIR informed the CoA and REMMs, with further compliance requirements outlined in Appendix B.

The BESIX Watpac Planning and Environmental Manager will review compliance with the CoAs and REMMs on a half yearly basis, or when modifications to the planning approval are approved. Likewise, the tracking required to inform the Compliance Tracking Report (CTR) will be managed by the BESIX Watpac Planning and Environmental Manager, together with the ER and SM via the Approvals matrix (refer Appendix B) at the frequency defined in the Sydney Metro Compliance Tracking Program/Environmental Audit Program. During this review each requirement will be mapped to the relevant project plans and owners. Where

evidence of the requirement is a referenced document, these will be managed in accordance with General Specification Clause 5.2.2.8 c), d), and e) respectively and maintained on the PDCS which is TeamBinder.

To avoid the risk of introducing changes that conflict with the project planning approval, BESIX Watpac will assess any construction methodology changes or proposed design changes to ensure there is no deviation from the approval.

1.6.1 Consistency Assessments

A consistency assessment is an assessment of whether a proposed activity, for the purpose of the CSSI, is consistent with the terms of the planning approval. Consistency assessments, if required will be prepared in accordance with 01.23.25 SM ES-PW-314_1.0 Sydney Metro Planning Approval Consistency Assessment.

BESIX Watpac and/or Sydney Metro will prepare consistency assessments in consultation with each other before submission to the ER and Sydney Metro for review and approval. Following this the consistency assessment will be made publicly available on the website of either BESIX Watpac, or Sydney Metro, depending on who authored the document.

If required, this CEMP or other relevant project plans or sub-plans will be revised to incorporate additional commitments or mitigation measures and the ER will review and approve these minor amendments in accordance with project planning approval Condition A24 (j).

If a design change is found by Sydney Metro to be inconsistent with the planning approval, Sydney Metro will notify BESIX Watpac of this determination. Where the proposed change is not consistent with the Approved Project including the conditions of approval, it would be subject to a separate modification application or new planning pathway. BESIX Watpac will be required to comply with any Secretary's requirements in completing further environmental assessment of the design change.

A register of all design changes approved for implementation on the project will be maintained by Sydney Metro with input from BESIX Watpac. Sydney Metro is responsible for assessing and obtaining any necessary approvals for changes it instigates unless otherwise specified.

1.6.2 Planning Modifications

For any new planning modification issued by DPE, BESIX Watpac will undertake a review to ascertain any new requirements or new activities, or environmental risks to be managed. A key objective of the review is to determine if the changes have a negative impact on any environmental aspect, and if so work to mitigate those impacts, and update the CEMP if necessary. Any amendment to the CEMP or sub-plans required due to a planning modification would be submitted to the ER for approval if considered a minor amendment under CoA A24(d) and (j).

1.7 Head Contract Specification compliance

The Head Contract General and Particular Specification compliance matrix for the CEMP is included in Appendix J. This compliance matrix is commercial in confidence for review by Sydney Metro only.

1.8 Environmental Policy

BESIX Watpac's Environmental Policy for this project is included in Appendix A.

This project specific environmental policy is aligned with both Sydney Metro's Environment and Sustainability Policy and BESIX Watpac corporate Health safety, Environment and Quality Policy.

The Environmental Policy will be displayed at the project office, and communicated to staff, sub-contractors and other interested parties via inductions and ongoing awareness programs.

1.9 Environmental Objectives

The environmental objectives presented in the EIS have been reviewed to assess relevance to this Project with the key objectives being as follows:

Table 3 Environmental Objectives

Category	Objective	Note
Dust - Air quality	Establishment of practical and robust site controls to minimise risk of dust generation in demolition, site roads, and structural works	This CEMP
Water quality discharge	Establish stringent environmental monitoring and management for all site water sources including seepage, dewatering, stormwater runoff, and ingress station box	This CEMP
Contamination	Identify and minimise potential pollution from contamination when found on site	This CEMP
Heritage	Minimise impact to and record heritage finds	Heritage sub plan Appendix D
Noise and Vibration	Minimise disturbance to sensitive receivers	Noise and Vibration sub plan Appendix C
Sustainability, Biodiversity, Waste	Minimisation of construction waste	Sustainability Management plan
Traffic, Transport and Access	Ensure the safety of road users generally and manage the impact of construction traffic on the local environment	Traffic Management Plan

The environmental target for the Project is to achieve zero medium risk environmental pollution events and less than one complaint per month. The specific targets for noise and vibration are referred in the Construction Noise and Vibration Management Plan (CNVMP).

1.10 CEMP Objectives and Key Performance Targets

The objectives of this CEMP and key performance targets derived from the Environmental Policy core commitments will be used to measure health of the implementation of the CEMP, as follows:

Table 4 Key Performance Targets

Policy element	CEMP Objective	Measurement Basis	Target	Responsibility
Compliance with Legislation and regulations	Comply with all Statutory Requirements	Commonwealth, State and Local Council regulation	Zero Penalty Infringement Notices issued by Regulators Zero Prosecutions issued Regulators	Construction Managers/ Planning & Environmental Manager
Minimise & eliminating environmental risks	Minimise the impact of the site works to the receiving environment	Internal audits conducted by Management	No more than 5 environmental Corrective Action items issues to a single project from an internal audit Zero Non-Conformances issues as a result Project is audited within 6 months of being established on site.	Construction Managers/ Planning & Environmental Manager
Quality System Compliance	Implement an EMS that meets the requirements of AS/NZS ISO 14001 and is subject to continuous improvement	Audits, management reviews	Address non-conformances and corrective actions within specific timeframes.	Planning & Environmental Manager

Policy element	CEMP Objective	Measurement Basis	Target	Responsibility
Compliance with Approvals	Deliver the project in accordance with environmental approvals	Audits, construction compliance reporting, management review	Full compliance with statutory approvals.	Planning & Environmental Manager
Community	Minimise complaints and respond to any complaints within an agreed timeframe	Record number of, and response times to complaints	Less than 2 complaints per month total. Each complaint will be responded to in less than 24 hours.	Construction Managers/ Community Relations Manager
Reporting	Ensure all environmental management measures are effectively implemented	Results of external and internal audits and site inspections	Nil non-conformances in relation to implementation of the CEMP.	Planning & Environmental Manager
Training	Ensure environmental leadership is empowered with right knowledge of issues	Provide environmental training to all key staff managing environmental issues	Training complete in first 12 months	Construction Mangers

1.11 Distribution and Document Control

1.11.1 General

The CEMP will be held within the BESIX Watpac Barangaroo Station Project Document Collaboration System (PDCS), where it can be accessed by all project personnel and subcontractors, as necessary. A copy of the Plan will also be held on the Principal's PDCS (TeamBinder) and on the Contractors website.

The BESIX Watpac Planning and Environment Manager is responsible for maintenance of the Plans and the BESIX Watpac Document Controller is responsible for the issuance of the Plans to both the PDCS and distribution parties as well as the Contractors website.

1.11.2 CEMP Reviews and Re-issue

A review of the CEMP will be undertaken every six months (or earlier if deemed necessary by the nature of circumstances or opportunity for improvement) by the BESIX Watpac Planning & Environment Manager and endorsed by the BESIX Watpac Senior Construction Manager.

The CEMP must be updated six monthly following the last approved revision. Draft changes can be reviewed, developed, and finalised in consultation with the ER, Sydney Metro and technical reviewers. Revisions must not reduce the scope or level of management control.

Criteria for changes may include:

- Any changes in environmental legislation or regulations;
- Incorporating improvements resulting from internal and external audits;
- To address any significant project change in scope;
- Sydney Metro or SM feedback or non-conformance reports; and,
- Lessons learnt or improvement initiatives from delivery team.

Draft changes in the CEMP will be submitted to Sydney Metro and the ER for review. If the changes are minor amendments, the ER will approve the Plan under CoA A24(j). Changes not considered to be minor in nature will be issued to DPE for approval. Once approved, the CEMP document number will be revised and

issued by the document controller to the BESIX Watpac project team, consultants and subcontractors on the Contractors PDCS with a covering summary explanation of key changes needing to take immediate effect. The CEMP will also be uploaded to the Contractor's Project website by the Document Controller.

Initial updates to this Plan will be issued alphabetically for review. Once endorsed/approved by Sydney Metro, any subsequent Plan updates will be numbered consecutively and transmitted to holders of controlled copies.

The draft initial revision of the CEMP will be issued for review and comment utilising an alphabetical revision, starting with revision A. Once the CEMP has been endorsed by the ER in accordance with CoA A24(d) and approved by DPIE, the revision was changed to numeric one, starting with Revision 00. Minor amendments will be approved by the ER in accordance with CoA A24(j) and the revision number ascended each time the Plan is re-issued.

2. Legislative and Other Requirements

2.1 Key Legislative and Regulatory Requirements

Table 5 Key legislative Requirements

Legislation	Requirement	How this Act relates to the project
Water Management Act 2000	The NSW Aquifer Interference Policy (NSW Office of Water, 2012) documents the NSW Government's intention to implement the requirement for approval of 'aquifer interference activities' under the *Water Management Act 2000*. The Act stipulates not to cause water pollution (other than to a sewer) except in accordance with the conditions of an Environmental Protection Licence (EPL)	No change in groundwater is proposed by BR COP. Groundwater will be withdrawn from sumps within the station box where groundwater has naturally seeped in. This has been assessed under Part 5.1 of the EP&A Act, therefore approvals are not required under Section 89 for water use, Section 90 for water management work. In addition, activities generally requiring permits under the Act are exempt from aquifer interference approval under Section 91 as no proclamation under Section 88A had been made.
Contaminated Land Management Act 1997	This Act outlines the circumstances in which notification to the Environment Protection Authority (EPA) is required in relation to the contamination of land	The EPA has previously declared portions of the wider Barangaroo Area significantly contaminated land, including the former Millers Point Gasworks. If contaminated land is discovered it must be assessed in accordance with this Act. Areas on site with potential contamination subject to services trench excavation have been identified and will be assessed further by subject matter expert engaged by BESIX Watpac
Heritage Act 1977 (Section 146)	The Heritage Council must be notified if a relic is uncovered during construction and if it is reasonable to believe that the Heritage Council is unaware of the location of the relic.	Items of historic heritage potential within or adjacent to the Site include: - Munn Street/Dalgety Bond Store; - Millers and Dawes Point Village Precincts; - Hickson Road Retaining Wall; and, - The Hickson Road Bridges. Areas on Site and adjacent to the Site with the potential for archaeological heritage have been assessed and mapped according to risk in the Heritage Management Sub-plan, Appendix D.
Dangerous Goods (Road & Rail Transport) Act 2008	A license is required for the storage and/or transport of prescribed quantities of dangerous goods	Quantities are expected to be low. Where threshold for quantities exceeded, specific requirements include appropriate placards on the transport vehicle, emergency procedures, personal protective equipment, cargo documentation and placement of fire extinguishers.

Legislation	Requirement	How this Act relates to the project
Protection of the Environment Operations Act 1997	The relevant objective of the Act is to prevent environmental pollution. The Act contains provisions relating to: • EPLs, including the calculation of administrative and load-based licence fees. EPLs are required when activities are above thresholds in Schedule 1 are identified. • the definition of water pollution and exemptions from the offence of polluting waters under the Act, • compliance with the National Environment Protection (National Pollutant Inventory) Measure made under the National Environment Protection Council Act 1994 (Cth), • the issuing of penalty notices under the Act and certain related environmental legislation, • the appropriate regulatory authority for certain type of activities, • fees for environmental protection notices, • notification of pollution incidents.	Construction works for the project are not listed as scheduled activities under the Act. During the TSE program the WTP operated under an EPL, however this EPL is no longer enforced and the WTP is managed under the WDIA during the construction only package of works. Should an Environmental Protection Notice be issued or an Environmental Protection Offence occur BESIX Watpac will comply with the requirements of the notice in accordance with the Act. BESIX Watpac will comply with Section 120 of the POEO in relation to water pollution, and other relevant parts of the Act in relation to air, water and noise pollution.
National Environment Protection (Diesel Vehicle Emissions) Measure 2001	Ensure emissions from all internal combustion engines including diesel engines are not visible for a continuous period of 10 or more seconds. Otherwise the vehicle must not be used until serviced.	All diesel powered plant to be in good operation to minimise air pollution from diesel fumes
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)	Act protects fauna (threatened species, ecological community, or migratory species from any action that may result in their death, injury, keeping or moving. Obligation to notify Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) within 7 days of finding sensitive fauna on site	Very low likelihood given the lack of natural environment, but in the case a sensitive fauna establishes itself on site, BESIX Watpac are to ensure it is protected until it can be handled by a qualified ecologist
Environmental Planning & Assessment Act 1979	The objects of the Act are as follows— (a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources, (b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment, (c) to promote the orderly and economic use and development of land, (d) to promote the delivery and maintenance of affordable housing, (e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats, (f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage), (g) to promote good design and amenity of the built environment,	BESIX Watpac need to comply with Critical State Significant Infrastructure 7400 Conditions of Approval and Revised Environmental Mitigation Measures.

Legislation	Requirement	How this Act relates to the project
	(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants, (i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State, (j) to provide increased opportunity for community participation in environmental planning and assessment.	
National Greenhouse and Energy Reporting Act 2007	The Act introduces a single national framework for reporting and disseminating company information about greenhouse gas emissions, energy production and energy consumption	BESIX Watpac and subcontractors site greenhouse gas emissions associated with the project scope, must be collated reported.
National Parks and Wildlife Act 1974	The Act aims at conserving the State's natural and cultural heritage, fostering public appreciation, understanding and enjoyment of the State's natural and cultural heritage.	Low Relevance. As the Project is Critical State Significant Infrastructure (CSSI), the requirements of the *National Parks and Wildlife Act 1974* are being assessed under Part 5.1 of the EP&A Act. Additionally no items of Aboriginal Significance have been identified as being present on the Site. This is addressed in the Project Planning Approval and no separate permits will be required.
Fisheries Management Act 1994	The Act governs the management of fish and their habitat in NSW including regulating activities that can impact on fish habitats.	Low Relevance Along with the POEO Act water discharging from the site must not pollute the adjacent streams or watercourses. Sydney Metro projects assessed under Part 5.1 of the EP&A Act are exempt from permits required under sections 201, 205 or 219.
Biosecurity Act 2015	The Act aims to provide for the prevention elimination, minimisation and management of biosecurity risks.	Under Part 3 of the Act there is a general biosecurity duty to prevent, eliminate or minimise risks posed by priority weeds
Ozone Protection Act 1989	The Act aims to project the environment by reducing emission of ozone depleting substances and synthetic greenhouse gases.	The relevance of this Act will relate to the use of refrigerators and air conditioning units in site buildings and vehicles which still contain CFCs. Such items are unlikely to be found on site.
Sydney Water Act 1994	The Act establishes Sydney Water as a State-owned corporation for the supply of water, provision of sewerage and stormwater drainage systems.	Coordination is required with Sydney water during the works. Operational groundwater may be discharged to sewer under a Trade Waste Agreement managed by Sydney Metro.
Waste Avoidance and Resource Recovery Act 2001	The Act aims to minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and reuse and recycling of waste.	The relevance of the Act to this project is to implement the strategies by adopting the hierarchy of: • avoidance of unnecessary resource consumption; • resource recovery (including reuse, reprocessing,

Legislation	Requirement	How this Act relates to the project
		• recycling and energy recovery), & disposal (as a last resort).

The BESIX Watpac Planning and Environment Manager will review legislative and other requirements at six monthly intervals during construction as part of the management review of this CEMP and update the document with any applicable changes. The Planning and Environment Manager will consult with internal legal advisors, SM and the ER to ensure new legislation is captured in the review. Any changes made to the legal and other requirements register will be communicated to the wider project team where necessary through toolbox talks, specific training and/or other methods detailed in Section 5.2.

2.2 Environment Protection Licences

The construction activities being undertaken as part of the Barangaroo Metro Station described in this CEMP have no activities identified under Schedule 1 of the *Protection of Environmental Operation Act 1997* (POEO), and as such no Environment Protection Licence (EPL) is required, or will be sought. During the TSE works an EPL was required for water discharge from the WTP, however upon the completion of these works NSW EPA indicated an EPL was not required. During the Construction Package the WTP discharge is managed in accordance with a Water Discharge Impact Assessment (WDIA) and water quality monitoring program.

2.3 Standards and Guidelines

2.3.1 Standards

The following Australian standards relating to environmental management apply to the project:

- ISO 14001:2015 Environmental Management Systems – Requirements with Guidance for Use
- AS4282:2019 Control of the Obtrusive Effect of Outdoor Lighting

Standards applicable to hazardous chemicals may be utilised where applicable:

- AS1940-2017 The Storage and Handling of Flammable & Combustible Liquids
- AS4326-2008 The Storage and Handling of Oxidising Agents
- AS 3780-2008 The Storage and Handling of Corrosive Substances (similar standards exist for other classes of dangerous goods)
- AS/NZS 3833:2007 The Storage and Handling of Mixed Classes of Dangerous Goods, in Packages and Intermediate Bulk Containers

Standards applicable to noise and vibration are included in the Construction Noise and Vibration Management Plan (CNVMP) which is a sub plan to the CEMP.

2.3.2 Guidelines

The following guidelines relating to environmental management apply to the project:

- ANZECC 2000: Australian Water Quality Guidelines for Fresh and Marine Water Quality.
- Department of Environment and Climate Change NSW 2009: Interim Construction Noise Guidelines.
- DPIE 2020: Environmental Management Plan Guideline, Guideline for Infrastructure Projects.
- EPA 2014: Waste Classification Guidelines.
- Landcom 2004: Managing Urban Stormwater - Soils and Construction (Blue Book), Version 4.
- SafeWork NSW 2022: Code of Practice How to Safely Remove Asbestos.
- SafeWork NSW 2022: Code of Practice How to Manage and Control of Asbestos in the Workplace.
- NSW EPA, 2016: Waste Locate Asbestos Waste Transporter User Guides.
- Sydney Metro Environment and Sustainability Policy.

- NSW EPA 2007: Storing and Handling Liquids: trainers manual, including Review of Best Practice and Regulation

The following Sydney Metro guidelines relating to environmental management apply to the project:

- Sydney Metro Unexpected Heritage Finds Procedure.
- Sydney Metro Pre-construction Minor Works Approval.
- Sydney Metro City & Southwest Out of Hours Strategy Protocol (SM-ES-PW-317).
- Sydney Metro City & Southwest Construction Noise and Vibration Strategy (SM-ES-ST-210).
- Sydney Metro Water Discharge and Reuse Procedure (SM-17-00000098).
- Sydney Metro Risk Management Standard (SM-17-00000182)
- Compliance Monitoring/Tracking and Reporting Program Report
- Sydney Metro Overarching Community Communication Strategy

3. Environmental Risk Assessment

The environmental assessment prepared for the project identifies environmental risks and safeguards to be implemented to avoid or minimise those risks. Other risks have been identified through detailed understanding of proposed construction activities.

BESIX Watpac carried out a risk workshop during the preparation of the CEMP, and will do so each time the CEMP is revised, to collate and identify environmental risks and utilise the template risk matrix from the Sydney Metro Risk Management Standard (SM-17-00000182). The risk workshops focus on first identifying and categorising the sources of risk, potential incidents, the potential consequences and the likelihood of those risks. Each risk is assessed with 'business as usual controls' then re-evaluated with proposed management and So Far As Is Reasonably Practicable (SFAIRP) additional controls and treatments to minimise those risks.

The environmental risk assessment for the project is included in Appendix I.

Risks are rated in four levels: Very High – High - Medium - Low

Nil Very High Risks were identified. Some High Risks were identified and mitigated to Medium risk. Any High Risks will require priority focus and are considered undesirable and will require confirmation from Sydney Metro that all reasonably practical treatments have been implemented. Medium Risks were identified are considered tolerable but are subject to reasonable and practical controls. Low Risks which are broadly acceptable subject to appropriate monitoring and standard controls.

Further detail on risk context is provided in Sydney Metro Risk Management Standard (SM-17-00000182).

The program for ongoing analysis of the key environmental risks and a review of the environmental risk assessment in Appendix I will occur as follows:

- During the six-monthly update of the CEMP;
- At the completion of environmental audits if required and when opportunities for improvement are identified;
- As a result of changes in environmental legislation or other requirements applicable to the project; and
- If there is a change to the scope of the project which may have an environmental impact.

3.1 Environmental Work Method Statement

There is the potential for works to be required that are outside of the initial scope of works for the COP. Environmental Work Method Statements will be used to address the risks to the environment that are identified as part of undertaking these works, with the objective to confirm the identified risks are within the acceptable limits for both personnel and the environment.

The Environmental Work Method Statement will be a document that contains the information required to manage the potential environmental risks of the activity to be undertaken. Environmental risks identified will be rated in the same manner as the Project's Environmental Risk Assessment in Appendix I.

The Environmental Work Method Statement will provide:

- Summary of the proposed works and justification;
- A methodology for the proposed works;
- Identification of relevant Revised Environmental Mitigation Measures and Conditions of Approval
- An environmental risk assessment for the proposed works before control measures are adopted;
- Control measures applicable to the proposed activities; and,
- An environmental risk assessment for the proposed works following the implementation of the proposed controls.

The adoption of the Environmental Work Method Statement process in each instance would also be subject to confirmation by Sydney Metro and the Environmental Representative of any minor planning or other

assessments that may be required, dependent on the level of risk involved and consistency with the approved project. Following this review and updates as required by Sydney Metro and the Environmental Representative as required the Environmental Work Method Statement will be approved by the BESIX Watpac Planning and Environmental Manager or a Designated Representative.

4. Environmental Management Requirements

4.1 Environmental Control Maps

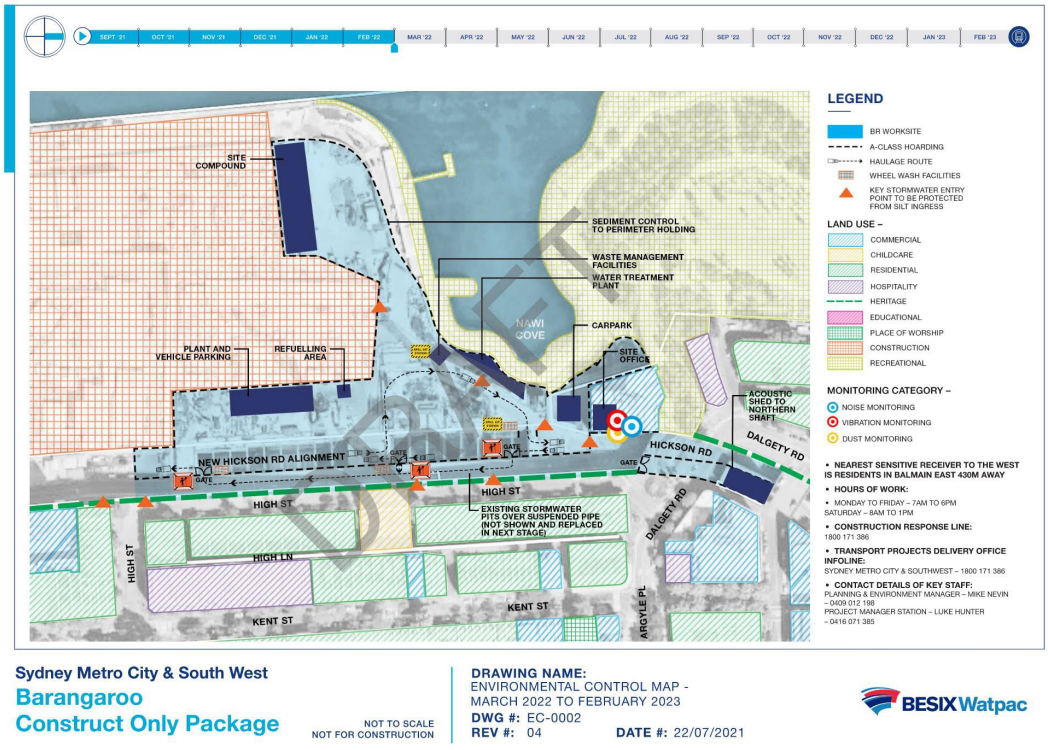
To assist construction planning and on-site construction management, Environmental Control Maps (ECM) have been prepared as part of this CEMP which is described below.

The ECM identifies:

- Those environmental procedures, environmental approvals, or licences which are applicable
- Environmentally sensitive areas and/or receivers on and adjacent to the site, including any exclusion zones
- Waterways, including stormwater drains
- Erosion and sediment control measures
- Significant structures, work areas, machinery and vehicle parking, spoil stockpiling and fuel/ chemical areas
- Tree protection zones
- Monitoring locations (e.g., noise, vibration and water), and
- Location of sensitive receivers (e.g., residents, hotels, pre-schools).

The ECM is a 'developing document' and will be updated and re-issued periodically as required. The ECM will be issued prior to any construction works or low impact works such as site establishment occurring. The ECM will be approved by the BESIX Watpac Planning and Environment Manager. Due to the need to change and support construction activities and environmental risks, the ECM will be controlled as a standalone document outside of the CEMP. At the completion of construction works environmental controls will be removed from the Site.

Figure 5 Example Environmental Control Map (ECM) – DRAFT



4.2 Condition Surveys

Condition surveys of properties potentially affected by Construction were offered to owners and, if accepted, were carried out a minimum of four weeks prior to being granted site access in accordance with CoA E59.

In accordance with CoA E90, a Road Dilapidation Report has been prepared for local roads proposed to be used by heavy vehicles for the Project. Copies of the report were submitted to relevant stakeholders within one month of use of roads by heavy construction vehicles in accordance with CoA E90.

The condition survey and dilapidation report were prepared by an independent consultant and will be used at the end of the high-risk activities as a base to assess possible links with any observed damage. In accordance with CoA E91 if damage is identified as a result of construction works either during works or at completion the damage will be rectified or compensated.

REMM T22 requires a condition survey to be undertaken where existing footpath routes used by pedestrians and cyclists are affected by construction. The survey is to confirm the footpath is suitably lit and paved for use.

4.3 Reinstatement

The Site will be reinstated in accordance with Section 5.3 of the CEMF at the conclusion of Construction as follows:

- BESIX Watpac will clear and clean all working areas and accesses at project completion;
- At the completion of construction all plant, temporary buildings or vehicles not required for the subsequent stage of construction will be removed from the Site;
- All land, including roadways, footpaths, loading facilities or other land having been occupied temporarily will be returned to their pre-existing condition or better;
  - » In accordance with REMM Condition LV10 rehabilitation works to public open space will be in consultation with the relevant local council and/or landowner;
- Reinstatement of any impacted community spaces, infrastructure and services will occur as soon as possible after completion of construction; and,
- As per SSI 7400 Condition E60 ,within three months of completion of construction, all property owners of buildings for which a building condition survey was carried out in accordance with CoA E59 must be offered a second building condition survey.

4.4 Register of Hold Points

Hold points beyond which approval is required to proceed with a certain activity are summarised in Table 6 below:

Table 6 List of Hold Points

Hold Point	Release of Hold point	By Whom
Prior to ground disturbance	Erosion and Sediment controls	BESIX Watpac Planning & Environmental Manager
Prior to Vegetation Clearance	Pre Clearance Inspection/Tree Report	Qualified Ecologist
Prior to any discharge of water off site	Approval of the WDIA, WQMP and updated Soil and Water Procedure	BESIX Watpac Planning Manager
Discharge of Water	Water tested to verify compliance prior to discharge	BESIX Watpac Planning & Environmental Manager
Out of Hours works	Construction Noise and Vibration Management plan and Out of Hours Works Approval	BESIX Watpac Planning & Environmental Manager, Sydney Metro, the Independent Acoustics Advisor (AA) and the ER

Hold Point	Release of Hold point	By Whom
Use of Local roads by Heavy vehicles	Road dilapidation report	Transport engineering consultant engaged by Contractor
Unexpected Heritage find	Primary Historic Excavation Director approval to progress construction	Primary Historic Excavation Director
Unexpected Heritage find (Aboriginal Heritage)	Aboriginal Heritage Excavation Director approval to progress construction	Aboriginal Heritage Excavation Director
Construction identified as affecting building (e.g. excavation and or dewatering)	Building condition survey	Structural engineering consultant engaged by Contractor
CEMP & Sub-plans	Site specific CEMP and sub-plans have been developed, reviewed, and approved.	DPE, AA (CNVMP) and ER
Transport of Controlled / Hazardous waste from the site	Verification that the waste has been classified in accordance with the guidelines, transport licensing in place and landfill can lawfully receive the waste Section 143 notice or equivalent from waste receiver has been received	BESIX Watpac Project Engineers
Spoil import and removal	Verification that the spoil has been classified and the disposal location can lawfully receive the waste. Section 143 notice or equivalent from waste receiver has been received Imported material has classification reports or appropriate testing to demonstrate that it meets any EPA exemptions All records maintained in Waste Spoil Register	BESIX Watpac Project Engineer and Planning and Environment Manager
Pre-construction compliance report	Pre-Construction Compliance Report (PCCR) to be completed in accordance with CoA A32 and submitted to DPE at least one month prior to the commencement of Construction	Sydney Metro
Construction Monitoring Programs	Endorsement of the programs by the ER and submission to DPE for approval at least one month prior to the commencement Construction Relevant baseline data for the specific construction activity has been collected.	BESIX Watpac Planning & Environmental Manager, Sydney Metro, the Independent Acoustics Advisor (AA) and the ER

4.5 Unexpected Finds – Asbestos or Contaminated Land

In the event of an unexpected find of materials containing asbestos or potentially contaminated soil BESIX Watpac will utilise the following procedures:

- Spoil Management Plan and Sampling, Analysis & Quality Plan (SMPSAQP);
- Unexpected Contaminated Land and Asbestos Finds Procedure (UCLAFP);
  - » Included in Appendix O; and,
- BESIX Watpac Standard Environmental Protocol (F.12).

A summary of the required actions provided below:

- Cease work in the immediate area;
- Notify the BESIX Watpac Construction Managers and Planning and Environmental Manager;
- BESIX Watpac Construction Managers to notify any other parties such as WHS Manager, and consultant Hygienist and consult with the BESIX Watpac Planning and Environment Manager;

- If potential asbestos containing materials are identified water spray will be utilised to keep dust levels down;
- Restrict affected workers from moving around Site or leaving site with potential contamination on clothes and boots;
- BESIX Watpac Planning and Environment Manager to assess if additional specialist expertise is required and that management, monitoring established to minimise risk; and
- At the completion and closure of the Unexpected Find, clearance/closure documentation will be provided to Sydney Metro.

4.6 Hazardous Chemicals

Typically only small volumes of hazardous chemical will be stored on site. Dangerous goods, as defined by the Australian Dangerous Goods Code, will be stored and handled in accordance with:

- All relevant Australian Standards;
- For liquids, a minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund; and,
- EPA guidelines for best practice.

Safety Data Sheets (SDS) of all hazardous chemicals will be kept on file in the Site Office, the SDS will be regularly reviewed through environmental inspections. All hazardous chemicals will be kept in locked containers, positioned away from vehicle movements, and have access to clean and dry spill kits.

5. Roles and Responsibilities

5.1 Key Personnel

The below roles and environmental responsibilities have been set out to satisfy CoA C2(j).

5.1.1 Project Director

The environmental responsibilities for the BESIX Watpac Project Director are:

- Ensure the requirements of this CEMP are fully implemented, and that environmental requirements are not secondary to other construction requirements;
- Endorse and support the environmental policy (Appendix A);
- Liaise with Sydney Metro and other government authorities as required;
- Participate and provide guidance in the regular review of this CEMP and supporting documentation;
- Provide adequate resources (personnel, financial and technological) to ensure effective development, implementation and maintenance of this CEMP;
- Ensure that all personnel receive appropriate induction training, including details of the environmental and community requirements;
- Ensure that complaints are investigated, and issues are resolved in accordance with the community and stakeholder engagement plan; and,
- Direct that works be stopped immediately where there is an actual or potential risk of harm to the environment, property and/or human health.

5.1.2 Construction Managers

The BESIX Watpac Construction Managers are responsible to the Project Director to ensure effective environmental controls are implemented for the duration of the project.

Specifically, the Construction Managers are responsible for the:

- Planning construction works so that it minimises impact to the environment;
- Implementing and maintaining the CEMP;
- Implementing the CTMP and related approvals;
- Reviewing the environmental aspects at project start-up and ensuring the CEMP addresses all requirements;
- Providing guidance, motivation and resources to achieve the provisions of the CEMP;
- Ensuring that subcontractors and suppliers are aware of BESIX Watpac's environmental policy and objectives, through conditions of contract, tender interviews, scopes of work and site environmental inductions as applicable; and,
- Establishing monitoring records and ensuring the scope and frequency of monitoring activities satisfies the requirements of the CEMP;

The Construction Managers shall have sufficient authority and independence to:

- Identify and record any environmental problems;
- Initiate solutions to the environmental problem;
- Stop the works, if such a decision becomes necessary, in order to prevent or mitigate adverse environmental conditions, or if corrective measures recommended are not being carried out; and,
- Provide recommendations for EMS and operational improvements to the BESIX Watpac Planning and Environment Manager.

5.1.3 Planning and Environment Manager

The BESIX Watpac Planning and Environment Manager is responsible for establishing and maintaining the Company's Environment Management System for the project and represents BESIX Watpac on all environmental matters pertinent to the CEMP and EMS.

The Planning and Environment Manager is responsible for:

- Reports to the Project Director on performance and implementation of the CEMP and associated sub-Plans;
- Assisting the Construction Managers with the implementation of the CEMP;
- Providing support and technical assistance to the Project Site Engineers;
- Monitoring the effectiveness of the Environmental Management System;
- Primary contact with Sydney Metro, the Environmental Representative and other government authorities on environmental and approvals issues;
- Ensures CEMP reviews are carried out in accordance with the CEMP;
- Monthly environmental reports;
- Applies and obtains all licenses;
- Compliance Tracking Reporting and collating of evidence;
- Register of Hold Points and Records of release
- Has authority to stop the works, if such a decision becomes necessary, in order to prevent or mitigate adverse environmental conditions, or if corrective measures recommended are not being carried out;
- Assists stakeholder and community manager on environmental issues;
- Attend environmental inspections, report on environmental incidents and non-compliances against the CoAs and REMMs and close out of related actions; and,
- Continually assess environmental risks.

The Planning and Environment Manager is authorised to require all employees, including Construction Managers to comply with the provisions of the CEMP and EMS and may issue directions to that effect.

5.1.4 Environmental Coordinator/Site Engineer

The Environmental Coordinator role will be fulfilled by a Site Engineer. The Environmental Coordinator is responsible to the Planning and Environment Manager and Construction Managers for the maintenance of the EMS and CEMP.

The Environmental Coordinator will prepare/compile registers, records, plans and forms necessary for the implementation of environmental controls.

Responsibilities of the Environmental Coordinator will include:

- Monitor the construction processes to ensure that appropriate environmental protection/procedures are in place;
- Identify and record any environmental issues;
- Recommend and initiate solutions to environmental problems and verify the implementation of solutions;
- Investigate all environmental complaints (which shall be recorded on the project records);
- Control and maintain project environmental records, including indexing records, prior to archiving;
- Implement any environmental checklists, field records and procedures as applicable to the works;
- Maintenance the CEMP and control of distribution;
- Provide recommendations to the Planning and Environment Manager for EMS and operational improvements; and,
- Collates input for monthly reports for the Planning and Environment Manager.

5.1.5 Document Controller

The BESIX Watpac Project Document Controller with respect to environmental issues reports to the Planning and Environment Manager. Responsibilities include:

- Uploading and maintaining controlled versions of the CEMP, and other document submissions, for approval and evidence for compliance tracking on the Principal and Contractor's PDCS and websites;
- Notices to the Principal regarding audits, corrective actions and dissemination of environmental audit reports; and,
- Upload of monthly reports.

5.1.6 Independent Verification and Audit Staff

Individual employees or consultants may be appointed by BESIX Watpac to assist the Planning and Environment Manager to carry out internal environmental verification and audit.

Independent Verification staff will not be drawn from personnel who are performing or directly supervising the activities being inspected.

5.1.7 Independent Environmental Auditor

The Independent Environmental Auditor is a stakeholder that is responsible for carrying out environmental audits of the project on behalf of Sydney Metro. The Independent Environmental Auditor will undertake external audits on environmental management as co-ordinated with Sydney Metro.

5.1.8 Stakeholder and Community Relations Manager

With respect to environmental issues the Stakeholder and Community Relations Manager is responsible for:

- Ensuring communities are informed in accordance with the Project requirements;
- Report to the Planning and Environment Manager of any issues raised by the community;
- Reporting to the Project Director;
- Maintaining a 24-hour complaints hotline;
- Maintaining the project website and reviews/endorses all content provided to that website;
- Drafting and issuing community notifications for works taking place out of hours; and,
- Representing BESIX Watpac at meetings with local stakeholders and community groups.

Refer to the Community Communications Strategy and Business Plan (a sub plan to the Contract Management Plan, which is separate to this CEMP)

5.1.9 Independent Environmental Representative

A suitably qualified and experienced Environmental Representative (ER) who is independent of the design and construction personnel has been nominated by Sydney Metro, approved by the Secretary and engaged by Sydney Metro for the duration of construction of the CSSI. The responsibilities of the independent ER are defined in CoA A24.

5.1.10 Independent Acoustic Advisor

A suitably qualified and experienced Acoustics Advisor (AA) who is independent of the design and construction personnel has been nominated by Sydney Metro, approved by the Secretary engaged by Sydney Metro for the duration of construction of the CSSI. The responsibilities of the independent AA are defined in CoA A25. Refer to the CNVMP for further detail.

5.1.11 Contracts Manager

The Contracts Manager shall be responsible to the Construction Managers to ensure proper procedures are followed for the procurement of goods and services to ensure that BESIX Watpac's environmental policy and objectives and the requirements of the CEMP are achieved.

5.1.12 Direct Labour

Each tradesperson, trades assistant, operator and employee shall be responsible for carrying out their work in accordance with BESIX Watpac's stated Environmental Policy and objectives, the CEMP and as instructed by their supervisor.

5.1.13 Subcontractors and Suppliers

BESIX Watpac will ensure all subcontractors and suppliers are responsible for conducting their activities in an environmentally sensitive manner and in compliance with the requirements of this CEMP and sub-plans, CSSI 7400, Environmental Control Maps, ISO 14001 and Sydney Metro procedures.

Site inductions will include detailed and site-specific environmental information. Any trade likely to have a high impact on the environment is required to submit an EMP, which is assessed using the "*Subcontractor EMP assessment checklist*" to ensure it is comprehensive.

All personnel shall notify the BESIX Watpac Site Manager of any activity or incident, or any deviations from workplace practices and procedures set out in this CEMP.

Subcontractor audits can be conducted. The standard audit checklist forming part of the BESIX Watpac quality assurance system environmental criteria which can be adapted to the nature of the trade work.

Contractors shall ensure their personnel working at the site:

- Have the appropriate environmental awareness training and / or qualification for the task undertaken; and,
- Are aware of the potential environmental impacts of their activities on the Site and the procedures by which such impacts are to be minimised or prevented.

5.1.14 Specialist Consultants

BESIX Watpac will engage consultants as per Table 7 below for environmental matters.

Table 7 Propose Consultant Team

Environmental Category	Consultant	Scope
Geotechnical / Contamination / Soil	Douglas Partners	Development of the SMPSAQP, ASSMP and Preliminary Site Investigation (Contamination)
Water	WSP	WDIA
Noise & vibration	Renzo Tonin	Refer CNVMP
Heritage	AMBS	Refer HMP
Sustainability	WSP	Refer SMP
Community	ERM	Refer CCSBMP
Water Quality Monitoring	Property Risk Australia (PRA)	Monitoring of water quality to meet the requirements of the WQMP

5.2 Environmental Training

As part of their Site induction all personnel engaged in the works shall be made aware of the provisions of this CEMP to promote a general awareness of the environment and to minimise any potential impact upon it.

Targeted environmental training will be appropriately commensurate with their roles and environmental responsibilities in the project. Specifically, the following environmental training will be undertaken by BESIX Watpac construction personnel:

- Use of noise monitoring equipment;
- Use of water quality sampling equipment; and,
- Use of spill kits.

Contractors shall be responsible for providing evidence to BESIX Watpac, as applicable, prior to commencing work that:

- Environmental training needs of their personnel working at the site been assessed and satisfied; and,
- Contractor personnel have received the appropriate environmental awareness training and / or qualification for the task to be undertaken.

Training requirements for BESIX Watpac personnel are identified and planned on appointment to their role, and for each project. The Construction Managers in consultation with the Planning and Environment Manager will monitor the skills required by BESIX Watpac personnel and contractors to effectively implement the CEMP and its procedures on Site.

All project personnel including subcontractors will be required to attend a general induction prior to commencement on site. General inductions will also have a structured component focussing on environmental issues and management.

The environmental induction will include:

- Relevant details of the CEMP;
- General environmental management requirements; and,
- Incident response and reporting requirements.

The Project Safety Advisor will establish a register (date, name, role/position, key activities) of all personnel inducted. The register will be maintained by the Project Safety Advisor for the duration of the project.

5.2.1 Toolbox Talks

To assist with ongoing awareness, Construction Managers and delegated representatives are to include relevant environmental specific management issues in toolbox talks.

Toolbox talks will be tailored to specific environmental issues including (but not limited to):

- Erosion and sedimentation control;
- Hours of work;
- Emergency and spill response;
- Heritage;
- Noise;
- Housekeeping and waste;
- Concrete washout;
- Excavation dewatering;
- Dust control;
- General procedures for site preparation prior to absence or significant rain events;
- Out of hour work approval processes;

- Working outside of standard construction hours (including monitoring of noise and light spill);
- Dealing with members of the public and/or stakeholders;
- Use of non-tonal reverse alarms; and,
- Respite periods.

Toolbox talk attendance is mandatory, and attendees of Toolbox talks are required to sign an attendance form. Records of toolbox talk attendance will be maintained by the Environmental Coordinator.

The Planning & Environment Manager will review the training program and monitor its implementation.

6. Implementation

6.1 Environmental Monitoring, Inspections and Auditing

The BESIX Watpac Planning and Environment Manager will facilitate the following program of monitoring, reviews and audits, to satisfy CoA C2(f), as per Table 8 below:

Table 8 Proposed Monitoring and Audit Frequency

Activity	Sub-category	Responsibility	Frequency
Environmental Site Surveillance	Erosion and sediment controls	Environmental Coordinator	Weekly and before and after any heavy rainfall event
	Water treatment plant	Environmental Coordinator	Daily, Monthly & Quarterly
	Dust - Air quality	Environmental Coordinator	Daily
	Noise control	Environmental Coordinator Refer CNVMP	Continuous
	Contamination identification, isolation and treatment	Environmental Coordinator	Daily during high risk activities
	Heritage finds, protection and recording	Environmental Coordinator refer HMP	Daily during high risk activities
	Visual amenity	Environmental Coordinator) refer VAP	Daily for damage and graffiti
ER Inspections	All relevant site environmental aspects	ER accompanied with the Planning & Environmental Manager and the Environmental coordinator	Between fortnightly and an as needs basis dependent on level of onsite work activities and environmental risk profile
Review of environmental actions and controls	All site environmental controls	BESIX Watpac Planning & Environmental Manager	Between weekly and an as needs basis dependent on level of onsite work activities and environmental risk profile
Formal Compliance Review of Requirements	Conditions of Approval, REMMs	BESIX Watpac Planning & Environmental Manager, and ER review	Quarterly
Independent Environmental Auditing	Scope TBC	Independent Auditor accompanied with BESIX Watpac Planning & Environmental Manager as required for access and records	As per the Independent Audit Schedule
	Water treatment plant	Independent auditor accompanied with ER as required for access and records	Annually
	Dust - Air quality	Independent auditor accompanied with ER as required for access and records	Annually
	Noise control	Refer CNVMP	Six monthly
	Contamination identification, isolation and treatment	Independent auditor accompanied with ER as required for access and records	Annually
	Heritage finds, protection and recording	Independent auditor accompanied with ER as	Annually

Activity	Sub-category	Responsibility	Frequency
		required for access and records	
Contractor Review	CEMP & Sub Plan	Planning & Environmental Manager, Environmental Coordinator, Construction Managers & Project Director	Six monthly and 4 weeks prior to SM review (Update maximum annually following approved revision)
Contractor Review	Environmental Risk Register and Risk assessment	Planning & Environmental Manager, Environmental Coordinator Construction Managers	Six monthly or at any time initiated by the Planning & Environmental Manager to address new or changed construction activities
Contractor Review	Environmental Management System	Planning & Environmental Manager, Environmental Coordinator Construction Managers	Annually or at any time initiated by the Planning & Environmental Manager to address new or changed construction activities
Contractor Internal Audits	All site environmental aspects	Planning & Environmental Manager and QA Lead (NSW) accompanied with the ER	Six monthly
Contractor Review	CEMP & Sub Plans	BESIX Watpac Planning & Environment Manager	Six monthly.

6.1.1 Environmental Management System Audit

Auditing of the project Environmental Management System (EMS) will be carried out in accordance with ISO14001:2015 Environmental Management Systems and AS/NZS ISO 19011:2014 -Guidelines for Auditing Management Systems

The audit will evaluate compliance with this CEMP and associated documentation including:

- Compliance with any approval, permit or licence conditions;
- Compliance with the EMS, CEMP, SMP, sub-plans and procedures;
- Community consultation and complaint response;
- Environmental training records; and,
- Environmental monitoring and inspection results.

The audits will be conducted by BESIX Watpac's Quality Manager, or an independent consultant engaged by BESIX Watpac.

An audit report will be issued by the Quality Manager to the Planning and Environment Manager for action. Actions will be followed up for close-out of actions within one month of the issue of the audit report.

The Independent Environmental Audit Program required by conditions A37 to A40 will be managed by Sydney Metro. BESIX Watpac will participate in these external audits as required by the Audit Working Group audit schedule.

6.1.2 Management Review

The Project Management Team will check the status and adequacy of the CEMP to ensure that it meets current Sydney Metro and BESIX Watpac requirements as well as relevant environmental standards.

The CEMP and an analysis of key environmental risks as defined in Appendix I will be reviewed during the course of the contract when the following situations arise:

- Sydney Metro recommendations for changes (particularly following initial review);
- Changes to the EMS; and,
- Opportunities for improvement or deficiencies in the project system are identified.

6.1.3 Environmental Audits

The audit frequencies noted above must be aligned with the Project Audit Program and the Compliance Tracking Program, a master program controlled by Sydney Metro. BESIX Watpac will provide Sydney Metro will all documentation relating to the Barangaroo Station construction activities to enable Sydney Metro to comply with the requirements of CoAs A37 to A45 as they relate to the Environmental Audit Program. The Planning and Environment Manager (or as delegated to the document controller) must notify the Principal with regard to audits timing with 10 days advance notice to enable opportunity to attend.

The Planning and Environmental Manager will be responsible for maintaining a controlled register of environmental issues arising from internal and external reviews and formal audits. The register will be updated within 24 hours of new information and reviewed monthly prior to the production of the monthly progress report.

The Environmental issues register will be structured as follows:

- Item No;
- Source (Observation, ER inspection, internal review, external review, internal audit, external audit);
- Notice type (improvement request, non compliance, incident etc);
- Date logged;
- Date targeted for closing out;
- Environmental category;
- Description of the issue;
- Action owner (as directed/authorised by the Planning and Environmental Manager or Project Director);
- Proposed action;
- Referenced evidence of action;
- Date closed;
- Findings & improvement identification (e.g. update inductions, training, CEMP, EMS etc); and
- Comments on closeout and improvements.

Independent Auditors will require, and be granted access to, all relevant environmental procedure and records of which access will be facilitated by the Planning and Environmental Manager or as directed and delegated any BESIX Watpac staff.

6.2 Environmental Non-Conformances, Corrective and Preventive Actions and Planning Non-Compliances

The BESIX Watpac Planning and Environment Manager will identify and evaluate all non-conformances with legal requirements; applicable permits; specifications and the requirements with this CEMP.

Non-conformance Reports shall be raised as appropriate to clearly identify the nature of the non-conformance and document the proposed remedial action and the person responsible.

The Planning and Environment Manager will work with the Construction Managers to verify that the follow-up action is implemented and effective. Reports will be distributed and filed on the Contractor's PDCS.

Corrective and Preventive Action Requests will be raised, where appropriate, to correct and/or prevent non-conformances in construction activities and in the operation of the EMS.

Actions as a result of Corrective and Preventive Action requests will be implemented, followed-up and recorded in the Project records.

Non-compliances with the planning approval will be documented and addressed by BESIX Watpac in accordance with the Sydney Metro Environmental Incident and Non-compliance Reporting Procedure.

6.3 Environmental Records and Compliance Reporting

6.3.1 Records

The following records are to be retained:

- Environmental Inspection Reports from the ER;
- Environmental Incident and Complaint Reports;
- Environmental Non-conformance Reports;
- Environmental Corrective and Preventive Action Requests;
- Environmental Reports from Specialist consultants;
- Copies of all applicable Environmental Permits;
- Environmental Monitoring Records;
- Environmental Induction and Training Records;
- Environmental Audit Reports;
- Any correspondence regarding environmental issues relating to the Site; and,
- CoA and REMMs compliance tracking (as related to this CEMP and sub plans).

Environmental documents maintained and kept electronically include:

- Environmental Control Maps (controlled revisions);
- Erosion and Sediment control Plans (controlled revisions); and,
- The CEMP, sub-plans and corresponding risk assessments.

Records and their summaries form key baseline information for monthly reports generated as per Section 6.3.3 below. Records will be retained onsite for the duration of works and following completion, records will be retained by BESIX Watpac for a period of no less than 7 years.

6.3.2 Compliance Tracking

BESIX Watpac will undertake compliance tracking to meet the requirements of CoAs A28 to A30 utilising the Compliance Tracking Program which SM have overall responsibility to manage. BESIX Watpac will monitor compliance tracking internally, quarterly at compliance tracking internal workshops where the status of those Conditions of Approval which BESIX Watpac are responsible for will be reviewed. On a quarterly basis the Planning and Environment Manager will meet with Sydney Metro and the ER to collaboratively review and update the Compliance Tracking Report to comply with the Sydney Metro Compliance Tracking Program CoAA30.

Non-compliances identified will be rectified to satisfy the requirements of CoA C2(h).

6.3.3 Monthly Reporting

During construction work a monthly progress report was issued. The BESIX monthly progress report contained a standalone section specifically for environmental reporting which had the following structure:

- Executive summary;
- Summary performance against the environmental management requirements of this CEMP;
- Status of the CEMP and all sub-plans;
- Status of environmental construction method statements;
- Identification and management of any consistency reviews to comply with the EP&A Act (NSW);
- Status (summary) of environmental obligations identified in the compliance tracking program;
- Status of and performance against environmental licences;
- Confirmation of compliance with relevant Environmental Law;
- Performance against environmental KPIs and targets;

- Graphical representation of the monthly frequency of environmental issues and incidents each month for the previous 12 months, including an analysis of trends and what actions are being taken to improve performance;
- Summarised details of environmental incidents or emergencies;
- Summary of environmental inspection reports;
- The results, findings and any environmentally relevant actions of any internal or external reviews and audits carried out;
- Summary of the number of employees that have received environmental training and the type of training they received; and,
- Outline data on spoil management which cross referenced to the sustainability management section of the monthly progress report.

Sustainability issues reporting is defined in the Sustainability Management Plan.

Monthly reports will focus on activities and records from that month prior, and if no change from previous month will not repeat that information. At the completion of works no further reporting will be undertaken.

6.4 Construction Monitoring Program

Construction monitoring programs, as required by CoA C9, have been developed by specialist consultants for monitoring of noise and vibration as outlined in *Appendix A – Applicability of C2S CoAs to each Stage*, of the Staging Report. Details of the noise and vibration monitoring program are included in the CNVMP. As required by CoA C10, the monitoring program will include the following:

- Details of baseline data available;
- Details of baseline data to be obtained and when;
- Details of all monitoring of the project to be undertaken;
- The parameters of the project to be monitored;
- The frequency of monitoring to be undertaken;
- The location of monitoring;
- The reporting of monitoring results;
- Procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and,
- Any consultation to be undertaken in relation to the monitoring programs captured in a Consultation Matrix.

The monitoring programs were developed in consultation with the NSW Environmental Protection Authority (EPA) and City of Sydney (CoS) Council and are managed in accordance with CoA C12, C13, C15, and C16. Monitoring reports are issued to the EPA and CoS for records upon issue.

The Construction Monitoring Programs, as approved by the Secretary including any minor amendments approved by the ER, must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Secretary, whichever is the greater in accordance with CoA C13.

Construction did not commence until the Secretary had approved all the required Construction Monitoring Programs and all baseline data for the specific construction activity collected as required by CoA C14.

Construction monitoring programs were undertaken in accordance with CoA. All monitoring programs have concluded as works onsite have been completed. The final monitoring reports are listed below.

1. Noise & Vibration Monitoring Report April 2024 - October 2024, SMCSWSBR-BWC-SBR-EM-REP-012335
2. Water Quality Monitoring Report: Q4 2024, SMCSWSBR-BWC-SBR-EM-REP-012467.

Whilst a water quality monitoring program is not a requirement of the Staging Report or the CoA, a Water Quality Monitoring Program (WQMP) was been developed to satisfy CoA E107, that the *NSW Water Quality Objectives* be maintained, and to meet Section 120 of the POEO Act. The WQMP will monitor the impact of BESIX Watpac's construction activities on groundwater and surface water and was been developed for assurance purposes in managing the environmental risks surrounding the discharge of treated water from the WTP, and water pumped from the western civil pit directly to the harbour bypassing the WTP. This water monitoring program is detailed within the Soil and Water Management Procedure and follow the recommendations made in the WDIA. At the completion of works the WTP was handed over to MTS with responsibility for water quality testing and management being held by the body in control of the WTP. The WTP was handed over to MTS on 20/12/24 and the final water quality monitoring report for Q4 2024 has been submitted, refer to SMCSWSBR-BWC-SBR-EM-REP-012467.

7. Communication and Consultation

7.1 Consultation

In accordance with CoA A9 all consultation with identified parties is required to be recorded with:

- Details of the consultation;
- Matters raised by the parties; and,
- How the matters were considered against the strategies, plans programs, reviews, audits and protocols.

The respective consultations in the preparation of this CEMP and sub plans are noted within each Plan.

The CEMP sub-plans are required to be prepared in consultation with the relevant government agencies as listed in CoA C3 and as per Table 9 as follows

Table 9 CEMP sub-plan consultation

CEMP sub-plan	Government agency being consulted
Construction Noise and Vibration Management Plan (CNVMP)	• City of Sydney Council – Responded 6th July 2021 (accepted)
Construction Noise and Vibration Monitoring Plan (CNVMP) **(issued as appendix in CNVMP)**	• City of Sydney – Responded 6th July 2021 (accepted) • NSW Environment Protection Authority (EPA) – Responded 13th July 2021 (accepted)
Heritage Management Plan (CHMP)	• Heritage NSW – Responded 6th August 2021 (accepted) • City of Sydney Council – Responded 6th July 2021 (accepted) • Registered Aboriginal Parties (RAPs) – 13 RAPs issued HMP on 18th June 21. Three RAPs have accepted. Remaining RAPs were phoned on the 9th of July 21 and follow up email sent. No comments from remaining 10 at date of submission.

A record of consultation which has been undertaken is contained within the Consultation Matrix which follows in Appendix K. Refer to Community Communication Strategy and Business Management Plan (CCS) for further detail.

7.2 Coordination Meetings

Planning and environment meetings will be held for representatives from Sydney Metro, the ER and BESIX Watpac key personnel. Meetings will take place following a site inspection by the ER and will be held on a fortnightly basis generally, unless the activities taking place on site and associated risk necessitate a more frequent meeting regime:

The agenda for the meetings will be to discuss the following:

- ER site inspection;
- Status of planning approvals;
- Any issues with respect to the project's environmental management;
- Any complaints and Non-conformances; and,
- Ensuring preparedness for short to mid-term look ahead in construction activities.

Meetings will be chaired by Sydney Metro and key actions minuted and distributed for action by Sydney Metro.

7.3 Internal Communication

Environmental management will be included in the weekly agenda of BESIX Watpac Project leadership meetings attended by the Project Director, Construction Managers, Commercial Manager, Program Manager, OHS Manager, Interface Manager, Planning and Environment Manager and other key managers

as required. These are structured weekly meetings to share insights and issues as to how the project is being managed, how subcontractors are performing and agree on actions to formalise with rest of the team.

7.4 Communication with Agencies and Authorities

Development of the CEMP is reliant on prior and ongoing consultation with various government agencies and authorities. The BESIX Watpac Planning and Environment Manager will be the primary contact with any external agencies regarding approvals, permits and environment.

7.5 CEMP feedback from Stakeholders

Comments received from stakeholder reviews will be logged in a register maintained in Appendix K of this CEMP. The register will record the author, date raised, the issue, the response to the issue and status. The BESIX Watpac Planning and Environmental Manager will be responsible for the maintenance and inclusion of the register in subsequent CEMP updates.

8. Incident and Emergency Management

An outline of incident and emergency management is provided below. Refer Incident Emergency and Crisis Management Plan for further details.

8.1 Definition

All environmental incidents and emergencies will be managed and classified in accordance with the *Sydney Metro Environmental Incident and Non-compliance Reporting Procedure Version 5.1 (SM-17-00000096)*.

SM define an incident as "*An occurrence or set of circumstances, as a consequence of which pollution (air, water, noise, and land) or an adverse environmental impact has occurred or is likely to occur*". With regards to the SM definition adverse environmental impact include "*contamination, harm to flora and fauna (either individual species or communities), damage to heritage items or adverse community impacts*".

It is noted that this definition of incident is different to the definition of an incident as defined in the project planning approval. In the planning approval an incident is defined as "*an occurrence or set of circumstances that causes, or threatens to cause, material harm to the environment, community or any member of the community, being actual or potential harm to the health or safety of human beings or to threatened species, endangered ecological communities or ecosystems that is not trivial*". As required by CoA A41 the Secretary will be notified as soon as possible and in any event within 24 hours of an incident occurring that meets the definition of an incident in the planning approval.

Material harm to the environment is defined by Section 147 of the POEO Act as follows:

"*harm to the environment is material if:*

- *it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or*
- *it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000 (or such other amount as is prescribed by the regulations), and*

loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment.

For the purposes of this Part, it does not matter that harm to the environment is caused only in the premises where the pollution incident occurs."

Under Section 148 of the POEO Act environmental incidents causing or threatening material harm to the environment must be reported to the EPA.

8.2 Response

In the event of an environmental incident causing or threatening 'material harm' to the environment the following general process would be followed:

8.2.1 Assess and Declare Incident

- All potential or actual environmental incidents would be verbally notified to the Construction Manager immediately;
- All works on the site, in the vicinity of the incident, are to cease immediately and the Construction Manager would immediately notify the Site Manager, Environmental Coordinator and Planning & Environment Manager of the incident;
- The Construction Manager or Planning and Environment Manager would direct actions to contain and/or minimise material harm caused by the incident and protect the environment and community where safe to do so. An exception to this would be where such action would result in additional material harm to the environment;

- The Planning & Environment Manager would document detailed information regarding the incident including:
  - Time, date, nature, duration and location of the incident;
  - Location of the place where pollution is occurring or is likely to occur;
  - Nature, the estimated quantity or volume and the concentration of any pollutants involved (if known);
  - Circumstances in which the incident occurred (including the cause of the incident, if known); and,
  - Any action taken or proposed to be taken to deal with the incident and any resulting pollution or threatened pollution.

8.2.2 Notify the Incident

The Planning & Environment Manager, or Construction Managers will immediately notify the Sydney Metro Construction Director, Sydney Metro Environmental Manager (or delegate) and the Independent ER of any environmental incident occurring on site in accordance with the Sydney Metro Environmental Incident and Non-compliance Reporting Procedure. The notification of an incident under Condition A41 will comply with CoA A42 and include the time and date of the incident, details of the incident and will identify any non-compliance with the conditions of approval. The Secretary will be notified as soon as possible of any incidents categorised as being Class 1 or Class 2, and in any event within 24 hours of the incident in accordance with CoA A41 by Sydney Metro. The Secretary will be notified of the time and date of the incident, details of the incident and any non-compliance with the conditions of approval as per CoA A42. BESIX Watpac, Sydney Metro and the ER would work together to immediately determine if the incident is to be notified to the regulatory authorities as per environmental legislative requirements (and the planning approval). If the incident is deemed to be required to be notified, relevant authorities must be notified immediately as required based on the nature of the incident:

- EPA;
- DPE;
- NSW Health;
- SafeWork NSW;
- Local council/INSW; and,
- Fire and Rescue NSW

If statutory notification is given to the EPA as required under the POEO Act in relation to the CSSI, such notification will also be provided to the Secretary via Sydney Metro for information within 24 hours, in accordance with CoA A44, after the notification was given to the EPA.

8.2.3 Manage the Incident

The Planning & Environment Manager (or delegate) would arrange to attend the site as soon as possible to inspect the environmental incident and advise the Construction Manager on additional management and monitoring measures to be implemented in addition to initial clean up measures previously implemented.

If required, the Planning & Environment Manager would liaise with the Sydney Metro Environmental Manager (or delegate) and the ER to determine response measures for the control and management of the environmental incident.

Any requirements of the Secretary or Relevant Public Authority to address the cause or impact of the incident will be met within the timeframe determined by the Secretary or relevant public authority.

8.2.4 Record the Incident

The Planning & Environment Manager will confirm recorded details of the environmental incident. Incident reports will be provided to Sydney Metro within 24 hours of becoming aware of the incident, including a root cause analysis and lessons learnt from each environmental incident and proposed measures to prevent the occurrence of a similar incident. Incidents will be closed out as quickly as possible and all required actions taken to resolve each environmental incident recorded.

8.3 Emergency Response Plan

The response procedures, emergency contact numbers, responsibilities and required actions for responding to environmental emergencies have been integrated into the Incident Emergency and Crisis Management Plan (sub plan to the WH&S Management Plan). Environmental Emergency Management Protocols are outlined below in Table 10:

Table 10 Outline Environmental Emergency Management Protocols

Emergency Management Protocols	
Objective	The Site Manager shall ensure that: • A spill kit is always available on site • All reasonable measures are taken to prevent environmental emergencies • The project emergency plan is readily accessible to all site personnel • Emergency plans are part of site inductions
Reporting	All emergency situations to be reported, investigated and recorded
In the event of an environmental incident	Stop work and secure the area if safe to do so Initiate the Project Crisis Checklist Prevent the incident from escalating Notify applicable management, emergency services and authorities Clean up the affected area. Engage specialist help if required Investigate the circumstances Record the incident Implement actions to prevent a recurrence Follow-up to ensure the actions were correctly implemented and effective
Extreme Wet Weather	Alert site personnel and stop all external work on if applicable Check site for plant, equipment and materials on site and secure anything not in immediate use Check water outlets, water catchments, stormwater and sedimentation controls
Unplanned Interruptions to Existing Services	Shut down and isolate plant if safe to do so Immediately notify relevant emergency services and service providers Secure the area and erect hazard markers as required Protect stormwater outlets, implement controls if required. Do not recommence work until approved by the relevant authority
High Wind Warning	Alert outdoor workers of potential dangers and stop all external work Secure any loose object that could become missiles Ensure stockpiles are covered
Dangerous goods spill or leak	In the event of spill: • Assess: evaluate the spill to determine if it can be dealt with by an individual, the spill response team or if outside assistance is required • Secure: make the site safe for all personnel and the general public • Contain: spill response equipment such as spill booms, drain covers or bunding can be used to contain the spill. for solids, tarps may be used to cover and prevent dampness to granules or possible dispersion by wind • PPE: identify the liquid and check the MSDS to ascertain the required PPE • Absorb: once the liquid is contained, it will need to be converted to a solid by absorption. Use the appropriate absorbing pads or absorbent to soak up the spill by placing them over the Liquid. remove the saturated pads and replace as necessary. on porous surfaces, sprinkle loose absorbent over the spill and broom through until surface appears dry • Dispose: place the spent absorbent in the disposal bags. correctly dispose of contaminants off site using a licensed contaminated waste disposal contractor • Report: document the incident and include what happened, when it happened, where it happened; and what was done to eliminate or minimise the impact

Emergency Management Protocols	
	• Restock: order and replace used up PPE and absorption materials
Water Treatment Plant overflow	Sump pumps feeding WTP to be turned off Reinforce containment and sediment controls Contact plant operator to respond and repair equipment Contact Planning and Environmental Manager Identify likely cause and location of overflow to identify any obvious mitigations Report: document the incident and include what happened, when it happened, where it happened; and what was done to eliminate or minimise the impact

9. Environmental Management

9.1 BESIX Watpac Environmental Management System

The BESIX Watpac EMS contains guidelines and procedures for managing environmental aspects during construction.

Key forms include the following, which available on request:

- Compliance & Incident Management procedure (C-PRO-023);
- Project Compliance and Incident register (C-FRM-061); and
- Complaint & Incident Report form (C-FRM-018).

The environmental risk assessment will be undertaken as per Section 3 of this CEMP and this replaces BESIX Watpac standard risk assessment form. Forms and register will be updated to align with data fields noted in Section 8.2 above.

Erosion and Sediment Control Guidelines (C-PLA-014) is BESIX Westpac comprehensive guide on controlling sediment with stormwater runoff.

Standard operating procedures are from BESIX Watpac's EMS are listed in Section 9.4 and included in Appendix F.

9.2 Sub Plans

9.2.1 Construction Noise and Vibration Management Plan

BESIX Watpac will undertake noise and vibration monitoring as outlined in the Construction Noise and Vibration Management Sub plan (CNVMP) – included in Appendix C of this CEMP.

9.2.2 Construction Heritage Management Plan

BESIX Watpac will manage potential heritage impacts from construction works as outlined in the Construction Heritage Management Plan (CHMP) – included in Appendix D of this CEMP.

9.2.3 Visual Amenity Management Plan

BESIX Watpac will manage visual amenity impacts from construction works as outlined in the Visual Amenity Management Plan (VAMP) – included in Appendix E of this CEMP.

9.3 Other Environmental Management Categories

9.3.1 Soil and Water Procedure

As required by Table 5 of the Staging Report, soil and water management has been addressed as an activity specific soil and water procedure in Appendix N.

9.3.2 Flooding Risk

The change-over of existing stormwater drainage to permanent drainage may require short term temporary stormwater solutions to enable construction activities in construction zones 1 and zone 4. In accordance with REMM FH1, BESIX Watpac will assess flood risk during construction staging. This would include identification of measures to avoid, where feasible and reasonable, the worsening of existing flooding characteristics up to and including the 100-year annual recurrence interval event in the vicinity of the project. In general, the temporary stormwater arrangement will have the same capacity as the existing stormwater network to avoid it becoming overwhelmed in the event of a high rainfall event.

9.3.3 Air Quality Procedure

As required by the Table 5 of the Staging Report, air quality management has been addressed as activity specific procedure, in Appendix M.

9.3.4 Stockpiles, Contamination and Spoil Management

A key environmental management objective for this site is for 100% of spoil that can be reused to be beneficially reused on site in accordance with REMM WM2. The bulk of the site requires filling with select materials but will offer some opportunities for utilising reusable spoil where it can meet the engineering and environmental reuse criteria. Spoil categorised as unusable or contaminated will be assessed, managed and removed in accordance with the Spoil Management Plan Sampling, Analysis & Quality Plan, and Acid Sulfate Soils will be addressed in accordance with the Acid Sulfate Soils Management Plan (ASSMP). Spoil removed from site will be listed on the waste tracking register.

Temporary spoil stockpiles will be generated from:

- Trenching for the stormwater trunk mains in construction zone 1;
- Trenching for cooling water pipes north of the station box;
- Excavation of the existing road pavement on Hickson Road Zone 6; and
- General civil construction activities.

Specific soil and water management requirements are detailed in the Soil and Water Management Procedure in Appendix N.

9.3.5 Excavation Risk to Services and Buildings

BESIX Watpac have engaged a geotechnical consultant to provide construction phase services such as monitoring of excavations and confirmation of bearing pressure capacities of excavated areas associated with services trenching. This is to ensure that the works are constructed in accordance with the design, and that potential impacts to nearby structures and services are mitigated.

9.3.6 Blasting

No blasting will be undertaken as part of the BR COP activities and this CEMP does not contemplate blasting being undertaken.

9.3.7 In-ground Services Identification Survey

In-ground services have been identified on the design drawings, however there is a risk that the information is incomplete. Prior to any excavation activities in areas with potential live services, BESIX Watpac will undertake Dial before you Dig desktop services search and non-destructive pothole surveys to locate underground utilities. The Construction Manager is responsible for authorising this work and ensuring information is distributed to SM, relevant subcontractors and the project team. Site services information and photo overlay will be displayed in the site office and included in inductions.

9.3.8 Construction Traffic Management

Refer to the Construction Traffic Management Plan (CTMP) which is separate to this CEMP.

9.3.9 Flora and Fauna Management

As required by Table 5 of the Staging Report, Flora and Fauna / Biodiversity management has been addressed as an activity specific procedure in Appendix L.

9.3.10 Carbon and Energy, Material Management, Waste Management and Recycling

In accordance with CoA E106, "*waste generated during construction will be dealt with in accordance with the following priorities:*

a) *Waste generation will be avoided and where avoidance is not reasonably practicable, waste generation will be reduced;*
b) *Where avoiding or reducing waste is not possible, waste will be re-used, recycled, or recovered; and*
c) *Where re-using recycling or recovering waste is not possible, waste will be treated or disposed of*".

Refer to the Carbon and Energy Management, Materials, and Waste and Recycling sub-plans of the Sustainability Management Plan (SMP) which are separate to this CEMP.

9.4 BESIX Watpac Standard Operating Procedures

BESIX Watpac relevant Standard Operating Procedures (SOPs) listed below in Table 11 are included in Appendix F. Environmental SOPs have been developed to manage each environmental aspect pertinent to this project, as identified in the Environmental Risk Assessment and are described in greater detail in Appendix F.

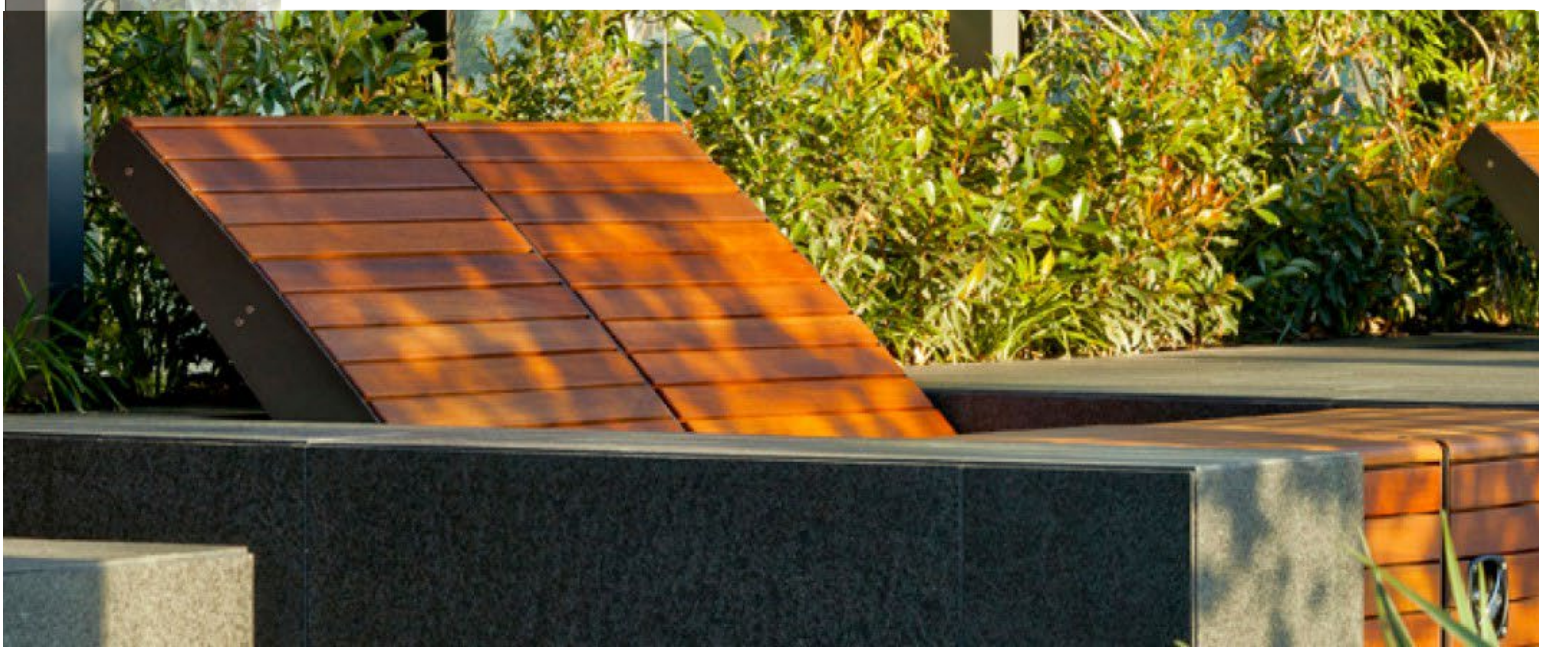
SOPs document the objective, strategy, action plan, control measures and performance targets for each identified aspect of the Environmental Risk Assessment. Each SOP is outlined separately under sub-headings in the page's hereafter. SOP describe minimum standard requirements and are applied where relevant to the construction activities and environmental aspects. Where more onerous requirements and processes are be stipulated in the CEMP and sub plans they supersede these SOP. Where noted actions are deferred to a person or role, the endorsement of this role on environmental matters is always subject to endorsement of the Planning and Environmental Manager.

Table 11 List of standard operating procedures

No	Title	Comment
F.1	Site Accommodation	
F.2	Site Amenities	
F.3	Air quality & Dust	
F.4	Noise	Refer CNVMP
F.5	Vibration	Refer CNVMP
F.6	Water Quality	
F.7	Erosion & sediment control	
F.8	Spill Response and management	
F.11	Weed Control	
F.12	Land Contamination	
F.13	Protection of Cultural Heritage and Aboriginal Artefacts	Refer HMP
F.14	Fire Protection	
F.16	Identification and Protection of existing Utility Services	
F.17	Waste Management	Refer SMP
F.18	Artificial Lighting	Refer VAMP
F.19	Vehicular and pedestrian Traffic Management	Refer CTMP
F.20	Acid Sulphate soils	
F.22	Asbestos	
F.23	Hazardous substances and dangerous goods	
F.24	Pests animals, vermin and infestation control	
F.25	Site demobilisation	Refer CTMP



Appendix A
BESIX Watpac Environmental Policy





Appendix B **Compliance Matrix** (REMMs & CoAs)



Caption: One Central Park, Sydney

Table 12 Conditions of Approval & REMMs Compliance Matrix

ID	Requirement	Reference
Conditions of Approval (CoAs) – SSI 7400 (Mod 8)		
A9	Where the terms of this approval require consultation with identified parties, details of the consultation undertaken, matters raised by the parties, and how the matters were considered must accompany the strategies, plans, programs, reviews, audits, protocols and the like submitted to the Secretary.	Appendix K CEMP
A16	Ancillary facilities that are not identified by description and location in the EIS as amended by the documents listed in A1, must meet the following criteria, unless otherwise approved by the Secretary: (a) the facility is development of a type that would, if it were not for the purpose of the CSSI, otherwise be exempt or complying development; or (b) the facility is located as follows: i. at least 50 metres from any waterway unless an erosion and sediment control plan is prepared and implemented so as not to adversely affect water quality in the waterway in accordance with Managing Urban Stormwater series; ii. within or adjacent to land upon which the CSSI is being carried out unless it can be demonstrated that performance criteria established in this approval can be met and that there will be a reduction in impact at other sites and a reduction in the construction program; iii. with ready access to a road network; iv. to prevent heavy vehicles travelling on local streets or through residential areas in order to access the facility, except as identified in the EIS and amended by the documents listed in A1; v. on level land; vi. so as to be in accordance with the Interim Construction Noise Guideline (DECC 2009) or as otherwise agreed in writing with affected landowners and occupiers; vii. so as not to require vegetation clearing beyond the extent of clearing approved under other terms of this approval except as approved by the ER as minor clearing; viii. so as not to have any impact on heritage items (including areas of archaeological sensitivity) beyond the impacts identified, assessed and approved under other terms of this approval; ix. so as not to unreasonably interfere with lawful uses of adjacent properties that are being carried out at the date upon which construction or establishment of the facility is to commence; x. to enable operation of the ancillary facility during flood events and to avoid or minimise, to the greatest extent practicable, adverse flood impacts on the surrounding environment and other properties and infrastructure; and xi. so as to have sufficient area for the storage of raw materials to minimise, to the greatest extent practicable, the number of deliveries required outside standard construction hours.	Section 1.2.3
A17	Before establishment of any ancillary facility that satisfies the criteria in Condition A16, the Proponent must prepare an Ancillary Facilities Management Plan which outlines the environmental management practices and procedures to be implemented for the establishment and operation of the ancillary facility. The Ancillary Facilities Management Plan must be prepared in consultation with the EPA and the relevant council(s) and submitted to the Secretary and EPA for information one month before installation of the relevant ancillary facilities. The Ancillary Facilities Management Plan must detail the management of the ancillary facilities and include: (a) a description of activities to be undertaken during construction (including scheduling of construction); (b) a program for ongoing analysis of the key environmental risks arising from the activities described in subsection (a) of this condition, including an initial risk assessment undertaken before the commencement of construction of the CSSI; and (c) details of how the activities described in subsection (a) of this condition will be carried out to: i. meet the performance outcomes stated in the EIS as amended by the documents listed in A1; and ii. manage the risks identified in the risk analysis undertaken in subsection (b) of this condition.	Section 1.2.3
A18	Minor ancillary facilities comprising lunch sheds, office sheds, and portable toilet facilities, or the like, that are not identified in the EIS as amended by the documents listed in A1 and which do not satisfy the criteria set out in Condition	Section 1.2.3

ID	Requirement	Reference
	A16 of this approval must satisfy the following criteria: (a) have no greater environmental and amenity impacts than those that can be managed through the implementation of environmental measures detailed in the CEMP required under Condition C1 of this approval; and (b) have been assessed by the ER to have: i. minimal amenity impacts to surrounding residences and businesses, after consideration of matters such as compliance with the Interim Construction Noise Guideline (DECC 2009), traffic and access impacts, dust and odour impacts, and visual (including light spill) impacts; ii. minimal environmental impact with respect to waste management and flooding; and iii. no impacts on biodiversity, soil and water, and heritage items beyond those already approved under other terms of this approval.	
A 22	A suitably qualified and experienced Environmental Representative (ER) who is independent of the design and construction personnel must be nominated by the Proponent, approved by the Secretary and engaged for the duration of construction of the CSSI. Additional ERs may be engaged for the purpose of this condition in which case the obligations to be carried out by an ER under the terms of this approval may be satisfied by any ER that is approved by the Secretary. The details of nominated ER(s) must be submitted to the Secretary for approval no later than one month before the commencement of works, or within another timeframe agreed with the Secretary.	Section 5.1.9
A23	Works must not commence until an ER nominated under Condition A22 of this approval in response of such work has been approved by the Secretary.	Section 5.1.9
A24	From commencement of construction until completion of construction, the approved ER must: (a) receive and respond to communications from the Secretary in relation to the environmental performance of the CSSI; (b) consider and inform the Secretary on matters specified in the terms of this approval; (c) consider and recommend any improvements that may be made to work practices to avoid or minimise adverse impact to the environment and to the community; (d) review documents identified in Conditions C1, C3 and C9 and any other documents that are identified by the Secretary, to ensure they are consistent with requirements in or under this approval and if so: i. make a written statement to this effect before submission of such documents to the Secretary (if those documents are required to be approved by the Secretary), or ii. make a written statement to this effect before the implementation of such documents (if those documents are required to be submitted to the Secretary for information or are not required to be submitted to the Secretary); (e) regularly monitor the implementation of environmental management related documents to ensure implementation is being carried out in accordance with what is stated in the document and the terms of this approval; (f) review the Proponent's notification of incidents in accordance with Condition A41 of this approval; (g) as may be requested by the Secretary, help plan, attend or undertake Department audits of the CSSI, briefings, and site visits; (h) if conflict arises between the Proponent and the community in relation to the environmental performance of the CSSI, follow the procedure in the Community Communication Strategy approved under Condition B3 of this approval to attempt to resolve the conflict, and if it cannot be resolved, notify the Secretary; (i) review any draft consistency assessment that may be carried out by the Proponent, and provide advice on any additional mitigation measures required to minimise the impact of the work; (j) consider any minor amendments to be made to the documents listed in Conditions C1, C3 and C9 and any document that requires the approval of the Secretary (excluding noise and vibration documents) that comprise updating or are of an administrative or minor nature, and are consistent with the terms of this approval and the documents listed in Conditions C1, C3 and C9 or other documents approved by the Secretary and, if satisfied such amendment is necessary, approve the amendment. This does not include any modifications to the terms of this approval; (k) assess the impacts of minor ancillary facilities as required by Condition A18 of this approval; and (l) prepare and submit to the Secretary and other relevant regulatory agencies, for information, a monthly Environmental Representative Report detailing the ER's	Section 5.1.9

ID	Requirement	Reference
	actions and decisions on matters for which the ER was responsible in the preceding month (or other timeframe agreed with the Secretary). The Environmental Representative Report must be submitted within seven (7) days following the end of each month for the duration of works and construction of the CSSI, or as otherwise agreed with the Secretary.	
	ACOUSTICS ADVISER	
A25	A suitably qualified and experienced Acoustics Advisor (AA), who is independent of the design and construction personnel, must be nominated by the Proponent and engaged for the duration of construction and for no less than six (6) months following operation of the CSSI. The details of the nominated AA must be submitted to the Secretary for approval no later than one (1) month before commencement of works, or within another timeframe as agreed with the Secretary. The Proponent may nominate additional suitably qualified and experienced persons to assist the lead Acoustics Advisor for the Secretary's approval. The Proponent must cooperate with the AA by: (a) providing access to noise and vibration monitoring activities as they take place; (b) providing for review of noise and vibration plans, assessments, monitoring reports, data and analyses undertaken; and (c) considering any recommendations to improve practices and demonstrating, to the satisfaction of the AA, why any recommendation is not adopted.	Section 5.1.10
A27	The approved AA must: (a) receive and respond to communication from the Secretary in relation to the performance of the CSSI in relation to noise and vibration; (b) consider and inform the Secretary on matters specified in the terms of this approval relating to noise and vibration; (c) consider and recommend, to the Proponent, improvements that may be made to work practices to avoid or minimise adverse noise and vibration impacts; (d) review all noise and vibration documents required to be prepared under the terms of this approval and, should they be consistent with the terms of this approval, endorse them before submission to the Secretary (if required to be submitted to the Secretary) or before implementation (if not required to be submitted to the Secretary); (e) regularly monitor the implementation of all noise and vibration documents required to be prepared under the terms of this approval to ensure implementation is in accordance with what is stated in the document and the terms of this approval; (f) review the Proponent's notification of noise and vibration incidents in accordance with Condition A41 of this approval; (g) in conjunction with the ER (where required), the AA must: i. consider requests for out of hours construction activities and determine whether to endorse the proposed activities in accordance with Condition E47; ii. as may be requested by the Secretary or Complaints Mediator, help plan, attend or undertake audits of noise and vibration management of the CSSI including briefings, and site visits; iii. if conflict arises between the Proponent and the community in relation to the noise and vibration performance during construction of the CSSI, follow the procedure in the Community Communication Strategy approved under Condition B3 of this approval to attempt to resolve the conflict, and if it cannot be resolved, notify the Secretary; iv. consider relevant minor amendments made to any noise and vibration document approved by the Secretary that require updating or are of an administrative or minor nature, and are consistent with the terms of this approval and the document approved by the Secretary and, if satisfied such amendment is necessary, approve the amendment. This does not include any modifications to the terms of this approval; v. assess the noise impacts of minor ancillary facilities as required by Condition A18 of this approval; and vi. prepare and submit to the Secretary and other relevant regulatory agencies, for information, a monthly Noise and Vibration Report detailing the AAs actions and decisions on matters for which the AA was responsible in the preceding month (or other timeframe agreed with the Secretary). The Noise and Vibration Report must be submitted within seven (7) days following the end of each month for the duration of construction of the CSSI, or as otherwise agreed with the Secretary.	Section 5.1.10

ID	Requirement	Reference
A28	A Compliance Tracking Program to monitor compliance with the terms of this approval must be prepared, taking into consideration any staging of the CSSI that is proposed in a Staging Report submitted in accordance with Condition A12 and Condition A13 of this approval.	Section 6.1.3
A29	The Compliance Tracking Program must be endorsed by the ER then submitted to the Secretary for information before the commencement of works or within another timeframe agreed with the Secretary.	Completed by Sydney Metro
A30	The Compliance Tracking Program in the form required under Condition A28 of this approval must be implemented for the duration of construction and for a minimum of one (1) year following commencement of operation, or for a longer period as determined by the Secretary based on the outcomes of independent environmental audits, Environmental Representative Reports and regular compliance reviews submitted through Compliance Reports. If staged operation is proposed, or operation is commenced of part of the CSSI, the Compliance Tracking Program must be implemented for the relevant period for each stage or part of the CSSI.	Section 6.3.2
A31	A Pre-Construction Compliance Report must be prepared and submitted to the Secretary for information no later than one month before the commencement of construction or within another timeframe agreed with the Secretary.	Section 6.3.2
A32	The Pre-Construction Compliance Report must include: (a) details of how the terms of this approval that must be addressed before the commencement of construction have been complied with; and (b) the commencement date for construction.	Section 6.3.2
A33	Construction must not commence until the Pre-Construction Compliance Report has been submitted to the Secretary.	Section 6.3.2
A34	Construction Compliance Reports must be prepared and submitted to the Secretary for information every six (6) months from the date of the commencement of construction or within another timeframe agreed with the Secretary, for the duration of construction. The Construction Compliance Reports must include: (a) a results summary and analysis of environmental monitoring; (b) the number of any complaints received, including a summary of main areas of complaint, action taken, response given and proposed strategies for reducing the recurrence of such complaints; (c) details of any review of, and minor amendments made to, the CEMP as a result of construction carried out during the reporting period; (d) a register of any consistency assessments undertaken and their status; (e) results of any independent environmental audits and details of any actions taken in response to the recommendations of an audit; (f) a summary of all incidents notified in accordance with Condition A41 and Condition A44 of this approval; and (g) any other matter relating to compliance with the terms of this approval or as requested by the Secretary.	Sydney Metro have overall responsibility for this CoA. BESIX Watpac will provide Sydney Metro with all documentation relating to the Barangaroo Station construction activities to enable Sydney Metro to comply with this CoA.
A37	An Environmental Audit Program for independent annual environmental auditing against the terms of this approval must be prepared in accordance with AS/NZS ISO 19011:2014 - Guidelines for Auditing Management Systems and submitted to the Secretary for information no later than one month before the commencement of construction or within another timeframe agreed with the Secretary.	Section 6.1.3
A38	The Environmental Audit Program, as submitted to the Secretary, must be implemented for the duration of construction and operation.	Section 6.1.3
A39	All independent environmental audits of the CSSI conducted under Conditions A37 and A38 must be conducted by a suitably qualified, experienced and independent team of experts in auditing and be documented in an Environmental Audit Report which: (a) assesses the environmental performance of the CSSI, and its effects on the surrounding environment; (b) assesses whether the project is complying with the terms of this approval;	

ID	Requirement	Reference
	(c) reviews the adequacy of any document required under this approval; and (d) recommends measures or actions to improve the environmental performance of the CSSI, and improvements to any document required under this approval.	
A40	The Proponent must submit a copy of the Environmental Audit Report to the Secretary with a response to any recommendations contained in the audit report within six (6) weeks of completing the audit, or within another timeframe agreed with the Secretary.	Section 6.1.3
A41	The Secretary must be notified as soon as possible and in any event within 24 hours of any incident.	Section 8.2
A42	Notification of an incident under Condition A41 of this approval must include the time and date of the incident, details of the incident and must identify any non-compliance with this approval.	Section 8.2
A43	Any requirements of the Secretary or Relevant Public Authority (as determined by the Secretary) to address the cause or impact of an incident reported in accordance with Condition A41 of this approval, must be met within the timeframe determined by the Secretary or relevant public authority.	Section 8.2
A44	If statutory notification is given to the EPA as required under the POEO Act in relation to the CSSI, such notification must also be provided to the Secretary for information within 24 hours after the notification was given to the EPA.	Section 8.2
B6	A Complaints Management System must be prepared before the commencement of any works in respect of the CSSI and be implemented and maintained for the duration of works and for a minimum for 12 months following completion of construction of the CSSI.	CCS & BMP
B7	The Complaints Management System must include a Complaints Register to be maintained recording information on all complaints received about the CSSI during the carrying out of any works associated with the CSSI and for a minimum of 12 months following the completion of construction. The Complaints Register must record the: (a) number of complaints received; (b) number of people affected in relation to a complaint; and (c) nature of the complaint and means by which the complaint was addressed and whether resolution was reached, with or without mediation.	CCS & BMP
B9	The following facilities must be available within one (1) month from the date of this approval and for 12 months following the completion of construction and appropriately broadcast to collect community enquiries and complaints: (a) a 24 hour telephone number for the registration of complaints and enquiries about the CSSI; (b) a postal address to which written complaints and enquires may be sent; (c) an email address to which electronic complaints and enquiries may be transmitted; and (d) place-based community manager for each of the station locations available to meet with community members on request.	CCS & BMP
B10	The telephone number, postal address and email address required under Condition B9 of this approval must be published in a newspaper circulating in the local area and on site hoarding at each construction site before commencement of construction and published in the same way again before commencement of operation. This information must also be provided on the website required under Condition B15 of this approval.	CCS & BMP
B11	A Community Complaints Mediator that is independent of the design and construction personnel must be nominated by the Proponent, approved by the Secretary and engaged during all works associated with the CSSI. The nominated Community Complaints Mediator must be submitted to the Secretary for approval within one month of the date of this approval or within another timeframe agreed with the Secretary.	CCS & BMP
B12	The role of the Community Complaints Mediator must address any complaint where a member of the public is not satisfied by the Proponent's response. Any member of the public that has lodged a complaint which is registered in the Complaints Management System identified in Condition B6 may ask the	CCS & BMP

ID	Requirement	Reference
	Community Complaints Mediator to review the Proponent's response. The application must be submitted in writing and the Community Complaints Mediator must respond within 28 days of the request being made or other specified timeframe agreed between the Community Complaints Mediator and the member of the public.	
B13	The Community Complaints Mediator will: (a) review the Proponent's unresolved disputes between the project and members of the public if the procedures and mechanisms under Condition B2(g)(iii) do not satisfactorily address complaints; and (b) make recommendations to the Proponent to satisfactorily address complaints, resolve disputes or mitigate against the occurrence of future complaints or disputes.	CCS & BMP
B14	The Community Complaints Mediator will not act before the Proponent has provided an initial response to a complaint and will not consider issues such as property acquisition where other dispute processes are provided for in this approval, or clear government policy and resolution processes are available, or matters which are not within the scope of the CSSI.	CCS & BMP
B15	A website providing information in relation to the CSSI must be established before commencement of works and maintained for the duration of construction, and for a minimum of 12 months following the completion of construction or other timeframe as agreed with the Secretary. The following up-to-date information (excluding confidential, private and commercial information or other documents as agreed to by the Secretary) must be published prior to the relevant works commencing, or in the case of documents prepared in accordance with E66 and E67 when finalised in accordance with the requirements of this approval, and maintained on the website or dedicated pages: (a) information on the current implementation status of the CSSI; (b) a copy of the documents listed in Condition A1 and Condition A2 of this approval, and any documentation relating to any modifications made to the CSSI or the terms of this approval; (c) a copy of this approval in its original form, a current consolidated copy of this approval (that is, including any approved modifications to its terms), and copies of any approval granted by the Minister to a modification of the terms of this approval; (d) a copy of any Environment Protection Licence obtained in relation to the CSSI or link to any existing Environment Protection Licence applied to the CSSI; and (e) a current copy of each document required under the terms of this approval must be published within one week of its endorsement / approval or before the commencement of any works to which they relate or before their implementation as the case may be. *Note: Environment Protection Licences relevant to each stage of the project need to be clearly differentiated to identify how and where they specifically apply.*	Refer CCSBMP
C1	A **Construction Environmental Management Plan** (**CEMP**) must be prepared in accordance with the Construction Environmental Management Framework (CEMF) included in the PIR and the Department's *Guideline for the Preparation of Environmental Management Plans* to detail how the performance outcomes, commitments and mitigation measures specified in Chapter 11 of the PIR, as amended by the documents listed in A1, will be implemented and achieved during construction.	Appendix H
C2	The CEMP must provide: (a) a description of activities to be undertaken during construction (including the scheduling of construction); (b) details of environmental policies, guidelines and principles to be followed in the construction of the CSSI; (c) a schedule for compliance auditing; (d) a program for ongoing analysis of the key environmental risks arising from the activities described in subsection (a) of this condition, including an initial risk assessment undertaken before the commencement of construction of the	(a) Section 1.2.5 (b) Section 1.9, Appendix A, Section 2.3 (c) Section 6.1 (d) Section 3 Appendix I (e) Section (f) Section 6.1

ID	Requirement	Reference
	CSSI; (e) details of how the activities described in subsection (a) of this condition will be carried out to: i. meet the performance outcomes stated in the EIS as amended by the PIR; and ii. manage the risks identified in the risk analysis undertaken in subsection (d) of this condition; (f) an inspection program detailing the activities to be inspected and frequency of inspections; (g) a protocol for managing and reporting any: i. incidents; and ii. non-compliances with this approval and with statutory requirements; (h) procedures for rectifying any non-compliance with this approval identified during compliance auditing, incident management or at any time during construction; (i) a list of all the CEMP sub-plans required in respect of construction, as set out in Condition C3. Where staged construction of the CSSI is proposed, the CEMP must also identify which CEMP sub-plan applies to each of the proposed stages of construction; (j) a description of the roles and environmental responsibilities for relevant employees and their relationship with the ER; (k) for training and induction for employees, including contractors and sub-contractors, in relation to environmental and compliance obligations under the terms of this approval; (l) for periodic review and update of the CEMP and all associated plans and programs.	(g) Section 8 (h) Section 6.2 (i) Section 1.1.3 (j) Section 5.1 (k) Section 5.2 (l) Section 1.10
C3	The following CEMP sub-plans must be prepared in consultation with the relevant government agencies identified for each CEMP sub-plan and be consistent with the CEMF and CEMP referred to in Condition C1. (a)Noise and Vibration (Council to be consulted) (b)Biodiversity (OEH and Council to be consulted) (c)Air Quality (n/a consultation) (d)Soil and Water (DPI Water, Council, OEH, SES, NSW Fire and Rescue to be consulted) (e)Groundwater (DPI Water) ~~(f)Blasting~~ (g)Heritage (Heritage Council and Council to be consulted) ~~(h)Construction Traffic~~	Appendix K
C4	The CEMP sub-plans must state how: (a) the environmental performance outcomes identified in the EIS as amended by the documents listed in A1 will be achieved; (b) the mitigation measures identified in the EIS as amended by documents listed in A1 will be implemented; (c) the relevant terms of this approval will be complied with; and (d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	This Plan
C5	The CEMP sub-plans must be developed in consultation with relevant government agencies. Where an agency(ies) request(s) is not included, the Proponent must provide the Secretary justification as to why. Details of all information requested by an agency to be included in a CEMP sub-plan as a result of consultation and copies of all correspondence from those agencies, must be provided with the relevant CEMP sub-plan.	This Plan
C6	Any of the CEMP sub-plans may be submitted to the Secretary along with, or subsequent to, the submission of the CEMP but in any event, no later than one (1) month before commencement of construction	This Plan
C7	The CEMP must be endorsed by the ER and then submitted to the Secretary for approval no later than one (1) month before the commencement of construction or within another timeframe agreed with the Secretary.	Section 1.6
C8	Construction must not commence until the **CEMP** and all **CEMP sub-plans** have been approved by the Secretary. The **CEMP** and **CEMP sub-plans**, as approved by the Secretary, including any minor amendments approved by the ER (or AA in regards to the Noise and Vibration sub-plan), must be	Section 1.6

ID	Requirement	Reference
	implemented for the duration of construction. Where the CSSI is being staged, construction of that stage is not to commence until the relevant CEMP and sub-plans have been approved by the Secretary.	
	CONSTRUCTION MONITORING PROGRAMS	
C13	The **Construction Monitoring Programs** must be endorsed by the ER (or AA in regards to the Noise and Vibration Construction Monitoring Program) and then submitted to the Secretary for approval at least one (1) month before commencement of construction or within another timeframe agreed with the Secretary.	Refer CNVMP
C 14	Construction must not commence until the Secretary has approved all of the required Construction Monitoring Programs, and all relevant baseline data for the specific construction activity has been collected.	Sydney Metro will notify BESIX Watpac once approval of the Secretary granted
C15	The **Construction Monitoring Programs**, as approved by the Secretary including any minor amendments approved by the ER (or AA in regards to the Noise and Vibration Construction Monitoring Program), must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Secretary, whichever is the greater.	Refer CNVMP
C16	The results of the Construction Monitoring Programs must be submitted to the Secretary for information, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	Refer CNVMP
C17	Where a relevant CEMP sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP sub-plan.	Refer CNVMP
	UTILITIES AND SERVICES	
E2	Utilities, services and other infrastructure potentially affected by construction must be identified before works affecting the item, to determine requirements for access to, diversion protection, and/or support. The relevant owner and/or provider of services must be consulted to make suitable arrangements for access to diversion, protection, and/or support of the affected infrastructure as required. The Proponent must ensure that disruption to any service is minimised and be responsible for advising local residents and businesses affected before any planned disruption of service.	Appendix F – SOP F.16 Identification and Protection of Existing Utility Services
E3	All excavations adjacent to RMS road infrastructure must meet the requirements of RMS Technical Direction (GTD 2012/0001) Excavation adjacent to RMS infrastructure.	No excavations adjacent to RMS road infrastructure will occur during the project. Hickson Road, the only existing road impacted by the project is classified as a Regional Road and therefore managed by City of Sydney Council.
	MATERIALS STORAGE	
E4	Dangerous goods, as defined by the Australian Dangerous Goods Code, must be stored and handled strictly in accordance with: (a) all relevant Australian Standards; (b) for liquids, a minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund; (c) Storing and Handling Liquids: Environmental Protection – Participants Manual (Department of Environment and Climate Change, May 2007); and (d) the Environmental Compliance Report: Liquid Chemical Storage, Handling and Spill Management – Part B Review of Best Practice and Regulation (Department of Environment and Conservation (NSW), 2005).	Appendix N – Soil and Water Management Procedure

ID	Requirement	Reference
	In the event of an inconsistency between the requirements listed from (a) to (d) above, the most stringent requirement shall prevail to the extent of the inconsistency.	
	AIR QUALITY	
E5	In addition to the performance outcomes, commitments and mitigation measures specified in PIR, all reasonably practicable measures must be implemented to minimise the emission of dust and other air pollutants during the construction and operation of the CSSI.	Appendix M – Air Quality Management Procedure
E6	The CSSI must be designed to retain as many trees as possible and provide replacement trees such that there a net increase in the number of trees. The Proponent must commission an independent, experienced and suitably qualified arborist to prepare a comprehensive Tree Report before removing any trees as detailed in the EIS, as amended by the documents listed in A1. The Tree Report must include: (a) a description of the conditions of the tree(s) and its amenity and visual value; (b) consideration of all options to avoid tree removal, including relocation of services, redesign or relocation of ancillary components (such as substations, fencing etc.) and reduction of standard offsets to underground services; and (c) measures to avoid tree removal, minimise damage to, and ensure the health and stability of those trees to be retained and protected. This includes details of any proposed canopy or root pruning, root protection zone, excavation, site controls on waste disposal, vehicular access, materials storage and protection of public utilities. In the event that tree removal cannot be avoided, then replacement trees are to be planted within, or in close proximity to the CSSI or other location in consultation with the Relevant Councils and agreed by the Secretary. The size of the replacement trees will be determined in consultation with the relevant Council. A copy of the Tree Report must be submitted to the Secretary before the removal, damage and/or pruning of any trees, including those affected by the site establishment works. All recommendations of the Tree Report must be implemented by the Proponent, unless otherwise agreed by the Secretary. The Tree Report may be prepared for the entire CSSI or separate reports may be prepared for individual areas where tree removal and/or pruning is proposed.	Appendix L
E36	Construction, except as allowed by Condition E48 (excluding cut and cover tunnelling), must only be undertaken during the following standard construction hours: (a) 7:00am to 6:00pm Mondays to Fridays, inclusive; (b) 8:00am to 6:00pm Saturdays; and (c) at no time on Sundays or public holidays	Refer CNVMP
E44	Notwithstanding Condition E36 construction associated with the CSSI may be undertaken outside the hours specified under those conditions in the following circumstances: (a) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or (b) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm; or (c) where different construction hours are permitted or required under an EPL in force in respect of the construction; or (d) construction that causes LAeq(15 minute) noise levels: i. no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), and ii. no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses, and iii. continuous or impulsive vibration values, measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), and	Refer CNVMP

ID	Requirement	Reference
	intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006); or (e) where a negotiated agreement has been reached with a substantial majority of sensitive receivers who are within the vicinity of and may be potentially affected by the particular construction, and the noise management levels and/or limits for ground-borne noise and vibration (human comfort) cannot be achieved. All agreements must be in writing and a copy forwarded to the Secretary at least one (1) week before the works commencing; or (f) construction approved through an Out of Hours Work Protocol referred to in Condition E47, provided the relevant council, local residents and other affected stakeholders and sensitive receivers are informed of the timing and duration at least five (5) days and no more than 14 days before the commencement of the works. *Note: This condition does not apply where an EPL is in force in respect of the construction.*	
E58	The CSSI must be designed and constructed with the objective of minimising impacts to, and interference with, third party property and infrastructure, and that such infrastructure and property is protected during construction.	This CEMP, CNVMP, HMP
E59	Before commencement of construction, all property owners of buildings identified as being at risk of damage must be offered a building condition survey. Where an offer is accepted a structural engineer must undertake the survey. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the owners of the buildings surveyed, and if agreed by the owner, the Relevant Council within three (3) weeks of completing the Survey Report and no later than one (1) month before the commencement of construction.	Section 4.5
E60	Within three (3) months of the completion of construction, all property owners of buildings for which a building condition survey was carried out in accordance with Condition E59 must be offered a second building condition survey. Where an offer is accepted, building condition surveys must be undertaken by a structural engineer. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the owners of the buildings surveyed within one (1) month of the survey being completed.	Section 4.5
E61	The Proponent must install appropriate equipment to monitor areas in proximity to construction sites and the tunnel route during construction and for a period of not less than six (6) months after settlement has stabilised with particular reference to risk areas identified in the building and infrastructure condition surveys required by conditions E59 and E60 and/or the geotechnical analysis as required. If monitoring during construction indicates exceedance of the criteria, then all construction affecting settlement must cease immediately and must not resume until fully rectified or a revised method of construction is established that will ensure protection of affected buildings.	Section 6.4
E66	A Site Contamination Report, documenting the outcomes of Phase 1 and Phase 2 contamination assessments of land upon which the CSSI is to be carried out, that is suspected to be, or known to be, contaminated must be prepared by a suitably qualified and experienced person in accordance with guidelines made or approved under the Contaminated Land Management Act 1997 (NSW).	Section 9.3.4
E67	If a Site Contamination Report prepared under Condition E66 finds such land contains contamination, a site audit is required to determine the suitability of a site for a specified use. If a site audit is required, a Site Audit Statement and Site Audit Report must be prepared by a NSW EPA Accredited Site Auditor. Contaminated land must not be used for the purpose approved under the terms of this approval until a Site Audit Statement is obtained that declares the land is suitable for that purpose and any conditions on the Site Audit Statement have been complied with	Section 9.3.4

ID	Requirement	Reference
E68	A copy of the Site Audit Statement and Site Audit Report must be submitted to the Secretary and Council for information no later than one (1) month before the commencement of operation.	Section 9.3.4
E69	An Unexpected Contaminated Land and Asbestos Finds Procedure must be prepared and must be followed should unexpected contaminated land or asbestos be excavated or otherwise discovered during construction.	Section 9.3.4
E70	The Unexpected Contaminated Land and Asbestos Finds Procedure must be implemented throughout construction.	4
E106	Waste generated during construction and operation is to be dealt with in accordance with the following priorities: (a) waste generation is to be avoided and where avoidance is not reasonably practicable, waste generation is to be reduced; (b) where avoiding or reducing waste is not possible, waste is to be re-used, recycled, or recovered; and (c) where re-using, recycling or recovering waste is not possible, waste is to be treated or disposed of.	Section 9.3.10 Refer SMP
E107	The CSSI must be constructed and operated so as to maintain the NSW Water Quality Objectives where they are being achieved as at the date of this approval, and contribute towards achievement of the NSW Water Quality Objectives over time where they are not being achieved as at the date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the NSW Water Quality Objectives, in which case those requirements must be complied with.	Sections 1.2.8, 4.4, 6.1 and 6.4 and Refer SWMP
Revised Environmental Mitigation Measures (REMMs)		
SWC 1	Updated desktop contamination assessments would be carried out for Chatswood dive site, **Victoria Cross Station, Artarmon substation,** Blues Point temporary site, Barangaroo Station, Central Station and Waterloo Station **and the Sydenham Maintenance Centre site within surface track works south.** If sufficient information is not available to determine the remediation requirements and the impact on potential receivers, then detailed contamination assessments, including collection and analysis of soil and groundwater samples would be carried out. Detailed contamination assessment would also be carried out for the Barangaroo power supply route within Hickson Road and the Marrickville power supply route adjacent to Sydney Park and Camdenville Oval. In the event a Remediation Action Plan is required, these would be developed in accordance with Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) and a site auditor would be engaged.	Section 9.3.4
SWC 2	Prior to ground disturbance in high probability acid sulphate areas at Barangaroo Station, Waterloo Station and Marrickville dive site, **Sydenham Station and the surface track works south,** testing would be carried out to determine the presence of acid sulphate soils. If acid sulphate soils are encountered, they would be managed in accordance with the Acid Sulphate Soil Manual (Acid Sulphate Soil Management Advisory Committee, 1998).	Section 9.3.4
SWC 3	Erosion and sediment control measures would be implemented in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and Construction Volume 2 (Department of Environment and Climate Change, 2008a). Measures would be designed as a minimum for the 80th percentile; 5-day rainfall event.	Section 9.3.1
SWC 4	Discharges from the construction water treatment plants would be monitored to ensure compliance with the discharge criteria in an environment protection licence issued to the project.	Section 2.2, Section 6.1
SO2	Specific consultation would be carried out with sensitive community facilities (including aged care, child care centres, educational institutions and places of worship) potentially impacted during construction. Consultation would aim to identify and develop measures to manage the specific construction impacts for individual sensitive community facilities.	Refer CCSBMP

ID	Requirement	Reference
B3	The local WIRES group and / or veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation.	Section 9.3.8
FH1	Detailed construction planning would consider flood risk at Barangaroo Station, Martin Place Station and the Waterloo Station construction sites. This would include identification of measures to avoid, where feasible and reasonable, not worsen existing flooding characteristics up to and including the 100-year annual recurrence interval event in the vicinity of the project. Not worsen is defined as: › A maximum increase flood levels of 50mm in a 100-year Average Recurrence interval flood event › A maximum increase in time of inundation of one hour in a 100 year Average Recurrence interval flood event › No increase in the potential for soil erosion and scouring from any increase in flow velocity in a 100 year Average Recurrence interval flood event.	Section 9.3.2
FH9	Design of the project would be reviewed to, where feasible and reasonable, not worsen existing flooding characteristics up to and including the 100 year annual recurrence interval event in the vicinity of the project. Detailed flood modelling would consider: • Potential changes to flood prone land and flood levels • Potential changes to overland flow paths • Redistribution of surface runoff as a result of project infrastructure • Behaviour of existing stormwater runoff • Potential changes required to flood evacuation routes, flood warning systems and • signage. Flood modelling to support detailed design would be carried out in accordance with the following guidelines: • Floodplain Development Manual (NSW Government, 2005b) • Floodplain Risk Management Guideline: Practical Consideration of Climate Change (DECC, 2007b) • Floodplain Risk Management Guide: Incorporating Sea Level Rise Benchmarks in Flood Risk Assessments (DECCW, 2010c) • New guideline and changes to section 117 direction and EP&A Regulation on flood prone land, Planning Circular PS 07-003 (NSW Department of Planning, 2007). Flood modelling and consideration of mitigation measures would be carried out in consultation with the relevant local councils, the Office of Environment and Heritage and the State Emergency Services. Not worsen is defined as: • A maximum increase flood levels of 50mm in a 100 year Average Recurrence interval flood event • A maximum increase in time of inundation of one hour in a 100 year Average Recurrence interval flood event • No increase in the potential for soil erosion and scouring from any increase in flow velocity in a 100 year Average Recurrence interval flood event	Sydney Metro have responsibility for the design of the Barangaroo Metro Station. BESIX Watpac to implement the design under the COP.
	During detailed design, project infrastructure would be designed to meet the following criteria, where feasible and reasonable: Locate station and service entrances to underground stations above the greater of the 100 year annual recurrence interval flood level plus 500mm or the probable maximum flood level Provide site surface grading and drainage collection systems at the Chatswood and Marrickville dive structures to manage the risk of local catchment and overland flooding for events up to and including the probable maximum flood event Locate aboveground rail system facilities (such as traction power supply sub stations) at least above the 100 year annual recurrence interval flood level plus 500mm	Sydney Metro have responsibility for the design of the Barangaroo Metro Station. BESIX Watpac to implement the design under the COP.

ID	Requirement	Reference
	Protect facilities that are identified as being critical to emergency response operations from the probable maximum flood level	
HR1	All hazardous substances that may be required for construction would be stored and managed in accordance with the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005) and Hazardous and Offensive Development Application Guidelines: Applying SEPP 33 (Department of Planning, 2011).	Section 4.6
HR2	Dial before you dig searches and non-destructive digging would be carried out to identify the presence of underground utilities.	Section 9.3.7
WM1	All waste would be assessed, classified, managed and disposed of in accordance with the *NSW Waste Classification Guidelines*	Section 9.3.4 Refer to the Sustainability Management Plan
WM2	100 per cent of spoil that can be reused would be beneficially reused in accordance with the project spoil reuse hierarchy.	Section 9.3.4
WM3	A recycling target of at least 90 per cent would be adopted for the project	Refer to the Sustainability Management Plan
WM4	Construction waste would be minims by accurately calculating materials brought to the site and limiting materials packaging.	Refer to the Materials Management sub-plan



Appendix C
Noise and Vibration Management Plan

Caption: One Central Park, Sydney

BESIX Watpac

NSW GOVERNMENT | sydney METRO

Barangaroo Station

Noise and Vibration Management Plan

N217

Barangaroo COP

4 November 2022



Project overview

Project Site Address:
25 Hickson Road
Barangaroo
NSW 2000

BESIX Watpac State Division Address:
Level 24, 44 Market Street
SYDNEY
NSW 2000

Project Commencement Date:
12 March 2021

BESIX Watpac ABN:
71 010 462 816

Document Control

Client:	Transport for NSW – Sydney Metro
Title:	BARANGAROO STATION
Subtitle:	Noise and Vibration Management Sub Plan
Author / Approver:	Mattia Tabacchi / Principal Engineer
TB Document Reference:	SMCSWSBR-BWC-SBR-EM-PLN-000018
TB Revision:	02

Revision History

Version	Date	Revision Description	Release Sign off
A	24/05/21	Submission for Review	Giovanni Polimeni / Project Director
B	18/06/21	Updated with Comments for Approval	Giovanni Polimeni / Project Director
C	11/07/21	Updated with Comments for Approval	Giovanni Polimeni / Project Director
D	22/07/21	Updated for Submission to DPIE	Giovanni Polimeni / Project Director
E	06/08/21	Updated to address DPIE comments	Giovanni Polimeni / Project Director
00	01/11/21	Approved For Construction	Luke Hunter / Project Director
01	07/10/22	6 monthly Update	Luke Hunter / Project Director
02	04/11/22	Update to address received comments	Luke Hunter / Project Director

BESIX Watpac Approvals

Name	Role & Title	Signature	Date
Mike Nevin	Reviewer / Planning & Environment Manager		04/11/2022
Daniel Gooch	Reviewer / Engineering Manager		04/11/2022

Note: A controlled copy of the Noise and Vibration Management Plan (NVMP) will be distributed to the Sydney Metro Principal's Representative, Independent Certifier (IC) and it will be made available to all BR COP employees and subcontractors in soft copy format through the project document control system.

The NVMP, when printed, will be uncontrolled and it will the responsibility of each user to confirm the currency of the plan through the project document control system.

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BARANGAROO METRO STATION

Noise and Vibration Management Plan (NVMP)

30 September 2022

BESIX Watpac

TM031-01F01 Barangaroo Metro Station NVMP(r10)

35 1983-2017 ACOUSTIC ENGINEERING EXCELLENCE

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The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

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In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

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NVMP Compliance Matrix

The Protect Planning Approval conditions for Critical State Significant Infrastructure (CSSI) 7400 and approved modifications relevant to this Plan are listed in the Table below. A cross reference is also included to indicate where the condition is addressed in this Plan or other project management documents.

Table 0-1: Minister's Conditions of approval

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
A2	The CSSI must be carried out in accordance with all procedures, commitments, preventative actions, performance criteria and mitigation measures set out in the EIS as amended by the documents listed in A1, unless otherwise specified in, or required under, this approval.		Project Environment Manager	N/A	Section 2.2
A3	In the event of an inconsistency between the EIS as amended by the description in Chapters 2, 3 and 9 of the PIR, or any other document required under this approval, and a term of this approval, the term of this approval prevails to the extent of the inconsistency. For the purpose of this condition, there will be an inconsistency between a term of this approval and any document if it is not possible to comply with both the term and the document.		Project Environment Manager	N/A	Section 2.2
A9	Where the terms of this approval require consultation with identified parties, details of the consultation undertaken, matters raised by the parties, and how the matters were considered must accompany the strategies, plans, programs, reviews, audits, protocols and the like submitted to the Secretary.		Stakeholder and Community Relations Manager Project Environment Manager	N/A	Section 5.3
C2	The CEMP must provide:		Project Environment Manager		
	(a) a description of activities to be undertaken during construction (including the scheduling of construction);				Section 1.2
	(b) details of environmental policies, guidelines and principles to be followed in the construction of the CSSI;				Section 2.1
	(c) a schedule for compliance auditing;				Section 7

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
	(d) a program for ongoing analysis of the key environmental risks arising from the activities described in subsection (a) of this condition, including an initial risk assessment undertaken before the commencement of construction of the CSSI;	Identification of potential noise and vibration impacts in relevant CNVISs		Prior to construction	Section 5
	(e) details of how the activities described in subsection (a) of this condition will be carried out to: i. meet the performance outcomes stated in the EIS as amended by the documents listed in A1; and ii. manage the risks identified in the risk analysis undertaken in subsection (d) of this condition;	This analysis will be included in relevant CNVISs			Section 5
	(f) an inspection program detailing the activities to be inspected and frequency of inspections;	Preparation of a monitoring program and CNVIS			Section 5 (CNVIS), APPENDIX E (monitoring program)
	(g) a protocol for managing and reporting any: i. incidents; and ii. non-compliances with this approval and with statutory requirements;				Section 7
	(h) procedures for rectifying any non-compliance with this approval identified during compliance auditing, incident management or at any time during construction;				Section 7
	(i) a list of all the CEMP sub-plans required in respect of construction, as set out in Condition C3. Where staged construction of the CSSI is proposed, the CEMP must also identify which CEMP sub-plan applies to each of the proposed stages of construction;				Refer to CEMP Table 1
	(j) a description of the roles and environmental responsibilities for relevant employees and their relationship with the ER;				Refer to CEMP Section 5
	(k) for training and induction for employees, including contractors and sub-contractors, in relation to environmental and compliance obligations under the terms of this approval;				Refer to CEMP Section 5.2
	(l) for periodic review and update of the CEMP and all associated plans and programs.				Refer to CEMP Table 9

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
A24	From commencement of construction until completion of construction, the approved Environmental Representative (ER) must: (a) receive and respond to communications from the Secretary in relation to the environmental performance of the CSSI; (b) consider and inform the Secretary on matters specified in the terms of this approval; (c) consider and recommend any improvements that may be made to work practices to avoid or minimise adverse impact to the environment and to the community; (d) review documents identified in Conditions C1, C3 and C9 and any other documents that are identified by the Secretary, to ensure they are consistent with requirements in or under this approval and if so: i. make a written statement to this effect before submission of such documents to the Secretary (if those documents are required to be approved by the Secretary), or ii. make a written statement to this effect before the implementation of such documents (if those documents are required to be submitted to the Secretary for information or are not required to be submitted to the Secretary); (e) regularly monitor the implementation of environmental management related documents to ensure implementation is being carried out in accordance with what is stated in the document and the terms of this approval; (f) review the Proponent's notification of incidents in accordance with Condition A41 of this approval; (g) as may be requested by the Secretary, help plan, attend or undertake Department audits of the CSSI, briefings, and site visits; (h) if conflict arises between the Proponent and the community in relation to the environmental performance of the CSSI, follow the procedure in the Community Communication Strategy approved under Condition B3 of this approval to attempt to resolve the conflict, and if it cannot be resolved, notify the Secretary; (i) review any draft consistency assessment that may be carried out by the Proponent, and provide advice on any additional mitigation measures required to minimise the impact of the work;	Requirement held by Sydney Metro. The ER has been approved by the Secretary of NSW Department of Planning, Industry and Environment DPIE See Section 2.4	Environmental Representative	N/A	Section 2.3, Section 2.4

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
	(j) consider any minor amendments to be made to the documents listed in Conditions C1, C3 and C9 and any document that requires the approval of the Secretary (excluding noise and vibration documents) that comprise updating or are of an administrative or minor nature, and are consistent with the terms of this approval and the documents listed in Conditions C1, C3 and C9 or other documents approved by the Secretary and, if satisfied such amendment is necessary, approve the amendment. This does not include any modifications to the terms of this approval; (k) assess the impacts of minor ancillary facilities as required by Condition A18 of this approval; and (l) prepare and submit to the Secretary and other relevant regulatory agencies, for information, a monthly Environmental Representative Report detailing the ER's actions and decisions on matters for which the ER was responsible in the preceding month (or other timeframe agreed with the Secretary). The Environmental Representative Report must be submitted within seven (7) days following the end of each month for the duration of works and construction of the CSSI, or as otherwise agreed with the Secretary.				
A25	A suitably qualified and experienced Acoustics Advisor (AA), who is independent of the design and construction personnel, must be nominated by the Proponent and engaged for the duration of construction and for no less than six (6) months following operation of the CSSI. The details of the nominated AA must be submitted to the Secretary for approval no later than one (1) month before commencement of works, or within another timeframe as agreed with the Secretary. The Proponent may nominate additional suitably qualified and experienced persons to assist the lead Acoustics Advisor for the Secretary's approval. The Proponent must cooperate with the AA by: (a) providing access to noise and vibration monitoring activities as they take place; (b) providing for review of noise and vibration plans, assessments, monitoring reports, data and analyses undertaken; and (c) considering any recommendations to improve practices and demonstrating, to the satisfaction of the AA, why any recommendation is not adopted.	Requirement held by Sydney Metro. The AA has been approved by the Secretary of DPIE See Section 2.4	AA	N/A	Section 2.3, Section 2.4
A26	Any activities generating noise and vibration in excess of the Noise Management Level derived from the Interim Construction Noise Guideline must not commence until an AA, nominated under Condition A25 of this approval, has been approved by the Secretary.	Requirement held by Sydney Metro. AA has been appointed by DPIE	N/A	N/A	Section 2.3,
A27	The approved AA must: (a) receive and respond to communication from the Secretary in relation to the performance of the CSSI in relation to noise and vibration; (b) consider and inform the Secretary on matters specified in the terms of this approval relating to noise and vibration;	Requirement held by Sydney Metro. AA has been appointed by DPIE See Section 2.4	N/A	N/A	Section 2.3,

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
	(c) consider and recommend, to the Proponent, improvements that may be made to work practices to avoid or minimise adverse noise and vibration impacts; (d) review all noise and vibration documents required to be prepared under the terms of this approval and, should they be consistent with the terms of this approval, endorse them before submission to the Secretary (if required to be submitted to the Secretary) or before implementation (if not required to be submitted to the Secretary); (e) regularly monitor the implementation of all noise and vibration documents required to be prepared under the terms of this approval to ensure implementation is in accordance with what is stated in the document and the terms of this approval; (f) review the Proponent's notification of noise and vibration incidents in accordance with Condition A41 of this approval; (g) in conjunction with the ER (where required), the AA must: i. consider requests for out of hours construction activities and determine whether to endorse the proposed activities in accordance with Condition E47; ii. as may be requested by the Secretary or Complaints Mediator, help plan, attend or undertake audits of noise and vibration management of the CSSI including briefings, and site visits; iii. if conflict arises between the Proponent and the community in relation to the noise and vibration performance during construction of the CSSI, follow the procedure in the Community Communication Strategy approved under Condition B3 of this approval to attempt to resolve the conflict, and if it cannot be resolved, notify the Secretary; iv. consider relevant minor amendments made to any noise and vibration document approved by the Secretary that require updating or are of an administrative or minor nature, and are consistent with the terms of this approval and the document approved by the Secretary and, if satisfied such amendment is necessary, approve the amendment. This does not include any modifications to the terms of this approval; v. assess the noise impacts of minor ancillary facilities as required by Condition A18 of this approval; and vi. prepare and submit to the Secretary and other relevant regulatory agencies, for information, a monthly Noise and Vibration Report detailing the AAs actions and decisions on matters for which the AA was responsible in the preceding month (or other timeframe agreed with the Secretary). The Noise and Vibration Report must be submitted within seven (7) days following the end of each month for the duration of construction of the CSSI, or as otherwise agreed with the Secretary.				

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
C3	The following CEMP sub-plans must be prepared in consultation with the relevant government agencies identified for each CEMP sub-plan and be consistent with the CEMF and CEMP referred to in Condition C1. Required CEMP sub-plan — Relevant government agencies to be consulted for each CEMP sub-plan (a) Noise and vibration — Relevant Council(s)	Development of this plan	Project Environment Manager Proponent and Key Principal Contractor Project Noise and Vibration Consultant	Construction	Section 2.5, APPENDIX F
C4	The CEMP sub-plans must state how: (a) the environmental performance outcomes identified in the EIS as amended by the documents listed in A1 will be achieved; (b) the mitigation measures identified in the EIS as amended by documents listed in A1 will be implemented; (c) the relevant terms of this approval will be complied with; and (d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	Development of this plan	Project Environment Manager Project Noise and Vibration Consultant	Construction	Section 6 This matrix
C5	The CEMP sub-plans must be developed in consultation with relevant government agencies. Where an agency(ies) request(s) is not included, the Proponent must provide the Secretary justification as to why. Details of all information requested by an agency to be included in a CEMP sub-plan as a result of consultation and copies of all correspondence from those agencies, must be provided with the relevant CEMP sub-plan.		Project Environment Manager	N/A	Section 2.5 APPENDIX F
C6	Any of the CEMP sub-plans may be submitted to the Secretary along with, or subsequent to the submission of the CEMP but in any event, no later than one (1) month before commencement of construction		Project Environment Manager	N/A	Section 2.4
C8	Construction must not commence until the CEMP and all CEMP sub-plans have been approved by the Secretary. The CEMP and CEMP sub-plans, as approved by the Secretary, including any minor amendments approved by the ER (or AA in regards to the Noise and Vibration sub-plan), must be implemented for the duration of construction. Where the CSSI is being staged, construction of that stage is not to commence until the relevant CEMP and sub-plans have been approved by the Secretary		Project Environment Manager Construction Managers	Construction	This plan and Section 2.4

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
C9	The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each Construction Monitoring Program to compare actual performance of construction of the CSSI against predicted performance. (a) Noise and Vibration — EPA and Relevant Council(s)	This NVMP outlines the monitoring expectations for this project. In addition, the Sydney Metro CNVS outlines monitoring requirements.	Project Environment Manager Project Noise and Vibration Consultant	Construction	Section 2.5 APPENDIX F
C10	Each Construction Monitoring Program must provide:	This NVMP outlines the monitoring expectations for this project. In addition, the Sydney Metro CNVS outlines monitoring requirements.	Project Environment Manager Project Noise and Vibration Consultant	Construction	APPENDIX E
	(a) details of baseline data available;				Section 1.2.1 in APPENDIX E
	(b) details of baseline data to be obtained and when;				Section 1.2.1 in APPENDIX E
	(c) details of all monitoring of the project to be undertaken;				Section 1.2 and Section 1.3 in APPENDIX E
	(d) the parameters of the project to be monitored;				Section 1.2.2 and Section 1.3.1 in APPENDIX E
	(e) the frequency of monitoring to be undertaken;				Section 1.2 and Section 1.3 in APPENDIX E
	(f) the location of monitoring;				Section 1.2 and Section 1.3 in APPENDIX E
	(g) the reporting of monitoring results;				Section 1.6 in APPENDIX E

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
	(h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and				Section 1.2 and Section 1.3 in APPENDIX E
	(i) any consultation to be undertaken in relation to the monitoring programs.				Section 2.5 and APPENDIX F
C11	The Noise and Vibration Construction Monitoring Program and Blast Construction Monitoring Program must include provision of real time noise and vibration monitoring data. The real time data must be available to the construction team, Proponent, ER and AA in real time. The Department and EPA must be provided with access to the real time monitoring data in real time.	This NVMP outlines the monitoring expectations for this project . In addition, the Sydney Metro CNVS outlines monitoring requirements.	Project Environment Manager Construction Managers	Construction	Section 1.2.5 and Section 1.3.3 in APPENDIX E
C12	The Construction Monitoring Programs must be developed in consultation with relevant government agencies as identified in Condition C9 of this approval and must include, to the written satisfaction of the Secretary, information requested by an agency to be included in a Construction Monitoring Programs during such consultation. Details of all information requested by an agency including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.		Project Environment Manager		Section 2.5 APPENDIX F
C13	The Construction Monitoring Programs must be endorsed by the ER (or AA in regards to the Noise and Vibration Construction Monitoring Program) and then submitted to the Secretary for approval at least one (1) month before commencement of construction or within another timeframe agreed with the Secretary.		Project Environment Manager		Section 2.4, APPENDIX G
C14	Construction must not commence until the Secretary has approved all of the required Construction Monitoring Programs, and all relevant baseline data for the specific construction activity has been collected.		Project Environment Manager Construction Managers		Section 1 in APPENDIX E
C15	The Construction Monitoring Programs, as approved by the Secretary including any minor amendments approved by the ER (or AA in regards to the Noise and Vibration Construction Monitoring Program), must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Secretary, whichever is the greater.		Project Environment Manager		Section 1 in APPENDIX E
C16	The results of the Construction Monitoring Programs must be submitted to the Secretary for information, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.		Project Environment Manager		Section 1.6 in APPENDIX E

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
C17	Where a relevant CEMP sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP sub-plan	This NVMP incorporates construction programs in APPENDIX E	Project Environment Manager Construction Managers		APPENDIX E, Section 1.4 (interaction with other plans)
E28	The Proponent must ensure that vibration from construction activities does not exceed the vibration limits set out in the British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from ground-borne vibration.	Vibration impact to be assessed for the worksite in CNVIS.	Project Environment Manager	Construction	Sections 4.8.2
E29	Owners of properties at risk of exceeding the screening criteria for cosmetic damage must be notified before construction that generates vibration commences in the vicinity of those properties. The management of construction works in the vicinity of properties at risk of exceeding the screening criteria for cosmetic damage must be considered in the Noise and Vibration management sub plan required by Condition C3.	Properties will be identified in the CNVIS and notified.	Project Environment Manager Construction managers Environment coordinators Project Noise and Vibration Consultant Community communication team	Prior to relevant construction activities	Section 5.3, Section 1.3.2 in APPENDIX E
E30	The Proponent must conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures.	Monitoring will be conducted as required under the CNVIS.	Project Environment Manager Construction managers Environment coordinators Project Noise and Vibration Consultant	Prior to and during relevant construction activities	Section 1.3.2 in APPENDIX E
E31	The Proponent must seek the advice of a heritage specialist on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures.	This advice will be included in the Heritage Management Plan (reference document: SMCSWSBR-BWC-SBR-HE-PLN-000010) and managed in conjunction with the AIMS.	Project Environment Manager Construction managers Environment coordinators	Prior to monitor installation	Section 1.3.4 in APPENDIX E

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
E32	The Proponent must review the Sydney Metro City and Southwest Construction Noise and Vibration Strategy in the PIR during detailed construction planning to consider scale and duration of impacts, the requirements of this approval and all measures to limit construction noise impacts to sensitive receivers including: (a) at property or architectural treatment; (b) relocation; and (c) other forms of mitigation where impacts are predicted to be long term and significant. The revised Sydney Metro City and Southwest Construction Noise and Vibration Strategy must be submitted to the Secretary for approval at least one (1) month before construction commences.	Already undertaken by Sydney Metro and incorporated into the CSNIS.	N/A	N/A	N/A
E33	Construction Noise and Vibration Impact Statements must be prepared for each construction site before construction noise and vibration impacts commence and include specific mitigation measures identified through consultation with affected sensitive receivers.	CNVISs will be prepared for all stages of work, under this Plan.	Project Noise and Vibration Consultant Project Environment Manager	Prior to relevant construction activities	Section 5.1.2
E34	Noise generating works in the vicinity of potentially-affected religious, educational, community institutions and noise and vibration-sensitive businesses and critical working areas (such as theatres, laboratories and operating theatres) must not be timetabled within sensitive periods, unless other reasonable arrangements to the affected institutions are made at no cost to the affected institution or as otherwise approved by the Secretary.	Potentially noise affected receivers are identified in Table 5-1. Consultation in accordance with the CCS will determine sensitive periods for these receivers.	Stakeholder and Community Relations Manager Project Environment Manager	Prior to relevant construction activities	Section 5.3.3
E35	The Proponent must review alternative methods to rock hammering and blasting for excavation as part of the detailed construction planning with a view to adopting methods that minimise impacts on sensitive receivers. Construction Noise and Vibration Impact Statements must be updated for each location or activity to adopt the least impact alternative in any given location unless it can be demonstrated, to the satisfaction of the AA, why it should not be adopted.	Section 6.3	Construction Managers Project Environment Manager Environment coordinators	Prior to relevant construction activities as part of relevant CNVIS	Section 6.3

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
E36	Construction, except as allowed by Condition E48 (excluding cut and cover tunnelling), must only be undertaken during the following standard construction hours: (a) 7:00am to 6:00pm Mondays to Fridays, inclusive; (b) 8:00am to 6:00pm Saturdays; and (c) at no time on Sundays or public holidays.	Section 4.2	Construction Managers Project Environment Manager Environment coordinators Project Noise and Vibration Consultant	Construction	Section 4.2
E37	The Proponent must identify all receivers likely to experience internal noise levels greater than Leq(15 minute) 60 dB(A) inclusive of a 5 dB penalty, if rock breaking or any other annoying activity likely to result in regenerated (ground-borne) noise or a perceptible level of vibration is planned (including works associated with utility adjustments), between 7am – 8pm at: (a) Crows Nest, Victoria Cross, Blues Point, Barangaroo, Martin Place, Pitt Street, and Central; and (b) Marrickville, Newtown, St Peters, Sydenham and Tempe for works specified in SSI 7400_MOD 4 referenced in Condition A1 (c).	Section 4.5.2, Section 5.3.3	Stakeholder and Community Relations Manager Project Environment Manager Project Noise and Vibration Consultant	Prior to relevant construction activities as part of relevant CNVIS	Section 4.5.2, Section 5.3.3
E38	The Proponent must consult with all receivers identified in accordance with Condition E37 with the objective of determining appropriate hours of respite so that construction noise (including ground-borne noise), does not exceed internal noise levels of: (a) Leq(15 minute) 60 dB(A) inclusive of a 5 dB penalty if rock breaking or any other annoying activity likely to result in ground-borne noise or a perceptible level of vibration is planned between 7am – 8pm for more than 50 percent of the time; and (b) Leq(15 minute) 55 dB(A) inclusive of a 5 dB penalty if rock breaking or any other annoying activity likely to result in ground-borne noise or a perceptible level of vibration is planned between 7am – 8pm for more than 25 percent of the time, unless an agreement is reached with those receivers. This condition does not apply to noise associated with the cutting surface of a TBM as it passes under receivers. Note This condition requires that noise levels be less than Leq(15 minute) 60 dB(A) for at least 6.5 hours between 7am and 8pm, of which at least 3.25 hours must be below Leq(15 minute) 55 dB(A). Noise equal to or above Leq(15 minutes) 60 dB(A) is allowed for the remaining 6.5 hours between 7am and 8pm.	Section 4.5.2, Section 5.3.3	Stakeholder and Community Relations Manager Construction Managers Project Environment Manager Project Noise and Vibration Consultant	Prior to relevant construction activities	Section 4.5.2, Section 5.3.3

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
E39	The Proponent must consult with proponents of other construction works in the vicinity of the CSSI and take reasonable steps to coordinate works to minimise cumulative impacts of noise and vibration and maximise respite for affected sensitive receivers.	Section 5.3.3	Stakeholder and Community Relations Manager Construction managers Project Environment Manager Project Noise and Vibration Consultant	Prior to relevant construction activities	Section 5.3.3
E40	The Proponent must ensure all works (including utility works associated with the CSSI where undertaken by third parties) are coordinated to provide the required respite periods identified in accordance with the terms of this approval.	All work undertaken will be assessed as noted in this Plan, see Section 5.3.3	Construction managers Project Environment Manager Project Noise and Vibration Consultant	Prior to relevant construction activities	Section 5.3.3
E41	The Proponent must ensure that residential receivers, located in non-residential zones, likely to experience an internal noise level exceeding Leq(15 minute) 60 dB(A) between 8pm and 9pm or Leq(15 minute) 45 dB(A) between 9pm and 7am (inclusive of a 5 dB penalty if rock breaking or any other annoying activity likely to result in ground-borne noise, or a perceptible level of vibration is planned (including works associated with utility adjustments)) must be offered additional mitigation in accordance with the Sydney Metro City and South West Noise and Vibration Strategy referenced in Condition E32.	Section 4.5.1	Construction managers Project Environment Manager Project Noise and Vibration Consultant	Prior to relevant construction activities	Section 4.5.1
E42	The Proponent must ensure that residential receivers in residential zones likely to experience an internal noise level of Leq(15 minute) 45 dB(A) or greater between 8pm and 7am (inclusive of a 5 dB penalty if rock breaking or any other annoying activity likely to result in ground-borne noise, or a perceptible level of vibration is planned (including works associated with utility adjustments)) must be offered additional mitigation in accordance with the Sydney Metro City and South West Noise and Vibration Strategy referenced in Condition E32.	Section 4.5.1	Construction managers Project Environment Manager Project Noise and Vibration Consultant	Prior to relevant construction activities	Section 4.5.1
E43	At no time can noise generated by construction exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of LAeq,8h, of 85dB(A) for any employee working at a location near the CSSI.	See Section 4.5.6	Construction managers Project Environment Manager	Construction	Section 4.5.6

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
E44	Notwithstanding Condition E36 construction associated with the CSSI may be undertaken outside the hours specified under those conditions in the following circumstances: (a) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or (b) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm; or (c) where different construction hours are permitted or required under an EPL in force in respect of the construction; or	Section 4.2	Construction Managers Project Environment Manager	Construction	Section 4.2
	(d) construction that causes LAeq(15 minute) noise levels: i) no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), and ii) no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses, and iii) continuous or impulsive vibration values, measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), and iv) intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006); or (e) where a negotiated agreement has been reached with a substantial majority of sensitive receivers who are within the vicinity of and may be potentially affected by the particular construction, and the noise management levels and/or limits for ground-borne noise and vibration (human comfort) cannot be achieved. All agreements must be in writing and a copy forwarded to the Secretary at least one (1) week before the works commencing; or (f) construction approved through an Out of Hours Work Protocol referred to in Condition E47, provided the relevant council, local residents and other affected stakeholders and sensitive receivers are informed of the timing and duration at least five (5) days and no more than 14 days before the commencement of the works. Note: This condition does not apply where an EPL is in force in respect of the construction. Note: This condition does not apply where an EPL is in force in respect of the construction.				

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
E45	On becoming aware of the need for emergency construction in accordance with Condition E44(b), the Proponent must notify the AA, the ER and the EPA (if an EPL applies) of the need for those activities or work. The Proponent must also use best endeavours to notify all affected sensitive receivers of the likely impact and duration of those works.	Section 4.2, Section 5.1.3	Construction managers Project Environment Manager	If emergency works required	Section 4.2, Section 5.1.3
E46	Notwithstanding Conditions E44 and E48, rock breaking and other particularly annoying activities for station shaft or cut and cover stations is not permitted outside of standard construction hours, except at Central (excluding Central Walk works at 20-28 Chalmers Street, Surry Hills); or (a) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm; or (b) where different construction hours are permitted or required under an EPL in force in respect of the construction; or (c) construction that causes LAeq(15 min) noise levels: i. no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009); and ii. no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses; and iii. continuous or impulsive vibration values, measures at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006); and iv. intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).	Section 4.2	Construction managers Project Environment Manager	Construction	Section 4.2

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
E47	An Out of Hours Work Protocol for the assessment, management and approval of work outside of standard construction hours, as defined in Condition E36 of this approval, must be prepared in consultation with the EPA and submitted to the Secretary for approval before construction commences for works not subject to an EPL. The protocol must include: • the identification of low and high risk construction activities; • a risk assessment process in which the AA reviews all proposed out of hours activities and identifies their risk levels; • a process for the endorsement of out of hours activities by the AA and approval by the ER for construction activities deemed to be of: i. low environmental risk; or ii. high risk where all construction works cease by 9pm. All other high risk out of hours construction must be submitted to the Secretary for approval unless otherwise approved through an EPL. The protocol must detail standard assessment, mitigation and notification requirements for high and low risk out of hours works, and detail a standard protocol for referring applications to the Secretary.	Project will use the City & Southwest Out of hour works protocol (sm-1700005396, version 5.2)	Construction managers Project Environment Manager	Prior to commencement of OOHW not subject to the EPL	Section 5.1.3
E48	Notwithstanding Condition E36 of this approval and subject to Condition E47, the following activities may be undertaken 24 hours per day, seven (7) days per week: (a) tunnelling and associated support activities (excluding cut and cover tunnelling, and excluding the installation and decommissioning of the Blues Point acoustic shed except where compliance with Condition E44 is achieved); (b) excavation within an acoustic enclosure (excluding the Blues Point temporary site except where compliance with Condition E44 is achieved); (c) excavation at Central (excluding Central Walk works at 20-28 Chalmers Street, Surry Hills) without an acoustic enclosure; (d) station and tunnel fit out; and (e) haulage and delivery of spoil and materials. E48.1 Notwithstanding E48(a), the Proponent must use best endeavours to schedule annoying activities, including steel hammering and movement of the self-propelled modular trailer, at the Blues Point temporary site between 7am and 8pm.	Section 4.2	Approvals, Environment and Sustainability Manager Construction managers Project Environment Manager	Construction	Section 4.2
E49	All acoustic sheds must be erected as soon as site establishment works at the facilities are completed and before undertaking any works or activities which are required to be conducted within the sheds.	N/A, the Project will use the existing acoustic shed on Hickson Road, see Section 6.3			

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
E50	A Blast Management Strategy must be prepared and include: (a) sequencing and review of trial blasting to inform blasting; (b) regularity of blasting; (c) intensity of blasting; (d) periods of relief; and (e) blasting program.	Blasting is not currently proposed and so has been excluded from this NVMP	N/A	N/A	N/A
E51	The Blast Management Strategy must be endorsed by a suitably qualified and experienced person and reviewed by an independent specialist.	Blasting is not currently proposed and so has been excluded from this NVMP	N/A	N/A	N/A
E52	The Blast Management Strategy must be prepared so that all blasting and associated activities are carried out so as not to generate unacceptable noise and vibration impacts or pose a significant risk to sensitive receivers. The Blast Management Strategy must be prepared in accordance with relevant guidelines including the principles outlined in Hazardous Industry Planning Advisory Paper No 6: Hazard Analysis (Department of Planning, January 2011) and Assessment Guideline: Multi-Level Risk Assessment (Department of Planning and Infrastructure, May 2011) for the handling and storage of hazardous materials and include: (a) details of blasting to be performed, including location, timing, method and justification of the need to blast; (b) identification of all potentially affected noise and vibration sensitive sites including heritage buildings and utilities; (c) establishment of appropriate criteria for blast overpressure and ground vibration levels at each category of noise sensitive site; (d) details of the storage and handling arrangements for explosive materials and the proposed transport of those materials to the construction site; (e) identification of hazardous situations that may arise from the storage and handling of explosives, the blasting process and recovery of the blast site after detonation of the explosives; (f) determination of potential noise and vibration and risk impacts from blasting and appropriate best management practices; and (g) community consultation procedures.	Blasting is not currently proposed and so has been excluded from this NVMP	N/A	N/A	N/A
E53	The Blast Management Strategy must be submitted to the Secretary one (1) month before blasting commences, or as agreed by the Secretary. The Blast Management Strategy as submitted to the Secretary, must be implemented for all blasting activities.	Blasting is not currently proposed and so has been excluded from this NVMP	N/A	N/A	N/A

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
E54	Blasting associated with the CSSI must not exceed the following criteria, measured at the most affected residence or other sensitive receiver as specified below: (a) airblast overpressure (dB(Lin Peak)) 125 dBL; and (b) vibration (PPV): i. 25 mm/s generally; or ii. 7.5mm/s for heritage structures except where detailed investigation of the construction of the building determines that increasing the screening criterion to 25 mm/s is acceptable. The investigation must be undertaken by a suitably qualified structural engineer with experience assessing heritage structures that is approved by the Secretary. Any decision to adopt the higher vibration criterion must be supported by evidence to demonstrate the higher criterion is appropriate.	Blasting is not currently proposed and so has been excluded from this NVMP	N/A	N/A	N/A
E55	Blasting must be limited to a single detonation in any one day, and a maximum of six per week, at each station location, or any other frequency agreed by the Secretary. Note: for the purpose of this Condition, a single detonation may involve a number of individual blasts fired in quick succession in a discrete area.	Blasting is not currently proposed and so has been excluded from this NVMP	N/A	N/A	N/A
E56	Blasting associated with the project must be undertaken at a time to have the least impact on the nearby sensitive receivers determined in consultation with those receivers. All sensitive receivers affected by any blast must be advised fortnightly of the proposed blasting schedule. The Secretary must also be advised of the advance blasting schedule for any location.	Blasting is not currently proposed and so has been excluded from this NVMP	N/A	N/A	N/A
E58	The CSSI must be designed and constructed with the objective of minimising impacts to, and interference with, third party property and infrastructure, and that such infrastructure and property is protected during construction	This Plan	Construction managers Project Environment Manager	During design and construction	This Plan
E59	Before commencement of construction, all property owners of buildings identified as being at risk of damage must be offered a building condition survey. Where an offer is accepted a structural engineer must undertake the survey. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the owners of the buildings surveyed, and if agreed by the owner, the Relevant Council within three (3) weeks of completing the Survey Report and no later than one (1) month before the commencement of construction.	See Building Condition Survey Report (to be prepared if any properties are at risk of damage).	Construction managers Project Environment Manager Community communication team	Pre-construction	Section 1.3.2 in APPENDIX E

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
E60	Within three (3) months of the completion of construction, all property owners of buildings for which a building condition survey was carried out in accordance with Condition E59 must be offered a second building condition survey. Where an offer is accepted, building condition surveys must be undertaken by a structural engineer. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the owners of the buildings surveyed within one (1) month of the survey being completed.	See Building Condition Survey Report (to be prepared if any properties are at risk of damage).	Construction managers Project Environment Manager Community communication team	Post construction	Section 1.3.2 in APPENDIX E

Table 0-2: Construction Environmental Management Framework

No.	Requirement	Proposed actions	Responsible Key Contributor	Timing	Relevant NVMP section
9.1 a	The following noise and vibration management objectives will apply to construction: i) Minimise unreasonable noise and vibration impacts on residents and businesses; ii) Avoid structural damage to buildings or heritage items as a result of construction vibration; iii) Undertake active community consultation; and iv) Maintain positive, cooperative relationships with schools, childcare centres, local residents and building owners.	See Section 1.3, Section 4, Section 5.3, Section 6	Project Environment Manager Project Noise and Vibration Consultant	Construction	This plan Section 1.3
9.2 a	Principal Contractors will develop and implement a Construction Noise and Vibration Management Plan for their scope of works consistent with the Interim Construction Noise Guidelines (Department of Environment and Climate Change, 2009). The Construction Noise and Vibration Management Plan will include as a minimum:	Development of this plan	Project Environment Manager Project Noise and Vibration Consultant	Construction	This plan
(i)	Identification of work areas, site compounds and access points;				APPENDIX C
(ii)	Identification of sensitive receivers and relevant construction noise and vibration goals;				Section 3 and Appendix B
(iii)	Be consistent with, and include the requirements of the noise and vibration mitigation measures as detailed in the environmental approval documentation and the Sydney Metro Construction Noise and Vibration Strategy (CNVS);				Section 2
(iv)	Details of construction activities and an indicative schedule for construction works, including the identification of key noise and/or vibration generating construction activities (based on representative construction scenarios) that have the potential to generate noise or vibration impacts on surrounding sensitive receivers, in particular residential areas;				Section 1.2, APPENDIX C

No.	Requirement	Proposed actions	Responsible Key Contributor	Timing	Relevant NVMP section
(v)	Identification of feasible and reasonable procedures and mitigation measures to ensure relevant vibrations and blasting criteria are achieved, including a suitable blast program;				Section 6.2 (Blasting is not currently proposed and so has been excluded from this NVMP)
(vi)	Community consultation requirements and Community notification provisions specifically in relation to blasting;				Section 5.3 (Blasting is not currently proposed and so has been excluded from this NVMP)
(vii)	The requirements of any applicable EPL conditions;				No EPL required
(viii)	Additional requirements in relation to activities undertaken 24 hours of the day, 7 days per week;				Section 5.1.3
(ix)	Pre-construction compliance requirements and hold points;				Section 2
(x)	The responsibilities of key project personnel with respect to the implementation of the plan;				Table 0-1
(xi)	Noise monitoring requirements;				APPENDIX E
(xii)	Compliance record generation and management; and				Section 7
(xiii)	An Out of Hours Works Protocol applicable to all construction methods and sites.				Section 5.1.3
9.2 b	Detailed Construction Noise and Vibration Impact Statements will be prepared for noise-intensive construction sites and or activities, to ensure the adequacy of the noise and vibration mitigation measures. Specifically, Construction Noise and Vibration Impact Statements will be prepared for EPL variation applications and works proposed to be undertaken outside of standard construction hours.	CNVISs will be prepared progressively for all worksites, under this Plan. EPL not required.	Project Environment Manager Project Noise and Vibration Consultant	Prior to the commencement of relevant construction activities	Section 5.1.2

No.	Requirement	Proposed actions	Responsible Key Contributor	Timing	Relevant NVMP section
9.2 c	Noise and vibration monitoring would be undertaken for construction as specified in the CNVIS.	This NVMP outlines the monitoring expectations for this project. In addition, the Sydney Metro CNVS outlines monitoring requirements.	Project Environment Manager Project Noise and Vibration Consultant	As specified in CNVIS and APPENDIX E	APPENDIX E
9.2 d	The following compliance records would be kept by Principal Contractors: i) Records of noise and vibration monitoring results against appropriate NMLs and vibration criteria; and ii) Records of community enquiries and complaints, and the Contractor's response.	Records of noise monitoring will be kept as outlined in Section 7.4	Project Environment Manager Project Noise and Vibration Consultant	Construction	Section 7.4
9.3 a	All feasible and reasonable mitigation measures would be implemented in accordance with the CNVS. Examples of noise and vibration mitigation measures include: i) Construction hours will be in accordance with the working hours specified in Section 5.1; ii) Hoarding and enclosures will be implemented where required to minimise airborne noise impacts; and iii) The layout of construction sites will aim to minimise airborne noise impacts to surrounding receivers.	The CNVIS will form the key to manage noise and vibration impact. All reasonable and feasible measures detailed in the CNVIS will be adhered to by the relevant construction manager. See Section 5.1.2	Construction Manager Project Environment Manager Environment Co-ordinators Project Noise and Vibration Consultant	Construction	Section 5.1.2

1 Introduction

1.1 Context

This Noise and Vibration Management Sub Plan (NVMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the Sydney Metro Barangaroo Metro Station (the Project).

This Plan has been prepared to address the relevant requirements of Sydney Metro's Construction Environmental Management Framework (Appendix B of the *Submissions and Preferred Infrastructure Report*), the Revised Environmental Mitigation Measures (REMMs), the Revised Environmental Performance Outcomes, applicable legislation, the SMCSWCS Environmental Impact Statement (EIS) (Sydney Metro, 2016) and contractual requirements and the Project Planning Approval and approved modifications.

1.2 Project background and description of works

The Minister approved the Stage 2 (Chatswood to Sydenham) Metro application lodged by Transport for NSW (TfNSW) as a Critical State Significant Infrastructure (CSSI) project (reference SSI 7400) (the CSSI Consent) on 9 January 2017. The construction of Barangaroo station forms part of the Sydney City Metro & Southwest (Chatswood to Sydenham) (SMCSWCS) project. This project falls under the construction and operation of the section between Chatswood and the Sydenham dive site known as "CSSI_7400". Approval was granted on 9 January 2017 followed by eight approved modifications:

MOD 1 – Victoria Cross and Artarmon Substation (determined 18 October 2017)

MOD 4 – Sydenham Station and Metro Facility South (determined 13 December 2017)

MOD 2 – Central Walk (determined 21 December 2017)

MOD 3 – Martin Place Metro Station (determined 22 March 2018)

MOD 5 – Blues Point Acoustic Shed (determined 2 November 2018)

MOD 6 – Administrative Changes (determined 21 February 2019)

MOD 7 – Administrative Changes (determined 24 June 2020)

MOD 8 – Blues Point Access Site (determined 25 November 2020)

MOD 9 – Extension to standard construction hours (determined 30 June 2022)

BESIX Watpac have been contracted by Sydney Metro for the construction of the Sydney Metro Barangaroo station, including station fit-out, building a station entrance next to Nawi Cove and reinstatement of Hickson Road. A preliminary construction program for the project has been developed by BESIX Watpac and is presented in Table 1-1 and Figure 1.1. The two major stages for the Project are:

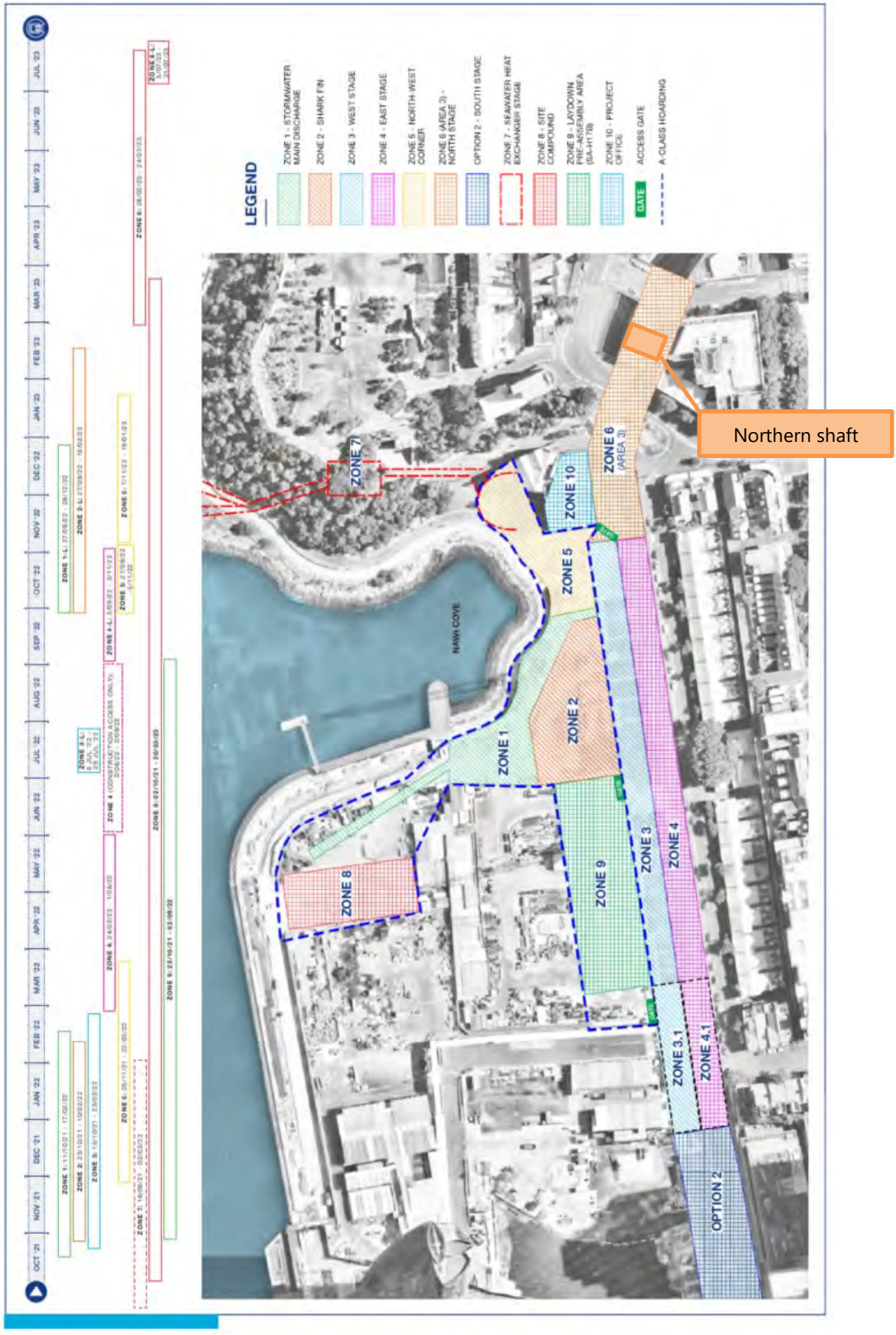
1. Station construction works;

2. Surface works including all utility and road reinstatement works.

Table 1-1: Indicative construction program

Stage	Work zone (see Figure 1.1)	Activity	Commencement	Completion
Station construction works	Station box (underground), Northern shaft shed and Zone 9 for deliveries	Basements Structure/ Core Structure/Fitout	September 2021	July 2023
Surface works	All zones	Site preparation and establishment (mobilisation, fencing, etc)	August 2021	October 2021
	Zone 3, Zone 4	Demolition works (girders. etc)	October 2021	November 2021
	Zone 1, Zone 2, Zone 3.1, Zone 4.1, Zone 5, Zone 6, Zone 7	Utility works (stormwaters and other services)	November 2021	July 2023
	Zone 3, Zone 4, zone 6	Road upgrading works	November 2021	July 2023
	Northern shaft	Northern shaft backfill	February 2023	March 2023
	Northern shaft	Northern shaft shed demolition and removal	March 2023	April 2023

Figure 1.1: Project work zones and indicative construction program



1.3 Purpose and objectives of this Plan

The purpose of this Plan is to describe how the BESIX Watpac proposes to manage potential noise and vibration impacts during construction of the Project. It provides the framework and mechanisms for the implementation of feasible and reasonable mitigation and management of potential noise and vibration impacts.

The objectives for this noise and vibration management plan are to ensure:

- Compliance with applicable conditions in CSSI 7400 and approved modifications 1-9.
- Noise levels would be minimised with the aim of achieving the noise management levels where feasible and reasonable;
- The project would avoid any structural damage to buildings or heritage items as results of construction vibration;
- Construction noise and vibration impacts are mitigated and managed in accordance with the Sydney Metro City and Southwest Construction Noise and Vibration Strategy (CNVS);
- Maintain a good relationship with the potential noise affected community (e.g. schools, childcare centres, local residents and building owners) through an effective, transparent and efficient communication strategy
- Affected sensitive receivers are notified of upcoming works and any out-of-hours works;
- Reasonable and feasible mitigation measures are implemented to minimise and manage noise and vibration impacts on surrounding residents, commercial and other sensitive receivers;
- Any complaints are addressed in a timely and efficient manner.

1.4 Interactions with other management plans

This NVMP is a sub-plan of the Construction Environmental Management Plan (CEMP). The environmental management system overview is described in the CEMP. Used together, the CEMP and the NVMP form management guides that clearly identify required environmental management actions for reference by BESIX Watpac personnel and contractors.

The NVMP has the following relationships with other management plans and documents:

- Construction Noise & Vibration Impact Statements (CNVIS) detail predicted noise and vibration impacts and site-specific management and mitigation measures for the Barangaroo Station works
- Site Environmental Control Maps identify adjacent residential and other sensitive receivers and Noise Catchment Areas and will be progressively updated to incorporate physical noise and vibration management measures identified in CNVIS

- Construction Heritage Management Plan (HMP) developed for the Project to provide details of heritage structures and items in the areas surrounding the Project. The HMP is a sub plan of the CEMP.
- Community Communications Strategy and Business Management Plan details the procedures and processes for community notification, consultation, and complaints management.

2 Environmental requirements

2.1 Relevant legislation and guidelines

2.1.1 Legislation

This NVMP is prepared in accordance with the:

- *Environmental Planning and Assessment Act 1979*
- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Environmental Planning and Assessment Amendment (Part 3A Repeal) Act 2011*
- *State Environmental Planning Policy (State and Regional Development) 2011.*

Refer to the CEMP for further details.

2.1.2 Guidelines

The main guidelines and standards relating to the management of construction noise and vibration from this project include:

- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- NSW Road Noise Policy (RNP), Department of Environment, Climate Change and Water 2011
- NSW Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- Australian Standard AS/NZS 2107:2016 *Acoustics - Recommended design sound levels and reverberation times for building interiors*
- Australian Standard 2834-1995 Computer Accommodation, Chapter 2.9 Vibration
- Australian Standard AS 2187.2 Explosives - Storage and use - Part 2 Use of explosives
- Australian Standard AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites
- British Standard BS 6472-2008, 'Evaluation of human exposure to vibration in buildings (1-80Hz);
- British Standard 7385: Part 2-1993 'Evaluation and measurement of vibration in buildings
- German Standard DIN4150-2016 Structural vibration Part 3: Effects of vibration on Structures
- Environmental Noise Management Manual (ENMM), Roads and Traffic Authority 2001.

2.1.3 Sydney Metro Construction Noise and Vibration Strategy

Sydney Metro City & Southwest Construction Noise and Vibration Strategy (Report No. 610.14213-R3, 2016) provides practical guidance on how to minimise, to the fullest extent possible, the impacts of noise and vibration on the community. They outline all feasible and reasonable mitigation measures that should be considered by the Project to reduce airborne noise, ground-borne noise and vibration during the construction of infrastructure projects. The above reference strategies will be adopted to guide management of construction noise and vibration impacts.

The Sydney Metro City & Southwest Construction Noise and Vibration Strategy (Addendum A v2) has been updated by Sydney Metro to satisfy Condition of Approval E32. The Addendum provides internal noise criteria for sensitive receivers, consistent with the requirements of Conditions of Approval E38, E41, E42 and E43. Where internal noise criteria are applicable, additional steps are required when preparing CNVISs to predict internal noise levels based on the facade transmission loss of affected receivers and applying appropriate levels of mitigation, consultation and respite (refer Sections 4.5.1 and 6.3).

2.2 Environmental performance outcomes

CoA C4(a) requires that the environmental performance outcomes identified in the EIS as amended by the documents listed in CoA A1 will be achieved.

As a CEMP sub-plan, this NVMP describes how noise and vibration will be managed and mitigated during construction of the Project. To achieve environmental performance outcomes, this Plan has been prepared to address the relevant requirements of Sydney Metro's Construction Environmental Management Framework (Appendix B of the Submissions and Preferred Infrastructure Report), the Revised Environmental Mitigation Measures (REMMs), the Revised Environmental Performance Outcomes, applicable legislation, the SMCSWCS Environmental Impact Statement (EIS) (Sydney Metro, 2016),contractual requirements and the Project Planning Approval. In the event of an inconsistency between the EIS as amended by the description in Chapters 2, 3 and 9 of the PIR, or any other document required under the CSSI 7400 conditions of approval and a term of the approval, the term of the approval prevails to the extent of the inconsistency.

2.3 Environmental Representative and Acoustic Advisor

The Project Planning Approval requires Sydney Metro to appoint an independent Environmental Representative (ER) for the duration of the Project and an independent Acoustic Advisor (AA) to oversee construction noise and vibration planning, modelling, management and reporting. The ER and AA have been appointed by Sydney Metro. The role of the ER and the AA is set out in the Construction Environmental Management Plan (CEMP) and in:

- Project Planning Approval Conditions A22 to A24, in relation to the ER
- Project Planning Approval Conditions A25 to A27, in relation to the AA.

The principal role of the ER and the AA with regard to noise and vibration from the SMCSWCS works is as follows:

- Receive and respond to communication from the Secretary of NSW Government Department of Planning and Environment (DPIE) in relation to the performance of SMCSWCS Works in relation to noise and vibration;
- Consider and inform the Secretary on matters specified in the terms of this approval relating to noise and vibration;
- Consider and recommend, to the Proponent, improvements that may be made to work practices to avoid or minimise adverse noise and vibration impacts;
- Review all noise and vibration documents required to be prepared under the terms of this approval and, should they be consistent with the terms of this approval, endorse them before submission to the Secretary (if required to be submitted to the Secretary) or before implementation (if not required to be submitted to the Secretary);
- Regularly monitor the implementation of all noise and vibration documents required to be prepared under the terms of this approval to ensure implementation is in accordance with what is stated in the document and the terms of this approval;
- Notify the Secretary of noise and vibration incidents in accordance with Condition A41 of this approval;
- In conjunction with the ER, the AA must:
    - Consider requests for out of hours construction activities and determine whether to endorse the proposed activities in accordance with Condition E47
    - As may be requested by the Secretary or Complaints Commissioner, help plan, attend or undertake audits of noise and vibration management of the SMCSWCS Works including briefings, and site visits;
    - If conflict arises between the Proponent and the community in relation to the noise and vibration performance during construction of the Project, follow the procedure in the Community Communication Strategy approved under Condition B3 of the CSSI Consent to attempt to resolve the conflict, and if it cannot be resolved, notify the Secretary;
    - Consider relevant minor amendments made to this CEMP, relevant sub-plans and noise and vibration monitoring programs that require updating or are of an administrative nature, and are consistent with the terms of this approval and the management plans and monitoring programs approved by the Secretary and, if satisfied such amendment is necessary, endorse the amendment. This does not include any modifications to the terms of this approval;
    - Prepare and submit to the Secretary and other relevant regulatory agencies, for information, a monthly Noise and Vibration Report detailing the AAs actions and decisions on matters for which the AA was responsible in the preceding month (or other timeframe agreed with

the Secretary). The Noise and Vibration Report must be submitted within seven (7) days following the end of each month for the duration of construction of the Project, or as otherwise agreed with the Secretary of DPIE.

2.4 Collaboration with Sydney Metro, ER and AA

The Environment Representative (ER) and the Acoustic Advisor (AA) have roles that include overseeing noise and vibration management. These roles are set out in the Construction Environmental Management Plan (CEMP).

BESIX WATPAC will provide Sydney Metro, the ER and the AA with:

- Noise and vibration documents for review
- Access to monitoring activities and data

BESIX WATPAC will work collaboratively with Sydney Metro, the ER and the AA to ensure all reasonable and feasible noise mitigation is implemented in accordance with the Conditions of Approval (CoA), the Revised Mitigation Measures and Performance Environmental Outcomes and this NVMP.

AA and ER endorsement of the NVMP is required prior to submission to DPIE for approval no later than one(1) month before the commencement of construction. Evidence of endorsement is presented in APPENDIX G.

Construction will not commence until this Plan has been approved by the Secretary. The NVMP, as approved by the Secretary, including any minor amendments approved by the AA will be implemented for the duration of construction. Where the CSSI is being staged, construction of that stage is not to commence until the relevant CEMP and sub-plans have been approved by the Secretary.

2.5 Consultation

This Plan is to be provided[1] to City of Sydney Council in accordance with CoA C3 (a), C5.

The Construction monitoring plan[2] (APPENDIX E of this Plan) is to be provided to EPA and City of Sydney Council in accordance with CoA C9(a).

A summary of the consultation undertaken in relation this Plan is included in APPENDIX F.

[1] Paragraph to be updated following agency consultation.

[2] Paragraph to be updated following agency consultation.

3 Existing noise environment and noise/vibration sensitive receivers

3.1 Surrounding receivers and land use

The location of the project site, and the nearby surrounding land use is presented in Appendix B.

A detailed land-use survey has been completed and will be further refined (if required) as part of each CNVIS. The survey brought the NSW cadastral database, a building basement survey conducted by Sydney Metro and identified land use details into a Geographic Information System (GIS). The GIS allows potentially critical areas that are sensitive to construction noise, vibration and ground-borne noise impacts to be easily identified and updated as land uses change during the project timeline. The data can be readily included into the noise and vibration modelling, to allow effective management of noise and vibration impacts on identified sensitive receivers.

3.2 Existing acoustic environment and residential receivers

The primary contributor to the ambient noise environment in the study area is traffic noise from the existing road network and urban hum (e.g. commercial building mechanical plant and equipment). SLR conducted long-term noise monitoring on behalf of TfNSW to quantify ambient noise levels for the EIS of the SMCSWCS project. Section 3.5 of the EIS Noise and Vibration Technical Paper provides noise data results.

Table 3-1 below summarises the NCAs for the Project and the representative Rating Background Levels (RBLs). These are used to establish construction noise management levels (NMLs) at residential receivers in accordance with the NSW ICNG.

Table 3-1: Nearest Noise and Vibration Sensitive Residential Receivers and Rating Background Noise Levels (RBLs)

NCA	EIS monitoring ID[1]	Address	Rating Background noise Levels, dBA			Ambient noise levels (L_{Aeq})		
			Day	Evening	Night	Day	Evening	Night
BN_01	EIA B.12	26A High Street, Millers Point (Barangaroo)	50	45	40	61	64	51
BN_02	EIA B.12	26A High Street, Millers Point (Barangaroo)	50	45	40	61	64	51
BN_03	EIA B.12	26A High Street, Millers Point (Barangaroo)	50	45	40	61	64	51
BN_04	EIS B.13	2-60 Cumberland Street, The Rocks	62	62	52	66	65	63
BN_05	EIS B.28	56A Pirrama Road, Pyrmont (Wharf 8)	51	46	41	56	52	47
BN_06	EIS B.29	Goat Island	49	49	41	55	55	49

Notes: 1) Based upon EIS and Submissions and Preferred Infrastructure Reports for the Sydney City Metro & Southwest (Chatswood to Sydenham) (SMCSWCS) project.

3.2.1 Noise and vibration sensitive receivers

The sensitivity of occupants to noise and vibration varies according to the nature of the occupancy and the activities performed within the affected premises. For example, recording studios are more sensitive to vibration and ground-borne noise than residential premises, which in turn are more sensitive than typical commercial premises.

To assess and manage construction noise impacts, the areas around the worksite (up to approximately 250 m from the worksite) have been divided into Noise Catchment Areas (NCAs). These are based on each area's similar acoustic environment before construction works start. The NCAs, based upon the SMCSWCS EIS, have been reviewed and modified, based on more detailed design information and site-specific characteristics.

The land use information was collated from a combination of site inspections; review of street-level imagery and aerial photography; and review of publicly available land and property information. All cadastral lots within the identified NCAs were classified into one of the following receiver categories:

Figure 3.1: Land use categories identified in Land Use Survey GIS and Appendix B



The comprehensive updated land-use survey in each project NCA are included in Appendix B.

3.2.2 Heritage receivers

Renzo Tonin and Associates, in consultation with BESIX Watpac, have identified potentially vibration sensitive heritage properties in each NCA near the construction site. Heritage properties (see list provided in Table 3-2) have been included in the land use GIS database, and subsequently incorporated into the vibration models to ensure vibration impacts are managed to minimise the risk of property damage.

APPENDIX B identifies heritage receivers in close proximity to the worksite.

Table 3-2: Identified heritage receivers in proximity to the project

Site	Item	Address	Significance
Barangaroo	Terrace duplex group including interiors	2–36 High Street	Item 883 City of Sydney LEP ; SHR Item 00920
	Terrace duplex group including interiors	3, 5, 7, 9 High Street	Item 884 City of Sydney LEP ; SHR Item 00918
	Lance Kindergarten including buildings and their interiors, early remnant fencing and grounds	37 High Street	Item 886 City of Sydney LEP
	Terrace duplex group including interiors	38–72 High Street	Item 888 City of Sydney LEP ; SHR Item 00919
	Terrace duplex group including interiors	74–80 High Street	Item 889 City of Sydney LEP ; SHR Item 00868
	Palisade Hotel including interior and archaeological site	35-37 Bettington Street	Item 874 City of Sydney LEP ; Archaeological site A1191 ; SHR Item 00510
	Bridges over Hickson Road	Argyle Place (and Munn and Windmill Streets)	Item 869 City of Sydney LEP
	Retaining Wall, Palisade Fence and Steps	High Street	Item 881 City of Sydney LEP/Item 882 City of Sydney LEP
	Hickson Steps	16-28 Windmill St	Maritime NSW S170 Register Item 4920007
	Dalgety Terrace	7, 9, 11, 13 Dalgety Terrace	SHR00867
	Terraces	27a, 29a, 31a, 33, 35a Dalgety Terrace	SHR00923
	Terraces	15, 17, 19, 21, 23, 25 Dalgety Terrace	SHR00867
	Dalgety's Bond Stores Group of Buildings	6-20 Munn Street	Maritime NSW S170 Register; SHR Item 00526
	Shops	10, 10a, 12, 12a Argyle Place	SHR00891
	Lord Nelson Hotel	19 Kent Street	SHR00509

4 Construction noise and vibration objectives

4.1 Summary of construction noise and vibration objectives

The policies and standards outlined in Table 4-1 have been used to establish construction noise and vibration management levels for the Project.

Table 4-1: Construction noise and vibration levels

Environment impact	Relevant policy/ standard used to establish noise and vibration management level
Airborne noise	ICNG Conditions of Approval
Sleep disturbance and maximum noise events	Road traffic noise - NSW Road Noise Policy (RNP) and the RMS Environmental Noise Management Manual (ENMM) Practice Note 3. Construction noise – NSW Environmental Criteria for Road Traffic Noise
Ground-borne noise	NSW Interim Construction Noise Guideline (ICNG) Conditions of Approval Australian Standard AS/NZS 2107:2016 Acoustics – Recommended design sound levels and reverberation times for building interiors
Construction-related road traffic noise	No specific guidelines, but guidance taken from the NSW Interim Construction Noise Guideline (ICNG) and the NSW Road Noise Policy (RNP).
Vibration (disturbance to building occupants)	NSW DECC's Assessing vibration; a technical guideline, published in February 2006, in line with CoA D16(b), which incorporates: British Standard BS 6472-2008, Evaluation of human exposure to vibration in buildings (1-80Hz)
Vibration (structural damage to buildings)	British Standard 7385:1993 Evaluation and measurement of vibration in buildings – Part 2 Guide to damage from ground-borne vibration
Vibration (structural damage to buried services)	German Standard DIN 4150:2016 – Part 3 Structural vibration in buildings – Effects on structures
Vibration (sensitive scientific and medical equipment)	ASHRAE Applications Handbook (SI) 2003, Chapter 47 Sound and Vibration Control Gordon GC 28 September 1999 Generic Vibration Criteria for Vibration Sensitive Equipment Australian Standard 2834-1995 Computer Accommodation, Chapter 2.9 Vibration
Blast noise and vibration*	Australian Standard AS 2187.2-2006 Explosives – Storage and use – Part 2 Use of explosives British Standard 7385: Part 2 Evaluation and measurement of vibration in buildings

*No blasting will be undertaken as part of the Barangaroo station project described in this management plan.

4.2 Construction hours

The construction hours for the Project are defined by the CSSI Project Planning Approval. The standard construction hours of work are defined in Project Planning Approval Condition E36 and summarised in Table 4-3. Works may be carried out outside standard hours under Project Planning Approval Conditions E44, E46, E47 and E48.

The standard hours and out-of-hours work (OOHW) periods are depicted in Table 4-2. The Sydney Metro CNVS defines the construction hours in Section 5.2, then further categorises the OOHW into two time periods, for the purpose of managing impacts and identifying additional mitigation measures. These two OOHW periods are both named 'OOHW' in the Sydney Metro CNVS. Guidance has been taken from the TfNSW Construction Noise and Vibration Strategy, which defines the OOHW periods as OOHW Period 1 and OOHW Period 2. The naming of the OOHW periods assists when reviewing, assessing and managing impacts from OOHW.

Table 4-2: Assessment periods

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

Table 4-3 summarises the information that the CoA require regarding construction working hours for the Project. Construction would be undertaken during the approved construction hours wherever possible.

Table 4-3: Summary of construction working hours for the Project

CoA	Description	Working hours applicable		
		Monday to Friday	Saturday	Sunday / Public Holiday
E36	**Standard construction hours**	7:00am to 6:00pm	8:00am to 6:00pm	No work[1]
E37/E38	**Respite for receivers** The Proponent must consult with all receivers likely to experience internal noise levels greater than LAeq,15min 60dB(A) inclusive of a 5 dB penalty (rock breaking or other annoying activity) with the objective of determining appropriate hours of respite so that construction noise (including ground-borne noise), does not exceed internal noise levels of: (a) $L_{Aeq,15min}$ 60 dB(A) inclusive of a 5 dB penalty if rock breaking or any other annoying activity likely to result in ground-borne noise or a perceptible level of vibration is planned between 7am – 8pm for more than 50 percent of the time; and (b) $L_{Aeq,15min}$ 55 dB(A) inclusive of a 5 dB penalty if rock breaking or any other annoying activity likely to result in ground-borne noise or a perceptible level of vibration is planned between 7am – 8pm for more than 25 percent of the time, unless an agreement is reached with those receivers.	7:00am to 8:00pm	7:00am to 8:00pm	7:00am to 8:00pm
E44	**Variation to Standard Construction Hours** Notwithstanding Condition E36 construction associated with the CSSI may be undertaken outside the hours specified under those conditions in the following circumstances: (a) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or (b) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm; or (c) where different construction hours are permitted or required under an EPL in force in respect of the construction; or (d) construction that causes LAeq(15 minute) noise levels: (i) no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), and (ii) no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses, and (iii) continuous or impulsive vibration values, measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), and (iv) intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006); or	6:00 pm to 7:00 am	6:00 pm to 8:00 am	8:00am to 7:00am

CoA	Description	Working hours applicable		
		Monday to Friday	Saturday	Sunday / Public Holiday
	(e) where a negotiated agreement has been reached with a substantial majority of sensitive receivers who are within the vicinity of and may be potentially affected by the particular construction, and the noise management levels and/or limits for ground-borne noise and vibration (human comfort) cannot be achieved. All agreements must be in writing and a copy forwarded to the Secretary at least one (1) week before the works commencing; or (f) construction approved through an Out of Hours Work Protocol referred to in Condition E47, provided the relevant council, local residents and other affected stakeholders and sensitive receivers are informed of the timing and duration at least five (5) days and no more than 14 days before the commencement of the works.			
E46	**Out of Hour rock breaking and other particularly annoying activities** Notwithstanding Conditions E44 and E48, rock breaking and other particularly annoying activities for station shaft or cut and cover stations is not permitted outside of standard construction hours, except at Central (excluding Central Walk works at 20-28 Chalmers Street, Surry Hills); or (a) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm; or (b) where different construction hours are permitted or required under an EPL in force in respect of the construction or approved through an Out of Hours Work Protocol developed in accordance with Condition E47; or (c) construction that causes LAeq(15 min) noise levels: (d) no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009); and (e) no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses; and (f) continuous or impulsive vibration values, measures at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006); and (g) intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).	6:00 pm to 7:00 am	6:00 pm to 8:00 am	8:00am to 7:00am
E47	**Out of Hour Work Protocol** An Out of Hours Work Protocol for the assessment, management and approval of work outside of standard construction hours, as defined in Condition E36 of this approval, must be prepared in consultation with the EPA and submitted to the Secretary for approval before construction commences for works not subject to an EPL.	6:00 pm to 7:00 am	6:00 pm to 8:00 am	8:00am to 7:00am

CoA	Description	Working hours applicable		
		Monday to Friday	Saturday	Sunday / Public Holiday
E48	**24 Hour Construction** Notwithstanding Condition E36 of this approval and subject to Condition E47, the following activities may be undertaken 24 hours per day, seven (7) days per week: (a) tunnelling and associated support activities (excluding cut and cover tunnelling, and excluding the installation and decommissioning of the Blues Point acoustic shed except where compliance with Condition E44 is achieved); (b) excavation within an acoustic enclosure (excluding the Blues Point temporary site except where compliance with Condition E44 is achieved); (c) excavation at Central (excluding Central Walk works at 20-28 Chalmers Street, Surry Hills) without an acoustic enclosure; (d) station and tunnel fit out; and (e) haulage and delivery of spoil and materials.	All	All	All

Notes 1) No work unless permitted and approved under the Out of Hours Work Protocol

4.3 COVID-19 extended construction hours

The Environmental Planning and Assessment (COVID-19 Development – Infrastructure Construction Work Days) Order 2020 commenced on 9 April 2020 and will continue until 31 March 2022. The order permits standard construction hours on this project to be extended as follows:

- Saturday from 7am to 8am and from 1pm to 6pm (no high noise work permitted)
- Sundays from 7am to 6pm (no high noise work permitted)
- Public holidays from 7am to 6pm (no high noise work permitted).

High noise work means activities such as rock breaking, rock hammering, sheet piling, pile driving or similar noisy activities, unless an existing consent or approval already allows these works to occur on any of the extended days.

4.4 Out of hours works

4.4.1 Utility and road works

Most utility and road area works will be undertaken during standard construction hours. However, when works are proposed to be carried out along Hickson Road, Road Occupancy Licence (ROL) may not be granted during the day due to the importance of the road to the functionality of the road network. This may preclude or restrict access to the work area before 10 pm, so that construction works would have to be carried out during the 'night' period, or OOHW Period 2.

The existing background noise levels around the project site are generally controlled by ambient urban noise since the Project site is an inner-city site. The noise logging results indicate that background noise levels remain steady or marginally decrease in the early night between 10 pm to 12 am, and decrease to minimum levels around 2 am to 4 am.

As such, it would be unduly stringent to apply stricter 'night' criteria during the 10 pm to 12 am period. Accordingly, a shoulder period has been derived in line with guidance provided in the NSW Industrial Noise Policy (INP) (Section 3.3) so that the assessment NMLs are consistent with the existing background noise levels during this assessment period. As such, an additional OOHW Period, OOHW Shoulder has been identified for assessing and managing OOHW at residential receivers and outlined in APPENDIX B.

4.4.2 Station works

In accordance with CoA E48(d), underground station fit out work may be undertaken 24 hours per day, seven days per week. These works will be completed underground inside the station box which would be enclosed with a concrete roof.

4.4.3 Material delivery to northern shed for station and tunnel fit out

In accordance with CoA E48(d)(e), delivery of materials for station and tunnel fit out through the northern shed may be undertaken 24 hours per day, seven days per week.

4.4.4 Northern shaft backfill

Works to backfill the northern shaft which has been utilised for construction material and operative access into the cross-over cavern, and forms part of the Barangaroo Station works is proposed to be undertaken 24 hours per day as part of the station construction works. This activity will only be undertaken for a relatively short period of time (three to four weeks) toward the conclusion of the project. The northern shaft needs to remain operational for as long as possible to facilitate the completion of the works by Sydney Metro Linewide and the other interfacing contractors. Out of hours works will be undertaken within the existing acoustic shed on Hickson road. In addition all reasonable and feasible mitigation and management measures will be implemented endeavouring to achieve ICNG NMLs where reasonable and feasible.

4.5 Airborne construction noise management levels

Construction noise management levels have been determined using the NSW Interim Construction Noise Guideline (ICNG) and the Conditions of Approval, in accordance with the Sydney Metro City & Southwest Construction Noise and Vibration Strategy. They are as follows:

- Internal noise management levels are applicable at sensitive receiver locations during the 7am to 8pm period per Conditions of Approval E37 and E38. This worksite is referred to as 'identified precincts' in Addendum A of the Sydney Metro CNVS;
- If approved OOHW are undertaken at the worksite, internal noise management levels are applicable at residential receiver locations during the 8pm to 7am period per Conditions of Approval E41 and E42. In addition, the requirements of Sydney Metro CNVS apply including OOHWA process.

4.5.1 Internal noise criteria from Conditions of Approval

Table 4-4 below (reproduced from Addendum A of Sydney Metro CNVS) sets out the internal noise criteria levels for residential and other sensitive receivers. The Project site falls within and an Identified Precinct in accordance with Condition E37.

Table 4-4: Internal construction noise criteria levels (Conditions of Approval)

Area	Receiver Type	Approval Condition	Time Period	Criteria (internal)[4]
Identified Precincts[1]	All	E38	7am to 8pm	Noise levels are required to be less than $L_{Aeq(15\ minute)}$ 60 dB(A) for at least 6.5 hours between 7am and 8pm, of which at least 3.25 hours must be below $L_{Aeq(15\ minute)}$ 55 dB(A). Noise equal to or above $L_{Aeq(15\ minute)}$ 60 dB(A) is allowed for the remaining 6.5 hours between 7am and 8pm.[3]

Area	Receiver Type	Approval Condition	Time Period	Criteria (internal)[4]
Non-residential zones[2]	Residential	E41	8pm to 9pm	$L_{Aeq(15minute)}$ 60 dB(A)
			9pm to 7am	$L_{Aeq(15minute)}$ 45 dB(A)
Residential zones[2]	Residential	E42	8pm to 7am	$L_{Aeq(15minute)}$ 45 dB(A)
All	All	E43	All	$L_{Aeq(8hour)}$ 85 dB(A) (external) near the CSSI

Notes: 1. Identified precincts are provided in Condition E37 and include Crows Nest, Victoria Cross, Barangaroo, Martin Place and Pitt Street.

2. These are identified by the applicable Local Environmental Plan land zoning of the receiver.

3. Criteria as described in Condition E38

4. A 5 dB penalty shall be applied if rock breaking or any other annoying activity likely to result in ground-borne noise or a perceptible level of vibration is planned.

4.5.2 Respite periods for high noise impact activities

Construction activities (including works associated with utility adjustments) between 7am and 8pm that result in high noise impact, such as rock breaking or other annoying activities, shall be managed in accordance with CoA E37 and E38 (refer Table 4-4).

Condition E38 requires consultation with all receivers with predicted internal noise levels greater than $L_{Aeq(15minute)}$ 60 dB(A) to determine appropriate hours of respite.

4.5.3 Noise Management Levels from SM CNVS (Residential receivers)

Table 4-5 below sets out the noise management levels and how they are to be applied to residential receivers in accordance with Section 5.3 of SM CNVS.

Table 4-5: ICNG Construction noise management levels (residential receivers)

Time of Day	Noise Management Level LAeq(15min)	How to apply
Standard hours: Monday to Friday 7 am to 6 pm Saturday 8 am to 6 pm No work on Sundays or public holidays	RBL + 10dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq (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.
Standard hours	Highly noise affected 75dB(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, considering: times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times

Time of Day	Noise Management Level LAeq(15min)	How to apply
Outside recommended standard hours	Noise affected RBL + 5dB(A)	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 5dB(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.

4.5.4 Noise Management Levels at other noise sensitive receivers

Table 4-6 sets out the noise management levels for various noise-sensitive land use developments, including commercial premises adopted from the ICNG. Internal (or indoor) noise management levels for land uses not identified in the ICNG are referenced to the 'maximum' internal noise levels presented in Australian Standard AS2107. The noise management levels presented in Table 4-6 are applicable where the premises are in use.

Table 4-6 presents a detailed, but not exhaustive list of typical 'other' land uses. Where a land use has not been identified in Table 4-6, a suitable noise management level can be determined by taking guidance from Australian Standard AS2107.

As identified for residential receivers, 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. All of the potentially impacted receivers shall be informed of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Table 4-6: ICNG airborne construction noise management levels at other noise sensitive land uses

Land Use	Noise Management Level $L_{Aeq(15min)}$	Where NML applies	Referenced from:	Assumed facade loss (conservative)	External equivalent NML - $L_{Aeq(15min)}$
Studio building (music recording studio)	25 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	45 dB(A)
Studio building (film or television studio)	30 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	50 dB(A)
Cinema space, theatre, auditorium	35 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	55 dB(A)
Hotel (Sleeping areas: Hotels near major roads)	40 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)[1]	60 dB(A)
Classrooms at schools and other educational institutions	45 dB(A)	Internal noise level	ICNG	10 dB(A)	55 dB(A)
Childcare centre (sleeping areas)	40 dB(A)	Internal noise level	AAAC - guideline for Child Care Centre Acoustic Assessment	10 dB(A)	50 dB(A)

Land Use	Noise Management Level $L_{Aeq(15min)}$	Where NML applies	Referenced from:	Assumed facade loss (conservative)	External equivalent NML - $L_{Aeq(15min)}$
Hospital wards and operating theatres	45 dB(A)	Internal noise level	ICNG	20 dB(A)	65 dB(A)
Places of worship	45 dB(A)	Internal noise level	ICNG	10 dB(A)	55 dB(A)
Library (reading areas)	45 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	65 dB(A)
Hotel (bars and lounges)	50 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	70 dB(A)
Community centres – Municipal Buildings	50 dB(A)	Internal noise level	AS2107 'maximum'	10 dB(A)	60 dB(A)
Restaurant, bar (Bars and lounges/ Restaurant)	50 dB(A)	Internal noise level	AS2107 'maximum'	20 dB(A)	70 dB(A)
Passive recreation (e.g. area used for reading, meditation)	60 dB(A)	External noise level	ICNG	-	60 dB(A)
Active recreation (e.g. sports fields)	65 dB(A)	External noise level	ICNG	-	65 dB(A)
Commercial premises (including offices and retail outlets)	70 dB(A)	External noise level	ICNG	-	70 dB(A)
Industrial premises	75 dB(A)	External noise level	ICNG	-	75 dB(A)

NOTES: 1) Most affected hotels are expected to have high performance façade (i.e. more than 20dB). Appropriate criteria should be set which takes into account the existing face performance of affected hotels

4.5.5 Sleep Disturbance

The ICNG recommends that where construction works are planned to extend over more than two consecutive nights, maximum noise levels and the extent and frequency of maximum noise level events exceeding the RBL should be considered. In line with the ICNG, further guidance is taken from the NSW Environmental Criteria for Road Traffic Noise (ECRTN) (Environment Protection Authority 1999).

To assess the likelihood of sleep disturbance, an initial screening level of $L_{Amax} < L_{A90,15min} + 15$ is used. In situations, where this results in an internal screening levels of less than 45 dB(A) (internal), a minimum internal screening level of 45 dB(A) is set. Note that this is equivalent to an external maximum noise level of 55 dB(A) with windows open or 65 dB(A) with closed windows, based on an outside-to-inside noise reduction of respectively 10 dB(A) and 20 dB(A).

Where there are noise events found to exceed the initial screening level, further analysis is made to identify:

- The likely number of events that might occur during the night assessment period
- Whether events exceed an 'awakening reaction' level of 55dBA L_{Amax} (internal) that equates to an external NML of L_{Amax} 75 dB(A) (assuming closed windows).

The ICNG recommends that where construction works are planned to extend over more than two consecutive nights, maximum noise levels and the extent and frequency that maximum noise levels exceed the RBL should be analysed.

4.5.6 National Standard for exposure to noise

In accordance with CoA E43, project worksites will be managed to ensure that noise generated by construction will not exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of $L_{Aeq,8h}$, of 85dB(A) for any employee working at a location near a Project worksite. Noise monitoring will be conducted to verify compliance with this condition (APPENDIX E).

4.6 Construction-related road traffic noise

When trucks and other vehicles are operating within the boundary of a construction site, road vehicle noise contributions are included in the overall predicted $L_{Aeq(15minute)}$ construction site noise emissions. When construction-related traffic moves onto the public road network a different noise assessment methodology is appropriate, as vehicle movements would be regarded as 'additional road traffic' rather than as part of the construction site.

On roads located immediately adjacent to construction sites, the community may associate heavy vehicle movements with the project works. However, once the heavy vehicles move further from construction sites onto major collector or arterial roads, the noise may be perceived as being part of the general road traffic.

Noise from construction traffic on public roads is not assessed under the ICNG, although the guideline does reference the Environmental Criteria for Road Traffic Noise (Environment Protection Authority, 1999), which has been superseded by the RNP. The RNP states that in assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person. For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments (in this case the construction area), any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'without construction' scenario.

Where the road traffic noise levels are predicted to increase by more than 2 dB as a result of construction traffic, consideration would be given to applying feasible and reasonable noise mitigation measures to reduce the potential noise impacts and preserve acoustic amenity.

In considering feasible and reasonable mitigation measures where the relevant noise increase is greater than 2 dB, consideration would also be given to the actual noise levels associated with construction traffic and whether or not these levels comply with the following road traffic noise criteria in the RNP:

- 60 dB $L_{Aeq(15hour)}$ day and 55 dB $L_{Aeq(9hour)}$ night for existing freeway/ arterial/ sub-arterial roads.
- 55 dB $L_{Aeq(1hour)}$ day and 50 dB $L_{Aeq(1hour)}$ night for existing local roads.

This approach is consistent with the Sydney Metro City & Southwest Construction Noise and Vibration Strategy.

4.7 Ground-borne construction noise management levels

Ground-borne noise management levels (GNMLs) are based on the ICNG and Conditions of Approval, in accordance with the Sydney Metro City & Southwest Construction Noise and Vibration Strategy.

4.7.1 Noise criteria from Project Planning Approval Conditions

The internal noise criteria outlined in Section 4.5.1 represent the total noise levels from airborne and ground-borne noise sources.

4.7.2 Ground-borne Noise management levels from ICNG (Residential receivers)

The following GNMLs for residences are nominated in the ICNG and indicate when management actions would be implemented. These levels recognise the temporary nature of construction and are only applicable when ground-borne noise levels are higher than airborne noise levels. This is typically where noise sensitive receivers are located vibration intensive construction activities (e.g. rock breaking).

Table 4-7 below (taken from the ICNG) sets out the GNMLs and how they are to be applied to residential receivers. The proponent should also inform all potentially impacted receivers of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.

Table 4-7: ICNG Ground-borne Construction Noise Management Levels at Residential Receivers

Assessment Period	Time of Day	Ground-borne Noise Management Level, LAeq(15minute)
Daytime	7:00am to 6:00pm	45 dB(A) internal
Evening	6:00pm to 10:00pm	40 dB(A) internal
Night	10:00pm to 7:00am	35 dB(A) internal

4.8 Construction vibration criteria

Effects of ground vibration on buildings resulting from construction may be segregated into the following three categories:

- Human comfort – disturbance to building occupants: vibration in which the occupants or users of the building are inconvenienced or possibly disturbed.
- Effects on building contents – vibration where the building contents may be affected.
- Effects on building structures – vibration in which the integrity of the building or structure itself may be prejudiced.

4.8.1 Disturbance to buildings occupants

Assessment of potential disturbance from construction vibration on human occupants of buildings is made in accordance with the guideline 'Assessing Vibration; a technical guideline' (DECC, 2006). The guideline provides criteria which are based on the British Standard BS 6472-1992 'Guide to evaluation of human exposure to vibration in buildings (1-80Hz)'.

The vibration dose values recommended in the guideline 'Assessing Vibration; a technical guideline' are presented in Table 4-8.

Table 4-8: Vibration Dose Values for intermittent vibration

Place and Time	Preferred Vibration Dose Value (VDV) in $m/s^{1.75}$	Maximum Vibration Dose Value (VDV) in $m/s^{1.75}$
Critical areas[1] (day or night)	0.1	0.2
Residential buildings 16 hr day	0.2	0.4
Residential buildings 8 hr night	0.13	0.26
Offices, schools, educational institutions and places of worship (day or night)	0.4	0.8
Workshops (day or night)	0.8	1.6

Notes:
1) Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above.

To assess the potential for vibration impact on human comfort, an initial screening test will be done based on peak velocity units, as this metric is also used for the cosmetic damage vibration assessment. This screening test is a conservative approach since it is based on the continuous vibration velocity criteria (i.e. vibration that continues uninterrupted for a defined assessment period) whilst construction works are mostly intermittent. The screening test (Table 4-9) will be based on maximum peak values for surface construction works, which are intermittent in nature. This approach has been adopted so that the screening test is not unduly stringent.

If the predicted vibration exceeds the initial screening test, the total estimated Vibration Dose Value (i.e. eVDV) will be determined based on the level and duration of the vibration event causing exceedance.

Table 4-9: Construction vibration disturbance – initial screening test.

Place and Time	Preferred peak velocity, mm/s (>8Hz)	Maximum peak velocity, mm/s (>8Hz)
Critical areas (day or night)	0.14	0.28
Residential buildings 16 hr day	0.28	0.56
Residential buildings 8 hr night	0.20	0.40
Offices, schools, educational institutions and places of worship (day or night)	0.56	1.10
Workshops (day or night)	1.10	2.20

4.8.2 Structural damage to buildings

Potential structural damage of buildings caused by vibration is typically managed by ensuring vibration induced into the structure does not exceed certain limits and standards, such as British Standard 7385 Part 2 (1993) as required by Project Planning Approval Condition E28. BS7385 suggests levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur.

The cosmetic damage levels set by BS 7385 are considered 'safe limits' up to which no damage due to vibration effects has been observed for certain particular building types. Damage comprises minor non-structural effects such as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks and separation of partitions or intermediate walls from load bearing walls. 'Minor' damage is considered possible at vibration magnitudes which are twice those given and 'major' damage to a building structure may occur at levels greater than four times those values.

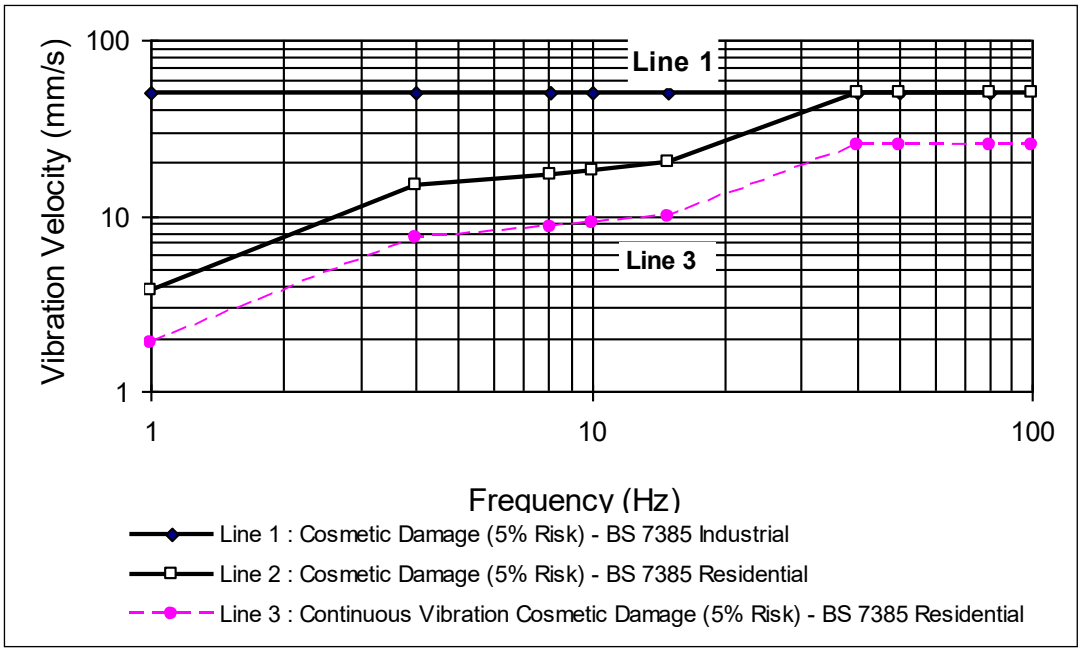
Table 4-10 sets out the recommended limits from BS7385 for transient vibration to ensure minimal risk of cosmetic damage to residential, commercial and industrial buildings. This is shown graphically in Figure 4.1.

Table 4-10: Transient vibration guide values - minimal risk of cosmetic damage (BS 7385) - peak component particle velocity

Line	Type of structure	Frequency range 4 to 15 Hz	Frequency range 15 to 40 Hz	Frequency range 40 Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s	50 mm/s	50 mm/s
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4Hz, increasing to 20 mm/s at 15Hz	20 mm/s at 15Hz, increasing to 50 mm/s at 40Hz	50 mm/s

BS7385 states that the guide values in Table 4-10 relate predominantly to transient vibration which does not give rise to resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 4-10 may need to be reduced by up to 50%, as shown by Line 3 of Figure 4.1 for residential buildings.

Figure 4.1: Graph of Transient Peak Component Particle Velocity Vibration Guide Values for Cosmetic Damage



4.8.3 General vibration screening criterion

The British Standard states that the guide values in Table 4-9 relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings. Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 4-9 may need to be reduced by up to 50%. This is especially applicable at the lower frequencies where lower guide values apply.

On this basis, consistent a conservative vibration screening criteria per receiver type is given below:

- Reinforced or framed structures (Line 1): **25.0 mm/s**
- Unreinforced or light framed structures (Line 2): **7.5 mm/s**

At locations where the predicted and/or measured vibration levels are greater than shown above (peak component particle velocity), a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be required to determine the applicable vibration level. The analysis would take into consideration the transient vibration guide values for minimal risk of cosmetic damage set out in Figure 4.1.

4.8.4 Heritage structures/buildings

The British Standard BS7385 states that *"A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive."*

In accordance with Project Planning Approval Condition E31, the advice of a heritage specialist on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures will be sought.

Unless otherwise advised, a conservative vibration damage screening level (peak component particle velocity) for heritage buildings/structures can be set to 2.5mm/s (the more stringent criterion in the German Standard DIN 4150-2016 Structural Vibration Part 3: Effects of Vibration on Structures). This screening level will allow potentially impacted heritage structures to be identified. If a heritage structure is predicted to be exposed to vibration levels above the conservative vibration screening level of 2.5mm/s, further investigation would be undertaken to determine whether the structure is structurally unsound. Where a heritage building is deemed to be sensitive to vibration impacts, the more stringent DIN 4150-2016 Group 3 guideline values can be applied. Otherwise, structural damage vibration limits based on BS 7385 (Section 4.8.3) can be applied.

4.8.5 Sensitive scientific and medical equipment

Some scientific equipment (e.g. electron microscopes and microelectronics manufacturing equipment) can require more stringent objectives than those applicable to human comfort.

No such equipment has been identified in proximity to the Project area. If required, objectives for the satisfactory operation of sensitive instruments will be identified in the relevant CNVIS. Where manufacturer's data is not available, generic vibration criterion (VC) curves as published by the Society of Photo-Optical Instrumentation Engineers (Colin G. Gordon - 28 September 1999) may be adopted as vibration goals.

4.8.6 Utilities and other vibration sensitive structures

Some structures and utilities located near the Project may be particularly sensitive to vibration. A vibration goal which differs from the cosmetic damage goals presented in Section 4.8.2 may need to be adopted. Examples of such structures and utilities include:

- Tunnels
- Gas pipelines
- Fibre optic cables

The British Standard BS 7385-2:1993 'Evaluation and measurement for vibration in buildings - Part 2: Guide to damage levels from ground-borne vibration' notes that structures below ground are known to sustain higher levels of vibration and are very resistant to damage unless in very poor condition (British Standard BS 7385-2:1993, p5). Further guidance is taken from the German Standard DIN 4150: Part 3-1999.02 'Structural vibration in buildings - Effects on Structures'. Section 5.3 of DIN 4150: Part 3 sets out guideline values for vibration velocity to be used when evaluating the effects of vibration on buried pipework.

Table 4-11 presents the initial reference guideline for utilities and other buried pipework to evaluate the effects of short-term vibration impact. Specific vibration goals should be determined on a case-by-case basis as part of the CNVIS for each work site.

Table 4-11: DIN 4150-3 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on buried pipework

Line	Pipe Material	Guideline values for vibration velocity measured on the pipe
1	Steel (including welded pipes)	100 mm/s
2	Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80 mm/s
3	Masonry, plastic	50 mm/s

Note 1. Rock breaking/hammering and sheet piling activities are considered to have the potential to cause dynamic loading in some structures and it may therefore be appropriate to reduce the transient values by 50%.

5 Construction noise and vibration assessment

5.1 Construction noise and vibration management system

5.1.1 Overview

This Plan has been prepared to provide a framework for assessment of noise and vibration impacts and the identification of reasonable and feasible noise mitigation measures. Site specific Construction Noise and Vibration Impact Statements (CNVIS) will be progressively prepared to address:

- Surface works (utility and road works);
- Station construction works.

Each CNVIS will provide detailed construction noise and vibration predictions, assessment, mitigation design outcomes and discussion of management measures to limit impacts to sensitive receivers.

The outcomes of the CNVIS feed into the Community Communication Strategy and Business Management Plan to inform the affected community of the likely noise and vibration that will be experienced during construction.

5.1.2 Construction noise and vibration impact statements

The CNVISs will be a key site management tool that will give BESIX Watpac clear instructions for managing the worksite. Each CNVIS will be prepared before construction noise and vibration impacts commence and will set out the mitigation and management measures required for the construction stage, through consultation with affected receivers (in accordance with Condition of Approval E33) and the specific measures that must be in place before any construction works may start.

Each CNVIS will address:

- Scope of work covered by the CNVIS;
- Justification for OOHW (where required);
- Nearest noise and vibration sensitive receivers, based on land use survey;
- Construction noise and vibration objectives;
- Construction noise and vibration assessment;
- Construction ground-borne noise;
- Construction traffic;
- Cumulative impacts;
- Mitigation options and preferred management measures;

- Noise and vibration monitoring requirements for each construction worksite/activity.

Physical noise mitigation measures such as noise barriers, fan attenuators and acoustic shed will be outlined in the CNVIS. Furthermore, management measures such as staging of works; respite periods and community notification will also be summarised. In accordance with CoA E33, site specific mitigation measures identified through consultation with affected sensitive receivers will be included in the CNVIS. The CNVIS will identify how the proponent is required to notify the community of works pending to ensure the community is informed of the likely noise and vibration impacts during the assessed works, the duration of impact and any additional mitigation (e.g. respite periods) that may be required to manage noise and vibration impacts. The CNVIS will aid in reducing noise and vibration impact from construction.

5.1.3 OOHW - Management procedures and hold points

All OOHWs will be assessed and managed in accordance with the Sydney Metro Out of Hours Works Protocol[3]. This document addresses internal approval and hold points relating to:

- The justification of OOHW
- Noise and vibration assessment
- External approvals, including high noise/vibration risk works, either
  - ER approval following endorsement by AA
  - DPE approval following endorsement by AA and ER for high risk works after 9 pm
- Community notification
- Tool boxing of the workforce on sensitive receivers and management requirements prior to the commencement of works
- Additional mitigation measures to be implemented
- Noise and vibration verification monitoring.

All OOHW (except in emergency situations) will be documented on the relevant OOHW Form and submitted to the AA and Sydney Metro for approval.

For emergency construction works, additional requirements are applicable per CoA E45 including notifying the AA of the need for those activities or work and using best endeavours to notify all affected sensitive receivers of the likely impact and duration of those works.

5.2 Overview of evaluation and assessment process

Renzo Tonin & Associates recognises construction noise and vibration management is a key community issue. Detailed models are developed to accurately model and predict airborne noise, ground-borne noise

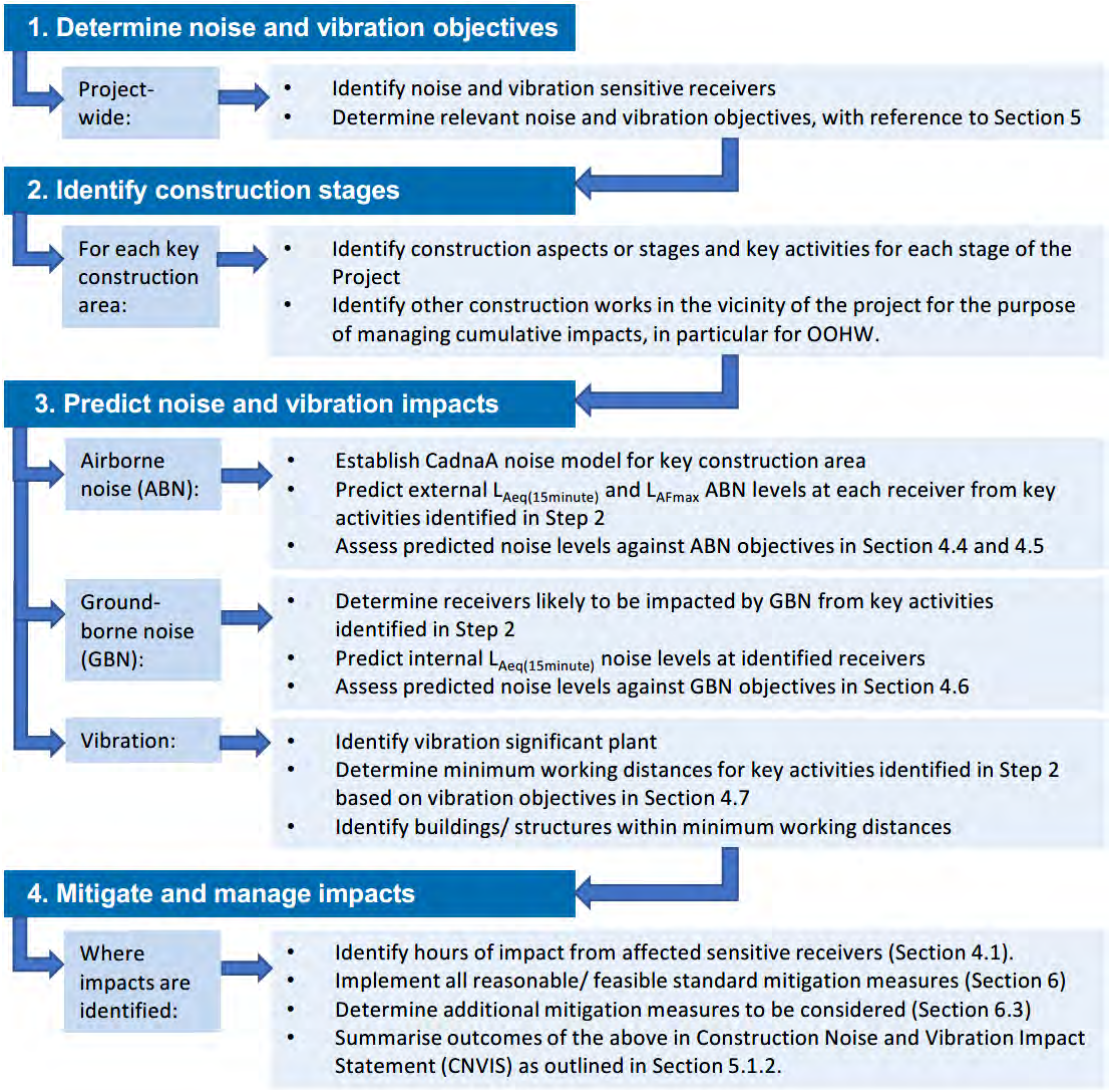
[3] City & Southwest out of hours works strategy/Protocol, reference SM-17-00005396, version 5.2, dated 9/10/2020

and vibration impacts related to the Project. In close consultation with the construction team, all potential options and optimum solutions for reasonable and feasible noise and vibration mitigation are identified for the construction works. This process includes:

- Use of CadnaA noise modelling software to develop detailed models of the construction worksites. The models allow different stages of construction to be modelled and noise emissions predicted, giving greater ability to find noise mitigation solutions that suit each construction stage of the worksite. Verification monitoring on previous infrastructure projects has found that measured noise levels are within the predicted noise levels, giving greater confidence in the modelled outcomes. The noise models consider:
  - Location of noise sources at each worksite, sources located within acoustic sheds and enclosures
  - Sensitive receiver locations, including land use details obtained from the GIS database, to ensure appropriate NMLs are applied
  - Height of sources and receivers referenced to digital ground contours within the construction site area and 1 to 2 metre digital ground contours outside the construction site area
  - Noise source levels of individual construction plant, based Renzo Tonin & Associate's extensive database of construction plant and equipment noise data
  - Outcomes from CadnaR modelling of acoustic enclosures (if required) to ensure noise inputs from these sources are representative in the CadnaA model
  - Ground type between sources and receivers (mixed soft/ hard)
  - Attenuation from barriers (natural and purpose built) and other structures such as buildings surrounding the construction site
  - Identifying facade transmission loss of airborne noise affected receivers to predict internal airborne noise levels.
- Training engineers on noise modelling and required inputs to ensure accurate information for the modelling process. Key details regarding the construction site layout, the likely plant and equipment (including truck movements), and hours of operation will be provided by the Design and Construction Teams
- Sensitivity analysis to determine the best combination of management measures including scheduling (avoiding impacts at night where possible), using quieter plant and equipment where practicable, using barriers and enclosures, and training staff in quiet noise practices
- Under the PPA, an independent Acoustic Advisor (AA) has been engaged by Sydney Metro to review noise and vibration assessments.
- Comprehensive community notification and complaints management. BESIX WATPAC will engage with residents, utility owners, businesses and stakeholders to help them understand what to expect during the Project works.

The assessment process for construction noise and vibration impacts is detailed in the flow diagram in Figure 5.1.

Figure 5.1: Process for assessing and managing construction noise and vibration



5.2.1 Construction traffic

The worksite will generate additional traffic movements in the form of:

- Light vehicle movements generated by construction personnel travelling to and from work
- Heavy vehicle movements generated by:
  - Delivery vehicles bringing raw materials, plant, and equipment to the site
  - Trucks removing demolition / excavation material from the site

Construction traffic on the site is included as part of the construction noise assessment of the work activities, while when construction-related traffic moves on the public road network, a different noise

assessment methodology is appropriate as vehicle movements would be regarded as additional road traffic on public roads rather than as part of the construction site's activities.

As part of the planning works for the project, BESIX WATPAC has developed a Construction Traffic Management Plan (CTMP). Noise impacts from construction related traffic on public roads will be reviewed and addressed in each CNVIS, to mitigate the potential impacts throughout the construction of the Project.

5.3 Communication and consultation

5.3.1 Overview of approach

The aim during construction is to minimise disruption, delay and inconvenience to nearby residents and businesses. The Community Communication Strategy (CSS) and Business Management (BMP) Plan outlines how essential commitment to collaboration, mutual respect and genuine consideration of community and business concerns is in achieving this. It also details how the proponent will meet the community relations obligations of the Project Approval. It acknowledges that robust community and stakeholder engagement depends on effective communications and on strong collaboration and coordination between Sydney Metro and BESIX Watpac, other Project contractors and other significant projects under construction near the Project construction site. The overarching objectives of the CCS are to:

- Comply with the community consultation obligations and Project Planning Approval;
- Summarise site-specific mitigation measures previously identified through community consultation in accordance with CoA E33.
- Summarise relevant information on nearby noise affected receivers such as sensitive periods, complaints, effectiveness and preferences on mitigation measures previously identified by JHCPBG JV on Sydney Metro City and Southwest Project at Barangaroo worksite.
- Work cooperatively with Sydney Metro to provide a coordinated and consistent approach;
- Identify and appropriately address stakeholder, business and community issues;
- Maximise stakeholders and the community understanding of the Project activities, the objectives and benefits and the timing, potential impacts, mitigation measures and expected outcomes;
- Provide timely, accurate and relevant information to the community;
- Minimise, where possible, the Project impacts on stakeholders, businesses and the community;
- Enhance and protect the reputation of the Project, the NSW Government and Sydney Metro.

There will be a diverse range of residential, commercial and government stakeholders, with potentially changing communication needs across the life of the project. A range of communication and consultation tools will be implemented for the Project. Recognising the relative strengths of different communication tools, they can be matched to stakeholders and their need for accurate information and interaction.

Capitalising on opportunities created by technology allows the proponent to better inform, receive and respond to feedback with interactive communication.

In the event of inconsistency between the CCS & BMP from this NVMP for communication, consultation and complaints, the CSS and BMP prevails.

5.3.2 Proactive consultation and notification

Residents, property owners, businesses and community facilities near the construction site will have a wide range of unique needs and concerns about construction impact. BESIX Watpac will engage through multiple channels to notify and build understanding of the likely impacts of airborne noise, ground-borne noise and vibration, and the reasonable and feasible options available to mitigate these impacts, including respite. Every effort will be made by the project team to mitigate these impacts. BESIX WATPAC will ensure proactive stakeholder and community liaison and communication at all times, is embraced across the project, delivering timely, quality information and consultation to local stakeholders and community as outlined in the Community Communication Strategy and Business Management Plan for the project. Using multiple communication channels, clear points of contact will be provided and face-to-face communication for those most affected. With the scale of construction currently underway in Sydney, the stakeholders and the community will be affected by multiple sources of impacts and information. When they are affected, they may not understand which of the projects or contractors should be contacted to address their issues. They are also likely to have interests in different stages of the Project (e.g. demolition works vs station fit-out works) for various reasons.

A key feature of the strategy is extensive collaboration with Sydney Metro, agencies and interface contractors to find opportunities to minimise cumulative impacts. Coordinated communications in 'plain English' will serve to guide the community to the right points of contact for information and complaints and minimise frustration.

When informing sensitive receivers on the level of noise and vibration to be expected from construction activities, potential impacts will be described using qualitative terminology consistent with the TfNSW Construction Noise and Vibration Strategy (e.g. noticeable, clearly audible, moderately intrusive, highly intrusive).

5.3.3 Specific Project Planning Approval requirements

CoA C3 requires relevant council(s) to be consulted for each CEMP sub-plan. The records of consultation with relevant agencies in this plan, responses to agency comments and how these were implemented in this plan are attached in APPENDIX F.

To satisfy the CoA E33, consultation will be carried out to develop specific mitigation measures for the works with the affected sensitive receivers. The outcomes of this consultation will be fed back into the construction noise and vibration management system and will assist with the final detailed design of mitigation measures for the site, where reasonable and feasible.

As presented in Table 5-1 and APPENDIX B, there are 'other' noise and vibration sensitive receivers (e.g. hotels, museums, cafes and restaurants) around the construction sites that have been identified. In accordance with CoA E34, relevant CNVIS's will assess the noise and vibration impacts at these receivers to determine if consultation is required as part of the management of the works to determine if respite periods or other suitable arrangements are required to avoid or minimise impacts during sensitive periods.

Table 5-1: E34 affected receiver locations

Other sensitive receivers (Condition E34)		
Address	**Business name**	**Other Sensitive Receiver Category**
35 Bettington St, Millers Point NSW 2000	Hotel Palisade	Restaurant, Cafes
1 Barangaroo Ave, Barangaroo NSW 2000	Crown Casino	Hotel, Restaurant, Cafes
1 Merriman St, Barangaroo NSW 2000	The Cutaway	Museum
89-113 Kent St, Millers Point NSW 2000	Langham hotel	Hotel, Restaurant
37 High St, Millers Point NSW 2000	KU Lance childcare centre	Childcare

CoA E38 requires consultation with all receivers likely to experience internal noise levels greater than $L_{Aeq,15min}$ 60 dB(A) inclusive of 5dB penalty (for rock breaking and any other annoying activities) at Barangaroo to determine appropriate hours of respite. These receivers will be identified in the CNVISs.

In addition, currently other worksites such as One Sydney Harbour and Sydney Metro Linewide are active in the area. Proponents of these construction sites near the worksite will be consulted and reasonable steps will be taken to coordinate works in order to minimise cumulative noise and vibration impact and coordinate respite for affected sensitive receivers, to satisfy CoA E39 and Condition E40. Furthermore, cumulative impacts will be assessed in the CNVISs.

In accordance with CoA E33, consultation with affected receivers identified in the CNVIS will take place prior to the works commencing and will include discussion on specific mitigation measures. However, CoA C3 does not require this for approval of the NVMP.

In accordance with CoA E29, owners of properties at risk of exceeding the screening criteria for cosmetic damage will be notified before construction that generates vibration commences in the vicinity of those properties.

5.3.4 Complaints management

A complaint is defined as any communication received from a stakeholder expressing dissatisfaction. This is a purposely broad definition and is used to ensure that matters of concern to stakeholders are addressed promptly.

Stakeholders will be able to register enquiries and complaints through several channels as set out in the Community Communications Strategy and Business Management Plan including:

- 24-hour, 1800 community information line (1800 171 386 which is run by Sydney Metro for the Project as a whole)
- Dedicated project email mailbox
- Dedicated project website
- Face to face meetings

Specific details on the above communication channels are made available within the project Community Communication Strategy and Business Management Plan. Complaints may be received directly or referred by Sydney Metro or other contractors.

All calls to the 1800-number will be answered and responded to 24 hours a day, seven days a week. A call centre reception service managed by Sydney Metro records contact details and basic information about the nature and location of the complaint. The complainant is made aware that an on-call officer will contact them shortly to address the issue. With this approach, the caller is not placed on hold or referred to a recorded message. If the rostered officer cannot receive a call (e.g. they are on the phone responding to another caller), calls can be directed to an alternate rostered on-call officer. Translators will be arranged if a stakeholder or community member is unable to communicate their concerns in English. Email and other contact options will assist those with disabilities.

Specific protocols and procedures have been arranged to ensure a consistent approach to managing enquires and complaints, including systems for recording and monitoring stakeholder contact. All staff and work crews will be informed that all contact from the community must be referred to the community relations team for action. To facilitate this everyone will be provided with community contact cards to direct enquiries to the community information line or email address.

Each stakeholder contact is an opportunity to build understanding about the Project and allay concerns. Complaints provide important feedback to improve project processes and mitigation measures to avoid or minimise further complaints. All reasonable measures will be taken to prevent the reoccurrence of stakeholder and community complaints. The strategic approach to managing complaints consists of:

- Courtesy
- Accessibility
- Responsiveness
- Delegation of authority to resolve the issue
- Access to accurate information.

All employees and subcontractors are required to respond to stakeholders with courtesy and professionalism. This will be reinforced during Project inductions. Specific toolbox talks will further consolidate the approach.

BESIX WATPAC Community and Stakeholder Liaison Manager will manage the ongoing communication with the complainant until they are satisfied with the actions taken. The BESIX WATPAC Community and Stakeholder Liaison Manager will immediately report all environmental complaints to the Project Environment and Planning Manager to confirm any required action, including but not limited to:

- Noise, and/or vibration monitoring (see APPENDIX D)
- Subject to monitoring results consideration of options to reduce impacts including:
  - Scheduling activities to minimise impacts
  - Targeted inspection to determine if it is reasonable and to install additional controls (i.e. noise barriers)
  - Respite offers (for example, coffee vouchers, movie tickets ormeal vouchers)
- Site visit with complainant to assist in understanding our operations and mitigation strategies.

The complaint is escalated to the BESIX Watpac Project Director and Sydney Metro representative if the complainant remains unsatisfied. Further escalation will be in line with the Sydney Metro Overarching Community Communications Strategy (Sydney Metro Document Reference: A5732897) and the Sydney Metro Construction Complaints Management System and may include the:

- Environmental Representative required under Project Planning Approval Condition A22,
- Acoustic Advisor required under Project Planning Approval Condition A25,
- Community Complaints Commissioner required under Project Planning Approval Conditions B11 to B14 or
- Independent Property Impact Assessment Panel (IPIAP) required under Project Planning Approval Condition E62 as appropriate.

5.4 Blasting assessment

No blasting assessment has been undertaken, as blasting is not proposed for the Project. In the event that this circumstance changes, a blast management strategy will be prepared.

6 Environmental control measures

As outlined in Section 5.1.2, each CNVIS will review in detail the noise and vibration mitigation and management measures for each construction stage, including all physical noise mitigation measures such as noise barriers, fan attenuations and acoustic sheds, along with all management measures such as staging of works; respite periods and community notification that are appropriate to the construction stage.

This section outlined the standard noise and vibration mitigation and management measures (including the Revised Environmental Management Measures NV1 to NV7) that are to be reviewed and adopted where reasonable and feasible across the project and will be considered in each CNVIS.

6.1 Revised Environmental Management Measures

Revised Environmental Mitigation Measures detailed in the EIS and Submissions Report that are relevant to the Barangaroo Metro Station works are summarised in Table 6-1 below (REMMs that are not applicable in accordance with staging report have not been included). This includes reference to required outcomes, the timing of when the commitment applies and relevant documents or sections of the environmental assessment influencing the outcome and implementation.

Table 6-1: Applicable Revised Environmental Management Measures

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
NV1	The Construction Noise and Vibration Strategy would be implemented with the aim of achieving the noise management levels where feasible and reasonable. This would include the following example standard mitigation measures where feasible and reasonable: • Provision of noise barriers around each construction site • Provision of acoustic sheds at Barangaroo • The coincidence of noisy plant working simultaneously close together would be avoided • Offset distances between noisy plant and sensitive receivers would be increased • Residential grade mufflers would be fitted to all mobile plant • Dampened rock hammers would be used • Non-tonal reversing alarms would be fitted to all permanent mobile plant • High noise generating activities would be scheduled for less sensitive period considering the nearby receivers • The layout of construction sites would consider opportunities to shield receivers from noise. • This would also include carrying out the requirements in relation to construction noise and vibration monitoring	All example NV1 mitigation measures will be considered and included in the development of CNVIS assessments (including use of the existing northern shed for deliveries and shaft backfill). Indicative mitigation and management measures are summarised in Section 6.2.	Environment Manager Construction Managers	Construction	Section 5.1.2 Section 6.2. Section 2.1.3
NV3	Where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and attended vibration monitoring would be carried out to ensure vibration levels remain below appropriate limits for that structure. For heritage items, the more detailed assessment would specifically consider the heritage values of the structure in consultation with a heritage specialist to ensure sensitive heritage fabric is adequately monitored and managed.	Vibration screening criteria and protocols to follow when exceedance of the screening criteria occurs are outlined in Section 4.8.3. Criteria for vibration sensitive and special structures (including heritage) are outlined in Section 4.8.4. Monitoring vibration protocols are presented in APPENDIX E	Construction Managers Project Noise and Vibration Consultant Heritage Consultant Project Environment Manager	Prior to the start of demolition/construction	Section 4.8.3. Section 4.8.4. APPENDIX E

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
NV4	Feasible and reasonable measures would be implemented to minimise ground-borne noise where exceedances are predicted.	CNVISs will review potential ground-borne noise impact and identify feasible and reasonable measures to manage this. See Section 5.1.2	Construction Managers Project Noise and Vibration Consultant	Prior to the start of demolition/construction stage	Section 5.1.2
NV6	Transport for NSW would engage an Independent Acoustic Advisor to act independently of the design and construction teams and provide oversight of construction methods, construction noise and vibration planning, management and mitigation, and construction noise and vibration monitoring and reporting. The key responsibilities of the Independent Acoustic Advisor would include: • Assurance of contractor noise and vibration planning, modelling, management and monitoring practices • Verification of compliance with relevant guidelines and approval requirements • Audit noise and vibration management practices	Independent Acoustic Advisor (Section 2.4).	N/A	N/A	Section 2.4 Section 2.3

No.	Requirement	Proposed actions	Responsible role	Timing	Relevant NVMP section
NV7	Alternative demolition techniques that minimise noise and vibration levels would be investigated and implemented where feasible and reasonable. This would include consideration of: • The use of hydraulic concrete shears in lieu of hammers/rock breakers • Sequencing works to shield noise sensitive receivers by retaining building wall elements • Locating demolition load out areas away from the nearby sensitive receivers • Providing respite periods for noise intensive works • Methods to minimise structural-borne noise to adjacent buildings including separating the structural connection prior to demolition through saw-cutting and propping, using hand held splitters and pulverisers or hand demolition • Installing sound barrier screening to scaffolding facing noise sensitive neighbours • Modifying demolition works sequencing/hours to minimise impacts during peak pedestrian times and/or adjoining neighbour outdoor activity periods.	See Alternative construction methods to rock hammering and blasting in Section 6.3 All example NV7 mitigation measures will be considered in the development of CNVIS assessments.	Construction Manager Project Environment Manager Demolition Subcontractor	Prior to construction commencement	Section 6.3

6.2 Standard noise and vibration management measures

An indicative list of standard noise and vibration mitigation measures to be implemented for the Project construction works to reduce construction noise and vibration is provided in the tables that follow. This information is based on information available at the time of preparation of this NVMP and includes:

- Table 6-2 which identifies standard noise and vibration management measures;
- Table 6-3 which lists standard noise and vibration source mitigation measures;
- Table 6-4 which lists standard noise and vibration path mitigation measures;
- Table 6-5 which sets out standard noise and vibration receptor mitigation measures.

Table 6-2: Standard noise and vibration management measures

Action required	Applies to[1]	Details	Estimated noise benefit[2]	Comments on feasibility/ reasonableness	Recommend to adopt for project where reasonable & feasible?
Construction Noise and Vibration Management Plan update	Prior to constructio n	The NVMP and associated CNVIS, must be prepared prior to the commencement of Construction and regularly updated to account for changes in noise management issues and strategies.	N/A	N/A	Yes
Implementation of any project specific mitigation measures required	ABN, GBN, V	Project specific measures will be determined on a site by site basis and outlined in the CNVISs	0-30dB reduction	Yes	Yes
Implement community consultation or notification measures	ABN, GBN, V	Notification detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night period, any operational noise benefits from the works (where applicable) and contact telephone number. Notification should be a minimum of seven calendar days prior to the start of works. For this project, more advanced consultation or notification should be adopted, including: • Website • Contact telephone number for community • Email distribution list (if required) More detail regarding community consultation and notifications is provided in Section 5.3 and Section 6.3	Ensures stakeholders know what to expect and keeps stakeholders informed of the likely impact. Community may identify solution to assist in managing impacts.	N/A	Yes
Register of Noise Sensitive Receivers	ABN, GBN, V	A register of all noise and vibration sensitive receivers (NSRs) would be kept. The register would include the following details for each NSR: • Address of receiver • Category of receiver (e.g. Residential/Commercial etc.) • Contact name and phone number This register will be based on the knowledge held by the contractor previously working on Sydney Metro City and Southwest Project at Barangaroo worksite (JHCPBG JV).	N/A Ensures worksites can contact NSRs.	N/A	Yes

Notes
1. ABN = Airborne noise, GBN = Ground-borne noise, V = Vibration
2. Estimated noise benefits are not necessarily cumulative

Action required	Applies to[1]	Details	Estimated noise benefit[2]	Comments on feasibility/ reasonableness	Recommend to adopt for project where reasonable & feasible?
Site inductions and briefings	ABN, GBN, V	All employees, contractors and subcontractors are to receive environment and community inductions and site briefings that will detail: • all project specific and relevant standard noise and vibration mitigation measures • relevant licence and approval conditions • community consultation and notification requirements • permissible hours of work • any limitations on high noise generating activities • location of nearest sensitive receivers • construction employee parking areas • designated loading/unloading areas and procedures • site opening/closing times (including deliveries) • community contact protocols • complaints management requirements.	Keeps construction workforce informed of actions required to minimise noise and vibration impact.	N/A	Yes
Behavioural practices	ABN, GBN, V	• No swearing or unnecessary shouting or loud stereos/radios on site. • No dropping of materials from height where practicable, throwing of metal items or solid objects onto metal items, and slamming of doors. • No excessive revving of plant and vehicle engines • Controlled release of compressed air.	0-20dB reduction Reduce annoyance + sleep disturbance.	Reasonable cost, limited noise reduction, reduced overall impact.	Yes
Verification	ABN, GBN, V	A noise verification program is to be carried out for the duration of the works in accordance with the NVMP and any approval and licence conditions. More detail on the program is provided in APPENDIX D. Ongoing noise monitoring during construction at sensitive receivers during critical periods (i.e. times when noise emissions are expected to be at their highest - e.g. piling and hammering) to identify and assist in managing high risk noise events.	Identifies and minimises noise and vibration impacts.	Reasonable cost, limited noise/vibration reduction, reduced overall impact.	Yes
Attended vibration measurements	V	Attended vibration measurements are required at the commencement of vibration generating activities to confirm that vibration levels satisfy the criteria for that vibration generating activity. Where there is potential for exceedances of the criteria further vibration site law investigations would be undertaken to determine the site-specific safe working distances for that vibration generating activity. Continuous vibration monitoring with audible and visible alarms would be conducted at the nearest sensitive receivers whenever vibration generating activities need to take place inside the applicable safe-working distances.	Reduces vibration impact + risk of building damage. Identifies and minimises noise and vibration impacts.	Reasonable cost, and consideration of refinement of operations to reduce overall impact.	Yes

Notes 1. ABN = Airborne noise, GBN = Ground-borne noise, V = Vibration

2. Estimated noise benefits are not necessarily cumulative

Table 6-3: Standard noise and vibration source mitigation measures

Action required	Applies to[1]	Details	Estimated noise benefit[2]	Comments on feasibility/ reasonableness	Recommend to adopt for project where reasonable & feasible?
Construction hours and scheduling	ABN, GBN, V	Where feasible and reasonable, construction would be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels would be scheduled during less sensitive time periods. When working adjacent to recording studios, particularly noisy activities should be scheduled outside recording periods, where feasible and reasonable.	Minimise high noise impact and reduce risk of annoyance.	The diverse mix of land uses around worksites will make reaching any agreement on scheduling a significant challenge	Yes
Construction respite period - standard hours	ABN, GBN, V	Appropriate construction respites for each stage of the works will be finalised after consultation with receivers identified in accordance with Condition E37. As a guide, high noise generating activities near receivers should be carried out in blocks that do not exceed three hours each, with a minimum respite period of one hour between each block. The duration of each block of work and respite should be flexible to accommodate the usage and amenity at nearby receivers.	Minimise noise and vibration impact and reduce risk of annoyance.	Reasonable cost, limited noise/vibration reduction, reduced overall impact.	Yes
Consider vibration in selecting plant and equipment	ABN, GBN, V	Use quieter and less vibration emitting construction methods where feasible and reasonable.	0-20dB reduction depending on selected equipment	Reasonable cost, limited noise reduction, reduced overall impact.	Yes
Construction methodology/ Equipment selection	ABN, GBN, V, notably high noise impact works	Use quieter and less noise emitting construction methods where feasible and reasonable, especially where they can replace high noise or vibration impact works.	0-20dB reduction/ less vibration impact + risk of annoyance.	Variable noise/vibration reduction, reduced overall impact, cost varies. Reasonableness and feasibility needs to be determined on a case by case basis.	Yes
Maximum noise levels	ABN	The noise levels of plant and equipment must have operating Sound Power Levels compliant with the maximum noise levels stated in the CNVIS. Regular compliance checks on the noise emissions of all plant and machinery used for the project would indicate whether noise emissions from plant items were higher than predicted. This also identifies defective silencing equipment on the items of plant.	Varies depending on plant sound power level	Reasonable cost, variable noise reduction, minimum requirement.	Yes
Plant and equipment maintenance	ABN	Plant and equipment to be maintained and operated competently and in a proper and efficient manner by an appropriately qualified and experienced person	Varies depending on plant sound power level	Reasonable cost, variable noise reduction, minimum requirement.	Yes
Rental plant and equipment	ABN	The noise levels of plant and equipment items are to be considered in rental decisions and in any case cannot be used on site unless compliant with the maximum noise levels stated in the CNVIS.	Varies depending on plant sound power level	Reasonable cost, variable noise reduction, minimum requirement.	Yes

Plan worksites and activities to minimise noise and vibration	ABN, V	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Use site sheds and other structures within the worksite to provide additional noise barriers to receivers. The offset distance between noisy plant items and nearby NSRs should be as great as possible	Reduce noise/ vibration impact + risk of annoyance.	Reasonable cost, variable noise/vibration reduction, reduced overall impact.	Yes
Switch off plant not in use	ABN, V	Avoid the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receivers to reduce noise to NSRs.	3-6dB reduction	Reasonable cost, medium reduction, where practicable	Yes
Non-tonal reversing alarms	ABN	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work. Whilst the use of non-tonal reversing alarms is suggested to ensure noise impacts are minimised, it is noted that WHS requirements must also be fully satisfied.	5-10dB reduction + reduce vibration	Reasonable cost, medium noise reduction	Yes
Minimise disturbance arising from delivery of goods to construction sites	ABN	Loading and unloading of materials/deliveries is to occur as far as possible from NSRs Select site access points and roads as far as possible away from NSRs Dedicated loading/unloading areas to be shielded if close to NSRs Delivery vehicles to be fitted with straps rather than chains for unloading, wherever feasible and reasonable	Reduce noise/ vibration impact + risk of annoyance.	Reasonable cost, variable noise/vibration reduction, reduced overall impact.	Yes
Engine silencing	ABN	The minimising of noise emissions from mobile plant by fitting residential grade mufflers on all mobile plant regularly used at worksites. Ensure plant including the silencer is well maintained. Heavy vehicle vehicles using the sites should have RMS compliant mufflers to control engine breaking noise.	0-20dB reduction Reduce annoyance + sleep disturbance.	Medium cost of install, moderate to high noise reduction.	Yes
Air brake silencing	OOHW truck movements ABN	Air brake silencers should be installed and fully operational for any heavy regularly used at worksite. This will reduce potential sleep disturbance impacts, especially at OOHW site exits	5-10dB LAmax reduction	Reasonable cost, medium noise reduction	Yes
Engine compression braking	ABN	Limit the use of engine compression brakes at night and in residential areas. Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard.	5-20dB reduction	Reasonable cost, medium noise reduction	Yes

Notes
1. ABN = Airborne noise, GBN = Ground-borne noise, V = Vibration
2. Estimated noise benefits are not necessarily cumulative

Table 6-4: Standard noise and vibration path mitigation measures

Action required	Applies to[1]	Details	Estimated noise benefit[2]	Comments on feasibility/ reasonableness	Preferred action where reasonable & feasible?
Shield stationary noise sources such as pumps, compressors, fans, etc.	ABN	Stationary noise sources should be enclosed or shielded where feasible and reasonable whilst ensuring that the occupational health and safety of workers is maintained. Appendix D of AS 2436:2010 lists materials suitable for shielding.	5-10dB reduction	Reasonable cost, medium noise reduction, reduced overall impact.	Yes
Shield sensitive receivers from noisy activities	ABN	Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of operational stage noise barriers (where practicable) and consideration of site topography when situating plant.	5-10dB reduction	Reasonable cost, medium noise reduction, reduced overall impact.	Yes
Use temporary noise barriers around worksites	ABN	Where construction compounds share a common boundary with residential or other noise sensitive receivers, a temporary noise barrier of nominal height 2 to 3 metres should be installed to reduce noise impact to receivers.	5-10dB reduction	Medium cost, medium noise reduction, reduced overall impact.	Yes

Notes 1. ABN = Airborne noise, GBN = Ground-borne noise, V = Vibration

2. Estimated noise benefits are not necessarily cumulative

Table 6-5: Standard noise and vibration receptor mitigation measures

Action required	Applies to	Details	Estimated noise benefit[2]	Comments on feasibility/ reasonableness	Preferred action where reasonable & feasible?
Building condition surveys	Prior to commencement of construction using vibration significant plant	Undertake building dilapidation surveys on all buildings assessed as being at risk of property damage prior to commencement of activities with the potential to cause property damage.	Limits building damage.	Reasonable cost, limited vibration reduction, reduced overall impact.	Yes
Condition surveys and vibration monitoring	Prior to using vibration significant plant near highly sensitive buildings	Pre-construction condition surveys of vibration sensitive buildings may be warranted. At locations where there are high-risk receptors, such as the heritage buildings listed in Appendix B vibration monitoring should be conducted during the activities causing vibration.	Limits building damage and risk of annoyance to receivers.	Reasonable cost, limited vibration reduction, reduced overall impact.	Yes

Notes
1. ABN = Airborne noise, GBN = Ground-borne noise, V = Vibration
2. Estimated noise benefits are not necessarily cumulative

6.3 Existing acoustic shed

BESIX Watpac will utilise the existing acoustic shed on the northern shaft on Hickson road to access the underground station and cross-over cavern and deliver materials required for the station fitout works.

6.4 Alternative methods to rock hammering

In accordance with CoA E35, the Proponent must review alternative methods to rock hammering and blasting (not currently proposed) for excavation as part of the detailed construction planning with a view to adopting methods that minimise impacts on sensitive receivers. The construction methodology is to adopt the least impact alternative in any given location unless it can be demonstrated, to the satisfaction of the AA, why it should not be adopted.

No excavation works are planned for the Project, however, hydraulic hammers are required for the demolition of piled walls, capping and steel beams, girders and the access bridge of the station box. After reviewing alternative demolition methodologies, BESIX Watpac is proposing to use a combination of pulverisers and hydraulic hammers whenever practicable. The use of pulveriser will be the preferred construction method, however, due to access limitations, hydraulic hammers may also be required. It is noted that the reduction in time spent using hydraulic hammers will provide the opportunity to offer respite periods to affected receivers.

6.5 Minimising vibration impacts

The pattern of vibration radiation is very different to the pattern of airborne noise radiation and is very site specific. Final vibration levels are dependent on many factors including the actual plant used, its operation and the intervening geology between the activity and the receiver.

Recommended minimum working distances presented in the following sections provide a conservative screening method for indicating buildings and structures where there is a risk of vibration impact. Vibration monitoring would be carried out to confirm the minimum working distances at specific sites, where vibration significant plant is required to operate within or near the recommended minimum working distances.

6.5.1 Human exposure

Many building occupants assume that building damage is occurring when they feel vibration or observe rattling of loose objects, however the level of vibration at which people perceive vibration or at which loose objects may rattle is far lower than vibration levels that can cause damage to structures. At properties near the construction works nearby receivers may be able to feel vibration when vibration-generating equipment is being utilised. For this reason it is appropriate identify properties where there is a probability of adverse comment so that impacts can be managed.

Recommended minimum working distances for typical vibration intensive construction equipment for human comfort (response) are shown in Table 6-6. These recommended distances relate to continuous vibration and are presented as a guide only. For most construction activities, vibration emissions are intermittent in nature and for this reason, higher vibration levels occurring over shorter time periods are allowed (see Section 4.8).

Table 6-6: Recommended minimum working distances (m) – human comfort (response)

Vibration significant plant item	Critical area	Residence (Day)	Residence (Night)	Office	Workshop
Concrete saw	15	10	10	5	5
Excavator 5t with auger	20	10	15	5	5
Excavator (tracked) ≤ 15t + hydraulic hammer	30	20	25	15	10
Excavator (tracked) ≤ 35t + hydraulic hammer	40	25	30	20	15
Piling rig - vibratory driven	305	170	225	100	55
Pneumatic hammer (jackhammer)	25	15	20	10	5
Vibratory roller ≤ 25t padfoot	120	70	90	40	25
Wacker packer	20	10	15	5	5

6.5.2 Buildings and structures

To limit the risks of vibration-induced damage on all nearby buildings and structures, pre- and post-construction building condition surveys will be conducted, in accordance with CoA E59 and E60. The inspections will document the existing condition of the property and typically note the location of all visible cracks and/or defects observed by the inspector. The post construction survey will record any changes to the property at construction completion.

Recommended minimum working distances to reduce the risk of cosmetic damage to buildings or structures from typical vibration intensive construction equipment are presented in Table 6-7 following. These are aimed at reducing the risk of cosmetic damage (as per BS 7385:1993 and DIN 4150-3:-2016) and are based on the vibration screening criteria set in Section 4.8.

Unlike noise, vibration cannot be readily predicted. The minimum working distances below are indicative and will vary depending on the plant item, building types and foundations and local geotechnical conditions. Vibration monitoring would be carried out to confirm the site specific minimum working distances for this Project.

Table 6-7: Minimum working distances (m) – cosmetic damage[1]

Vibration significant plant item	Reinforced or frame structures (BS7385)[2]	Unreinforced or light framed structures (BS7385)[2]	Structurally unsound heritage structures (DIN 4150-3)[3]	Site-specific MWD for the Hickson Road wall[7]
Concrete/ road saw	5	5	5	1[5]
Excavator 5t with auger	5	5	10	1[5]

Vibration significant plant item	Reinforced or frame structures (BS7385)[2]	Unreinforced or light framed structures (BS7385)[2]	Structurally unsound heritage structures (DIN 4150-3)[3]	Site-specific MWD for the Hickson Road wall[7]
Excavator (tracked) ≤ 25t + hydraulic hammer	5	5	10	1[4]
Excavator (tracked) 26-35t + hydraulic hammer	5	10	10	5[6]
Piling rig - vibratory driven (upper range)	10	20	50	10[6]
Pneumatic hammer (jackhammer)	5	5	5	1[5]
Vibratory roller ≤ 25t padfoot	5	10	20	5[6]
Wacker packer	5	5	5	1[5]

Notes:
1. Minimum working distances are in 5m increments only to account for the intrinsic uncertainty of this screening method
2. Minimum working distance based on vibration screening criterion which reduced the cosmetic damage levels set by BS7385 (see table 4-10) by 50% due to potential dynamic magnification.
3. A building condition inspection should determine whether a heritage item is structurally unsound.
4. Refer to vibration monitoring report (reference: TM031-05F02 Rockhammering Noise and Vibration Monitoring Report, dated: 19/09/2022, revision 2).
5. The site-specific MWDs has been derived from the rockhammering vibration monitoring assuming this plant is less vibration intensive.
6. Valid until monitoring verification onsite confirms otherwise.
7. Applicable in situations where there is the same structural connection to the Hickson Road wall as during the vibration measurements on 15/07/2022

CoA E29 requires owners of properties at risk of exceeding the screening criteria for cosmetic damage to be notified before the commencement of vibration-generating works. Properties at risk of cosmetic damage will be identified through the vibration screening drawings, prepared based on proposed vibration intensive construction activities and presented in the CNVIS prepared for the Project. To provide an indication of the typical worst case vibration impact, vibration screening drawings based on the likely highest vibration generating plant are presented in the . Structures within the minimum working distance screening limits and potentially at risk of damage from vibration are identified on the drawings in APPENDIX D.

Where properties are identified as within the recommended minimum working distances presented in CNVIS, vibration monitoring is recommended to determine site specific minimum working distances that will prevent cosmetic and structural damage. If the monitoring above identifies that vibration is likely to exceed the screening criteria for cosmetic damage, further analysis would be undertaken, including consideration of a different construction method with lower source vibration levels and/or implement additional mitigation measures to prevent damage.

6.6 Additional noise and vibration management measures

During the Project construction works there will be circumstances where after application of the all reasonable and feasible mitigation measures identified in Table 6-2 to Table 6-5, the construction noise and vibration objectives (refer Section 4) will be exceeded. In these instances, and consistent with the Sydney Metro CNVS, additional noise and vibration management may be applicable, taking into

consideration when works are being undertaken (standard hours or OOHW) and the level of exceedance.

Additional management measures to be applied when mitigating and managing impacts from the Project construction works in the CNVISs are described in Table 6-8.

Table 6-8: Additional management measures

Measure	Description	Abbreviation
Alternative accommodation	Alternative accommodation options may be provided for residents living in close proximity to construction works that are likely to incur unreasonably high impacts over an extended period of time.	AA[1]
Monitoring	Where it has been identified that specific construction activities are likely to exceed the relevant noise or vibration goals, noise or vibration monitoring may be conducted at the affected receiver(s) or a nominated representative location (typically the nearest receiver where more than one receiver have been identified). Monitoring can be in the form of either unattended logging or operator attended surveys. The purpose of monitoring is to inform the relevant personnel when the noise or vibration goal has been exceeded so that additional management measures may be implemented.	M
Individual briefings	Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project.	IB
Letter box drops	For each Sydney Metro project, a newsletter is produced and distributed to the local community via letterbox drop and the project mailing list. These newsletters provide an overview of current and upcoming works across the project and other topics of interest. The objective is to engage and inform and provide project-specific messages. Advanced warning of potential disruptions (e.g. traffic changes or noisy works) can assist in reducing the impact on the community. Content and newsletter length is determined on a project-by-project basis. Most projects distribute notifications on a monthly basis. Each newsletter is graphically designed within a branded template.	LB
Project specific respite offer	The purpose of a project specific respite offer is to provide residents subjected to lengthy periods of noise or vibration respite from an ongoing impact.	RO
Phone calls and emails	Phone calls and/or emails detailing relevant information would be made to identified/affected stakeholders within 7 days of proposed work. Phone calls and/or emails provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs etc.	PC
Specific notifications	Specific notifications would be letterbox dropped or hand distributed to identified stakeholders no later than 7 days ahead of construction activities that are likely to exceed the noise objectives. This form of communication is used to support periodic notifications, or to advertise unscheduled works.	SN

Notes:
1) In this section, this abbreviation refers to Alternative Accommodation. It has been also used for Acoustic Advisor in Section 2.

6.6.1 Applying additional management measures - airborne construction noise

In circumstances where, after application of all reasonable and feasible mitigation measures, the $L_{Aeq(15minute)}$ airborne construction noise levels are still predicted to exceed the NMLs, additional airborne noise management measures can be applied to further limit the risk of annoyance from construction noise. This requirement is supplemental to the basic requirements in the ICNG. These measures are consistent with the approach outlined in the Sydney Metro City and Southwest Construction Noise and Vibration Strategy (SMCSNVS) [15].

The steps to be carried out to determine the additional management measures to be implemented are identified in Figure 6.1.

Figure 6.1: Additional airborne noise mitigation measures

Time Period		Mitigation Measures			
		Predicted $L_{Aeq(15minute)}$ Noise Level Above Background (RBL)			
		0 to 10 dB	10 to 20 dB	20 to 30 dB	> 30 dB
Standard	Mon-Fri (7.00 am - 6.00 pm)	-	-	M, LB,	M, LB
	Sat (8.00 am - 1.00 pm)				
	Sun/Pub Hol (Nil)				
OOHW 1	Mon-Fri (6.00 pm - 10.00 pm)	-	LB	M, LB	M, IB, LB, PC, RO,SN
	Sat (1.00 pm - 10.00 pm)				
	Sun/Pub Hol (8.00 am - 6.00 pm)				
OOHW 2	Mon-Fri (10.00 pm - 7.00 am)	-	M, LB,	M, IB, LB, PC, RO, SN	AA, M, IB, LB, PC, RO, SN
	Sat (10.00 pm - 8.00 am)				
	Sun/Pub Hol (6.00 pm - 7.00 am)				

Notes: LB = Letter box drops
M = Monitoring
PC = Phone Call and email
SN = Specific notifications
IB = Individual Briefing
RO = Project specific respite offer
AA* = Alternative accommodation

Where OOHW occur in the evening/night shoulder period (10:00pm to 12:00am) or the night/morning shoulder period (5:00am to 7:00am) apply additional airborne mitigation measures from the OOHW Period 2, excluding AA.

*AA applies where a construction activity impacts receivers over 2 or more consecutive nights.

6.6.2 Applying additional management measures – ground-borne construction noise

In circumstances where, after application of all reasonable and feasible mitigation measures, the $L_{Aeq(15minute)}$ ground-borne construction noise levels are still predicted to exceed the ground-borne NML identified in Table 4-7 ,additional ground-borne noise management measures can be applied to further limit the risk of annoyance from construction noise. This requirement is supplemental to the basic requirements in the ICNG.

The steps to be carried out to determine the additional management measures to be implemented are identified in Figure 6.2.

Figure 6.2: Additional ground borne noise management measures

Time Period		Mitigation Measures		
		Predicted LAeq(15minute) Noise Level Exceedance		
		0 to 10 dB	10 to 20 dB	> 20 dB
Standard	Mon-Fri (7.00 am - 6.00 pm)	LB	LB	M, LB, SN,
	Sat (8.00 am - 1.00 pm)			
	Sun/Pub Hol (Nil)			
OOHW 1	Mon-Fri (6.00 pm - 10.00 pm)	LB	M, LB, SN,	M, IB, LB, PC, RO, SN
	Sat (1.00 pm - 10.00 pm)			
	Sun/Pub Hol (8.00 am - 6.00 pm)			
OOHW 2	Mon-Fri (10.00 pm - 7.00 am)	M, LB, SN,	AA, M, IB, LB, PC, RO, SN	AA, M, IB, LB, PC, RO, SN
	Sat (10.00 pm - 8.00 am)			
	Sun/Pub Hol (6.00 pm - 7.00 am)			

Notes: LB = Letter box drops
M = Monitoring
PC = Phone call and email
SN = Specific notifications
IB = Individual briefing
RO = Project specific respite offer
AA** = Alternative accommodation

Where OOHW occur in the evening/night shoulder period (10:00pm to 12:00am) or the night/morning shoulder period (5:00am to 7:00am) apply additional airborne mitigation measures from the OOHW Period 2, excluding AA.

*AA applies where a construction activity impacts receivers over 2 or more consecutive nights.

6.6.3 Applying additional management measures – construction vibration

In circumstances where, after application of all reasonable and feasible mitigation measures, construction vibration is still found to exceed the maximum Vibration Dose Value outlined in Table 4-8, additional vibration management measures can be applied to further limit the risk of annoyance from construction noise.

The steps to be carried out to determine the additional management measures to be implemented are identified in Figure 6.3.

Figure 6.3: Additional vibration management measures

Time Period		Mitigation Measures Predicted Vibration Levels Exceed Maximum Levels
Standard	Mon-Fri (7.00 am - 6.00 pm)	M, LB, RP
	Sat (8.00 am - 1.00 pm)	
	Sun/Pub Hol (Nil)	
OOHW 1	Mon-Fri (6.00 pm - 10.00 pm)	M, IB, LB, PC, RO, SN
	Sat (1.00 pm - 10.00 pm)	
	Sun/Pub Hol (8.00 am - 6.00 pm)	
OOHW 2	Mon-Fri (10.00 pm - 7.00 am)	AA, M, IB, LB, PC, RO, SN
	Sat (10.00 pm - 8.00 am)	
	Sun/Pub Hol (6.00 pm - 7.00 am)	

Notes: LB = Letter box drops
M = Monitoring
PC = Phone call and email
SN = Specific notifications
IB = Individual briefing
RO = Project specific respite offer
AA* = Alternative accommodation

Where OOHW occur in the evening/night shoulder period (10:00pm to 12:00am) or the night/morning shoulder period (5:00am to 7:00am) apply additional airborne mitigation measures from the OOHW Period 2, excluding AA.

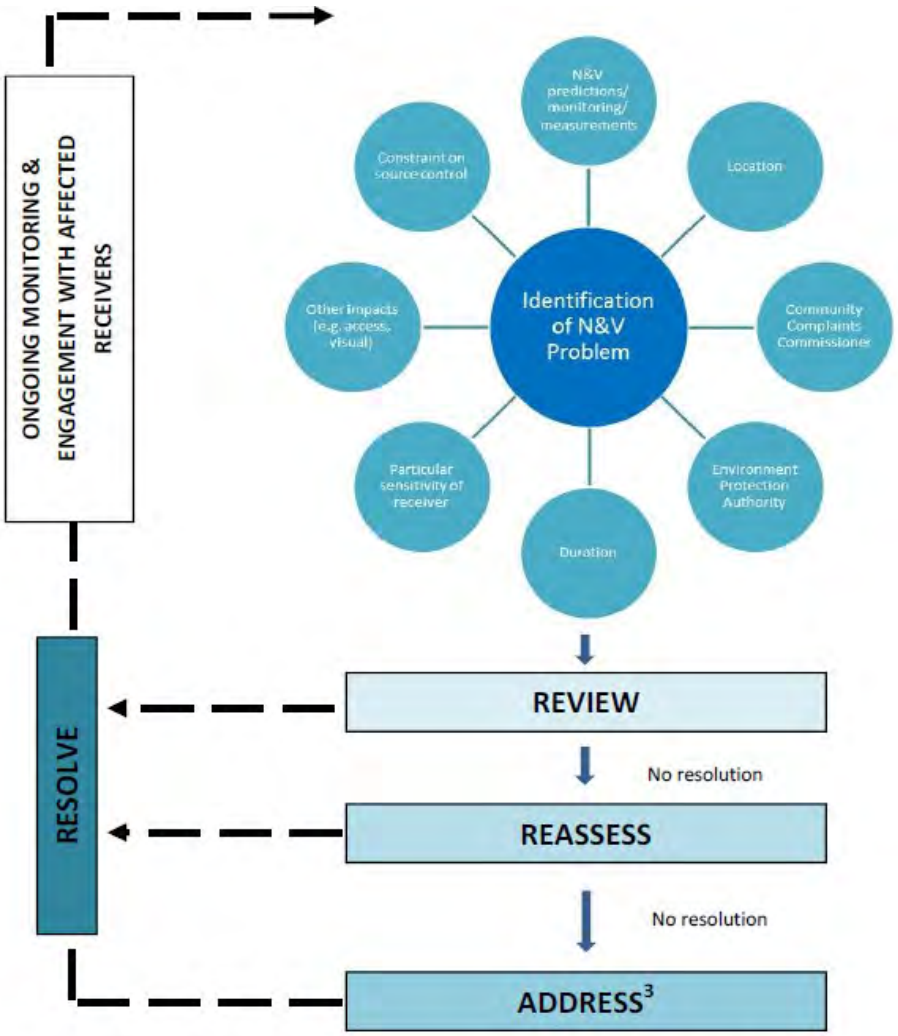
*AA applies where construction activity impacts receivers over 2 or more consecutive nights.

If the predicted ground-borne vibration levels exceed the structural damage objectives in Section 4, a different construction method with lower source vibration levels should be considered. Attended measurements should be undertaken at the commencement of all high vibration generating activities. If there is any risk of exceedance of the structural damage objective, a permanent vibration monitoring system should be installed, to warn plant operators (via flashing light, audible alarm, SMS, etc.) when vibration levels are approaching the structural damage objective.

6.6.4 Applying additional management measures – Exceedances of internal noise levels

Should detailed modelling as part of CNVIS predictions indicate exceedances of the noise and vibration objectives, the process described in Addendum A2 of the Sydney Metro CNVS (Figure 6.4) will be followed to identify additional mitigation and management measures.

Figure 6.4: Mitigation process for locations where impacts are predicted to be long term and significant



Note 3 – Additional mitigation measures are to be considered (e.g. at property treatment, temporary relocation, other forms of mitigation where impacts are predicted to be long term and significant)

7 Compliance management

7.1 Roles and responsibilities

Specific responsibilities for the implementation of environmental controls are detailed in NVMP compliance matrix.

7.2 Training

All employees, contractors, sub-contractors and utility staff working on site will undergo site induction training that includes construction noise and vibration management issues. The induction training will address elements related to noise and vibration management including:

- Existence and requirements of this sub-plan
- Relevant legislation
- Approved construction hours
- The process for seeking approval for OOHW, including consultation
- Location of noise sensitive areas
- Complaints reporting
- General noise and vibration management measures

Specific responsibilities to minimise impacts on the community and built environment from noise and vibration associated with the works.

7.3 Inspection and monitoring

Weekly and other routine inspections by the BESIX Watpac Team, Sydney Metro, AA will occur throughout construction.

Noise and vibration monitoring will also occur routinely for the duration of the Project, in accordance with the Project's Noise and Vibration Monitoring Program, which is detailed in APPENDIX E.

The noise and vibration monitoring program details when monitoring will be undertaken, as well as the representative locations adjacent to the construction works where noise and vibration monitoring will be undertaken.

To satisfy CoA C11, where real time noise and vibration monitoring is undertaken, the data would be readily available to the construction team, Sydney Metro, AA. DPIE and EPA would be provided with access to the real-time monitoring data in real-time.

Monitored noise and vibration levels will be analysed against the predictions made in the relevant noise and vibration assessments. Where monitored noise levels are found to be above modelling predictions or vibration goals are exceeded, the following actions will be undertaken:

- Cease the noise and/or vibration generating source which causes the exceeded predictions,
- Confirm the monitored levels are not being impacted by other (non-Project related) noise or vibration sources,
- Confirm if the exceedance is due to an uncharacteristically loud piece of equipment,
- Identify if the equipment can be swapped out for another piece of equipment or alternative equipment or plant, or if additional mitigation can be included in the site design,
- Confirm that the modelling reflects the actual activity being undertaken,
- Implement other feasible and reasonable measures which may include reducing plant size, modifying time of works, changing operational settings (such as turning off the vibratory function of the machine), and utilising alternative construction methodology or a combination of these,
- Review and revision of additional mitigation measures previously applied where appropriate,
- Review work practices to ensure compliance with the management levels set out in this NVMP,
- Ensure that the learnings from the above are fed back into the noise modelling assessment process for fine-tuning,
- Continue work where impacts can be reduced and
- Communicate lessons learnt to relevant personnel.

7.4 Complaints

Complaints will be recorded and managed as detailed in the Community Communications Strategy and Business Management Plan.

7.5 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this NVMP, CoA and other relevant approvals and guidelines.

Audit requirements are detailed in the CEMP.

7.6 Reporting

Reporting requirements and responsibilities are documented in the CEMP. The complaints management and reporting procedure is described in Section 5.3.4.

7.7 Records Management

Records will be maintained by the Planning and Environment manager and Stakeholder and Community Manager of the following:

- Any complaints received in relation to noise or vibration
- Out of Hours permits applied for and issued
- Approvals received
- Hold point clearances for out of hours works
- Compliance Monitoring undertaken

8 Review and improvement

8.1 Continuous improvement

Continuous improvement of this Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance;
- Determine the cause or causes of non-conformances and deficiencies;
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies;
- Verify the effectiveness of the corrective and preventative actions;
- Document any changes in procedures resulting from process improvement;
- Make comparisons with objectives and targets.

8.2 Update and amendment

The processes described the CEMP may result in the need to update or revise this Plan. This will occur as needed, in accordance with the process outlined in the CEMP.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to the CEMP.

References

1. Department of Environment and Climate Change 2009 NSW Interim Construction Noise Guideline
2. Environment Protection Authority 1999 NSW Environmental Criteria for Road Traffic Noise
3. Department of Environment Conservation NSW 2006 Assessing Vibration; a technical guideline
4. British Standard BS 6472-2008, Evaluation of human exposure to vibration in buildings (1-80Hz)
5. German Standard DIN 4150-3: 1999-02, Structural vibration - Effects of vibration on structures, February 1999
6. ASHRAE Applications Handbook (SI) 2003, Chapter 47 Sound and Vibration Control, pp47.39-47.40
7. Australian Standard 2834-1995 Computer Accommodation, Chapter 2.9 Vibration, p16
8. Australian Standard AS/NZS 2107:2016 *Acoustics - Recommended design sound levels and reverberation times for building interiors*
9. Australian Standard AS 2187.2 Explosives - Storage and use - Part 2 Use of explosives
10. Gordon CG 1991 Generic Vibration Criteria for Vibration Sensitive Equipment *Proceedings of International Society for Optical Engineering (SPIE)*, Vol. 1619, San Jose, CA, November 4-6, 1991, pp. 71-85
11. Transport for NSW Construction Noise and Vibration Strategy, reference ST-157/4.1, version 4.1, dated 23 April 2019
12. Australian Standard AS2187:2-1993 Explosives - Storage and use Part 2: Use of explosives (superseded by AS2187:2-2006)
13. Sydney Metro City and Southwest Chatswood to Sydenham, Out of Hours Works Protocol , Document reference: SM-17-00005396, version 5.2, dated 9 October 2020
14. Sydney Metro Overarching Community Communications Strategy, Sydney Metro Document Reference: A5732897, Revision 5.3 (FINAL), 12 April 2017
15. Sydney Metro City and Southwest Chatswood to Sydenham, Construction Noise and Vibration Strategy, Document reference: 610.14213 R3, version 0.4, dated 8 August 2016

APPENDIX A Glossary of terminology

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

Absorption Coefficient α	The absorption coefficient of a material, usually measured for each octave or third-octave band and ranging between zero and one. For example, a value of 0.85 for an octave band means that 85% of the sound energy within that octave band is absorbed on coming into contact with the material. Conversely, a low value below about 0.1 means the material is acoustically reflective.
Adverse weather	Weather effects that enhance noise (particularly wind and temperature inversions) occurring at a site for a significant period of time. In the NSW INP this occurs when wind occurs for more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of nights in winter.
Active recreation	Active recreation area, characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion, e.g. school playground, golf course
Air-borne noise	Noise which is fundamentally transmitted by way of the air and can be attenuated by the use of barriers and walls placed physically between the noise source and receiver.
Alternate Solution	An Alternative Solution is a design that complies with the relevant Performance Requirements of the National Construction Code other than by using Deemed-to-Satisfy Provisions.
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Amenity	A desirable or useful feature or facility of a building or place.
AS	Australian Standard
Assessment period	The time period in which an assessment is made. e.g. Day 7am-6pm, Evening 6pm-10pm, Night 10pm-7am.
Assessment Point	A location at which a noise or vibration measurement is taken or estimated.
Attenuation	The reduction in the level of sound or vibration.
Audible Range	The limits of frequency which are audible or heard as sound. The normal hearing in young adults detects ranges from 20 Hz to 20 kHz, although some people can detect sound with frequencies outside these limits.
A-weighting	A filter applied to the sound recording made by a microphone to approximate the response of the human ear.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the LA90 noise level if measured as an overall level or an L90 noise level when measured in octave or third-octave bands.
Barrier (Noise)	A natural or constructed physical barrier which impedes the propagation of sound and includes fences, walls, earth mounds or berms and buildings.
Berm	Earth or overburden mound.
Buffer	An area of land between a source and a noise-sensitive receiver and may be an open space or a noise-tolerant land use.
Bund	A bund is an embankment or wall of brick, stone, concrete or other impervious material, which may form part or all of the perimeter of a compound.
BS	British Standard
CoRTN	United Kingdom Department of Environment entitled "Calculation of Road Traffic Noise (1988)"

Decibel [dB]	The units of sound measurement. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear, defined as 20 micro Pascal 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibel. The A- weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies. The dB(C) level is not widely used but has some applications.
Diffraction	The distortion of sound waves caused when passing tangentially around solid objects.
DIN	German Standard
DnT,w	Weighted Standardised Field Level Difference A measure of sound insulation performance of a building element. It is characterised by the difference in noise level on each side of a wall or floor. It is measured in-situ. It is a field measurement that relates to the Rw laboratory measured value but is not equal to it because an in-situ space is not of the same quality as a laboratory space. The value is indicative of the level of speech privacy between spaces. The higher its value the better the insulation performance.
ECRTN	Environmental Criteria for Road Traffic Noise, NSW, 1999
EPA	Environment Protection Authority
Field Test	A test of the sound insulation performance in-situ. See also 'Laboratory Test' The sound insulation performance between building spaces can be measured by conducting a field test, for example, early during the construction stage or on completion. A field test is conducted in a non-ideal acoustic environment. It is generally not possible to measure the performance of an individual building element accurately as the results can be affected by numerous field conditions.
Fluctuating Noise	Noise that varies continuously to an appreciable extent over the period of observation.
Free-field	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5m from any acoustic reflecting structures other than the ground.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Ground-borne noise	Vibration propagated through the ground and then radiated as noise by vibrating building elements such as wall and floor surfaces. This noise is more noticeable in rooms that are well insulated from other airborne noise. An example would be vibration transmitted from an underground rail line radiating as sound in a bedroom of a building located above.

Habitable Area	Includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room, home theatre and sunroom. Excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.
Heavy Vehicle	A truck, transporter or other vehicle with a gross weight above a specified level (for example: over 8 tonnes).
Impact Noise	The noise in a room, caused by impact or collision of an object onto the walls or the floor. Typical sources of impact noise are footsteps on the floor above a tenancy and the slamming of doors on cupboards mounted on the common wall between tenancies.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
INP	NSW Industrial Noise Policy, EPA 1999
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
Intrusive noise	Refers to noise that intrudes above the background level by more than 5 dB(A).
ISEPP	State Environmental Planning Policy (Infrastructure), NSW, 2007
ISEPP Guideline	Development Near Rail Corridors and Busy Roads - Interim Guideline, NSW Department of Planning, December 2008
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
$L_{10(1hr)}$	The L10 level measured over a 1 hour period.
$L_{10(18hr)}$	The arithmetic average of the L10(1hr) levels for the 18 hour period between 6am and 12 midnight on a normal working day.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L_{Aeq} or L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time, which would produce the same energy as a fluctuating sound level. When A-weighted, this is written as the L_{Aeq}.
$L_{Aeq(1hr)}$	The L_{Aeq} noise level for a one-hour period. In the context of the NSW EPA's Road Noise Policy it represents the highest tenth percentile hourly A-weighted L_{eq} during the period 7am to 10pm, or 10pm to 7am (whichever is relevant).
$L_{Aeq(8hr)}$	The L_{Aeq} noise level for the period 10pm to 6am.
$L_{Aeq(9hr)}$	The L_{Aeq} noise level for the period 10pm to 7am.
$L_{Aeq(15hr)}$	The L_{Aeq} noise level for the period 7am to 10pm.
$L_{Aeq\ (24hr)}$	The L_{Aeq} noise level during a 24 hour period, usually from midnight to midnight.
L_{max}	The maximum sound pressure level measured over a given period. When A-weighted, this is usually written as the L_{Amax}.
L_{min}	The minimum sound pressure level measured over a given period. When A-weighted, this is usually written as the L_{Amin}.
Ln,w	Weighted Normalised Impact Sound Pressure Level A measure of the sound level transmitted from impacts on a floor to a tenancy below. It is measured in very controlled conditions in a laboratory and is characterised by how much sound reaches the receiving room from a standard tapping machine. A lower value indicates a better performing floor.

LnT,w	Weighted Standardised Field Impact Sound Pressure Level As for Ln,w but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The equivalent measurement in a laboratory is the Ln,w. A lower value indicates a better performing floor.
Laboratory Test	The performance of a building element when measured in a laboratory. The sound insulation performance of a building element installed in a building however can differ from its laboratory performance for many reasons including the quality of workmanship, the size and shape of the space in which the measurement is conducted, flanking paths and the specific characteristics of the material used which may vary from batch to batch.
Loudness	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on. That is, the sound of 85 dB is four times or 400% the loudness of a sound of 65 dB.
Microphone	An electro-acoustic transducer which receives an acoustic signal and delivers a corresponding electric signal.
NCA	Noise Catchment Area. An area of study within which the noise environment is substantially constant.
Noise	Unwanted sound
NRC	Noise Reduction Coefficient. A measure of the ability of a material to absorb sound. The NRC is generally a number between 0 and 1 but in some circumstances can be slightly greater than 1 because of absorption at the edges of the material. A material with an NRC rating of 1 absorbs 100% of incoming sound, that is, no sound is reflected back from the material. The NRS is the average of the absorption coefficient measured in the octave bands 250Hz, 500Hz, 1kHz & 2kHz which correspond to the predominant frequencies associated with the human voice.
Passive recreation	Area specifically reserved for passive recreation, characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion e.g. reading, meditation
PPA	Project Planning Approval
Reflection	Sound wave reflected from a solid object obscuring its path.
Reverberation Time	The time (in seconds) it takes for a noise signal within a confined space to decay by 60dB. The longer the reverberation time (usually denoted as RT60), the more echoic a room. Longer reverberation times generally result in higher noise levels within spaces.
RMS	Root Mean Square value representing the average value of a signal.
Rw	Weighted Sound Reduction Index A measure of the sound insulation performance of a building element. It is measured in very controlled conditions in a laboratory. The term supersedes the value STC which was used in older versions of the Building Code of Australia. Rw is measured and calculated using the procedure in ISO 717-1. The related field measurement is the DnT,w. The higher the value the better the acoustic performance of the building element.
R'w	Weighted Apparent Sound Reduction Index. As for Rw but measured in-situ and therefore subject to the inherent accuracies involved in such a measurement. The higher the value the better the acoustic performance of the building element.
RNP	Road Noise Policy, NSW, March 2011
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.

Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy by conversion to thermal energy.
Sound Insulation	Sound insulation refers to the ability of a construction or building element to limit noise transmission through the building element. The sound insulation of a material can be described by the Rw and the sound insulation between two rooms can be described by the DnT,w.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 pico watt.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone referenced to 20 mico Pascal.
Spoil	Soil or materials arising from excavation activities.
Standardised	A method of adjusting the measured noise indices in-situ so that they are independent of the measuring space. The noise level in a room is affected by reverberation in the room. For example, the L'n,w impact sound pressure level measured in a room is dependent upon the amount of absorptive material in the receiving room. The value is adjusted to what would be measured if the reverberation time in the receiving room is set at 0.5 seconds. This enables the same value to be reported independent of whether the room contains carpet and furnishings and the like. See also 'Normalised'.
STC	Sound Transmission Class A measure of the sound insulation performance of a building element. It is measured in controlled conditions in a laboratory. The term has been superseded by Rw.
Structure-borne Noise	Audible noise generated by vibration induced in the ground and/or a structure. Vibration can be generated by impact or by solid contact with a vibrating machine. Structure-borne noise cannot be attenuated by barriers or walls but requires the isolation of the vibration source. This can be achieved using a resilient element placed between the vibration source and its support such as rubber, neoprene or springs or by physical separation (using an air gap for example). Examples of structure-borne noise include the noise of trains in underground tunnels heard to a listener above the ground, the sound of footsteps on the floor above a listener and the sound of a lift car passing in a shaft. See also 'Impact Noise'.
Tonal Noise	Sound containing a prominent frequency and characterised by a definite pitch.
Transmission Loss	The sound level difference between one room or area and another, usually of sound transmitted through an intervening partition or wall. Also the vibration level difference between one point and another. For example, if the sound level on one side of a wall is 100dB and 65dB on the other side, it is said that the transmission loss of the wall is 35dB. If the transmission loss is normalised or standardised, it then becomes the Rw or R'w or DnT,w.

APPENDIX B Land Use Survey, Noise Catchment Areas (NCA) and Noise Management Levels (NML)

Land-Use file revision_date: r37_19/05/21

Plot Date: 16/06/21 - 11:56 Layout: TM031 Vibration screening for cosmetic damage (r0)

GIS File: R:\Technical Resource\Data Library\GIS Data\00 Master projects\Master project (r2).qgz

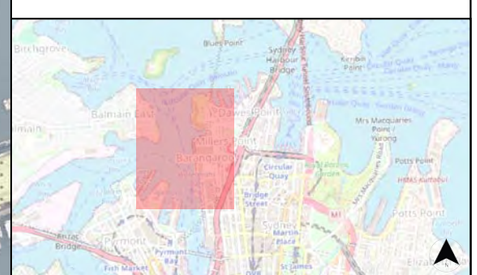


LEGEND

Noise sensitive receivers

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

- NCA
- Northern shed
- A-class hoarding
- Heritage Wall
- Project Work Zones



0 40 80 120 160 200 240 280 320 360 400 m

0 80 160 240 m

1:4000

REV	BY	DATE	DESCRIPTION	APPROVER
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r0	MS	16/06/21	Prepare figures	MT

FULL SIZE A3

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

CLIENT

BESIX Watpac

ACOUSTIC CONSULTANT

RENZO TONIN & ASSOCIATES
inspired to achieve

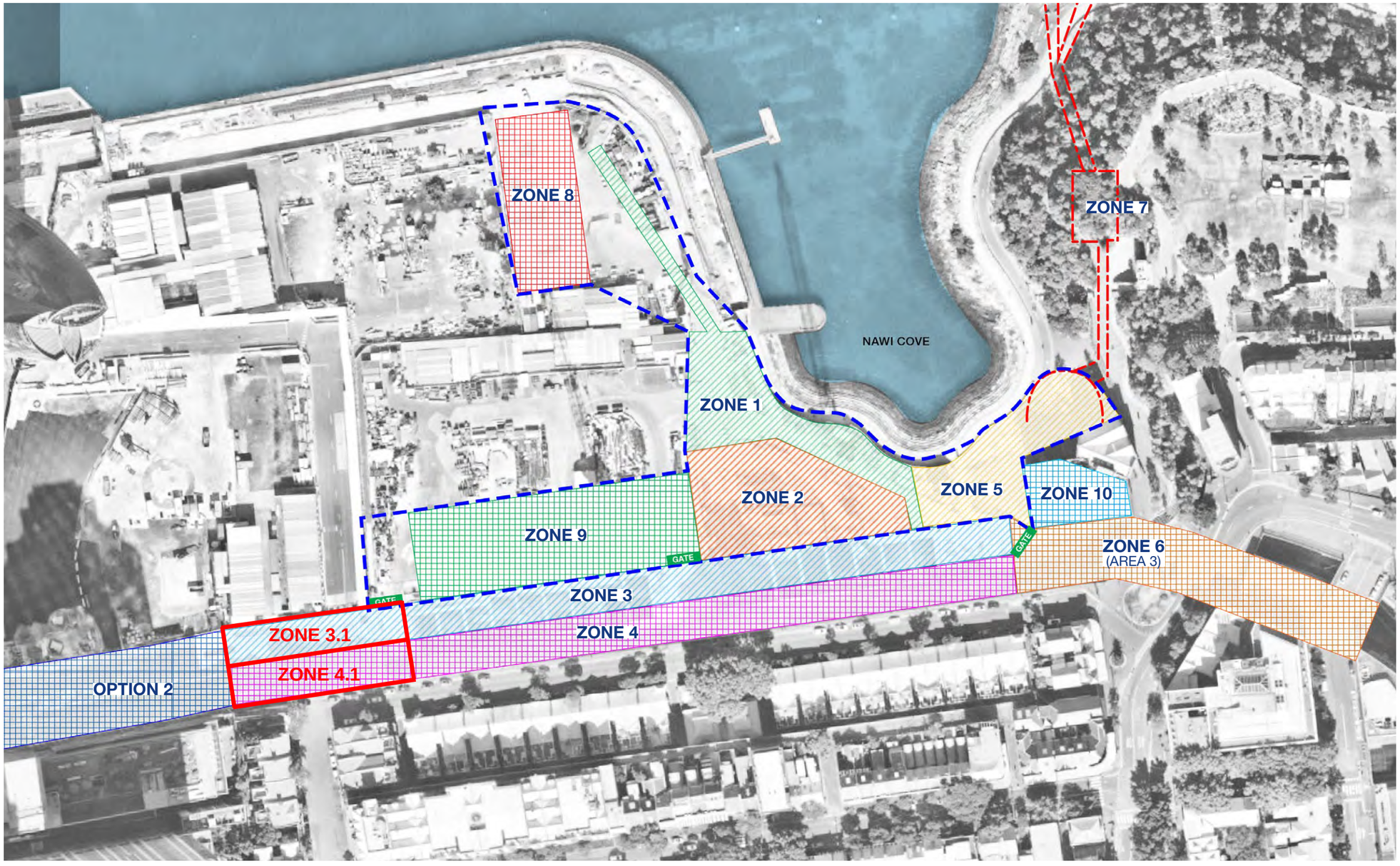
Ph (02) 8218 0500 Fax (02) 8218 0501

Sydney Metro Barangaroo Station

Land Use, NCAs
All Project Work Zones

Sheet 1 of 1

APPENDIX C Indicative site layouts and schedule of construction activities



LEGEND

- ZONE 1 - STORMWATER MAIN DISCHARGE
- ZONE 2 - SHARK FIN
- ZONE 3 - WEST STAGE
- ZONE 4 - EAST STAGE
- ZONE 5 - NORTH-WEST CORNER
- ZONE 6 (AREA 3) - NORTH STAGE
- OPTION 2 - SOUTH STAGE
- ZONE 7 - SEAWATER HEAT EXCHANGER STAGE
- ZONE 8 - SITE COMPOUND
- ZONE 9 - LAYDOWN PRE-ASSEMBLY AREA (SA-H17B)
- ZONE 10 - PROJECT OFFICE
- GATE — ACCESS GATE
- A-CLASS HOARDING

Sydney Metro City & South West

Barangaroo Construct Only Package

NOT TO SCALE
NOT FOR CONSTRUCTION

DRAWING NAME:
PROJECT WIDE ZONING

REV: 01

DATE: 23/4/2021

BESIX Watpac

Table C1: Construction timetable/ activities/ equipment **BARANGAROO**

Activity	Aspect	Indicative timing/ Duration	Work area	Plant/ Equipment	Plant/ Equipment (as provided by client)	Number of plant/equipment items (operating on site) Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am	Sound Power Level (Lw re: 1pW) in Noise Model, dB(A) L_{Aeq}	Penalty	L_{Amax}	High noise plant	Vibration intensive plant	Notes
Surface Works	Site preparation and establishment (mobilisation, fencing, etc)	October 2021 / Less than 1 month	All Zones	Telehander / Franna crane (20t)	Franna Crane	1	-	-	98	-	102	-	-	
				Handtool - power	Hand tools	2	-	-	108	-	118	-	-	
				EWP	EWP	1	-	-	95	-	98	-	-	
				Excavator with auger (5t)	Excavator with auger attachment	1	-	-	102	-	106	-	X	
				Hiab	Hiab	2	-	-	95	-	98	-	-	
				Excavator w bucket (5t)	Small excavators	1	-	-	101	-	114	-	-	
				Forklift	Forklift	1	-	-	99	-	103	-	-	
	Demolition works (girders, etc)	October 2021 - November 2021 / 1 month	Zone 3	Excavators with hammers (35-45T)	30t excavator with rock breaking tool	1	-	-	118	5	126	HN	X	
			Zone 3, Zone 9	Mobile crane (20t-250t)	150t crawler crane	1	-	-	104	-	108	-	-	
			Zone 3, Zone 4	Handtool - rattle gun	Rattle guns	2	-	-	107	-	118	-	-	
			Zone 9	Welding tools /oxy	Oxy Acetylene torch	1	-	-	96	-	107	-	-	
			Zone 3, Zone 4	Excavators with hammers (10-15T)	Concrete pecker / rock hammer	1	-	-	118	5	123	HN	X	
			Zone 4	Excavator w bucket (25t)	30t excavator	1	-	-	103	-	108	-	-	
	Utility works (stormwater and other services) (OOHW Zone 6)	Novermber 2021 - July 2023 / 19 months	Zone 1	Concrete cutting saw	Concrete saw	1	-	-	119	5	124	HN	X	
			Zone 1, Zone 5	Excavator w bucket (25t)	30t excavator	2	-	-	103	-	108	-	-	
			Zone 1	Mobile crane (20t-250t)	150t crawler crane	1	-	-	104	-	108	-	-	
			Zone 1	Piling Rig - vibratory	High frequency vibrodriver type PTC 24 HVF or similar	1	-	-	116	5	119	HN	X	
			Zone 1	Telehander / Franna crane (20t)	Franna Crane	2	-	-	98	-	102	-	-	
			Zone 1	Water pump - Diesel	Water pumps	3	-	-	99	-	101	-	-	
			Zone 1	Concrete vibrator	Concrete vibrators	1	-	-	97	-	100	-	-	
			Zone 1	Tipper	Tipper	1	-	-	103	-	111	-	-	
			Zone 2	Mobile crane (20t-250t)	Truck mounted crane	1	-	-	104	-	108	-	-	
			Zone 2	Marr Diesel Tower Crane	Tower crane	1	-	-	115	-	122	-	-	
			Zone 2	Vibratory Roller (20T Padfoot)	Roller compactor	1	-	-	108	5	113	HN	X	
			Zone 7	Mobile crane (20t-250t)	15t mobile crane	1	-	-	104	-	108	-	-	
			Zone 7	Vacuum truck	Suction truck	2	-	-	107	-	111	-	-	
			Zone 7	-	Cable roll feed	1	-	-	-	-	-	-	-	
			Zone 7	Handtool - power	Hand tools	1	-	-	108	-	118	-	-	
			Zone 6	Tipper	Asphalt trucks	1	1	1	103	-	111	-	-	OOHW required due to ROL
			Zone 6	Vibratory Roller (20T Padfoot)	Rollers	1	1	1	108	5	113	HN	X	OOHW required due to ROL
			Zone 6	Concrete Agitator	Concrete trucks	2 p.h.	2 p.h.	2 p.h.	108	-	111	-	-	OOHW required due to ROL
			Zone 6	Concrete pump	Concrete pumps	1	1	1	103	-	107	-	-	OOHW required due to ROL
			Zone 9	Forklift	14t forklift	1	1	1	99	-	103	-	-	OOHW requred to support main laydown area, materials, equipment in Zone 9
			Zone 9	Telehander / Franna crane (20t)	Franna Crane	1	1	1	98	-	102	-	-	OOHW requred to support main laydown area, materials, equipment in Zone 9
	Road upgrading works (OOHW zone 6)	Novermber 2021 - July 2023 / 19 months	Zone 3, Zone 4	Excavator w bucket (25t)	30t excavator	2	-	-	103	-	108	-	-	
			Zone 3, Zone 4	Tipper	Tipper trucks	1	-	-	103	-	111	-	-	
			Zone 3, Zone 4	Vibratory Roller (20T Padfoot)	Roller compactor	1	-	-	108	5	113	HN	X	
			Zone 3, Zone 4	Tipper	Asphalt trucks	1	-	-	103	-	111	-	-	
			Zone 3, Zone 4	Vibratory Roller (20T Padfoot)	Rollers	2	-	-	108	5	113	HN	X	
			Zone 3, Zone 4	Concrete Agitator	Concrete trucks	4 p.h.	-	-	108	-	111	-	-	
			Zone 3, Zone 4	Concrete pump	Concrete pumps	1	-	-	103	-	107	-	-	
			Zone 3, Zone 4	Concrete cutting saw	Wet saws	1	-	-	119	5	124	HN	X	
			Zone 3, Zone 4	Handtool - power	Hand tools	1	-	-	108	-	118	-	-	
			Zone 3	Mobile crane (20t-250t)	Truck mounted crane	1	-	-	104	-	108	-	-	
			Zone 6	Mobile crane (20t-250t)	Truck mounted crane	1	1	1	104	-	108	-	-	OOHW required due to ROL
			Zone 6	Excavators with hammers (10-15T)	Concrete pecker / rock hammer	1	1	1	118	5	123	HN	X	OOHW required due to ROL
			Zone 6	Truck and Dog	Trucks	4 p.h.	2 p.h.	2 p.h.	106	-	111	-	-	OOHW required due to ROL
			Zone 9	Forklift	14t forklift	1	1	1	99	-	103	-	-	OOHW requred to support main laydown area, materials, equipment in Zone 6
			Zone 9	Telehander / Franna crane (20t)	Franna Crane	1	1	1	98	-	102	-	-	OOHW requred to support main laydown area, materials, equipment in Zone 6
	Traffic switch	Novermber 2021 - July 2023 / 19 months	Zone 3.1, Zone 4.1, Zone 3, Zone 4, Zone 6	Excavator w bucket (25t)	30t excavator	1	1	1	103	-	108	-	-	OOHW is proposed during the traffic switch from East to West, Zone 6
			Zone 3.1, Zone 4.1, Zone 3, Zone 4, Zone 6	Tipper	Tipper trucks	1	1	1	103	-	111	-	-	OOHW required to install concrete barriers for traffic switch
			Zone 3.1, Zone 4.1, Zone 3, Zone 4, Zone 6	Lighting tower	Lighting towers	2	2	2	99	-	102	-	-	OOHW is proposed during the traffic switch from East to West, Zone 6
			Zone 3.1, Zone 4.1, Zone 3, Zone 4, Zone 6	Mobile crane (20t-250t)	Truck mounted crane	2	2	2	104	-	108	-	-	OOHW is proposed during the traffic switch from East to West, Zone 6
			Zone 3.1, Zone 4.1, Zone 3, Zone 4, Zone 6	Telehander / Franna crane (20t)	Franna Crane	1	1	1	98	-	102	-	-	OOHW is proposed during the traffic switch from East to West, Zone 6
			Zone 9	Forklift	14t forklift	2	2	2	99	-	103	-	-	OOHW requred to support main laydown area, materials, equipment in Zone 9
			Zone 9	Telehander / Franna crane (20t)	Franna Crane	2	2	2	98	-	102	-	-	OOHW requred to support main laydown area, materials, equipment in Zone 9
	Northern shaft backfill	Feb 2023 - March 2023 / 1 month	Northern shaft	Truck and Dog	Spoil trucks	8 p.h.	-	-	106	-	111	-	-	Up to 24 trucks per day
			Northern shaft	Compactor / Wacker packer	Compactors	1	1	1	108	-	110	-	X	Within the Northern Shed. Limited use during OOHW subject to noise verification
			Northern shaft	Gantry Crane - electric	Gantry crane	1	1	1	96	-	100	-	-	Gantry crane used to lower stabilised sand into the shaft, compactors, small excavators to move material around in the Northern shaft. Only flash lighting OOH.
			Northern shaft	Excavator w bucket (5t)	Small excavators	1	1	1	101	-	114	-	-	Loading Gantry crane inside the Northern Shed
	Northern shaft shed demolition and removal	March 2023 - April 2023 / 1 month	Zone 6	Excavator with pulverizer	Excavator with pulverizer	3	-	-	104	-	108	-	-	
			Zone 6	Excavator w bucket (25t)	30t excavator	2	-	-	103	-	108	-	-	
			Zone 6	Handtool - rattle gun	Rattle guns	3	-	-	107	-	118	-	-	
			Zone 6	EWP	EWP	3	-	-	95	-	98	-	-	
			Zone 6	Concrete cutting saw	Concrete Saw	2	-	-	119	5	124	HN	X	
			Zone 6	Dump truck	Dump Truck	8 p.h.	-	-	106	-	111	-	-	
	General landscaping/hardscaping	Not specified (TBC by the client)	Zone 2	Handtool - power	Hand tools	3	-	-	108	-	118	-	-	
			Zone 2, Zone 4, Zone 5	Concrete cutting saw	Wet saws	1	-	-	119	5	124	HN	X	
			Zone 4	EWP	Scissor lift	1	-	-	95	-	98	-	-	
			Zone 4	EWP	Cherry picker	1	-	-	95	-	98	-	-	
			Zone 5	Marr Diesel Tower Crane	Tower crane	1	-	-	115	-	122	-	-	
			Zone 5	Handtool - power	General landscaping equipment	3	-	-	108	-	118	-	-	
			Zone 5	Generator	Generator	2	-	-	94	-	95	-	-	
Station works	Station works and fitouts (including deliveries)		Zone 2, Zone 3	Handtool - power	Power hand tools	3	-	-	108	-	118	-	-	
			Zone 4	Concrete Agitator	Concrete trucks	4 p.h.	-	-	108	-	111	-	-	
			Zone 4	Concrete vibrator	Concrete vibrators	2	-	-	97	-	100	-	-	
			Zone 4	Concrete Agitator	Concrete agitator	2	-	-	108	-	111	-	-	
			Zone 4	Concrete pump	Concrete pumps	2	-	-	103	-	107	-	-	
			Zone 4	-	Finishing screed	2	-	-	-	-	-	-	-	It is assumed that the finishing creed does not requre a motor to operate. Hence not producing any noise. TBC by the client
			Station Box	EWP	Scissor lift	2	2	2	95	-	98	-	-	Underground, inside the station
			Station Box	Handtool - power	Hand tools	3	3	3	108	-	118	-	-	Underground inside the station
			Northern shaft	Delivery truck	Vehicle movements	4 .ph.	4 .ph.	4 .ph.	106	-	111	-	-	Vehicle movements reversing into the Northern shaft to deliver goods into the crossover cavern
			Station Box	Forklift	14t forklift	2	2	1	99	-	103	-	-	Underground inside the station
			Station Box	Telehander / Franna crane (20t)	Franna Crane	3	3	3	98	-	102	-	-	Underground inside the station
			Station Box	Concrete cutting saw	Wet saws	1	-	-	119	5	124	HN	X	Inside the station, OOHW limited used subject to noise verification

APPENDIX D Vibration screening for cosmetic damage - Indicative minimum working distances

Land-Use file revision_date: r36_29/04/21

Plot Date: 06/05/21 - 12:03 Layout: TM031 Vibration screening for cosmetic damage (r0)

GIS File: R:\Technical Resource\Data Library\GIS Data\00 Master projects\Master project (r0).qgz



0 20 40 60 80 100 120 140 160 180 200 m

LEGEND

Noise sensitive receivers

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

- Heritage Wall
- Project Work Zones
- Receivers within MWD for cosmetic damage

MWD for cosmetic damage for vibration intensive plant (35T excavator with hammer attachment and vibratory roller)

- Unreinforced structures (7.5mm/s ppv)
- Heritage structures (2.5mm/s ppv)



REV	BY	DATE	DESCRIPTION	APPROVER
r0	MS	06/05/21	Prepare figures	MT

A3 Original | Co-ordinate System: MGA Zone 56

0 40 80 120 m

1:2000

FULL SIZE A3

NOTE: Do not scale from this drawing.

CLIENT

BESIX Watpac

ACOUSTIC CONSULTANT

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Sydney Metro Barangaroo Station

Vibration screening for cosmetic damage
Project Work Zones: 2, 3, 4 and 6

APPENDIX E Monitoring program

RENZO TONIN & ASSOCIATES
Inspired to achieve

Acoustics
Vibration
Structural Dynamics

BARANGAROO METRO STATION

Construction Noise and Vibration Monitoring Plan

6 August 2021

BESIX Watpac

TM031-01F01 Barangaroo Metro Station - NVMP APPE Monitoring program (r4)

35 1983-2017 ACOUSTIC ENGINEERING EXCELLENCE

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Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Authorised
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06.08.2021	Update following comments from DPIE	-	4	M. Tabacchi	-	T. Gowen

Important Disclaimer:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

This document is issued subject to review and authorisation by the Team Leader noted by the initials printed in the last column above. If no initials appear, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

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In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

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1 Introduction

The Construction Noise and Vibration Monitoring Guideline in the Sydney Metro CNVS sets out the requirements for:

- Operator attended monitoring (short term)
- Continuous, unattended monitoring (including real-time monitoring)

This construction noise and vibration monitoring program will apply for the duration of works that pose a risk of exceeding set criteria. Monitoring is not required where activities to be undertaken do not pose risk of exceeding set criteria from the project planning approval.

The Construction Noise and Vibration Monitoring Program results will be submitted to the EPA and relevant Councils, as required by PPA Condition C9. Construction will not commence until the Secretary has approved this monitoring plan.

The Construction Noise Monitoring Program, as approved by the Secretary including any minor amendments approved by the AA will be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Secretary, whichever is the greater.

Noise and vibration monitoring will be undertaken to verify compliance with the noise and vibration objectives and/or the predicted levels in the relevant CNVIS's. Real-time noise and vibration monitoring will be undertaken at the affected receivers as detailed in the following sections. After application of all reasonable and feasible mitigation measures identified in Section 6.2 of the NVMP, monitoring may still be above the construction noise and vibration objectives. In these instances, additional noise and vibration managements outlined in Section 6.6 of the NVMP may be applicable, taking into consideration when works are being undertaken (standard hours or OOHW) and the level of exceedance.

1.1 Guidelines

The main guidelines, specifications and policy documents relevant to monitoring include:

- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- NSW Noise Policy for Industry (NPfI), Environment Protection Authority 2017
- NSW Assessing Vibration – a technical guideline (AVTG), Department of Environment and Conservation 2006
- Australian Standard AS/NZS 1055 Acoustics - Description and Measurement of Environmental Noise
- Australian Standard AS 2659.1 1988 Guide to use sound measuring equipment

- Australian Standard AS/NZS 2012.1 Acoustics - Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors - Stationary test condition - Determination of compliance with limits for exterior noise
- Australian Standard AS/NZS 2107:2016 Acoustics - Recommended design sound levels and reverberation times for building interiors
- Australian Standard AS 2187.2 Explosives - Storage and use - Part 2 Use of explosives
- Australian Standard AS2436-2010 Guide to Noise Control on Construction, Maintenance and Demolition Sites
- Australian Standard 2775 Mechanical Mounting of Accelerometers
- British Standard BS 6472-2008, 'Evaluation of human exposure to vibration in buildings (1-80Hz)
- British Standard 7385: Part 2-1993 'Evaluation and measurement of vibration in buildings'
- German Standard DIN4150- 2016 Structural vibration Part 3: Effects of vibration on Structures,
- ISO 3744 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane
- ISO 3746 Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane
- ISO 6393 Earth-moving machinery - Determination of sound power level - Stationary test condition
- ISO 6395 Earth-moving machinery - Determination of sound power level - Dynamic test conditions.

1.2 Noise Monitoring

1.2.1 Baseline noise monitoring data

Baseline noise monitoring data was reported in the SMCSWCS EIS. Ambient noise measurements were undertaken at four noise monitoring locations near Barangaroo worksite. A summary of the noise monitoring results at these locations is provided below:

Table 1.1 Summary of unattended noise monitoring results

NCA	EIS monitoring ID[1]	Address	Rating Background noise Levels, dBA			Ambient noise levels (L_{Aeq})		
			Day	Evening	Night	Day	Evening	Night
BN_01	EIA B.12	26A High Street, Millers Point (Barangaroo)	50	45	40	61	64	51
BN_02	EIA B.12	26A High Street, Millers Point (Barangaroo)	50	45	40	61	64	51
BN_03	EIA B.12	26A High Street, Millers Point (Barangaroo)	50	45	40	61	64	51
BN_04	EIS B.13	2-60 Cumberland Street, The Rocks	62	62	52	66	65	63
BN_05	EIS B.28	56A Pirrama Road, Pyrmont (Wharf 8)	51	46	41	56	52	47
BN_06	EIS B.29	Goat Island	49	49	41	55	55	49

Notes: 1) Based upon EIS and Submissions and Preferred Infrastructure Reports for the Sydney City Metro & Southwest (Chatswood to Sydenham) (SMCSWCS) project.

No further baseline data is required to be obtained.

1.2.2 Parameters to be monitored

The following noise parameters are required to be measured when assessing construction noise levels:

- $L_{Aeq(15minute)}$ (internal or external) to assess compliance with the relevant internal or external NMLs
- L_{Amax} or L_{A1min} to assess potential sleep disturbance at residential receivers.

Environmental noise monitoring (excluding spot checks of plant and equipment) will be recorded over 15-minute sample intervals, excluding periods of extraneous noise until a representative sample has been obtained. A representative sample will be determined by the operator, who will be competent, suitability trained and experienced in undertaking noise measurements and familiar with the relevant Australian Standards.

For spot checks of noise intensive plant and equipment, duration of monitoring will depend on the source of noise being monitored. Sources of continuous noise (such as generators or fans), measurements will be monitored over one-to-two-minute intervals. For dynamic plant, such as front-end loaders, spot checks will capture a representative activity, such as one truck-and-trailer load cycle.

1.2.3 Airborne noise monitoring in the community

Attended monitoring of construction noise levels will be undertaken as follows:

- Monitoring will be carried out at the commencement of activities identified in the CNVIS as requiring verification monitoring, to confirm that actual noise levels are consistent with

predicted noise impacts and that the management measures that have been implemented are appropriate.

- Where a change in methodology, plant or equipment is anticipated to result in a significant increase in construction noise impact than what has been assessed (i.e. more than 5dB).
- To ensure that noise generated by construction will not exceed the National Standard for exposure to noise in the occupational environment of an eight-hour equivalent continuous A-weighted sound pressure level of $L_{Aeq,8h}$, of 85dB(A) for any employee working at a location near a Project worksite.
- Where appropriate in response to a noise related complaint(s) (determined by the project environmental manager on a case-by- case basis following procedures outlined in the CCS).
- As otherwise required by the CNVIS. Specific monitoring requirements will be identified in the relevant CNVIS as they are location and task specific.
- As required by the Out of Hours Works (OOHW) Protocol.
- As identified in the OOHW application.
- Following the implementation of mitigation measures or noise attenuation as a result of exceedance of predicted noise levels.
- Ongoing spot checks for noise intensive plant and equipment will be undertaken at the first opportunity withing the fire month of staring construction activities as well as throughout construction to ensure compliance with the noise levels for construction equipment assumed in the CNVIS or the levels established in Table 11 of the Sydney Metro City and South West CNVS. Spot checks would be carried out approximately every 6 months depending on the plant/equipment, in response to a specific noise related complaint and during noise and vibration assessment validation monitoring when it is possible to isolate the noise from one piece of plant or equipment.
- Unattended airborne noise monitoring may also be undertaken, with a noise logger deployed to obtain noise results over longer periods.

Attended and unattended noise monitoring locations may vary throughout the life of the Project. Monitoring locations would be determined on a case-by-case basis based on the locations recommended in a CNVIS, in response to complaints and on the location of the noise source to be monitored.

In accordance with the ICNG the duration and amount of noise monitoring will depend on the scale of the construction activities and extent of expected noise impacts. Noise monitoring will cover a representative period of the construction activity. A representative period is the stage of a construction activity where all the plant and equipment operating is consistent with the full range of plant and equipment modelled in the noise assessment, i.e. noise monitoring is not to be undertaken when the key noise contributing plant and equipment are turned off.

Where possible, monitoring will be undertaken at the most affected noise sensitive receiver location in proximity to the Project's construction activities. Noise monitoring locations will consider factors, including the:

- Location of previous monitoring sites,
- Proximity of the receiver to a Project worksite,
- Sensitivity of the receiver to noise,
- Background noise levels, and
- Safety of personnel undertaking the measurements,
- Expected duration of the impact.

Where noise monitoring indicates that the activity, work or combination of simultaneous activities or works has caused or is causing noise or vibration levels higher than the predicted levels at any noise sensitive receiver, BESIX WATPAC must review and where possible, modify the work or activity to prevent any recurrence and additional mitigation measures applied.

1.2.4 Ground-borne noise monitoring

Attended monitoring of ground-borne construction noise levels will be undertaken as follows:

- At the first opportunity following the commencement of works if ground-borne noise impacts are identified in the CNVIS,
- Where appropriate in response to a ground-borne noise related complaint(s) (determined on a case-by- case basis), and
- As otherwise required by a CNVIS or OOHW Protocol.

Monitoring will be undertaken in the most affected habitable room of the sensitive receiver building and will be conducted in conjunction with vibration measurements whenever practicable. The room selected for noise monitoring should be well shielded from airborne noise intrusions, such as road traffic noise to allow the ground-borne noise to dominate over non-construction generated airborne noise.

There may be instances where the resident does not allow access to monitor in the most suitable habitable room. In these instances, BESIX Watpac will endeavour to monitor at the next most suitable available room or location, noting this in the monitoring form.

Given that ground-borne noise is mostly noticed during the evening or at night, noise loggers may also be left in place over night and picked up at a mutually agreed time with the resident. In these instances, noise loggers will record audio to allow for the identification construction noise contribution and the presence of any extraneous noise, provided privacy concerns can be overcome. Where the sensitive receiver will not allow the noise logger to record audio, attended noise monitoring will be offered instead.

Measurements will be carried out by an appropriately trained and competent person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.

1.2.5 Real-time (unattended) noise monitoring

Real time (unattended) noise monitoring will be undertaken to satisfy PPA Condition C11. A real time noise monitor will be deployed to manage noise impacts from 'high risk' activities where there is likely to be a high risk of annoyance from construction noise (i.e. road reinstatement works and utility works).

Real-time noise monitor will be installed along High Street or Hickson Road. An indicative monitoring location is presented in APPENDIX A. The timing, duration and final location of the real-time noise monitoring equipment will be subject to the construction program, availability of mains power, safety requirements and consultation.

Real-time noise monitoring will continue during works that pose a risk of exceeding set criteria. Where activities being undertaken do not pose risk of exceeding set criteria from the project planning approval, real-time monitoring may be ceased. A secure website is required for data storage for the duration of monitored construction activities.

The monitor will be installed by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.

The real-time monitoring data will be available to the construction team, Sydney Metro, ER, AA, DPIE and EPA via a web-based portal.

1.2.6 Calibration, QA and competency

All monitoring will be undertaken by competent personnel, suitability trained and experienced in undertaking noise measurements.

Noise monitoring equipment used will be at least Type 2 instruments and calibrated in accordance with manufacturer specifications or relevant Australian Standards. Records of equipment laboratory calibration will be maintained by BESIX Watpac throughout the delivery of the Project. The calibration of the monitoring equipment will be checked in the field before and after the noise measurement period.

All monitoring records will be retained throughout the delivery of the Project by BEISX Watpac. Noise monitoring records will be completed to record:

- Date and time of measurement,
- Name of person undertaking the measurement,
- Type and model number of monitoring instrumentation and calibrator,

- Date of last laboratory calibration in a NATA accredited facility for the monitoring instrumentation and calibrator,
- Results of field calibration checks,
- Time of day, length of measurement and any measurement time intervals,
- Monitoring location, including a sketched map of area and/or photographs clearly identifying the monitoring location,
- Measurement location details and number of measurements at each location,
- Weather conditions during measurements,
- Operation and activities of the noise sources under investigation,
- Estimated contribution of the Project's activities,
- Construction works location, and
- Noise due to other extraneous and environmental sources (e.g. traffic, aircraft, trains, dogs barking, insects).

Noise monitoring will be undertaken and recorded in accordance with the relevant noise measurement requirements in the reference standards and documents in Section 1.1.

All outdoor noise measurements will be undertaken with a windscreen over the microphone and measurements of noise will be disregarded when rain or wind affects the measured noise levels as described in the AS 1055.. Where high background noise levels obscure construction noise contribution during attended noise measurements, operators will either:

- Measure closer to the source and calculate back to the required position, or
- Measure with the source noise off and then on (where possible) and calculate the difference or use the 'pause and cut' feature on the sound level meter to try to exclude as much of the extraneous noise as possible.

Where possible, outdoor noise monitoring is to be carried out at least 3.5 m from any reflective surface other than the ground. The preferred microphone/measurement height is 1.2-1.5 m above the ground level.

Measurements taken inside buildings should be at least one metre from walls or other reflective surface, and about 1.5 metres from windows, where such instrument siting is possible. The preferred microphone/measurement height is 1.2-1.5 m above the floor level.

1.3 Vibration Monitoring

1.3.1 Parameters to be monitored

The following noise parameters are required to be measured when assessing construction noise levels:

- Peak Particle Velocity (ppv) in mm/s to assess compliance with the relevant cosmetic damage criteria;
- Root-Mean-Square acceleration (a) in m/s^2 to estimate the Vibration Dose Value (eVDV) and determine compliance with relevant human annoyance management levels.

All short term attended vibration monitoring will be recorded over a representative sampling interval where the worst-case vibration levels can be captured. Where unattended vibration monitoring is proposed, monitoring will be undertaken continuously whilst the vibrating plant is operational to capture the worst-case vibration impacting on the structure.

1.3.2 Vibration monitoring

Attended vibration monitoring is to be undertaken as follows:

- To confirm/identify the site-specific minimum working distances to prevent cosmetic damage or damage to sensitive equipment or buried pipework.
- at the commencement of vibration intensive activities on site that have been identified in a CNVIS as likely to exceed the vibration screening criteria.
- at the commencement of vibration generating activities that have the potential to impact on heritage items.
- where vibration sensitive locations are found to fall within the recommended minimum working distances established for vibration intensive plant.
- Where appropriate in response to a vibration related complaint(s) (determined on a case-by-case basis).
- As otherwise required by a CNVIS (note that specific monitoring requirements will be identified in the relevant CNVIS and not prescribed in this Program), OOHW Protocol.

Vibration monitoring will be undertaken in accordance with the relevant vibration measurement requirements in the reference standards and documents in Section 1.1.

Where human comfort is a concern, vibration monitoring would be undertaken as outlined in Figure 1.1. Vibration monitoring results would be assessed and reported against the values set out in Tables 2.2 and 2.4 of the EPA's Assessing Vibration – a technical guideline.

Where property damage is a concern, vibration monitoring would be undertaken as outlined in Figure 1.2. Vibration monitoring results will be assessed and reported against the British Standard 7385 and German Standard DIN 4150. The approach that will be adopted for the Project to assess and manage potential vibration impact, including on heritage structures is outlined in Section 4.6 of the NVMP.

The following notes of importance are included:

- Vibration monitoring equipment shall be placed outside at the footings or foundations of the building of interest, closest to the vibrating plant, where access is permitted.
- The surface should be solid and rigid to best represent the vibration entering the structure of the building under investigation.
- The vibration sensor or transducer shall not be mounted on loose tiles, loose gravel or other resilient surfaces.
- The vibration sensor or transducer shall be directly mounted to the vibrating surface using either bees wax or a magnetic mounting plate onto a steel washer, plate or bracket which shall be either fastened or glued to the surface of interest.
- Where a suitable mounting surface is unavailable, then a metal stake of at least 300mm in length shall be driven into solid ground adjacent to the building of interest and the vibration sensor or transducer shall be mounted on that.

Where attended vibration monitoring is not feasible, due to extended periods of vibration intensive works, an unattended vibration monitoring system will be installed where initial monitoring to establish site specific minimum working distances is insufficient to ensure vibration criteria are met, due to changing plant or unknown/unstable ground conditions. Unattended monitors will warn plant operators (e.g. SMS, etc.) that vibration is approaching levels where there is potential for cosmetic damage to buildings and structures.

Where unattended vibration monitors are left in place on a private property they will be picked up at a mutually agreed time with the resident.

In accordance with PPA Condition E29, owners of properties at risk of exceeding the screening criteria for cosmetic damage (if any) will be notified before construction that generates vibration commences in the vicinity of those properties. A building condition survey will be prepared prior to construction for all properties identified at risk of damage and a follow-up survey will be offered within three months of the completion of works in accordance with PPA Conditions E59 and E60.

Figure 1.1: Vibration monitoring (human comfort) flowchart

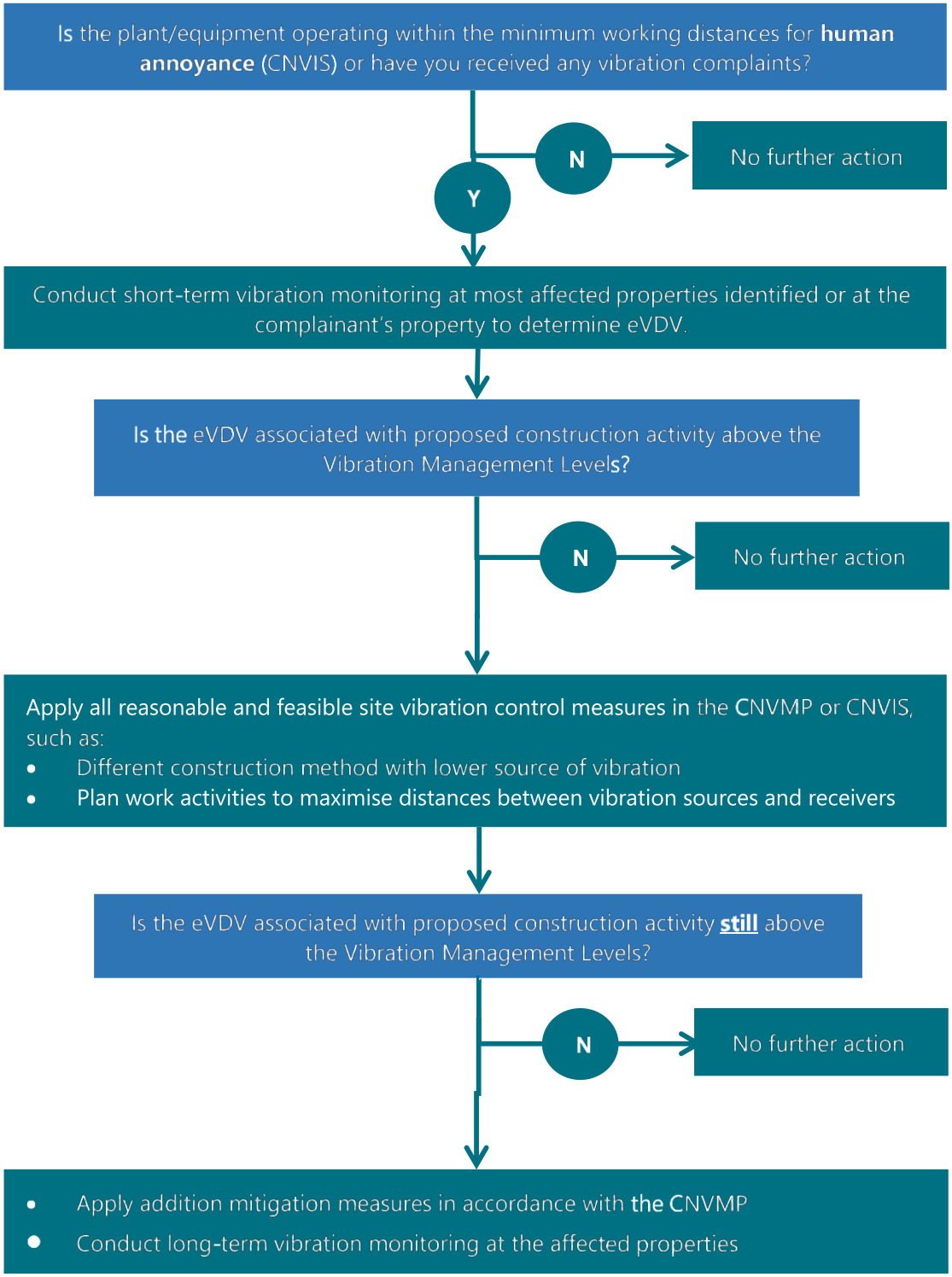
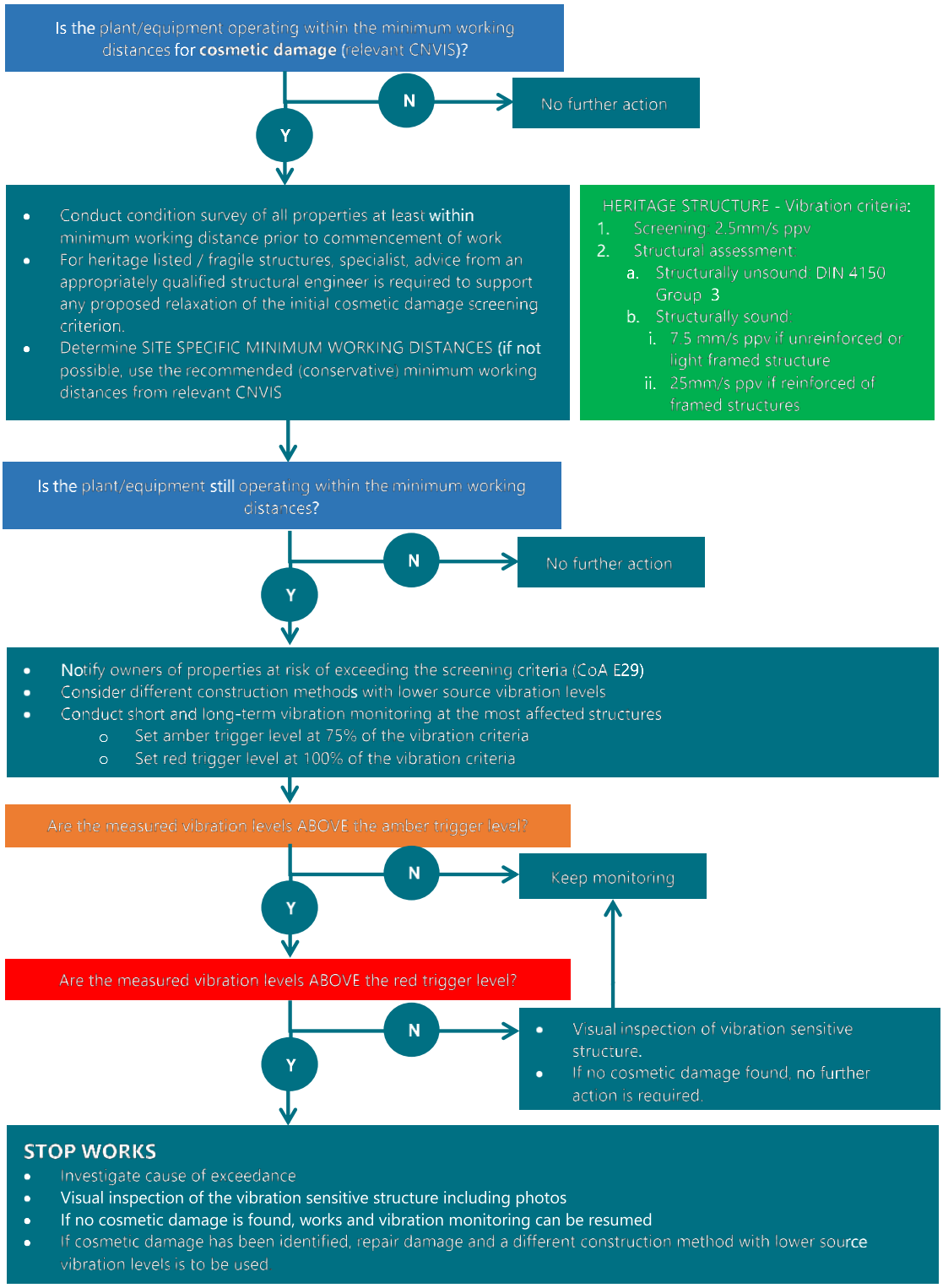


Figure 1.2: Vibration monitoring (cosmetic damage to structures) flowchart



1.3.3 Real-time (unattended) vibration monitoring

Real time (unattended) vibration monitoring will be undertaken to satisfy PPA Condition C11. A real time vibration monitor will be deployed to manage vibration impacts from 'high risk' activities, where there is an increased risk of annoyance (or potential building damage) from construction vibration.

Real time vibration monitors will be installed when works are proposed to occur within minimum working distances established for cosmetic damage. The final timing, duration and location of the real-time vibration monitoring equipment will be subject to the construction program, availability of mains power, safety requirements and consultation. Real-time vibration monitoring will continue during works that pose a risk of exceeding set criteria. Where activities being undertaken do not pose risk of exceeding set criteria from the project planning approval, real-time monitoring may be ceased. An indicative monitoring location is presented in APPENDIX A.

The monitor will be installed by an appropriately trained person in the measurement and assessment of construction noise and vibration, who is familiar with the requirements of the relevant standards and procedures.

The real-time monitoring data will be available to Sydney Metro, ER, AA, DPIE and EPA via a web-based portal.

1.3.4 Heritage-listed structures

BESIX WATPAC will seek the advice of a Heritage Engineer on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures. Heritage structures near the works are identified in Section 3.2.2 of the NVMP. The location and activity specific CNVIS prepared for the Project will identify which nearby heritage items at risk of impact from vibration intensive activities.

In accordance with PPA E30, BESIX Watpac will conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items, as identified in the CNVIS, to identify minimum working distances to prevent as far as practicable cosmetic damage. Should vibration testing and monitoring show that the preferred values for vibration are likely to be exceeded, BESIX Watpac will follow the process in Figure 1.2.

1.4 Blast monitoring

Blasting will not be adopted for the Project, therefore blast vibration and air-overpressure monitoring is not required.

1.5 Continual improvement and corrective action

Monitored noise and vibration levels will be analysed against the predictions made in the relevant CNVIS. Where monitored construction noise levels are found to be above modelling predictions or vibration criteria are exceeded, the following actions will be undertaken:

- Cease the noise and/or vibration generating activity which causes the exceeded predictions,
- Confirm the monitored levels are not being impacted by other noise or vibration sources,
- Confirm if the exceedance is due to an uncharacteristically loud piece of equipment,
- Identify if the equipment can be swapped out for another piece of equipment or alternative equipment or plant,
- Confirm if the exceedance is due to an uncharacteristically vibratory piece of equipment and if an alternative, less vibration generating mode of operation can be used,
- Confirm that the modelling reflects the actual activity being undertaken,
- Implement other feasible and reasonable measures which may include reducing plant size, modifying time of works, changing operational settings (such as turning off the vibratory function of the machine), and utilising alternative construction methodology or a combination of these,
- Review work practices to ensure compliance with the relevant guidelines,
- Review and revision where appropriate of previously applied adaptation mitigation measure,
- Ensure that the learnings from the above are fed back into the noise and vibration assessment process,
- Continue work where impacts can be reduced,
- Where no alternative construction method is available and an exceedance of vibration objectives is still measured, site specific mitigation measures should be identified on a case-by-case basis. In this case, a site and activity specific management strategy for the vibration intensive works should be established so that the risk of building/structure damage can be minimised.
- Communicate lessons learnt to relevant personnel.

BESIX Watpac will review the work or activity or combination of simultaneous works or activities and where possible, modify the work or activity to prevent any recurrence. Lessons learnt will be communicated to relevant personnel in toolbox talks.

1.6 Reporting of monitoring results

The results of noise and vibration monitoring shall be documented every 6 months in a noise and vibration monitoring report and submitted to the Secretary for information.

PPA Condition 16 includes the following requirements:

> *The results of the Construction Monitoring Programs must be submitted to the Secretary for information, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.*

APPENDIX A Barangaroo Metro Station – Indicative monitoring locations



APPENDIX F Records of Agency Consulation

Date	Report Section	Agency Comment	BESIX Watpac Response
City of Sydney Council			
16.06.2021	NVMP (including monitoring plan)	City of Sydney responded on 6th July 2021 finding the plan satisfactory (accepted)	No further action
NSW Environment Protection Authority			
09.07.2021	Monitoring plan	EPA responded on 13th July 2021 with no comments (accepted)	No further action
Acoustics Advisor and Environmental Representative			
01/06/2021	All comments are summarised in the document SMCCSWSBR-BWC-SBR-EM-PLN-000018, dated 01/06/2021		All responses are summarised in the document SMCCSWSBR-BWC-SBR-EM-PLN-000018, dated 16/06/2021 (SMCSW2 - Feedback on Document Comments or Responses (003) - RTA response)

APPENDIX G Endorsement letters

APPROVAL
CITY & SOUTHWEST ACOUSTICS ADVISOR

Review of:	Barangaroo Metro Station Noise and Vibration Management Plan (NVMP)	**Document reference:**	TM031-01F01 Barangaroo Metro Station NVMP (r10) (Besix Watpac Version 2) Prepared by Renzo Tonin & Associates Pty Ltd 30 September 2022
Prepared by:	Daniel Weston Acoustics Advisor		
Date of issue:	10 November 2022		

As approved Acoustics Advisor for the Sydney Metro City & Southwest project, I have reviewed the Noise and Vibration Management Plan (NVMP; revision 10) for the Barangaroo Metro Station, as required under A27 (g) (iv) of the project approval conditions.

This revision includes minor updates to construction hours on Saturdays to reflect the extended hours in the approved Modification 9.

I am satisfied that such amendments are necessary, approve revision 10 of the NVMP, and consider that the document is appropriate for submission to the Secretary for information.



Daniel Weston, City & Southwest Acoustics Advisor



Appendix D
Heritage Management Plan

Caption: One Central Park, Sydney

BESIX Watpac

NSW GOVERNMENT | sydney METRO



Barangaroo Station

Heritage Management Sub Plan

N217

BR COP

11 January 2024

Project overview

Project Site Address:
25 Hickson Road
Barangaroo
NSW 2000
Project Commencement Date:
12 March 2021

BESIX Watpac State Division Address:
Level 24, 44 Market Street
SYDNEY
NSW 2000
BESIX Watpac ABN:
71 010 462 816

Document Control

Client:	Transport for NSW – Sydney Metro
Title:	BARANGAROO STATION
Subtitle:	Heritage Management Sub Plan
Owner / Approver:	Primary Excavation Director / Senior Project Manager
TB Document Reference:	SMCSWSBR-BWC-SBR-HE-PLN-000010
TB Revision:	04

Revision History

Version	Date	Revision Description	Release Sign off
A	24/05/21	Submission for Review	Luke Hunter / Contractor's Representative
B	16/06/21	Response to comments	Luke Hunter / Contractor's Representative
C	09/07/21	Response to comments	Luke Hunter / Contractor's Representative
D	20/08/21	Response to DPIE comments	Luke Hunter / Contractor's Representative
E	25/08/21	Response to DPIE comments	Luke Hunter / Contractor's Representative
F	01/09/21	Response to DPIE comments	Luke Hunter / Contractor's Representative
00	15/07/22	6 Monthly Update	Luke Hunter / Contractor's Representative
01	06/09/22	Zone 5 works	Luke Hunter / Contractor's Representative
02	28/02/23	6 Monthly Update	Luke Hunter / Contractor's Representative
03	23/11/23	6 Monthly Update, Revised following Sydney Metro Environmental Alert 23_10	Luke Hunter / Contractor's Representative
04	11/1/24	6 Monthly Update – Comments Addressed	Luke Hunter / Contractor's Representative

BESIX Watpac Approvals

Name	Role & Title	Signature	Date
Mike Hincks	R01 Author / Primary Excavation Director		06/09/22
Anthony Richard	R02/R03/R04 Revision Author / Planning and Environmental Manager		11/1/24
Daniel Gooch	Reviewer / Engineering Manager		11/1/24
Luke Hunter	Approver / Contractor's Representative		11/1/24

Note: A controlled copy of the Heritage Management Plan (HMP) will be distributed to the Sydney Metro Principal's Representative, Independent Certifier (IC) and other nominated stakeholders, and it will be made available to all BR COP employees and subcontractors in soft copy format through the project document control system.

The HMP, when printed, will be uncontrolled and it will the responsibility of each user to confirm the currency of the plan through the project document control system.

Acronym and Definitions

Acronym	Term and/or Definitions
AARD	Archaeological Assessment Research Design Report
ACHAR	Aboriginal Cultural Heritage Assessment Report
AEO	Authorised Engineering Organisation (issued by Sydney Metro - ASA)
AFC	Approved/Endorsed/Issued For Construction documentation, NAC-3 endorsed documentation
AMS	Archaeological Method Statement
BCA	Building Code of Australia
BDA	Barangaroo Development Authority (known as iNSW)
BR-CODD	Barangaroo 'Construct Only Delivery Deed'
BR-COP	Barangaroo 'Construct Only Package' (also various documents refer to: BZZ Contractor / STME)
CSSI	Critical State Significant Infrastructure Sydney Metro City & Southwest Chatswood to Sydenham.
CCB	Configuration Control Board
CEMP	Construction Environmental Management Plan
CEMF	Construction Environmental Management Framework
CMP	Contract Management Plan (this controlled plan and associated plans)
CNVMP	Construction Noise and Vibration Management Sub-Plan
CNVIS	Construction Noise and Vibration Impact Statement
CSG	Construction Safety Group
DIS	Detailed Interface Specification
DITP	Detailed Inspection and Test Plan
DPE	Department of Planning and Environment (formerly DPIE)
DPIE	New South Wales Department of Planning, Industry and Environment (now DPE)
DRP	Design Review Panel
E&SMS	Environment and Sustainability Management System
ER	Environmental Representative
GS	General Specification
GBCAGSDABSMRT	Green Building Council of Australia Green Star Design & As Built Sydney Metro Rating Tool
HMP	Heritage Management Sub Plan
iNSW	Infrastructure NSW (https://www.infrastructure.nsw.gov.au/projects-nsw/barangaroo/)
MTS	Metro Trains Sydney, Operator of Northwest and City & Southwest (https://www.ourmetro.com.au)
NAC	Network Assurance Committee
NGERS	National Greenhouse and Energy Reporting Act 2007
NSMS	The BESIX Watpac certified National Safety Management System
ONRSR	Office of the National Rail Safety Regulator (https://www.onrsr.com.au)
PS	Particular Specification
RIM	Rail Infrastructure Maintainer (in terms of the RSNL, NSW)

Acronym	Term and/or Definitions
RIW	Rail Industry Worker (https://www.riw.net.au)
RSNL	Rail Safety National Law, NSW
RSW	Rail Safety Worker (in terms of the RSNL, NSW)
RTO	Rail Transport Operator (in terms of the RSNL, NSW), the RTO may include a RIM or number of RIM's providing railway capital works and/or railway maintenance programs. Note: the defined railway term, should not be confused with 'Registered Training Organisation'
SDPP	Station Design and Precinct Plan
SFAIRP	So Far As Is Reasonably Practicable (in terms of the RSNL, NSW)
SME	Subject Matter Expert, a person with expert knowledge and competency in a specified subject or topic matter area.
SMCSW	Sydney Metro City & Southwest (the overall program of works, which Barangaroo Station is part of)
SWMS	Safe Work Method Statement
TfNSW	Transport for New South Wales (https://www.transport.nsw.gov.au)
TfNSW - ASA	*TfNSW - Assets Standards Authority (https://www.transport.nsw.gov.au/industry/asset-standards-authority)*
TfNSW - SM	*TfNSW - Sydney Metro (https://www.sydneymetro.info)*
WHS	Work Health and Safety

Heritage Management Sub Plan

Heritage Management Sub Plan v

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1 Plan Overview

1.1 Purpose

BESIX Watpac has prepared this Construction Heritage Management Plan (HMP) to describe how we will minimise Aboriginal and non-Aboriginal (historic) heritage impacts during the Barangaroo Construction Only Package (COP) works as part of the Sydney Metro City & Southwest Project at Barangaroo Metro Station, Barangaroo.

This Plan has been prepared to address the relevant requirements of Sydney Metro's Construction Environmental Management Framework (CEMF), the Revised Environmental Mitigation Measures (REMMs), the Project Planning Approval (CoAs), applicable legislation, and contractual requirements. Non-Aboriginal heritage mitigation measures are outlined in NAH1 to NAH 13 of the REMMs and Aboriginal heritage mitigation measures are outlined in AH1 to AH6 of the REMMs.

1.2 Background

This Plan builds on the Aboriginal and historic heritage assessments undertaken in the Environmental Impact Statement (EIS) and Submissions and Preferred Infrastructure Report (SPIR). Artefact Heritage conducted the assessments as part of the EIS, to set out the heritage context of the study area and potential impacts. As the EIS did not identify detailed mitigation strategies, additional studies including an Historical Archaeological Assessment and Research Design (AARD) and Aboriginal Cultural Heritage Assessment Report (ACHAR) were therefore included in the Submissions and Preferred Infrastructure Report (SPIR).

AMBS Ecology & Heritage (AMBS) has comprehensively reviewed the EIS and Submissions and PIR and primary historical resources in developing this Plan on behalf of BESIX Watpac. An Historical Archaeological Method Statement and Aboriginal Archaeological Method Statement have been prepared for this stage of works in accordance with the archaeological management strategies set out in the AARD and ACHAR. The Archaeological Method Statements are included in Appendix A.

1.3 Objectives

The following heritage management objectives will be applied on the Barangaroo COP Works:

- Implement measures to appropriately manage all known Aboriginal and historic heritage items and places that will be directly impacted by the COP Works activities
- Avoid accidental impacts on heritage items through use of a procedure to identify and manage unexpected heritage finds
- Maximise COP Works personnel's awareness of Aboriginal and historic heritage relevant to their work.

1.4 Approval

The HMP was reviewed by Sydney Metro, endorsed by the Environmental Representative (ER) and submitted to the Secretary of the Department of Planning, Industry and Environmental (DPIE) for approval in accordance with CoA C8. The Secretary provided approval on 8th September 2022. The HMP was submitted to DPIE along with the submission of the CEMP no later than one (1) month before commencement of Construction. Construction did not commence until the CEMP and sub-plans (including this Plan) were been approved.

2 Legal and other requirements

2.1 Legislation

As the Project is Critical State Significant Infrastructure (CSSI), the requirements of the Heritage Act 1977 and the National Parks and Wildlife Act 1974 are being assessed under Part 5.1 of the Environmental Planning and Assessment Act 1979. This is addressed in the Project Planning Approval and no separate permits will be required.

2.2 Project Compliance Requirements

Key planning requirements from the Project Planning Approval are summarised in the Compliance Matrix included in Appendix C. This matrix also includes key requirements from Sydney Metro's Construction Environmental Management Framework (CEMF) for preparation of a Heritage Management Plan.

2.3 Guidelines

Relevant guidelines include:

- NSW Heritage Council's Criteria for Assessment of Excavation Directors (2019)
- NSW Heritage Council's Assessing Significance for Historical Archaeological Sites and Relics (2009)
- NSW Heritage Office Archaeological Assessments (1996)
- Office of Environment and Heritage's Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (2011)
- Office of Environment and Heritage's Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW 2010)
- NSW Heritage Council's Photographic Recording of Heritage Items Using Film or Digital Capture (2006) guidelines
- NSW Heritage Office Guidelines for Management of Human Skeletal Remains (1998)

2.4 Specialist Consultants

BESIX Watpac has engaged AMBS Ecology and Heritage Pty Ltd (AMBS) to prepare this Plan after comprehensively reviewing the Aboriginal and historic heritage research and planning Sydney Metro completed in finalising the EIS and Submissions, and Preferred Infrastructure Report. During delivery, AMBS will continue to lead the development and implementation of this Plan and associated documents to ensure impacts can be avoided, minimised or appropriately mitigated.

The roles and responsibilities of key AMBS personnel with respect to heritage management are outlined in Table 1. Refer to Sections 5 and 6 and Appendix B for further details.

Table 1 Roles and responsibilities of key AMBS personnel

Role	Responsibility for Heritage Management
Primary Historic Excavation Directors	• Have overall responsibility for all archaeological works • Prepare this Plan and oversee its implementation. • Preparation of Archaeological Method Statements for historical archaeological sites and review of those prepared by secondary excavation/site director. • Direction and responsibility for all historical archaeological investigations including: • implementation of Archaeological Method Statements • testing and monitoring of historical archaeological sites • historical archaeological excavations and salvage • Review and approve temporary heritage interpretation including information signage on hoardings prepared by secondary excavation/site director. • Provide expert advice to assist in planning open days on historical archaeological sites. • Implementation of the unexpected finds protocol • Prepare clearance certificates. • Prepare preliminary archaeological results reports for each site. • Prepare reporting on the results of the historical archaeological excavations. • Manage and direct historic artefact cataloguing, analysis, storage requirements and reporting. Peer review of all reports.
Secondary Historic Excavation/Site Directors	• Report to the Primary Historic Excavation Director and provide assistance in managing the relevant archaeological investigations, as instructed.
Aboriginal Heritage Excavation Director	• Prepare this Plan and oversee its implementation • Prepare Archaeological Method Statements for Aboriginal archaeological excavation areas • Direct, manage and undertake a program of Aboriginal archaeological test and salvage excavations • Manage and direct Aboriginal artefact analysis, storage requirements and reporting • Manage the preparation and implementation of the unexpected finds protocol for Aboriginal heritage • Issue clearance certificates following finalisation of all Aboriginal archaeological investigations at each relevant site • Manage and direct Aboriginal artefact analysis, storage requirements and reporting • Continue consultation and engagement with the RAPs, and participate and engage in the Aboriginal Focus Group maintained by Sydney Metro
Historic Heritage Consultant	• Manage and direct historical archaeological investigations in consultation with the Primary Excavation Director including: - implementation of Archaeological Method Statements - Managing testing and monitoring of historical archaeological sites - Managing historical archaeological excavations and salvage

Role	Responsibility for Heritage Management
	- Provide input into temporary heritage interpretation including information signage on hoardings in consultation with Primary Excavation Director for submission and approval of Sydney Metro - Preparation and implementation of unexpected finds protocol for historic heritage

2.5 Collaboration with Sydney Metro and other Stakeholders

2.5.1 Aboriginal Focus Group

Sydney Metro and Artefact initiated the Aboriginal community consultation process in 2016, in accordance with Heritage NSW, Department of Premier and Cabinet (HNSW - formerly known as Office of Environment and Heritage (OEH), Department of the Environment, Climate Change and Water NSW [DECCW]) Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010a). The following parties registered their interest in the study area through the consultation process, and will continue to be involved in the project as Registered Aboriginal Parties (RAPs):

- Metropolitan Local Aboriginal Land Council
- Darug Land Observations
- Tocomwall Pty Ltd
- Darug Aboriginal Cultural Heritage Assessments
- Kamilaroi-Yankuntjatjara Working Group
- Woronora Plateau Gungangara Elders Council
- Murra Bidgee Mullangari Aboriginal Corporation
- Aboriginal Archaeology Service Inc
- Gundungurra Tribal Technical Services
- Bilinga Cultural Heritage Technical Services
- Gunyuu Cultural Heritage Technical Services
- Mynyunga Cultural Heritage Technical Services
- Murrumbul Cultural Heritage Technical Services
- Wingikara Cultural Heritage Technical Services

Consultation and engagement in accordance with condition AH1 will continue with the established RAPs, and draft reporting, including reports produced following any archaeological excavations undertaken will be provided to all RAPs following client approval, for their review and input. Aboriginal community representatives participating in fieldwork will be drawn from these RAP organisations, based on experience, availability, and the advice of the Sydney Metro Aboriginal Focus Group.

Evidence of consultation with RAPs is included in Appendix D as required by CEMF section 10.2(a)(i).The above listed RAPS were issued the HMP on the 18th June 21 for their review and comment. Details of the comments received are detailed in Table 9 of Appendix D. Three responses accepting the plan were received from Kamilaroi-Yankuntjatjara Working Group, Murra Bidgee Mullangari Aboriginal Corporation and Tocomwall Pty Ltd within the 28 day review period provided. Follow up phone calls and emails were sent to the remaining RAPs and at the time of updating this plan the remaining RAPs have not responded.

2.5.2 Other Stakeholder Consultation

The HMP has been prepared in consultation with the Heritage Council of New South Wales and City of Sydney Council in accordance with CoA C3(g). City of Sydney responded on the 6th of July 2021 finding the plan to be satisfactory. The Heritage Council of NSW responded on the 6th August 2021 finding the HMP to be a fit for purposed document generally and provided two

comments, both of which have been addressed in the HMP. The details of the consultation undertaken with these agencies is provided in Appendix D.

2.6 Compliance Management

2.6.1 Heritage Monitoring and Inspections

Environmental compliance monitoring and inspections generally are documented in Chapter 6 of the CEMP. Heritage monitoring will be undertaken as outlined in Table 9 of chapter 6.1 of the CEMP which nominates that heritage finds, protection and recording be undertaken on a daily basis during high-risk activities. Vibration monitoring will take place as outlined in Chapter 5 of the CNVMP and where construction activities may result in impacts to heritage buildings. A review of these construction activities will be undertaken by the Planning and Environment Manager to determine the appropriate monitoring in consultation with specialist vibration and heritage consultants. The location of monitoring equipment will be documented on environmental control maps (ECMs). Independent environmental auditing will be undertaken on an annual basis for heritage finds, protection and recording.

2.6.2 Record Management

Compliance records will be maintained as outlined in Chapter 6.3 of the CEMP and will include the following in relation to heritage management:

- Documentation in relation to any unexpected finds including assessment, reporting and stop work orders
- Archival recordings undertaken of any heritage items
- Details of any human remains discovered and the exhumation process
- Inspections undertaken in relation to heritage management measures
- Vibration monitoring data for heritage items identified as being at risk of damage as outlined in the CNVMP
- Records of any impacts avoided or minimised through design or construction methods

3 Context and scope

3.1 Historic Heritage

Prior to the start of work all on-site staff will be given a historic heritage induction (see section 6.2). The induction will outline the significance and potential of the site, and the procedures in place to manage the resource.

Within the footprint of the COP Works are locations with the potential to expose evidence of early occupation and settlement, wharf building, and the infrastructure and architecture of maritime and mercantile industries at Millers Point and Darling Harbour. The TSE archaeological investigations in 2018 demonstrated that the historical archaeological resource survives with good integrity in many parts of the site. Archaeological excavations during the COP Works have the potential to provide insights into Sydney's past that are not available from other sources.

The archaeological potential at the site includes:

- Moderate to high potential for evidence of Thomas Agars' pre-1833 infilled jetty
- Moderate potential for the remains of abandoned vessels, refuse and detritus from boatbuilding activities to have been buried by the estuarine sands in areas of low water.
- Moderate potential for mid-century boat sheds and seawalls.
- Moderate potential for evidence of the early foreshore and possibly lime kilns
- High potential for Cuthbert's shipbuilding yard and wharf including a narrow dock that was constructed prior to 1863, evidence of the 1863 and 1865 stone seawalls, and moderate potential for the large timber store and the footings of several peripheral structures.
- High potential for evidence of boatbuilding activity in the form of discarded boat parts, timber offcuts and tools on Cuthbert's wharf surface.
- Moderate potential for Dibbs' modification of the wharf including changes to seawalls and fills to raise the height of the wharf, as well as Dibbs' flour shed and several peripheral structures at the rear of the wharf.

The site is significant at a local level for its ability to contribute to our understanding of development and change in Darling Harbour throughout the nineteenth century, including working conditions and day-to-day life in the shipyards, investment and change in the material culture of altered landscapes and land creation, the influence of topography as a delimiter on construction and the material manifestation of commercial ambition in wharf creation and building construction. The site has the potential to represent these changes as they occurred both through the large-scale developments of Cuthbert and Dibbs, and also through the piecemeal undertakings and modest ambitions of the small landholders on Lots 3 and 4 at the southern end of the site.

The research potential of the site is related to the adaptation and development of the eastern shore of the bay, the day-to-day working conditions of the shipyard, the scale of the undertakings in wharf-building and reclamation. The site is significant at a local level for its ability to represent these changes as they occurred in the nineteenth century development of Darling Harbour and Millers Point.

Evidence of the early nineteenth century occupation and exploitation of the resources in and around Darling Harbour would be rare and would offer a unique representation of these activities that could not be gained from other sources. If remains of Martin's lime kiln and associated contexts or structures survive with good integrity at the site they may be of State significance for their ability to represent early lime-burning technologies in Sydney and the use of naturally occurring shell beds and middens in Darling Harbour for lime burning.

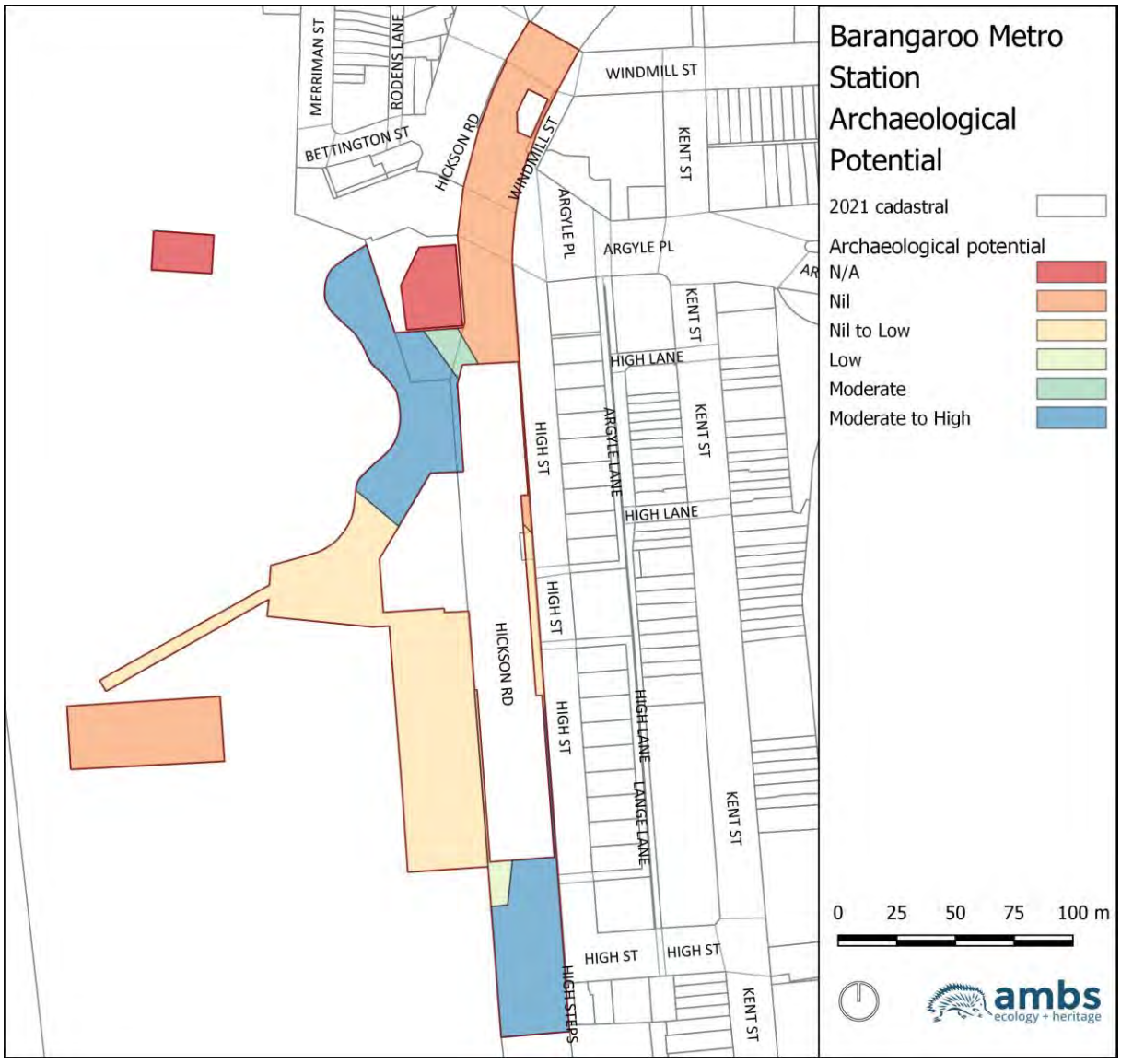


Figure 3.1: Archaeological potential at the site.

3.2 Aboriginal Heritage

Prior to the start of work all on-site staff will be given an Aboriginal heritage induction (see section 8.7). The induction will outline the significance and potential of the site, and the procedures in place to manage the resource.

The results of the TSE archaeological excavations within the Barangaroo station box confirmed that the eastern portion of Hickson Road has been extensively disturbed by the construction of the road, which required cutting into the sandstone to level the area for construction. Archaeological deposits in the eastern portion of the Hickson Road COP Works are likely to have been removed where this has occurred. Likewise, extensive wharf-building activity and the construction of substantial bond stores in the northwest of the site are expected to have had similar impacts. However, in the limited locations where the level of the shoreline was such that it required infilling prior to road construction or wharf building, Aboriginal archaeological deposits or natural sandstone surfaces with potential to retain engravings or rock art may remain relatively undisturbed beneath fill materials. If Aboriginal archaeological items are present at the site, they will be of moderate or high heritage significance.

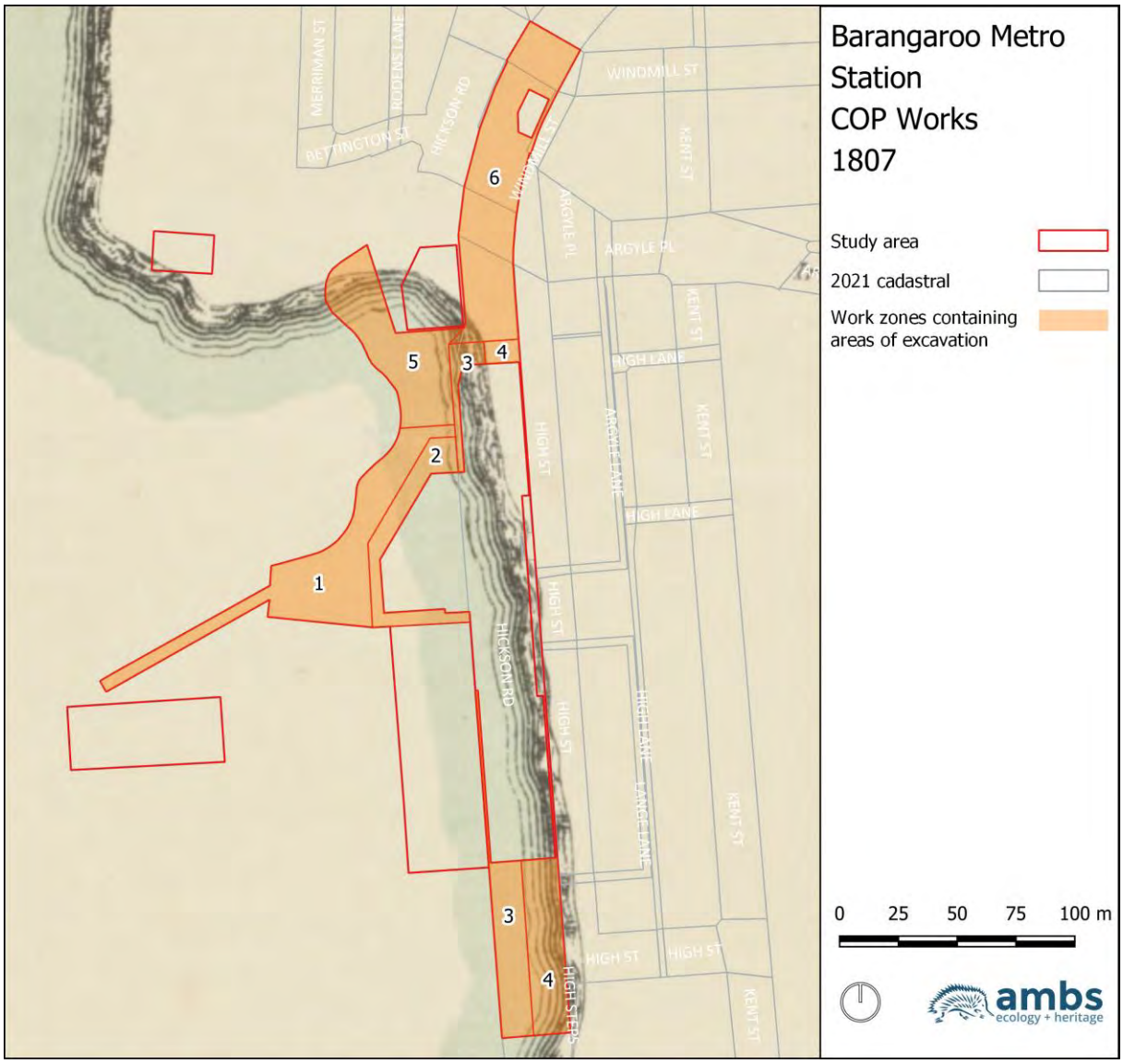


Figure 3.2: The 1807 shoreline relative to the study area, work zones, and areas of excavation.

3.2.1 Heritage investigation and management

The scope of Aboriginal and historic heritage investigation and management entails:

1. Delineating (fencing off) to protect any heritage items to be retained within the Construction Sites and installation of protection measures required to mitigate potential impacts on directly adjacent heritage items
2. Archaeological investigation strategies including:
    a. Development of an archaeological testing, investigation and salvage program for areas identified as having Potential Archaeological Deposit (PAD)
    b. Implementation of the archaeological testing, investigation and salvage program
    c. Reporting on the findings of all archaeological investigations.
    d. Implementation of an unexpected finds procedure

3.2.2 Sydney Metro's heritage scope and responsibilities

Sydney Metro will be responsible for heritage investigation and management not listed in Section 3.2.3 including:

- Archival recording of all other heritage items and streetscapes adjacent to the Construction Site (except those listed in Section 3.2.3)

- Development of the Heritage Interpretation Plans, to meet the requirements of REMM NAH8 and CoA E21. The overarching Chatswood to Sydenham Heritage Interpretation Plan (SM HIP) was submitted to the Secretary on 11th May 2017 (including details of consultation). The site-specific Heritage Interpretation Plan for Barangaroo Station (Station HIP) will be submitted to DPIE prior to the commencement of permanent above-ground works as per the Sydney Metro Chatswood to Sydenham Staging Report (Staging Report).
- Appointment of Peter Phillips who is the appropriately qualified and experienced heritage architect, as required by NAH 6, forming part of the Sydney Metro Design Review Panel and who has provided independent review periodically throughout the detailed design.

3.2.3 BESIX Watpac's COP Works Heritage Scope

The scope of the COP Works includes:

- Fencing off to protect any heritage items to be retained within Construction Sites
- Implementation of the Sydney Metro Exhumation Management Plan if historic or Aboriginal human remains will be disturbed
- Implementation of the Sydney Metro SM HIP and the site-specific Station HIP for Barangaroo Station as relevant to BESIX Watpac's construction activities as the Barangaroo Metro Station
- Site establishment
- Stormwater installation
- Waterproofing of station concrete roof, backfill and installation of landscaping and station entrance cladding, escalators and lifts
- Demolition and removal of the existing red steel girders and road deck. Relocation of services. Complete concrete structure of ventilation pods, waterproof station concrete roof, backfill, install services and relocate the road, kerb and guttering. Install street trees / landscaping and clad the station ventilation and emergency egress stair pods
- Excavation of existing carpark, removal of existing surfaces, installation of new services to the chilled water plant room under Headland Park
- Removal of the northern shaft acoustic shed, infill of the northern shaft with sand; replacement of the road, kerb and landscaping works
- Connecting up and commissioning plant and pipework

The COP Works will require the following heritage investigation and management:
Archaeological investigation strategies including:

- Preparation of Archaeological Method Statements for historical and Aboriginal archaeology
- Development of an archaeological testing, investigation and salvage program for areas identified as having historical archaeological potential and Aboriginal PADs
- Implementation of the archaeological testing, investigation and salvage program
- Processing and analysis of historical and Aboriginal archaeological artefacts
- Preparation of Archaeological Relic Management plan for the unexpected discovery of state significant relics
- Reporting on the findings of all archaeological investigations following completion of all archaeological investigations and issue of clearance certificates.
- Implementation of an unexpected heritage finds procedure
- Implementation of the Sydney Metro Exhumation Management Plan in the event of human remains being discovered.
- Compliance with the Sydney Metro Heritage Interpretation Plan (HIP) as relevant to construction activities at the Barangaroo Metro station.

3.2.4 Heritage Management System Overview

Documents for Aboriginal and historic heritage management on the COP Works are outlined in Table 2.

Table 2 Aboriginal and historic heritage documents

Document type	Aboriginal heritage	Historic heritage
Strategic Assessment	Sydney Metro Aboriginal Cultural Heritage Assessment	Sydney Metro Non-Aboriginal Heritage Impact Assessment Sydney Metro Historical Archaeological Assessment and Research Design
Management Plan	Barangaroo COP Construction Heritage Management Plan (this Plan)	
Methodology Statement	Barangaroo COP Aboriginal Archaeological Method Statement detailing archaeological strategies and methodologies for inspection, testing and salvage (Appendix A)	Barangaroo COP Historical Archaeological Method Statement which includes detailed research questions and archaeological strategies and methodologies for monitoring, testing and salvage excavation (Appendix A)
Construction Protocols	Barangaroo COP Aboriginal and Historic Heritage Management and Unexpected Finds Procedures and Archaeological Relics Management Plans if required (See Section 9.3)	
	Sydney Metro Project Wide Exhumation Management Plan (if triggered)	
Hold Point release letters	Hold Point sign-offs for each item and place recorded	Hold Point sign-offs for each item and place recorded
Certificate	Clearance Certificates for areas after completion of archaeological works	Clearance Certificates for excavation areas after completion of archaeological investigations
Reports	Preliminary archaeological findings reports (40 business days after issue of Clearance Certificates)	Preliminary archaeological findings reports (40 business days after issue of Clearance Certificates)
	Final Aboriginal archaeological report (two years after completion of the entire archaeological investigation program)	Site specific Heritage Archival Reports for each relevant item (two years after completion of recording)

Document type	Aboriginal heritage	Historic heritage
	OEH Aboriginal Heritage Information Management System registration (if required for any unexpected finds)	Final Historical Archaeological Excavation Report (two years after completion of the entire archaeological investigation program)

4 Management of Listed Historic Heritage Items

BESIX Watpac's historic heritage consultant is AMBS Ecology & Heritage. Jennie Lindbergh, AMBS' Director Historic Heritage, will be responsible for directing all aspects of built and industrial heritage within the COP scope, including:

- Provision of written and verbal heritage advice as required on all heritage aspects of the project, and
- Overall responsibility for the quality of all heritage outcomes.

Jennie, has a Master of Heritage Conservation, Architecture, University of Sydney (1998) and has been responsible for significance and impact assessments, management plans and interpretation plans for built and industrial heritage items and places since that time. Since 2017 Jennie has provided high level heritage advice and reports on the Sydney Metro City & Southwest Project for the John Holland CPB Ghella JV, and was the Primary Excavation Director on archaeological excavations at six of the new station sites.
Sydney Metro is currently managing the archival and photographic recordings of affected heritage listed buildings and associated streetscapes. An appropriately qualified and experienced heritage architect was appointed by Sydney Metro to the Design Review Panel and has been involved as part of the Design Review Panel throughout the evolution of the Barangaroo Station design process in accordance with condition NAH6.

4.1 Adjacent Historic Heritage Items

There are a number of listed heritage items that in the vicinity of the COP works requiring management during construction. These are summarised in Table 3 below and have been identified during an environmental risk assessment as requiring management during construction in accordance with CEMP item C4(d). The process for the management of environmental risks is outlined in Chapter 3 of the CEMP. The program for the ongoing analysis of key environmental risks, and a review of the environmental risk register in Appendix I of the CEMP, will take place as outlined in Chapter 3 of the CEMP. Damage to these items will be avoided in accordance with condition NAH11.
Heritage listed items in the vicinity of the COP works are detailed in the sections below.

4.1.1 Warehouses/ Munn Street Bond Stores/ Dalgety Bond Stores

The **Warehouses/Munn Street Bond Stores/ Dalgety Bond Stores (SHR 00526)** group consists of two complimentary warehouse buildings fronting onto what is now the Munn Reserve. They both feature free classical facades but illustrate two distinct phases in warehouse construction – one incorporating a timber structure, the other steel. The original detailing is largely intact , both internally and externally. The group contain a hydraulic pump and lift structure which is given an "A" class listing by the National Trust's IEA Committee. The bale lifts and overhead crane were fabricated by Babcock & Wilcox. (Anglin 1990:1042).
The former Dalgety's Bond Store is a good example of an early stone warehouse, which if retained will maintain a link with the early commercial character of the area, once the hub of Sydney's shipping activity. (M. Stapleton 1978)

4.1.2 Millers Point & Dawes Point Village Precinct

The **Millers Point & Dawes Point Village Precinct (SHR 01682)** is of state significance for its potential to yield information from its archaeological resources not readily available elsewhere. Excavation in Work Zones 3 and 4 will remove the archaeological resource from within the curtilage of the Millers Point & Dawes Point Village Precinct.
The building and archaeological fabric of the place has remained intact through community opposition to redevelopment, resulting in a large number of sites within the locale that remain

comparatively or minimally undisturbed. This physical evidence of the area's history is complemented by the wealth of oral history contained within the existing resident population, which is a rare resource that allows a greater opportunity to understand the historic role of Millers Point and its social frameworks.
Impacts to the Millers Point and Dawes Point Village Precinct include the archaeological resource beneath Hickson Road and potential indirect impacts through vibration caused by construction activities in the vicinity of the Hickson Road Retaining Wall and adjacent structures on High Street. An Historical and Aboriginal Archaeological Method Statement (AMS) have been prepared for the project by AMBS, included in Appendix A, which include mitigation strategies for the removal of the archaeological resource associated with the Millers Point and Dawes Point Village Precinct (Section 6 and Section 8.1.2). A Construction Noise and Vibration Impact Statement (CNVIS) has be prepared that addresses construction activities in the vicinity of the heritage items shown in Figure 4.1. Structures that are assessed as being potentially affected will be monitored to ensure that damage is avoided or minimised throughout the construction period in accordance with condition NAH11.
The Hickson Road Retaining Wall (Section 4.1.3 below) is an important contributory element to the Millers Point & Dawes Point Village Precinct that is within the study area. It is discussed in detail separately.

4.1.3 Retaining Wall, Palisade Fence and High Steps

The Hickson Road **Retaining Wall, Palisade Fence and High Steps (I881, I882 Sydney LEP 2012)** are a contributory element to the **Millers Point & Dawes Point Village Precinct (SHR 01682)**. In July 2017, AMBS Ecology & Heritage prepared a Statement of Heritage Impact (SoHI) for the Hickson Road Retaining Wall, also known as the High Street Cutting, High Street Wall, and the Hickson Road Wall (*High Street Cutting, Millers Point Statement of Heritage Impact*). The report identified the wall as being contributory to the significance of the Millers Point & Dawes Point Village Precinct and as having historic, aesthetic and social significance. The supporting Statement of Significance for the SoHI *Hickson Road Retaining Wall Heritage Significance Assessment Technical Report* was prepared by GML Heritage for the Sydney Metro – City & Southwest – Technical Services in February 2017. GML Heritage also provided the *Hickson Road Retaining Wall Barangaroo Conservation Policy and Guidelines* for Sydney Metro in April 2021.
The Hickson Road Retaining Wall is a significant, contributory built element within the Millers Point and Dawes Point Village Precinct and the Millers Point Conservation Area, an intact residential and maritime precinct of outstanding state significance. The retaining wall is a dominant and relatively intact component of the extensive alterations to the natural topography of Millers Point designed to facilitate the management of cargo into and out of the new two-level finger wharves. The wall incorporated steps at its northern and southern ends to provide improved access to the wharves for stevedores and wharf workers who resided in Millers Point. It provides a dramatic street edge to the eastern side of Hickson Road. The wall has landmark quality and displays an interface of fabrics, comprising the excavated rock face, cement render and masonry construction at the northern end of the wall. While there are varying degrees of erosion and deterioration to the stone/render, as well as intrusive fixtures, signage and penetrations, the retaining wall continues to define the edge of Millers Point and makes a positive contribution to the unique landscape character of Hickson Road.
The Hickson Road Retaining Wall holds social significance as it forms part of the ‘Hungry Mile’, a historic stretch of Sydney’s waterfront where men and women would walk from wharf to wharf in search of employment during the Great Depression of the 1930s. (GML 2017:22-23)
The significance of the High Street cutting and retaining wall as a contributory item of the state heritage Millers Point & Dawes Point Village Precinct should be understood by all on-site staff and construction team to ensure that no inadvertent damage is done to the wall.
Prior to works commencing, all on-site staff will be briefed on the heritage requirements of the High Street Cutting and retaining wall, its heritage significance, and the value of its fabric. There is potential for inadvertent damage to the wall during the nearby construction of the Barangaroo station and the reinstatement of Hickson Road. The CNVIS addresses construction activities in the vicinity of the wall and stipulates that vibration monitoring be undertaken to ensure that damage is avoided or minimised throughout the construction period. Monitoring will include the

use of attended vibration monitors where vibration significant plant is operating within minimum working distances in proximity of the wall. In addition to this, BESIX Watpac will comply with the *Hickson Road Retaining Wall Barangaroo Conservation Policy and Guidelines* (GML, 2021) guidelines for all relevant works and undertake conditions surveys of the wall prior to the commencement of construction on site and at the conclusion of the construction of the station.

4.1.4 Bridges Over Hickson Road

Landmark bridge structures (1869 Sydney LEP 2012) form a "tunnel", and gateway between the Darling Harbour and the Walsh Bay wharf and shipping terminus. Rock excavations and concrete walling form dramatic high walls, and the generous width of Hickson Road emphasises the scale. The structures demonstrate an early use of reinforced concrete in Sydney. The bridges are located on Munn Street, Argyle Place and Windmill Street. The CNVIS has not identified any risk of damage to the bridges due to the vibration caused by BESIX Watpac's construction activities. Notwithstanding this, there is a risk of inadvertent damage to these structures during the removal of the existing acoustic shed currently located in the void between the two bridges. BESIX Watpac will undertake pre-construction condition surveys of both bridges as well as post completion condition surveys to mitigate any direct impact of construction in accordance with REMM NAH11.

4.2 Vibration Considerations

A Construction Noise and Vibration Impact Statement (CNVIS) that addresses the heritage structures in the vicinity (Figure 4.1) has been prepared by Renzo Tonin, The CNVIS has identified that the Munn Street Bond Store / Dalgety Bond Stores (SHR 00526) and the Hickson Road heritage wall (SHR 01682) are the two heritage structures in the vicinity of the station construction activities, within minimum working distances for cosmetic damage to heritage structures (2.5mm/s ppv) if vibration significant plant is operating in the immediate vicinity of these structures. To mitigate any direct impact, in accordance with REMM NAH11, the following measures will be implemented:

- Permanent vibration monitoring equipment will be mounted on the Munn Street Bond Store / Dalgety Bond Stores (SHR 00526)
- Where vibration intensive plant is required to operate within the site-specific minimum working distances, as outlined in the CNVIS, attended vibration monitoring will be undertaken to verify that vibration levels achieve compliance with the structural damage objectives
- If the monitoring being undertaken identifies that vibration is likely to exceed, or is exceeding the structural damage objectives, the construction methodology will be reviewed and, if necessary, additional mitigation measures will be implemented
- Conditions surveys of the Munn Street Bond Store / Dalgety Bond Stores (SHR 00526) and the Hickson Road heritage wall (SHR 01682) will be undertaken in advance of, and at the conclusion of construction activities on site

In accordance with CoA E31, where noise, vibration, or movement monitoring equipment needs to be installed on a heritage structure, a heritage specialist will be consulted to advise on the method and mounting locations of such equipment.

Table 3 Historic heritage items requiring management during construction

Item	Address	Listing	Significance	Potential impact	Mitigation Measures
Warehouses/ Munn Street Bond Stores/ Dalgety Bond Stores	6-20 Munn Street, Millers Point, NSW 2000	00526 SHR	State	CNVIS has identified a risk of damage due to vibration if vibratory intensive plant is operating within minimum working distances of this building. This building will be used as an office during construction, without further modification to the building's interior or exterior.	A permanent vibration monitor will be affixed to this structure as recommended by the CNVIS. A pre and post construction condition survey will also be undertaken. Vibration levels will not be permitted to exceed CVNIS recommendations
Millers Point & Dawes Point Village Precinct	Upper Fort Street, Millers Point, NSW 2000	01682 SHR	State	Major Direct The COP works have the potential to remove the archaeological resource from areas of Hickson Road	Archaeological investigation and salvage, archaeological interpretation
Bridges Over Hickson Road	Argyle Place (And Munn and Windmill Streets), Millers Point, NSW 2000	I869 Sydney Local Environmental Plan 2012	Local	Indirect The COP Works will not have a direct impact on the heritage fabric of this item. There is a risk of inadvertent damage through movement of plant during removal of the acoustic shed.	Protect original fabric against inadvertent damage during Hickson Road replacement works and acoustic shed removal. Pre and post construction condition survey to be undertaken
Retaining Wall, Palisade Fence and High Steps	High Street, Millers Point, NSW 2000	I881 and I882 Sydney Local Environmental Plan 2012	Local	Indirect The COP Works will not have a direct impact on the heritage fabric of this item. There is a risk of inadvertent damage from tools and plant operating in the vicinity of the wall and vibratory damage as identified in the CNVIS. Potential impact during the removal of the protective mesh put in place during the TSE works.	Protect original fabric against inadvertent damage during construction activities. Vibratory intensive plant and equipment will be monitored with attended vibration monitors when operating within minimum working distances of the wall as outlined in the CNVIS An Environmental Works Method Statement (EWMS) to be prepared and issued prior to mesh removal works commence
Cuthbert's Seawall & Deadman Anchor Blocks (re-instated)	Foreshore of Nawi Cove between The Cutaway and 25 Hickson Road, Barangaroo, 2000	HP8. Barangaroo Development Authority – Heritage and Conservation register	Local	Direct The COP Works will necessitate the temporary removal, storage and then reinstatement of these items.	Protect items insitu during tree removal activities. Survey, photo-document, remove, store and re-instate following construction activities.

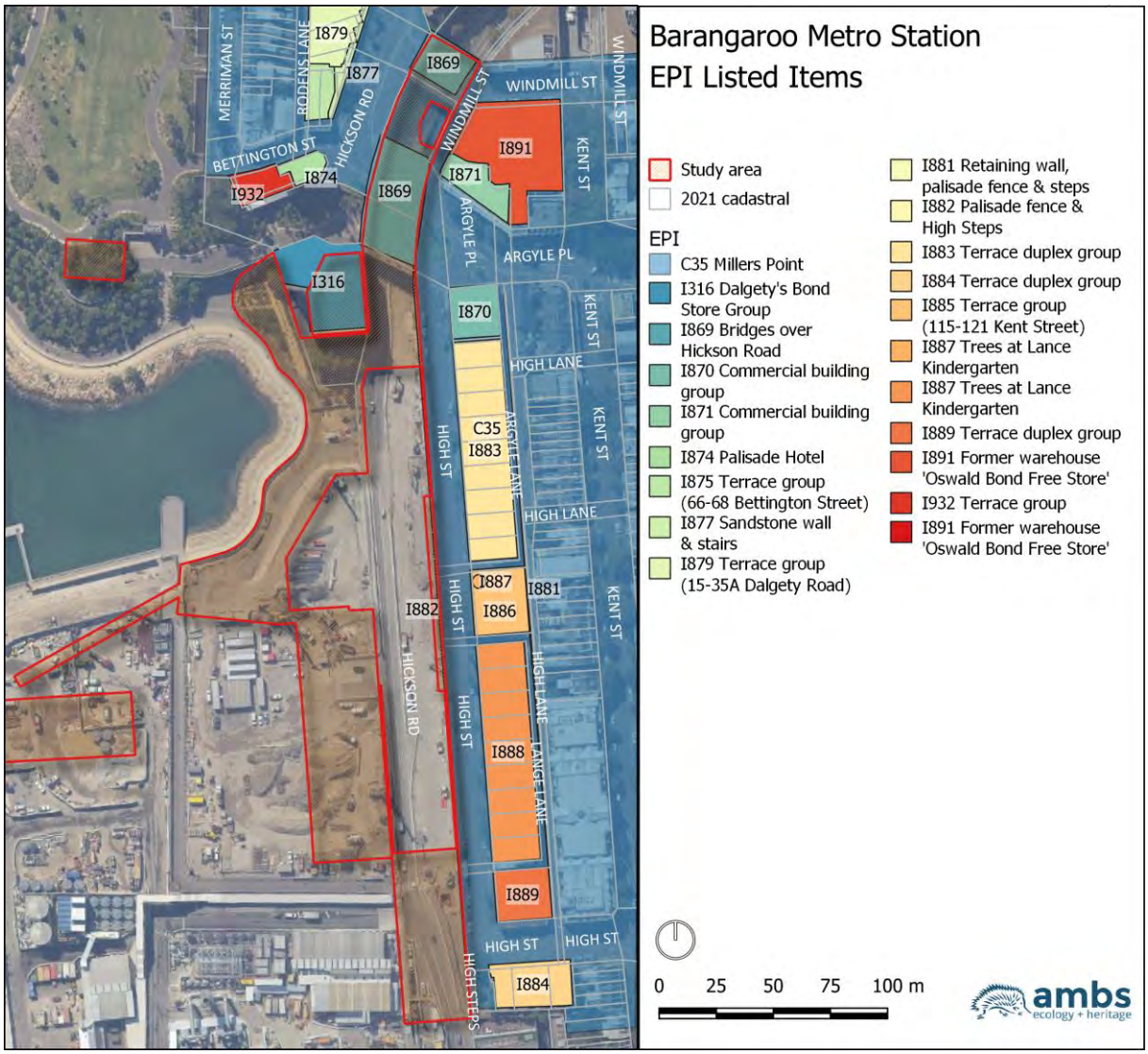


Figure 4.1: EPI listed items in the vicinity of the project area.

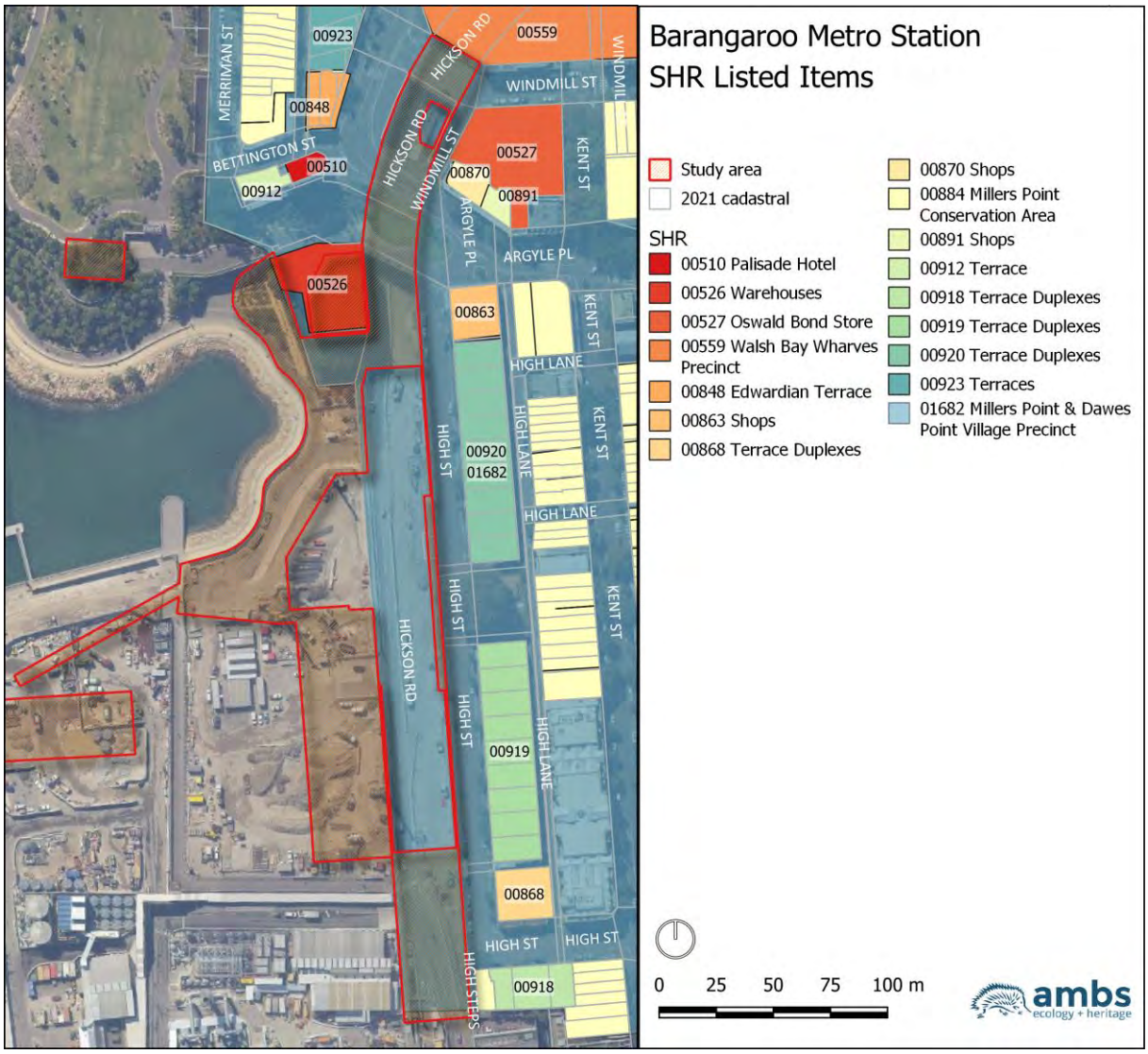


Figure 4.2: SHR listed items in the vicinity of the project area.

4.3 Photographic and archival recording

4.3.1 Overview

The Hickson Road Wall is the only heritage item that requires photographic archival recording at the Barangaroo site as required by CoA E13(b). Photographic and archival recordings of the Hickson Road Wall has already been undertaken by Sydney Metro and was submitted to DPIE on the 22nd December 2019 as part of the following reports:

- Sydney Metro – Chatswood to Sydenham Photographic Archival Recording Report (MGL, August 2019)
- Hickson Road Bridges Archival Recording (Alexander Mayes, April 2018)

4.3.2 Reporting

A memo addressing the impact of the removal of the mesh from the High Street Cutting has been prepared by AMBS however this activity is currently excluded from the scope of BESIX Watpac's construction activities on site

4.4 Protection of Historic Heritage Items to be Conserved

4.4.1 Overview

The boundary of the construction worksite will be fenced to prevent construction personnel and plant from inadvertently damaging listed heritage items or sites outside the construction footprint. As noted in Table 3, the COP Works are likely to have a potential impact on the following heritage items:

- Millers Point & Dawes Point Village Precinct (including the Hickson Road Retaining Wall)

Where works are taking place in proximity to any of the identified heritage items the heritage status of these items should be incorporated into safety planning sessions like High Risk Workshop and documented. This documentation should be updated post planning sessions to reflect the content covered and/or discussion points should be included in minutes of meetings held. Subcontractor methodology documentation should be reviewed in advance of the works and progressively updated as required to ensure all heritage risks of the works are communicated and reviewed appropriately.

Where there is a potential risk of physical impact to heritage listed items, the nominated heritage consultant for the Site should review proposed methodologies and provide advice as required to ensure the materials, equipment and techniques used are appropriate to the conservation of the heritage fabric. Special attention should be paid to methodologies where works are physically adjoining or attached to heritage items.

4.4.2 Millers Point & Dawes Point Village Precinct

Millers Point & Dawes Point Village Precinct is of state significance for its ability to demonstrate, in its physical forms, historical layering, documentary and archaeological records and social composition, the development of colonial and post-colonial settlement in Sydney and New South Wales. Millers Point & Dawes Point Village Precinct is of state significance under SHR Criterion (e) for its potential to yield information from its archaeological resources not readily available elsewhere.

The archaeological resources which may be affected by the Barangaroo COP works are located beneath Hickson Road and fall within the curtilage of the Millers Point and Dawes Point Village precinct. The SHR listing for the item notes that much of Millers Point retains high archaeological potential, as demonstrated in reports by Higginbotham et al, notably Observatory Hill, Fort Street School and its immediate environment, and under all c.1900 buildings, external spaces and asphalted areas.

Millers Point is notable for the presence of the earliest known above-ground archaeological structures relating to Fort Phillip. Archaeological significance and potential to reveal items of historical merit is considerably higher than elsewhere in the Sydney CBD.

The archaeological resources in this area have been assessed as locally significant by the AARD and historical Archaeological Method Statement (AMS), with the possible exception of an early lime kiln, the historical location of which is uncertain, but may be within the study area footprint, and would be of State significance if it survived with good integrity.

The mitigation for the impacts to the archaeological resource is archaeological salvage excavation, analysis, reporting and interpretation of finds as detailed in the project AARD and historical AMS and outlined in Section 6 and Section 8.1.2. The AMS is provided in Appendix A.

5 Historical Archaeological Investigations

5.1 Excavation Directors

5.1.1 Mike Hincks, Historical Archaeology Primary Excavation Director

AMBS Senior Historic Heritage Consultant, Mike Hincks, will lead historic heritage investigation and archaeological investigations on the COP Works. Mike takes the lead on many historic heritage projects and provides high-level advice on heritage issues for government agencies and private sector clients.

Mike is a Senior Heritage Consultant with over 15 years' experience in commercial heritage management in NSW, including over 9 years' experience as a Senior Archaeologist and Heritage Consultant in historical archaeology in Sydney and over 5 years' experience in Aboriginal archaeology across NSW. Mike has been Primary Excavation Director for locally significant projects in Sydney and Parramatta, and Secondary Excavation Director for state significant projects in Western Sydney and Parramatta including testing at the Female Factory site, Cumberland Hospital, North Parramatta, and open area excavation of the 1813 Market/Annual Feasts site at 7PS, Parramatta. Mike has managed excavations at World Heritage listed Cockatoo Island and Old Government House. He has managed large teams and multiple trenches on complex maritime industrial sites at Barangaroo and Darling Quarter. Mike has written excavation reports, assessments, SoHIs and interpretive works for many archaeological and built heritage sites in NSW.

Mike was secondary Excavation Director on the Barangaroo Station TSE Works archaeological investigations for Casey & Lowe in 2018 and has been excavation director or site director on many similar maritime sites in Sydney including Darling Quarter (2009), Cockatoo Island (2010), Barangaroo South (2010-11), and Darling Square (2016).

5.1.2 Lian Ramage, Historical Archaeology Secondary Excavation Director

Secondary Excavation Director Lian Ramage will assist with the on-site day-to day management of the excavations, as appropriate and under the direction of the Primary Excavation Director. Lian Ramage is an archaeologist with over ten year's archaeological experience and has participated in heritage projects across Australia and internationally in the UK and Italy. She has experience in the successful completion of Historical assessments, archaeological surveys, excavations, and post excavation analysis of Historical artefactual material. She has authored reports including Historical Impact Assessments, Statements of Heritage Impact, Archaeological Assessments and Historical Archaeological Excavation reports and written the artefactual analysis components for Historical Archaeological Excavation reports.

Her specialist skills include the excavation and analysis of human osteological material and analysis of Australian faunal skeletal material. She has extensive experience in archaeological surveys and historical excavations on sites dating from early colonisation to later European settlements. She is an experienced project manager and specialises in large scale historical excavations successfully running field teams and training student archaeologists in historical excavation methods. She has proven historical expertise and meets the Heritage Council's Excavation Director's Assessment Criteria for section 140 archaeological excavations. Additional detail and response to excavation director's criteria is provided in Appendix B.

5.1.3 Additional Archaeological Resources

AMBS will assemble a team of experienced archaeologists to be available to work at the Barangaroo site including Site Supervisor AMBS Historic Heritage Consultant James Cole and Historic Heritage Consultant Madeline Rodwell
AMBS will also be adding Cosmos Coroneos of Cosmos Archaeology, to the team as the maritime archaeologist, if required. Cosmos was involved in the recovery of the 180s boat (UDHB1) during the TSE Works archaeological excavations at Barangaroo in 2018 and has over 25 years experience in maritime archaeology.
Additional detail is provided in Appendix B.
In addition, AMBS will recruit recent graduates and junior archaeologists, who will be closely monitored and trained to develop their excavation and analysis skills during the excavations.
A key team member will be the archaeological surveyor who will establish site data, set out grids and provide spatial data in support of all archaeological investigations. Watpac will also provide additional personnel, plant and equipment to support the archaeological excavations.

6 Historical Archaeological Method Statement

A historical Archaeological Method Statement has been prepared for the Barangaroo COP works, in accordance with Condition E17. The historical Archaeological Method Statement is one of two AMS's prepared for the project. The Aboriginal Archaeological Method Statement is discussed in section 8.1.2. The method statements are provided in Appendix A.

AMBS has undertaken additional research to verify the findings of the EIS AARD with regard to the likely archaeological potential at the site. The research included analysis of historic maps and plans and other primary sources as well as the preliminary results of the Barangaroo TSE archaeological excavations. The archaeological potential of the site has been further refined in the Archaeological Method Statements for historical and Aboriginal archaeology. The scope of archaeological investigations will be determined by the final design and impacts for the COP works. Archaeological testing prior to the works is recommended to establish the depth and integrity of the archaeology, followed by open area salvage excavation where impacts will occur. The historical Archaeological Method Statement includes additional research and an appropriate strategy for managing the archaeological resources, in accordance with the likely significance, integrity and research potential. The method statement includes research questions and a research design to guide the archaeological methodology.

Two large-scale open area archaeological excavations have taken place within and adjacent to the study area in the last 8 years. In 2013 Austral Archaeology undertook archaeological investigations within Hickson Road and to the northwest of the study area as part of the construction of Nawi Cove. In 2018, Casey & Lowe undertook open area investigation of the station box for Barangaroo Metro station. Archaeological excavations by Austral within the Northern Cove Excavation area primarily identified remains associated with shipbuilding and maintenance and land reclamation, firstly, relating to Munn's (1824-1848) occupation of the site, then to Cuthbert's Shipbuilding Yard (1854-1875). Following this was the construction of Dibbs' Wharves (c.1875-1899), then the resumption of the land followed by the establishment of a concrete seawall (1900-1907). The investigations by Casey & Lowe encountered substantial archaeology in five areas:

In Areas R and T (immediately adjacent to Work areas 1 and 2 in the current project), the investigations found evidence of Cuthbert's shipbuilding yard and wharf (1854-1875) and Dibbs's seawalls and wharfage (c.1875-1899). The remains included timber debris, extensive evidence of woodworking and distinct areas of activity on Cuthbert's wharf surface. Cuthbert's seawalls and a slipway, and piles for suspended wharfage were also found in good condition. Modifications to the walls and slipway that were undertaken by Dibbs, and contemporary public steps and paving were found at the termination of Clyde Street. Cuthbert's wharf and shipbuilding yard, and buildings associated with Dibbs' use of the wharf are also partly located within Work Zones 1, 2 and 5 of the current project.

The remains of a rocky and sandy intertidal zone that predated the extension of Clyde Street was found beneath Hickson Road (in Area X), next to the foundations of an 1830s house. Partly buried by the beach sand was the remains of a 30ft boat that had been abandoned prior to the construction of Cuthbert's wharf. Similar intertidal environments are thought to have existed within the current study area adjacent to boatbuilding businesses in Work Zones 3 & 4 South.

In Areas Y and Z were the remains of late nineteenth century wharf structures, built on the outcropping sandstone and reclaimed land beneath Hickson Road. The truncated remains of a well or cistern associated with housing on Wentworth Street was located in Area Z adjacent to Work Zones 3 & 4 North, and Work Zone 6.

Based on the results of the excavations and further research, an updated assessment of archaeological potential was prepared for the historical AMS. The updated assessment of archaeological potential is shown in Table 4 and Figure 6.1. A mitigation strategy of archaeological excavation and recording has been developed based on the assessment of potential and is discussed in sections 6.1.1-6.1.4 and section 7 below.

Table 4 Archaeological potential at the site

Work Zone	Phases represented	Archaeological potential	Comments
3 and 4 (south)	• Early development of the foreshore (Phase 1: 1788-1830) • Mid-century boat sheds (Phase 2: 1830-1900) • Late nineteenth-century wharf construction (Phase 2: 1830-1900)	Moderate-High	This area has Moderate to high potential for evidence of Thomas Agars' pre-1833 infilled jetty including cut stone or rubble walls and working surfaces. The empty beachfront of the adjacent government land is likely to have been permissively used and may contain residential or commercial refuse or offcuts and discards from nearby boatbuilding activities. The low water and undeveloped beach in the northern part of this area is likely to have been a similar environment to that in which UDHB1 was found during the Station Box excavations. There is potential for the remains of abandoned vessels to have been buried by the estuarine sands along this stretch of beach. The mid-century boat sheds depicted on the 1865 survey were demolished prior to the construction of the filled-in wharf (c.1876). It is possible that the structural material of the sheds was used as part of the infill and highly likely that the foundational piles of these structures will remain buried beneath the wharf fills. There may be evidence of partially completed seawalls which were not finished prior to resumption in 1901.
1, 2 and 5	• Early foreshore (Phase 1: 1788-1830) • Cuthbert's shipbuilding yard (Phase 2: 1830-1900) • Dibbs' wharf and stores (Phase 2: 1830-1900) • Gibb & Bright's bond and wool stores (Phase 2: 1830-1900)	Moderate-High	This area has Moderate potential for evidence of the early foreshore including Martin's narrow jetty (it may be located further to the northeast). There is High potential for evidence of Cuthbert's shipbuilding yard and wharf including a narrow dock that was constructed prior to 1863, evidence of the 1863 and 1865 stone seawalls, and moderate potential for the large timber store and the footings of several peripheral structures. The narrow dock appears to have been short-lived, and its infill and construction methods may contain evidence of why that was so. It is also likely to contain evidence of boatbuilding such as offcuts and abandoned boat parts that found their way into the dock while it was in use. Previous excavations by Austral and Casey & Lowe suggest that there is a high potential for evidence of boatbuilding activity in the form of discarded boat parts, timber offcuts and tools on the wharf surface. There is moderate potential for evidence of Dibbs' modification of the wharf including changes to seawalls and fills to raise the height of the wharf, as well as Dibbs' flour shed and several peripheral structures at the rear of the wharf. The scale of the woolstore recorded in 1894 suggests that this is the most likely structure to have left substantial evidence.
1, 2 and 9	• Construction of Dibbs' finger wharfs	Nil-Low	This part of the study area was not infilled until the second half of the 20th century and was deep water throughout the 19th century. Although evidence of Dibbs' finger wharfs may remain, it is likely to only be in the form of cut-down timber piles, which have no research potential or significance of their own. The archaeological potential of this area is therefore considered to be Nil-Low.
8	None	Nil	This part of the study area was deep water until the second half of the twentieth century and has no archaeological potential.
10	N/A	N/A	This part of the study area is Dalgety's stores which will be used as a site office without modification. An assessment of archaeological potential for this area is not relevant to the project.

Work Zone	Phases represented	Archaeological potential	Comments
7	N/A	N/A	This part of the study area is the site of service connection works in existing service pits without modification. An assessment of archaeological potential for this area is not relevant to the project.
3	• Early development of the foreshore (Phase 1: 1788-1830) • Mid-century boat sheds (Phase 2: 1830-1900) • Late 19th century wharf construction (Phase 2: 1830-1900)	Low	This area is on the periphery of the activity associated with the foreshores of Lots 3, 4 and 5 of Section 93. However, in 1887 it was recorded as being at Low Water and may contain intertidal refuse and other peripheral evidence of activities on the shore. This area is considered to have Low potential for significant archaeology.
3 and 4 (north), 6	• Hickson Road construction	Nil	This area has no potential for pre-Hickson Road archaeology. The original landform in this area has been completely removed.
4 (north)	• Early shoreline (Phase 1: 1788-1830)	Nil-Low	1887 contours suggest that remnants of unmodified outcropping sandstone or evidence of wells or other deep features cut into it may survive. However, this is considered unlikely and the potential for this area is Nil to Low.
3 (north) and 5	• Early foreshore, Martin's jetty and buildings (Phase 1: 1788-1830)	Moderate	There is Moderate potential for evidence of the early shoreline and Martin's Jetty, limekiln or structures to survive beneath this part of Hickson Road. 1887 contours suggest that the surface of the landform prior to the construction of Hickson Road may be partially preserved in this area.

6.1 Scope of Test and Salvage Excavations

Historical archaeological test and salvage excavations will be undertaken where there is a Moderate to High potential for archaeological remains at the site. Archaeological monitoring and unexpected finds procedure will apply to other areas of the site as set out in the historical Archaeological Method Statement.
Where there is a Nil, Nil to Low or Low assessment of potential, the Sydney Metro Unexpected Heritage Finds Procedure [SM-18-00105232] will be will be in place, and no archaeological investigation will be required prior to works commencing.

6.2 Heritage Induction

Prior to the start of work all on-site staff will be given a heritage induction. In addition, regular toolbox talks will be presented when site conditions change and/or new staff join the on-site team. Each induction/toolbox will comprise an illustrated easy to understand presentation and hard copy, which will include:

- Understanding the heritage significance of the anticipated archaeological resource, including
- Repercussions of any breaches to the approved archaeological strategy

- Understanding the unexpected finds procedures
- The nature of the archaeological resource
- Maps showing location of anticipated archaeological features
- Photographs of the types of anticipated archaeological features

6.3 Archaeological Testing and Monitoring

Archaeological testing will be undertaken in areas of Moderate-high potential to establish the depth of archaeology and to confirm its integrity in those areas. If it is found that the impacts will exceed the depths of the top of the nineteenth century archaeology, then open area stratigraphic excavation would proceed to salvage all archaeological remains within areas of impact. The testing will be directed by Mike Hincks, primary excavation director for the project.

Three trenches of 10m x 2m are proposed to be excavated within areas of Moderate to High archaeological potential. If the results are ambiguous, a fourth trench may be needed in either the southern area of Work Zones 3 and 4 or in Work Zones 2 and 5. Archaeological testing under the direction of the Primary Excavation Director will verify the presence of significant archaeological resources.

If no evidence of significant archaeology is encountered in the test trenches in areas of Moderate to High potential, the works may proceed under the unexpected finds procedure. If isolated areas of significant archaeology are encountered they will be excavated and recorded archaeologically and salvaged from the areas of impact.

Archaeological monitoring will be undertaken in areas of Moderate archaeological potential. If significant archaeology is encountered then open area stratigraphic excavation would proceed to salvage all archaeological remains within areas of impact. Monitoring will be undertaken by Mike Hincks.

If there are no underlying archaeological relics, features or deposits in the areas under investigation, the Primary ED will attend the site to verify and a Clearance Certificate will be prepared by the Primary ED to inform the project team and Proponent in writing.

There is potential that unexpected relics may be exposed during site works, which will be addressed by the Primary ED (see Section 7.6 below).

Where a significant archaeological resource with good integrity is exposed, open area excavation will proceed following removal of the overburden and once the area has been made safe to salvage the archaeological remains.

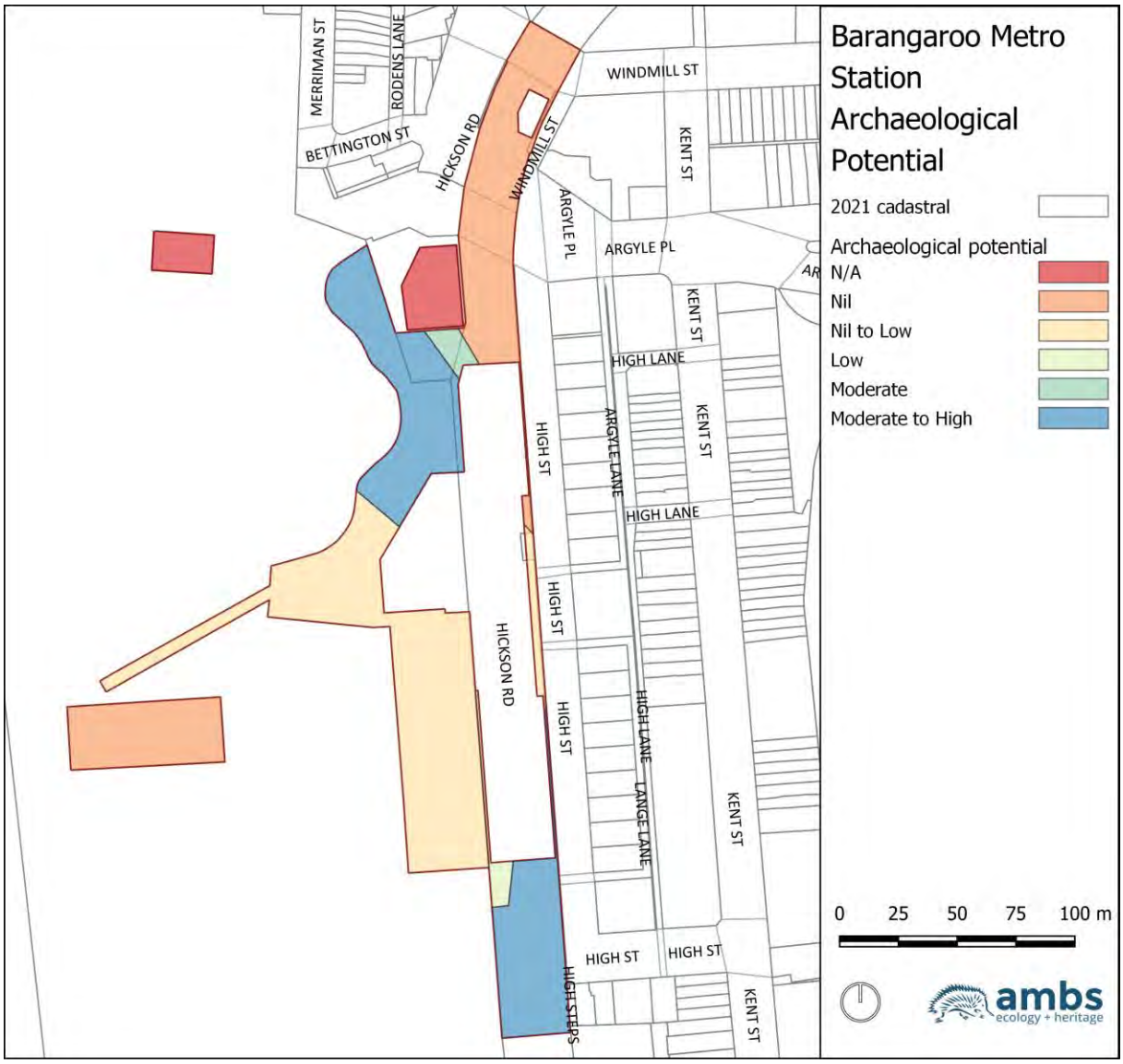


Figure 6.1: Areas of historical archaeological potential at the Barangaroo COP site.

6.4 Open Area Salvage Excavation

The extent that open area excavation will be required will not be known until the specific area of impact and the depth and nature of significant archaeology is established. Excavations will be directed by the Primary ED, Mike Hincks, assisted by Secondary ED Lian Ramage and Archaeologist James Cole. The team may comprise up to 20 archaeologists if large areas of the site are required to be salvaged, though this may increase or reduce in accordance with the site archaeology.

Excavation will be in accordance with the following methodology to ensure that all significant archaeological relics, features and deposits are appropriately managed and recorded:

- Establish a site datum and lay out a grid, relevant to the size of the site, 10m, 20m or 50m, across the site in order to record the levels of extant deposits, features and relics;
- Significant features will be recorded in detail and excavated manually under the supervision of the excavation director
- All significant archaeological deposits, features and relics that are exposed during the excavations will be recorded in accordance with heritage best practice standards.

Recording will include:

  - Cleaning features to facilitate photographic recording;
  - Scale plans;
  - Elevations of features, if relevant;
  - Digital photographs (in JPG and RAW format); and
  - Photogrammetry
  - Site survey; and
  - Detailed description of the feature, deposit or relic to ensure that a clear and comprehensive record of the archaeological resource of the site is preserved for the future.
- Sequential numbering of features and deposits to facilitate preparation of a Harris Matrix and artefact labelling;
- Preparation and development of a Harris matrix, to show stratigraphic relationships between all recorded archaeological features and deposits;
- All information regarding the location, dimensions and characteristics of all recorded archaeological features and deposits will be recorded on pro-forma context sheets;
- Collection of all significant artefacts for analysis, except from non-significant unstratified fill. Samples of bricks and mortar will be collected from each structure, as relevant;

Soil samples will be taken from topsoils, cesspits and other relevant deposits for analysis by a palynologist. The results of the analysis should provide an insight into the indigenous and introduced flora of the locality and diet of the local community.
A Clearance Certificate will be issued by the Historic Excavation Director for each site requiring archaeological testing or excavation and recording after investigations are completed at that particular location.

7 Unexpected Heritage Finds

The Project Planning Approval defines 'Unexpected heritage find' as "A potential heritage item discovered (usually during construction) but not identified in the EIS or PIR, where assessment is required to determine if the item has heritage significance, or is an Aboriginal object. Unexpected heritage finds does not include human remains."
Archaeological testing will not be needed in areas identified as having little or no potential for archaeological resources to be present and as such the Unexpected Finds Protocol outlined in the AMS applies:

- To areas which are not subject to the detailed archaeological investigations set out in the AMS
- To unexpected heritage finds uncovered in the areas that are subject to the detailed archaeological investigations set out in the but may be the relics of a previous land use that was previously unknown.

Unexpected heritage finds will be managed in accordance with the *Sydney Metro Unexpected Heritage Finds Procedure* [SM-18-00105232]. The procedure has been prepared for Sydney Metro to provide a method for managing unexpected heritage items (both Aboriginal and non-Aboriginal) that are uncovered during construction and for works subject to the NSW Heritage Act (1977). The procedure provides a simple-to-follow flowchart outlining the steps to follow if unexpected heritage items are discovered during construction and has been included in Appendix E.

7.1 Archaeological Relics Management Plan

Project Planning Approval Condition E20 requires preparation of an Archaeological Relic Management Plan if a relic is unexpectedly found during investigations or construction. Conditions E19 and E20 essentially overlap and must be considered simultaneously to determine required consultation and the need for additional management documentation. The preparation of an Archaeological Relics Management Plan will be limited to unexpected relics of State significance discovered during construction.
Locally significant unexpected heritage finds will be addressed in the Unexpected Finds Protocol contained within the AMS, without the need for any additional management documentation or consultation prior to implementation.
In the event of an unexpected State significant find, an Archaeological Relics Management Plan will be prepared and will include the appropriate management for such relics.
If unexpected finds or archaeological features are exposed, work will stop in the affected area and the Historic/Aboriginal Excavation Director(s), who will be on call during this stage of works, will be contacted to assess the integrity and significance of the exposed relics. They will then identify the appropriate management of the relics.
Human remains are not expected to be unearthed in delivering the COP Works. As such, in accordance with the note for Project Planning Approval Condition E27, it is highly likely that any human remains uncovered as part of the COP Works would be under the jurisdiction of the NSW State Coroner and must be reported to NSW Police immediately. If any human remains are located NSW Police Force will be immediately notified. If required, Sydney Metro's Exhumation Management Plan will be implemented.

7.2 Hold points to be Released by Primary Historic Excavation Director

The Excavation Director(s) will be responsible for releasing the following Hold Points:

- Historic excavation identifies Aboriginal artefacts or intact remnant soil profiles requiring Aboriginal archaeological test excavations
- Historical archaeological excavation or inspection identifies intact remnant soil profiles or Aboriginal artefacts requiring archaeological test excavations

- Historical/Aboriginal archaeological salvage excavation exposes unanticipated significant deposits requiring extended excavation or analysis
- Unexpected finds are encountered
- State significant finds are encountered and a Relics Management Plan is required

7.3 Clearance Certificates

Primary Historic/Aboriginal Excavation Director(s) will provide written advice that all archaeological investigations within an area have been completed and issue clearance certificates to allow works to commence or resume.

7.4 Analysis and Reporting

A Preliminary Archaeological Report on the archaeological investigations at each site will be finalised 40 business days after issue of Clearance Certificates and provided to Sydney Metro to assist in heritage interpretation and should also be issued to the Heritage Council for their information.
Condition E18 requires preparation of a final archaeological excavation report. The Historical Archaeological Excavation Report will be prepared in accordance with the standard requirements of an Excavation permit issued by the Heritage Council:

- An executive summary of the archaeological programme;
- Due credit to the client paying for the excavation, on the title page;
- An accurate site location and site plan (with scale and north arrow);
- Historical research, references and bibliography;
- Detailed information on the excavation, including the aim, the context for the excavation, procedures, treatment of artefacts (cleaning, conserving, sorting, cataloguing, labelling, scale photographs and/or drawings, location of repository) and analysis of the information retrieved;
- Nominated repository for the items;
- Detailed response to research questions (at minimum those stated in the approved Research Design);
- Conclusions from the archaeological programme. The information must include a reassessment of the site's heritage significance, statement(s) on how archaeological investigations at this site have contributed to the community's understanding of the site and other comparable archaeological sites in the local area and any relevant recommendations for the future management of the site information and artefacts;
- Details of how this information about this excavation has been publicly disseminated (for example provide details about Public Open Days and include copies of press releases, public brochures and/or information signs produced to explain the archaeological significance of the site).

The Historical Archaeological Excavation Reports will also include:

- Detailed catalogue of artefacts, in accordance with Best Practice and as set out in the Archaeological Research Design and Method Statement.
- Description and Analysis of artefacts from main contexts.
- Location for the repository for the storage of artefacts in perpetuity.

Artefact processing and analysis will be in accordance with the system developed by AMBS and currently in use for the other Metro sites excavated by AMBS; Crows Nest, Chatswood, Sydney Metro South and Waterloo. The database for the site will be included in the Excavation Report for the site.
Processing, analysis and storage of the artefacts for the duration of the project will be conducted at AMBS premises. However, a repository for the long-term storage of the artefacts from the Sydney Metro project will be required to be provided by Sydney Metro.

The report will be submitted to Sydney Metro, and the Heritage Council within two years following completion of all archaeological investigations for the Project, in its entirety.

7.5 Future Research

The focus of research questions changes from generation to generation. Information gained during excavations, analysis of artefacts and the archaeology would make a significant contribution to on-going and future research for students, archaeologists and historians and as such, the information should be made freely available. This would include ensuring a secure and accessible repository for the artefacts, to be available for further research.

8 Aboriginal Heritage Investigation

8.1 Chris Langeluddecke, Aboriginal Heritage Excavation Director

AMBS Director Aboriginal Heritage, Chris Langeluddecke will be the Aboriginal Heritage Excavation Director for the COP Works and responsible for Aboriginal heritage investigations at the site.
Chris has more than 16 years of experience as a consultant working in the field of Aboriginal archaeology, community consultation and heritage management planning. Before becoming a founding director of AMBS, he was engaged as an archaeologist for nine years with Australian Museum Consulting and three years with global provider Environmental Resources Management (ERM). Prior to that, for two years as a project officer with the Tasmanian Aboriginal Heritage Office he established site maintenance programs within Tasmania's World Heritage Wilderness Area. Chris has a comprehensive knowledge of current Australian Aboriginal heritage management practices and archaeological methodologies, and has extensive experience working with State and Commonwealth heritage legislation and management planning requirements.

8.2 Aboriginal Archaeological Method Statement

An Aboriginal Archaeological Method Statement (AMS) for the Works has been prepared in accordance with Condition E17, E23 and E24 and in accordance with AH2 (Appendix A). The Aboriginal AMS includes a mitigation strategy involving archaeological inspections, test excavation (when required) and salvage excavation (when required) in accordance with condition AH3. The excavation strategy is outlined in section 8.1.3 below. AMBS has undertaken additional research to verify the findings of the EIS ACHA with regard to the likely Aboriginal archaeological potential at the site. The additional research included analysis of geotechnical boreholes, maps and plans and other historical documents included in the historical Archaeological Method Statement, as well as archaeological inspections that were undertaken during the TSE historical archaeological investigations and the preliminary results of those works.
Historical archaeological excavations for the Barangaroo station box and TSE in 2018 (Casey & Lowe, 2019) exposed parts of the original shoreline beneath Hickson Road including outcropping sandstone and intertidal estuarine deposits. The outcropping bedrock had been heavily modified both by nineteenth century structures and wharfs, quarrying for land reclamation, and by the cutting down of the landform to create Hickson Road. Beach sands, where present, were found to be the product of nineteenth century deposition and contained large quantities of refuse and detritus from the adjacent shipbuilding activities. Inspections of historical archaeological excavation Areas X and Y by Aboriginal Heritage Excavation Director Chris Langeluddecke found no evidence of intact Aboriginal archaeological deposits.
The western portion of the Barangaroo Station footprint was demonstrated to be below the low-water mark prior to European occupation, and contained only evidence of wharf building and reclamation.
The historic Archaeological Method Statement for the COP works (AMBS 2021) has built on the results of the 2018 excavations which demonstrated multiple phases of development and reclamation along the shoreline. The majority of the COP study area was below the low-water mark prior to European development in the area. The approximate location of the original shoreline in relation to the study area is presented in Figure 8.1.
Reclamation and development began to encroach into the harbour from the 1830s, with wharves, jetties, warehouses and stores being established along the foreshore. A quarry was active in the south of the study area from the 1840s until at least the 1850s. During the 1950s, finger wharves were infilled, significantly expanding the land reclamation in the study area. In the northwest of the site (Work Zone 5), wharf-building and the construction of substantial woolstores and bond stores at the water's edge is expected to have had a considerable impact (Historical AMS, pp. 15-17). The northern portion of Hickson Road in Work Zone 6 was shown to have been cut down up

to 12m from 1887 levels, and Work Zone 6 was assessed as having Nil archaeological potential (Historical AMS, pp. 9, 35).
A mitigation strategy of inspections and trigger points for further investigations was considered appropriate for the level of archaeological potential at the site. The mitigation strategy is discussed in sections 8.1.3-8.1.8 and section 9 below.

8.3 Scope of Aboriginal Archaeological Investigations

Archaeological inspections will be undertaken by an AMBS archaeologist at Barangaroo, following clearance of historic materials, to determine the presence of intact remnant soil profiles or artefacts. Archaeological test excavations would be undertaken from the information provided in the projects Aboriginal Cultural Heritage Assessment Report (ACHAR).Inspection results will guide the need for Stage 1 archaeological test excavations in accordance with AH3. Inspections will be triggered by the historical archaeologist during monitoring or excavation, or through the Sydney Metro Unexpected Heritage Finds Procedure [SM-18-00105232] in accordance with CoA E25.
A program of archaeological excavations will be required where:

- Identified areas have the potential to retain subsurface Aboriginal archaeological deposits
- Clearance inspections or historic archaeological excavations identify Aboriginal artefacts or intact remnant soil profiles

Intact soil profiles are most likely to be located in the east of the site, wherever the pre-colonial shoreline has not been dramatically disturbed (Figure 8.1).

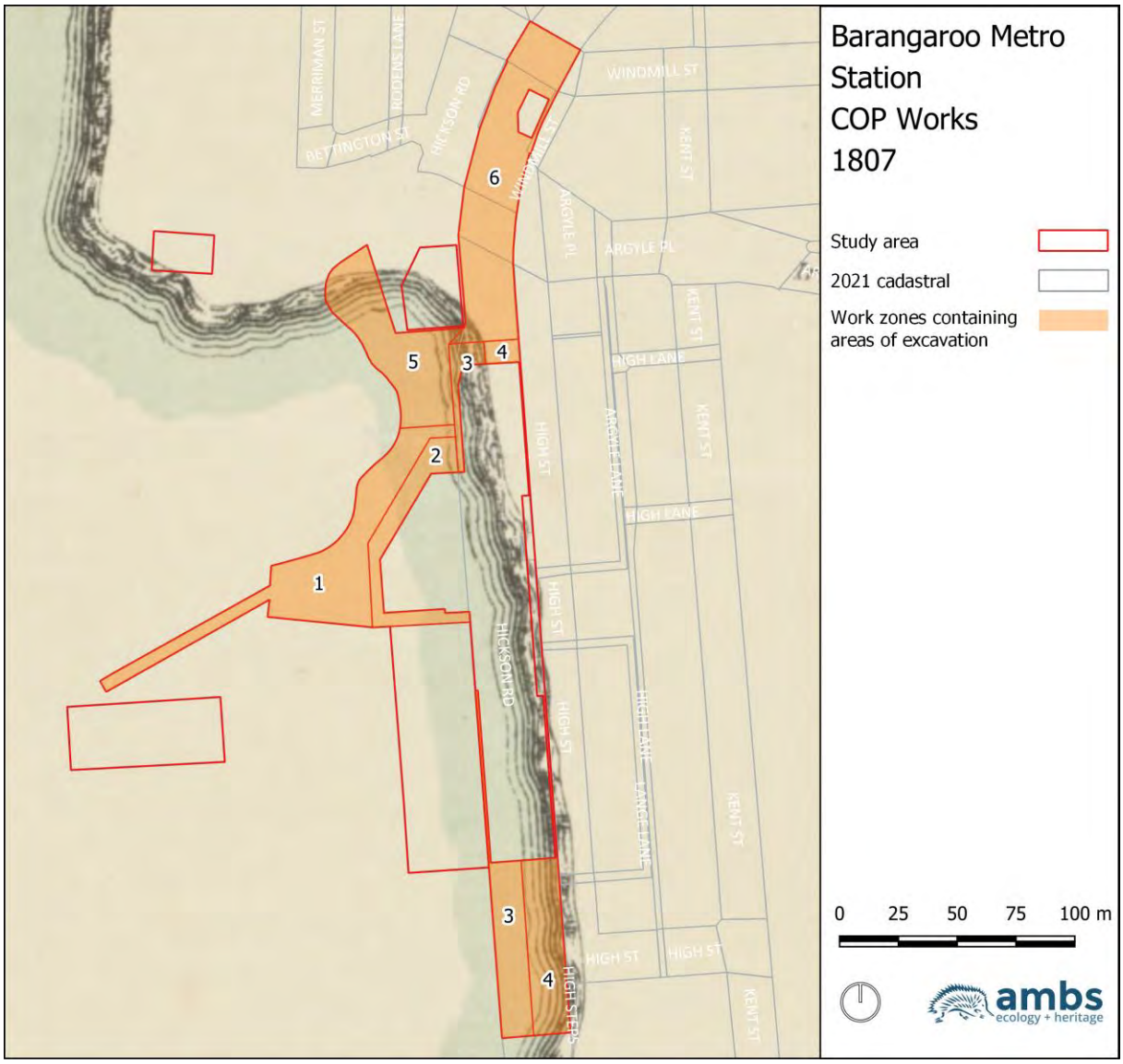


Figure 8.1: The 1807 shoreline in relation to excavation works at Barangaroo. Aboriginal archaeology-bearing deposits are most likely to be located in the vicinity of, or east of this shoreline.

Stage 1 test excavations will only be required if intact remnant soil profiles or Aboriginal artefacts are located during historic excavations.Where test excavations identify archaeologically significant or intact Aboriginal heritage deposits, Stage 2 archaeological salvage excavations will be undertaken. The extent of the Stage 2 salvage excavations will be determined by the Stage 1 testing results. Excavations will cease once an adequate sample of the archaeological resource has been recovered to allow an appropriate level of analysis.

8.4 Exhumation Management

In accordance with CoA E27 an Exhumation Management Plan (ExMP) has been prepared by Sydney Metro to guide the relocation of recovered human remains uncovered during construction to address the requirements of CoA E26. The plan was submitted to the Secretary on 9th July 2019 in advance of excavation works being carried out on the site. Any human remains uncovered during construction will be dealt with in accordance with the ExMP which is provided in Appendix E. The ExMP has been developed to address the relevant planning conditions of approval and provides a clear and concise easy-to-follow process to adopt in the event of the discovery of potential human remains during construction.

8.5 Hold points to be released by the Aboriginal Heritage Excavation Director

The Aboriginal Heritage Excavation Director will be responsible for releasing the following Hold Points:

- Historic excavation identifies Aboriginal artefacts or intact remnant soil profiles requiring Aboriginal archaeological test excavations
- Post-demolition/historical archaeological excavation inspection identifies intact remnant soil profiles or Aboriginal artefacts requiring archaeological test excavations
- Aboriginal archaeological salvage excavation exposes unanticipated significant deposits requiring extended excavation or analysis

8.6 Clearance Certificates

The Aboriginal Heritage Excavation Director will provide written advice that all archaeological investigations within an area have been completed and issue clearance certificates to allow works to commence or resume.

8.7 Heritage Induction

Aboriginal heritage inductions for all on-site staff will be conducted prior to the start of work as a component of the heritage induction. In addition, regular toolbox talks will be presented when site conditions change and/or new staff join the on-site team. Each induction/toolbox will comprise an illustrated easy to understand presentation and hard copy, which will allow an understanding the Aboriginal heritage significance of the anticipated archaeological resource, including:

- Repercussions of any breaches to the approved Aboriginal heritage strategy
- Understanding the unexpected finds procedures
- The nature of the Aboriginal cultural heritage resource
- Maps showing location of anticipated archaeological features
- Photographs of the types of anticipated archaeological features

8.8 Analysis and Reporting

Excavated archaeological material will be analysed by AMBS on a similar level to that of previous assemblages from the Sydney Basin. Information from this analysis will be used to make interpretations about the Aboriginal site use, antiquity and settlement patterns of the study area, and to assess regional cultural heritage values. A full description of the recording methods will be included in the final archaeological report.

Analysis of the excavation results will allow a reassessment of the archaeological and cultural significance of the study area and its context in the surrounding lands. Preliminary analysis of materials will be carried out during the excavations to determine the appropriate scale of the salvage excavation phase. Detailed analysis will be undertaken after all excavation works are completed. Following completion of analysis, Sydney Metro will provide long term storage of relics.

Preliminary archaeological findings reports will be finalised 40 business days after issue of Clearance Certificates and provided to Sydney Metro to assist in heritage interpretation.

The final Aboriginal Investigation Report for the COP Works will be completed after sign-off and the issue of clearance certificates on all areas of Aboriginal archaeological potential. The report will address:

- The Aboriginal cultural heritage and environmental context of the project area
- The Aboriginal community consultation process, and identified cultural values of the project areas to the local Aboriginal community

- The Aboriginal archaeological methodology used for inspections and archaeological excavations
- The results of archaeological inspections and excavations, and results of analysis of the results of the investigations, including any artefact or geomorphological analysis
- An assessment of the heritage significance of any Aboriginal heritage sites, objects or places identified by the investigations, and conclusions addressing the implications of the results of the investigations for the understanding of Aboriginal archaeology in the local area and wider region.
- recommendations for final storage and appropriate use for interpretation.

Reporting will be completed within 2 years of historic and Aboriginal archaeological excavations being completed. All Aboriginal heritage documents produced as part of the works, including this Plan, draft reporting and archaeological method statements, will be given to the RAPs for their review, comment and input before they are finalised.

9 Relic storage and interpretation

9.1 Storage

Artefacts that are recovered during the archaeological investigations will be cleaned, bagged, labelled and appropriately analysed and stored so that information that can contribute to the understanding of the site and its historical development is not lost. Such information may be appropriate for use in the site interpretation. Historical artefacts that are non-diagnostic or do not contribute to the significance values of the site will not be collected from the site and will not form part of the post-excavation analysis.

Sydney Metro will provide long term storage of both historical relics and Aboriginal artefacts salvaged and uncovered during archaeological investigations as these will be required to be considered in the permanent heritage interpretation under Project Planning Approval Condition E21 and may be used in the final design of stations under Condition E101, which will be ongoing after the completion of the COP Works.

Sydney Metro's storage facility will be secure to protect all historical relics, Aboriginal artefacts and salvaged elements from damage or vandalism.

9.2 Heritage Interpretation

The responsibility for the design of the Barangaroo Station, and incorporation of heritage interpretation into the station design, is held by Sydney Metro who have produced the overarching Chatswood to Sydenham Heritage Interpretation Plan (SM HIP) for the project, to meet the requirements of REMM NAH 8 and CoA E21. A station specific Heritage Interpretation Plan (Station HIP) has been prepared for Barangaroo station, by Sydney Metro which informs the Station Design and Precinct Plan (SDPP) as per CoA E101. The SM HIP identifies the key Aboriginal and non-Aboriginal heritage values, stories of heritage items and heritage conservation areas affected by the CSSI. The construction of Barangaroo station is a construct only contract for BESIX Watpac who will be responsible for implementing the HIPs and ensuring that the station is constructed in accordance with the approved SDPP which has been informed by the Station HIP. The overarching Chatswood to Sydenham SM HIP was submitted to the Secretary on 11th May 2017. The Barangaroo Station HIP will be submitted to the Secretary for information prior to the commencement of construction of permanent above-ground works as per the Staging Report.

Section 5.6 of the overarching SM HIP documents temporary heritage interpretation responses proposed for Barangaroo and includes the following themes which BESIX Watpac are proposing to incorporate into the site hoarding design, in accordance with CoA E21(b)(i) :

- Pre-European history of the place informed by any archaeological investigation
- The European history of Miller's Point
- The Plague and the resumption
- The Hungry Mile
- Public Housing
- Maritime History
- Archaeological resources from the Barangaroo development / Hickson Road excavation

Further, in accordance with REMM NAH2, significant archaeological findings that result from the archaeological investigations will be incorporated into the interpretation strategy. Appropriate Aboriginal Heritage interpretation will be incorporated into the design for the project in consultation with Aboriginal stakeholders in accordance with REMM AH4 which is Sydney Metro' responsibility and outside of the scope of this HMP.

The Primary Excavation Directors will provide Sydney Metro with regular updates regarding archaeological sites under investigation to be included in publicly accessible web-based updates.

The archaeological excavation report will synthesise historical information and the results of the excavation to produce clear context for the findings and to form the background of the interpretation of the archaeological material from the site.

Appendix A
Archaeological Method Statements

Sydney Metro Barangaroo COP Works Aboriginal Archaeological Method Statement

Prepared by AMBS Ecology & Heritage
for BESIX Watpac

May 2021

AMBS Reference: 20870

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1 Introduction

The Sydney Metro & City Southwest project is 30km of a new rail system from Chatswood to Bankstown and includes a new crossing beneath Sydney Harbour, and new railway stations. The scope of the Metro project includes the Barangaroo Metro Station Construction Only Package (COP) which is the subject of this AMS.

The Project was approved by the Minster for Planning on 9 January 2017, subject to a number of Conditions set out in Critical State Significant Infrastructure [CSSI] Sydney Metro & Southwest Chatswood to Sydenham Infrastructure Approval (Application no. SSI 15_7400) (Project Planning Approval). Excavation works for road replacement, landscaping and service installation have the potential to impact on deposits containing Aboriginal heritage objects that may be present at the Barangaroo Station site. Documentation for the project includes *Sydney Metro Chatswood to Sydenham Aboriginal Heritage – Archaeological Assessment* (EIS Technical Paper 5) and *Sydney Metro Chatswood to Sydenham Aboriginal Cultural Heritage Assessment* (ACHA) prepared by Artefact Heritage (Artefact). Minister's Condition of Approval (CoA) E17 refers to the following requirements addressing Aboriginal heritage:

Aboriginal Heritage

E23 The Proponent must take all reasonable steps so as not to harm, modify or otherwise impact any Aboriginal object associated with the CSSI except as authorised by this approval.

E24 Before excavation, the Proponent must implement the Aboriginal Cultural Heritage Assessment prepared for the CSSI and included in the PIR. Excavation and/or salvage must be undertaken by a qualified archaeologist in consultation with the Registered Aboriginal Parties for the CSSI.

E25 Where previously unidentified Aboriginal objects are discovered during construction of the CSSI, construction must stop in the vicinity of the affected area and a suitably qualified and experienced Aboriginal heritage expert must be contacted to provide specialist heritage advice, before works recommence. The measures to consider and manage this process must be specified in the Heritage Management sub-plan required by Condition C3 and, where relevant, include registration in the OEH's Aboriginal Heritage Information Management System (AHIMS).

BESIX Watpac (Watpac) is undertaking the COP works and has commissioned AMBS Ecology & Heritage (AMBS) to manage the Aboriginal heritage provisions for the project. This Aboriginal Archaeological Method Statement (AMS) has been prepared in accordance with Condition E24 and the requirements of the ACHA, and addresses the Barangaroo Station COP project area.

1.1 Aboriginal Community Consultation

Sydney Metro and Artefact initiated the Aboriginal community consultation process in 2016, in accordance with the Office of Environment and Heritage (OEH, now Heritage NSW, Department of Premier and Cabinet *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a). The following parties registered their interest in the study area through the consultation process, and will continue to be involved in the project as Registered Aboriginal Parties (RAPs):

- Metropolitan Local Aboriginal Land Council
- Darug Land Observations
- Tocomwall Pty Ltd

- Darug Aboriginal Cultural Heritage Assessments
- Kamilaroi-Yankuntjatjara Working Group
- Woronora Plateau Gungangara Elders Council
- Murra Bidgee Mullangari Aboriginal Corporation
- Aboriginal Archaeology Service Inc
- Gundungurra Tribal Technical Services
- Tony Williams
- Bilinga Cultural Heritage Technical Services
- Gunyuu Cultural Heritage Technical Services
- Mynyunga Cultural Heritage Technical Services
- Murrumbul Cultural Heritage Technical Services
- Wingikara Cultural Heritage Technical Services

Consultation and engagement will continue with the established RAPs, and draft reporting, including reports produced following any archaeological excavations undertaken will be provided to all RAPs following client approval, for their review and input. Aboriginal community representatives participating in fieldwork will be drawn from these RAP organisations, based on experience, availability, and the advice of the Sydney Metro Metro Aboriginal Focus Group.

1.2 Methodology & Authorship

This report is consistent with the principles and guidelines of the *Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance 2013*. It has been prepared in accordance with current heritage best practice and Heritage NSW guidelines as specified in the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011), the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* and the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a; 2010b).

The report has been prepared by Christopher Langeluddecke, AMBS Director Aboriginal Heritage and Mike Hincks, AMBS Senior Heritage Consultant.

2 Barangaroo Station Study Area

The Barangaroo Station COP works include service installation and connection, station fitout, road replacement and removal of the northern shaft acoustic shed. The study area has been split into 10 work zones, which are summarised in Table 2.1 and presented in Figure 2.1. Five of the work zones contain areas of excavation including Hickson Road north and south of the station box between High Street and Windmill Street, and sections of the Nawi Cove foreshore (Figure 2.2).

Table 2.1 Work Zones and Activities at Barangaroo Metro Station

Zone	Activity
Zone 1	Stormwater installation
Zone 2	Waterproofing of station concrete roof, backfill and installation of landscaping and station entrance cladding, escalators, and lifts
Zone 3 and Zone 4	Demolition and removal of the existing red steel girders and road deck. Relocation of services. Complete concrete structure of ventilation pods, waterproof station concrete roof, backfill, install services, and relocate the road, kerb and guttering. Install street trees / landscaping and clad the station ventilation and emergency egress stair pods
Zone 5	Excavation of existing carpark, removal of existing surfaces, installation of new services to the chilled water plant room under Headland Park
Zone 6	Removal of the northern shaft acoustic shed, infill of the northern shaft with sand; replacement of the road, kerb, and landscaping works
Zone 7	Connecting up and commissioning plant and pipework which is already in place. All works are within existing man-holes.
Zone 8	Site sheds / canteen / change rooms
Zone 9	Temporary laydown area used to store material and plant / equipment
Zone 10	Site offices

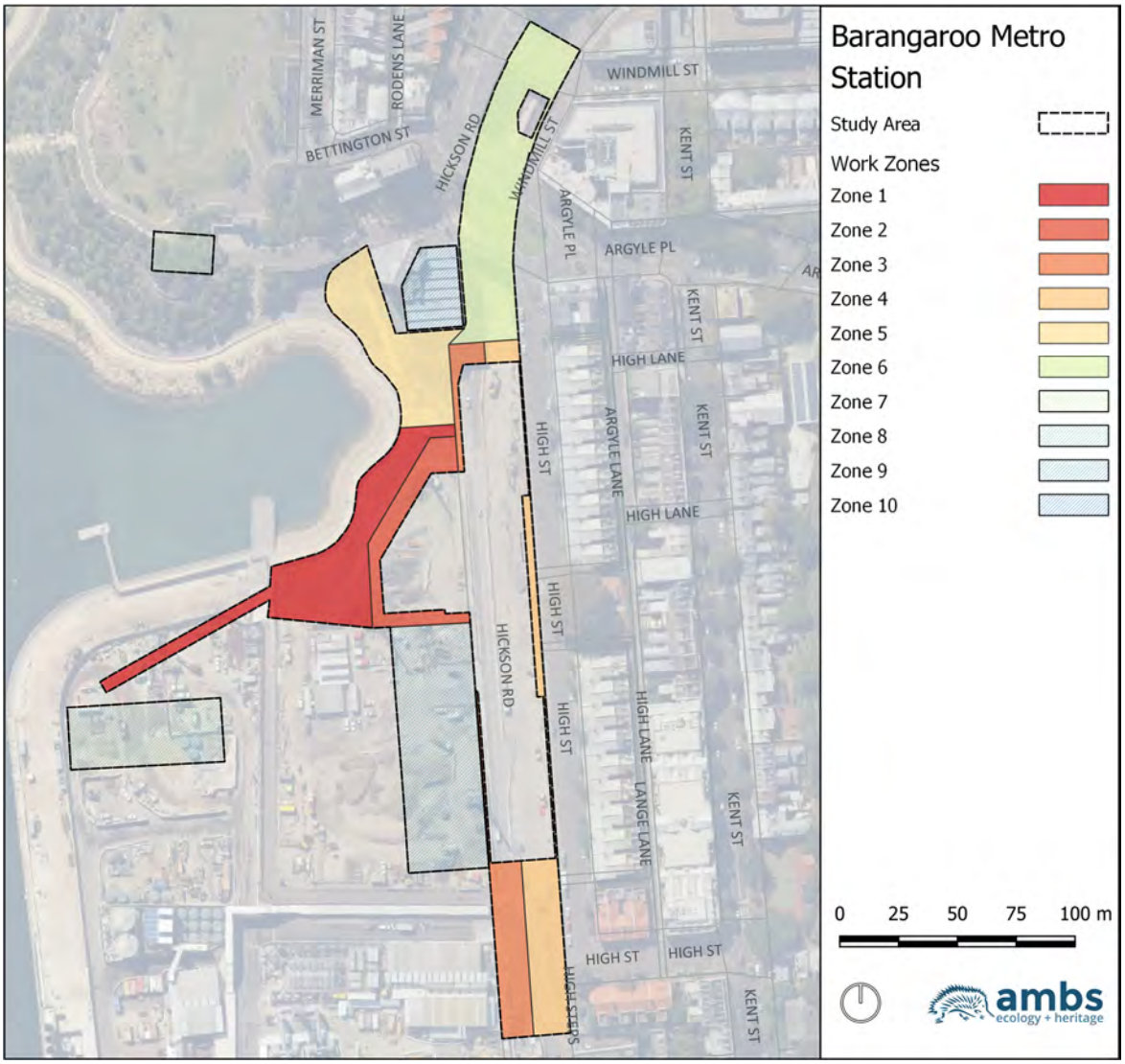


Figure 2.1 Barangaroo COP Work Zones.

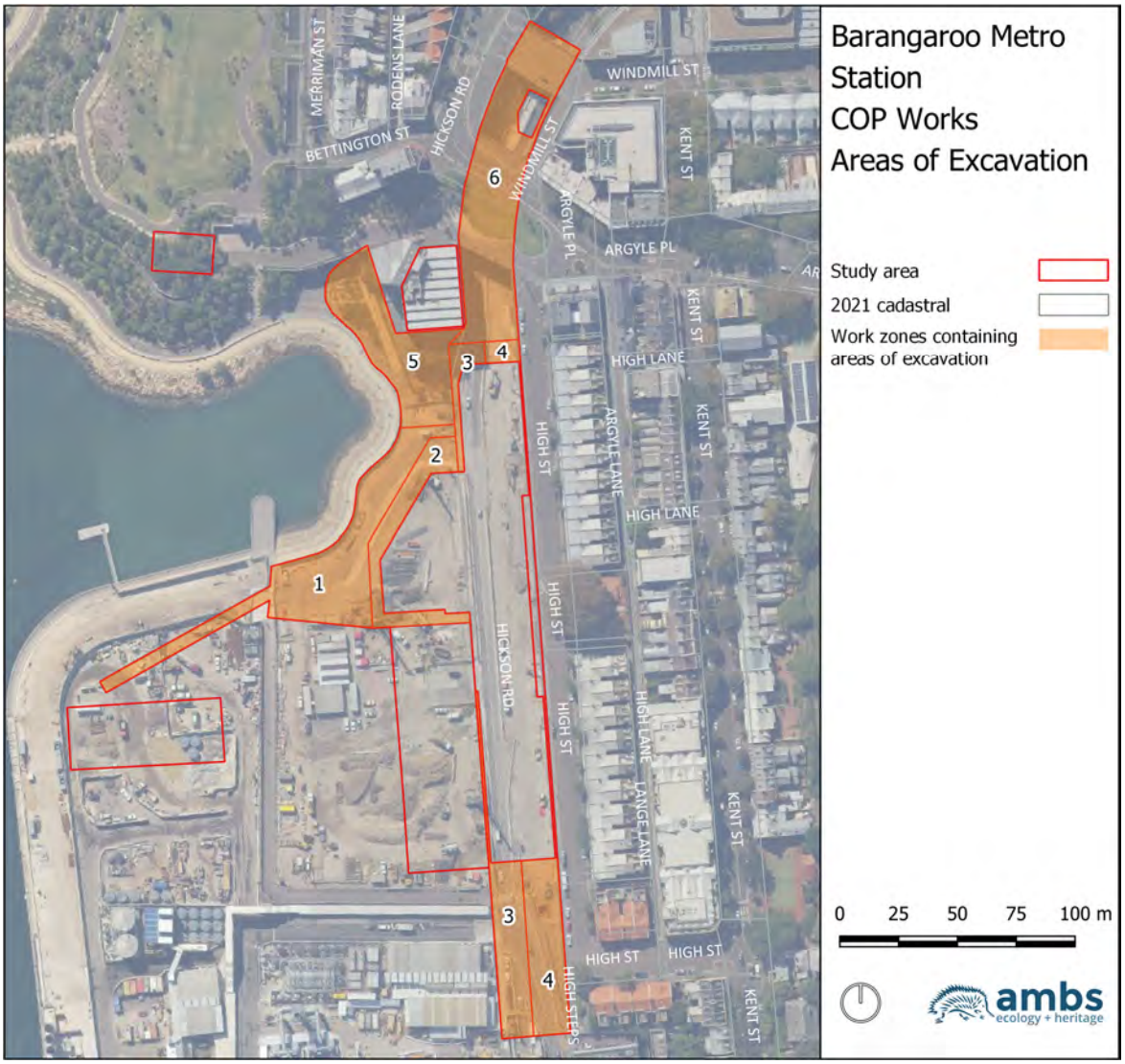


Figure 2.2 Barangaroo COP Work Zones containing areas of excavation.

3 Archaeological Context

The archaeological context of the project area has been researched and addressed in the EIS Technical Paper and ACHA, which should be referred to for detailed information on the heritage context and archaeological background which underpins this AMS. Summaries of those investigations are presented below, along with additional information gathered through research carried out for the historic archaeological investigations, and geotechnical and contamination investigations for the project areas.

3.1 Barangaroo Station

The original landscape of the Barangaroo study area is likely to have consisted of a rocky shoreline, which would have represented an important resource zone for Aboriginal people. The study area has been significantly altered since European contact, with progressive land reclamation and wharf construction along the shoreline leading to the current extent of the Darling Harbour shoreline throughout the 19th and 20th centuries. In addition, much of the current alignment of Hickson Road on the eastern extent of the study area is located along a cutting into the natural Hawkesbury Sandstone slope.

No previously identified Aboriginal heritage sites have been recorded within 100m of the study area on the Heritage NSW Aboriginal Heritage Information Management System (AHIMS) database. The nearest identified Aboriginal heritage sites recorded on AHIMS are an open camp site approximately 300m north (AHIMS #45-6-0519), and a rock engraving approximately 180m north (AHIMS #45-6-1939.

Excavation of AHIMS #45-6-0519 undertaken in 1984 identified shell midden material overlying approximately 30cm of grey sand with stone artefacts. Shell species recovered by the excavations included Rock and Mud Oyster (*Saccostrea sp.* and *Ostrea sp.*), cockle (*Anadara trapezia*), whelk (*Pyrazus ebininus*) and mussel (*Trichomya sp.*). Approximately 392 silcrete, quartz, quartzite and chert stone artefacts were recovered, including cores, used flakes and fabricators. In addition, the presence of ceramic fragments in association with the grey sand suggested continued Aboriginal use of the site following European contact.

A preliminary summary of archaeological potential and archaeological significance of the study area as assessed by Artefact in the EIS Technical Paper is presented in Table 3.1. The assessment of potential and significance assumes that archaeological deposits are present within the study area.

Table 3.1 Summary of archaeological potential and significance for Barangaroo Station study area (Artefact 2016a:101).

Location	*Archaeological potential*	*Archaeological significance*
Barangaroo Station	*Moderate to high – Archaeological potential has been identified within the western portion of the Barangaroo Station footprint. This archaeological potential relates to the possible survivability of buried shell midden deposits associated with the original shoreline of Darling Harbour.* *The eastern portion of the Barangaroo Station footprint does not demonstrate archaeological potential due to the large-scale removal of the original sandstone context.*	*Potentially high – Intact Aboriginal archaeological deposits within the Sydney CBD are extremely rare and would be of high research significance. It is also possible that out-of-context Aboriginal artefacts may be present in the layers of fill used in the area. Any such artefacts would not likely demonstrate high archaeological significance as they would not have potential to provide accurate information or answers to relevant research questions.*

3.1.1 Additional Information

Historical archaeological excavations for the Barangaroo station box and TSE in 2018 (Casey & Lowe, 2019) exposed parts of the original shoreline beneath Hickson Road including outcropping sandstone and intertidal estuarine deposits. The outcropping bedrock had been heavily modified both by nineteenth century structures and wharfs, quarrying for land reclamation, and by the cutting down of the landform to create Hickson Road. Beach sands, where present, were found to be the product of nineteenth century deposition and contained large quantities of refuse and detritus from the adjacent shipbuilding activities. Inspections of historical archaeological excavation Areas X and Y by Aboriginal Heritage Excavation Director Chris Langeluddecke found no evidence of intact Aboriginal archaeological deposits.

The western portion of the Barangaroo Station footprint was demonstrated to be below the low-water mark prior to European occupation, and contained only evidence of wharf building and reclamation.

The historic Archaeological Method Statement for the COP works (AMBS 2021) has built on the results of the 2018 excavations which demonstrated multiple phases of development and reclamation along the shoreline. The majority of the COP study area was below the low-water mark prior to European development in the area. The approximate location of the original shoreline in relation to the study area is presented in Figure 3.1.

Reclamation and development began to encroach into the harbour from the 1830s, with wharves, jetties, warehouses and stores being established along the foreshore. A quarry was active in the south of the study area from the 1840s until at least the 1850s. During the 1950s, finger wharves were infilled, significantly expanding the land reclamation in the study area. In the northwest of the site (Work Zone 5), wharf-building and the construction of substantial woolstores and bond stores at the water's edge is expected to have had a considerable impact (AMBS, 2021, pp. 15-17). The northern portion of Hickson Road in Work Zone 6 was shown to have been cut down up to 12m from 1887 levels, and Work Zone 6 was assessed as having Nil archaeological potential (AMBS, 2021, pp. 9, 35).

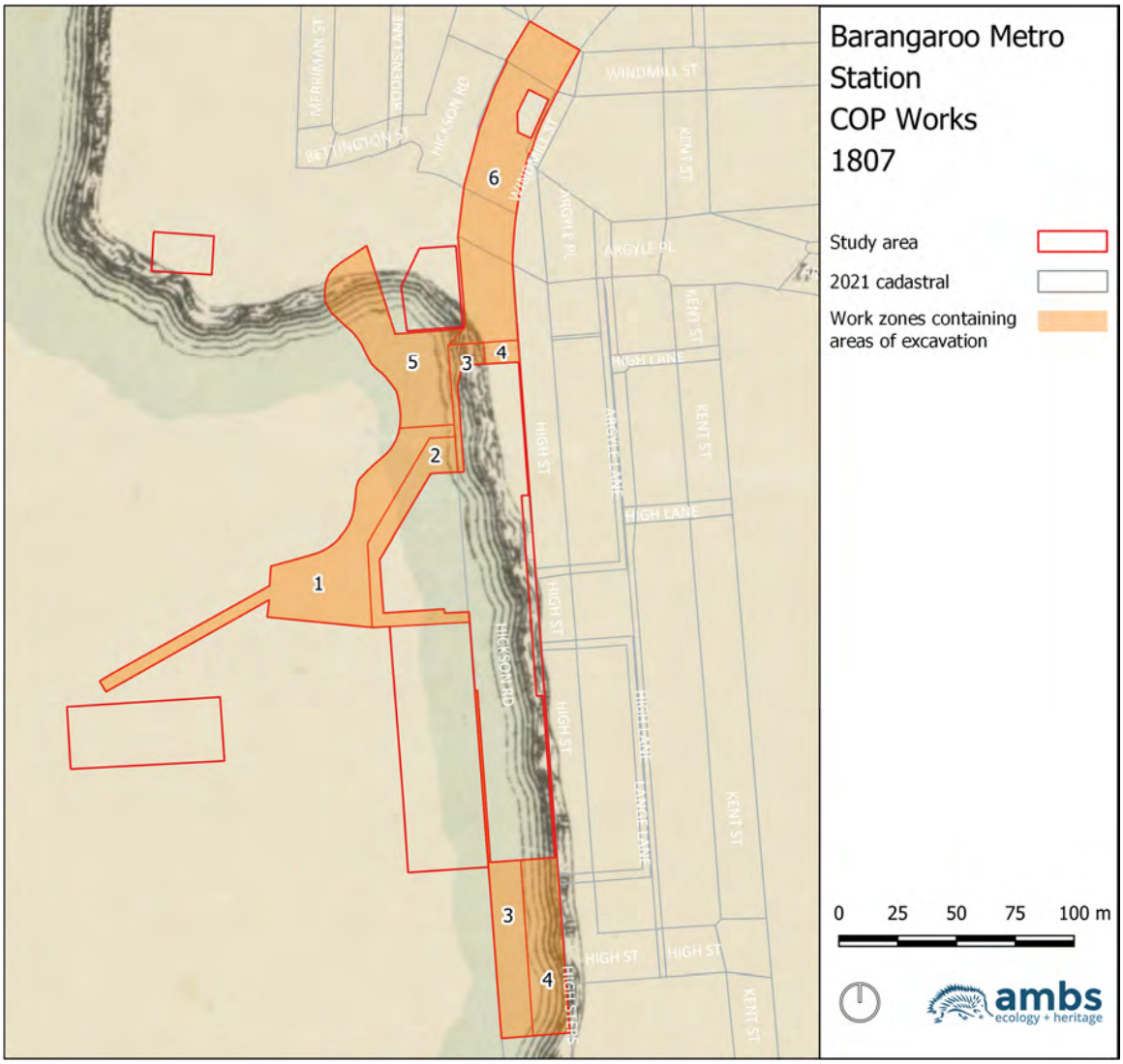


Figure 3.1 The approximate location of the Barangaroo COP study area in relation to the eastern foreshore of Cockle Bay, as presented in James Meehan's 1807 plan of Sydney (*Plan of the Town of Sydney in New South Wales,* National Library of Australia [NLA] http://nla.gov.au/nla.obj-229911438/view.

4 Research Design

The excavations and associated works required for the Barangaroo COP have the potential to impact on any Aboriginal heritage objects which may remain present within the study areas. The archaeological research design establishes research questions to guide the archaeological process, and provide the basis for the analysis of archaeological information gathered through the investigations.

4.1 Research Questions

Where archaeological excavations are undertaken, their primary aim will be to recover an appropriate sample of any archaeological deposit present. Archaeological excavations will ensure the existence of an archaeological record of the study areas, and will allow an appropriate level of archaeological analysis to be carried out on the excavated cultural material that would otherwise have been lost due to the works. Excavations aimed at increasing the current scientific knowledge of the region provide an appropriate offset to the cumulative impacts on Aboriginal heritage arising from the development, ensuring that sites will not be destroyed without retaining the information they may hold for archaeological knowledge of the area and future research.

To ensure that the research potential and significance of an archaeological resource is realised, archaeological investigations should aim to address substantive research themes. If deposits which have the potential to contain Aboriginal objects are encountered during the works, the following research questions will form the foundation of the archaeological investigations within the COP project study area, and are based on key research questions identified in the ACHA (Artefact 2017b:41).

- **Intactness**: Does the study area contain spatially intact, stratified Aboriginal archaeological deposits? Investigation of the intactness of archaeological deposits has potential to contribute to the understanding of the impacts of urban development on Aboriginal heritage sites.
- **Nature and Extent**: What is the nature and extent of any Aboriginal archaeological deposits in the study area? Is it possible to identify distinct activity areas such as knapping floors, or is there evidence of the nature of the occupation of the sites, such as longer-term occupation which might be associated with larger water supplies, to which Aboriginal people transported larger quantities of stone and practiced varying flaking techniques?
- **Significance**: What is the archaeological and cultural significance of Aboriginal sites which are identified in the study area? Where archaeological investigation identifies Aboriginal archaeological deposits in the study area, the heritage significance of the COP work site should be reassessed in line with the Heritage NSW *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b), which states that archaeological values should be identified and their significance assessed using criteria reflecting best practice assessment processes as set out in the Burra Charter. Assessments of cultural significance can only be made by the relevant Aboriginal communities, and will be established through consultation with the RAPs.
- **Comparative**: How do the results of the archaeological investigations and reassessments of significance compare with Aboriginal archaeological sites in the vicinity of the study area, and what are the implications for the understanding of Aboriginal archaeology in the Sydney Basin?

5 Archaeological Methodology

The overall scope and nature of the archaeological methodology has been defined in the EIS and ACHA, and will be applied to the Barangaroo COP study area.

5.1 Archaeological Inspection & Liaison with Historical Archaeological Investigations

Archaeological inspections will be carried out by the Aboriginal archaeological Excavation Director (ED) following completion of historic archaeological investigations and clearing of historic materials, to identify if intact remnant soil profiles are present, and to determine if there is potential for Aboriginal archaeological deposits to be present. The Aboriginal archaeological ED will liaise with the historic archaeological team for each study area during their works, to ensure that potential Aboriginal objects recovered during historic investigations are appropriately identified and taken into account when determining the requirement for Stage 1 test excavations.

Where historic archaeological excavation has been undertaken, but has not cleared large enough areas to allow adequate inspection of the study area to determine the potential for intact remnant soil profiles to be present, the mechanical removal of the extant surface, base gravels and overburden will be undertaken, directed by an archaeologist.

If soil profiles with potential to retain Aboriginal archaeological deposits are identified during inspection, or located during the historic archaeological investigations, the Aboriginal archaeological ED will assess the need for Stage 1 test excavations to be undertaken.

If no evidence of intact remnant soils with potential to retain Aboriginal archaeological deposits is identified during inspection or historic archaeological investigations, or if no Aboriginal objects are identified during historic archaeological investigations, the Aboriginal archaeological ED will issue a Clearance Certificate to inform the project team and proponent in writing.

5.2 Stage 1 Test Excavation

Stage 1 test excavations will primarily comprise manual or mechanical excavation of test pits in controlled units within each area confirmed as having potential to retain Aboriginal archaeological deposits, in order to confirm if Aboriginal objects are present, and to allow determination of the need for expanded Stage 2 salvage excavations.

Manual test pits will be $1m^2$, and dependent on the cultural material present and the nature of the deposit, excavation will proceed as 10cm arbitrary units, or stratigraphic units where identifiable stratigraphic layers are present. Archaeological test pits will initially be positioned in a grid approximately 10m apart, dependent upon the area available for investigations, and the observable levels of disturbance.

As the final design of works and impacts is not complete for the COP study area, and the study area has not been cleared at the time this AMS is being prepared, it is not possible to identify the areas that could potentially require and be available for excavation, and as such it is not possible to determine specifically where test pits would be placed during excavations. Where there are constraints preventing pits being positioned on the grid layout, pits will be offset by up to 5m within the study area. Where limited areas of remnant soils are present, pit sizes may be reduced to allow excavation to proceed. In study areas where the area of potential archaeological deposit is very limited, it is possible that Stage 1 excavations may be sufficient to archaeologically excavate the entirety of the archaeological resource, without Stage 2 excavations being undertaken.

If historic materials or introduced fill materials overlie the area to be excavated following completion of historic archaeological investigations, they may be removed by machine to expose soils requiring manual excavation, under the direction of an archaeologist.

Excavation pits will be set out by hand, and their location recorded using handheld GPS units. Excavated pits will be surveyed by a qualified surveyor prior to completion of excavation works in any portion of the study areas and the issuing of Clearance Certificates.

Test pits would be manually excavated to a depth assessed as being culturally sterile, or to a point where it is no longer physically possible to archaeologically excavate, such as when the water table is reached, the walls of the pits are no longer stable, or the pits are inundated. Due to health and safety considerations, pits will be manually excavated to 1.5m in depth, at which point additional pits will be excavated adjacent, to allow the area to be stepped; or the pits will be shored.

Where excavation is required beyond 1.5m, and previously excavated units have identified limited numbers of archaeological materials in upper units, machine excavation may be undertaken to recover or expose soils at depths shown to be likely to retain archaeological materials, or adjacent to manually excavated test pits in order to create a stepped working surface to allow manual excavation at depth. Machine excavation will require a mechanical excavator equipped with a small, flat edged bucket, excavating in shallow scrapes to remove soils, under the direction of an archaeologist. Mechanical excavation should take place in 20cm units, and the directing archaeologist should record the excavated soils as per the manual excavation methodology. A sample of up to 50% of units excavated by machine should be sieved.

Should it be determined that there is potential for additional cultural material to be present at depths deeper than that able to be manually excavated, deeper sediments may be investigated through the use of a hand auger. Where hand auger results suggest that archaeological deposits have potential to continue beyond the point where test pits are inundated, the Aboriginal archaeological ED may consider bulk recovery of units beyond that depth using machine excavation and sieving.

Where appropriate, sections will be drawn detailing the stratigraphy and features within the excavated deposit, and all units will be photographed, prior to and during excavation. Soil and carbon samples will be collected where appropriate, and measurements of the pH of soils will be made. All manually excavated material will be sieved on-site through 3mm and 5mm sieves, to ensure recovery of small archaeological materials, and material will be wet or dry sieved as appropriate to soil conditions.

If suitable features or deposits are identified during excavations, samples will be taken for dating by radiocarbon or OSL analysis, depending on the nature of the sample. If shell midden material, hearths or suspected hearths are identified, samples of each layer or deposit material will be subject to C^{14} radiocarbon dating determinations by the University of Waikato Radiocarbon Dating Lab, or similar facility.

To allow comparison with other archaeological studies in the local region, where appropriate a suitably qualified geomorphologist will be engaged to analyse the soils in the study areas, and examine soil profiles revealed during excavation. Geomorphological information will be appended to and summarised within final reporting, and will contribute to the overall interpretation of the results of the archaeological excavation.

If Stage 1 excavations recover insufficient Aboriginal cultural material to trigger Stage 2 salvage excavations, the Aboriginal archaeological ED will issue a Clearance Certificate to inform the project team and proponent in writing following completion of the Stage 1 works. Clearance

Certificates may apply to an entire study area, or discrete portions of the study areas, as works are completed.

5.3 Stage 2 Salvage Excavation

Where the Stage 1 test excavations identify archaeologically significant or intact Aboriginal heritage deposits, Stage 2 archaeological salvage excavations will be undertaken.

Triggers for Stage 2 excavations within the Barangaroo COP study area are as follows:

- Identification of any artefacts during Stage 1 excavations. A minimum number of artefacts has not been set due to the potential heritage significance of sites in these areas
- Identification of rare or significant artefacts, features or site types
- Identification of artefacts in contexts which may provide significant information on site formation, including potential for samples to be extracted suitable for dating

The extent of the Stage 2 salvage excavations will be determined by the Stage 1 test excavation results, and will utilise the same methods of manual or mechanical excavation. Manually excavated salvage pits shall initially be undertaken by expanding out in four $1m^2$ pits adjacent to the sides of the original pit, where the study area to be investigated is large enough to allow such expansion. Excavations will cease once an adequate sample of the archaeological resource has been recovered to allow an appropriate level of analysis, and to allow adequate description of the intactness, nature, extent and significance of the site. Machine excavation will be utilised as per Stage 1, where it is necessary to remove historic materials, introduced fill, or culturally sterile soils prior to manual excavation, or to investigate areas over 1.5m in depth.

Where Aboriginal heritage objects are identified during historic archaeological excavations, the Stage 1 test excavation will form part of the historic excavation program, and will be guided in line with the relevant historic Archaeological Method Statement for that work site. RAP representatives would be involved in the excavation of Aboriginal objects from historic archaeological contexts. Where historic materials are identified during the Stage 1 or 2 test excavations, the historic ED will be consulted with to determine any necessary modifications to the Aboriginal AMS.

Should Aboriginal heritage objects be identified in introduced fill material that is not considered a historic archaeological context and will not be excavated under the historic AMS for the relevant study area, the Aboriginal archaeological ED will establish if additional investigation of the fill material is required. Additional investigation may include, but not be limited to, excavation of manual test pits to sample the fill as per the Stage 1 methodology, or mechanical excavation and sieving of a larger area of fill.

Following completion of Stage 2 excavations, the Aboriginal archaeological ED will issue a Clearance Certificate to inform the project team and proponent in writing. Clearance Certificates may apply to an entire study area, or discrete portions of the study areas, as works are completed.

5.4 Post Excavation Analysis & Reporting

Following excavation, attributes will be recorded for each excavated artefact in accordance with the Heritage NSW AHIMS Feature Recording Form – Artefact, which requires identification and recording of material, artefact type, dimensions, and platform and termination type. Excavated archaeological material will be analysed on a similar level to that of previous assemblages from the Sydney Basin, and information from this analysis will be used to make interpretations about the Aboriginal site use, antiquity and settlement patterns of the study area, and to assess regional cultural heritage values.

A full description of the recording methods will be included in the final archaeological reporting, and analysis of the excavation results will allow a reassessment of the archaeological and cultural significance of the study area and its context in the surrounding land. Preliminary analysis of materials will be carried out during Stage 1 test excavations to determine the appropriate scale of the Stage 2 salvage excavation phase. Detailed analysis will be undertaken after all excavation works are completed.

An Aboriginal archaeological excavation report will be prepared the parts of the study area subject to archaeological excavations, and will address:

- The Aboriginal cultural heritage and environmental context of the project area
- The Aboriginal community consultation process, and identified cultural values of the project areas to the local Aboriginal community
- The Aboriginal archaeological methodology used for inspections and archaeological excavations
- The results of the archaeological investigations, including any artefactual or geomorphological analysis
- An assessment of the heritage significance of any Aboriginal heritage sites, objects or places identified by the investigations, and conclusions addressing the implications of the results of the investigations for the understanding of Aboriginal archaeology in the local area and wider region
- Recommendations for final storage and appropriate use for interpretation.

Following completion of the Aboriginal heritage excavations, the location, nature and extent of any sites identified by the works will be recorded on an Aboriginal Heritage Information Management System recording form, and provided to Heritage NSW in line with their requirements.

All draft reports will be sent to the RAPs for comment, and any feedback received in a timely manner will be incorporated into the final report as part of the consultation process, in accordance with Heritage NSW requirements.

5.5 Storage of Aboriginal Objects

Aboriginal objects that are recovered during the archaeological investigations will be cleaned, bagged, labelled and appropriately analysed and stored so that information that can contribute to the understanding of the sites is not lost. Prior to analysis, Aboriginal objects will be stored in a locked container on site during excavations.

Sydney Metro will provide long term storage of both historic and Aboriginal relics salvaged and uncovered during archaeological investigations. Sydney Metro's storage facility will be secure to protect all relics and salvaged elements from damage or vandalism.

5.6 Human Remains

In the event that suspected human remains are identified during the Aboriginal archaeological investigations, works must immediately cease in the vicinity of the find, and the find should be managed in accordance with the *Aboriginal and Historic Heritage Unexpected Finds Protocol.* If the remains are identified as human, the finds will be managed in accordance with the Sydney Metro *Exhumation Management Plan.*

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Barangaroo Metro Station
Construct Only Package (COP)
Archaeological Method Statement

Prepared by AMBS Ecology & Heritage
for BESIXWatpac

May 2021

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1 Introduction

AMBS Ecology & Heritage (AMBS) has been commissioned by BESIXWatpac on behalf of Sydney Metro, to prepare an *Archaeological Assessment and Research Design* (AARD) for the Barangaroo Metro Station Construction Only Package (COP). The Barangaroo COP will involve fitout of the new Barangaroo Metro Station, installation and connection of services, and establishment of the new road surface on Hickson Road.

The Barangaroo COP project is a component of the Sydney Metro City and Southwest project, which is a new 30km-long rail system from Chatswood to Sydenham and includes a new crossing beneath Sydney Harbour, and new railway stations.

The Project was approved by the Minster for Planning on 9 January 2017 subject to a number of Conditions set out in Critical State Significant Infrastructure Sydney Metro & Southwest Chatswood to Sydenham Infrastructure Approval (Application no. SSI 15_7400) (Project Planning Approval). Documentation for the project-wide works included a *Non-Aboriginal Impact Assessment* (EIS Technical Paper 4) and *Sydney Metro Historical Archaeological Assessment and Research Design Report* (AARD), both prepared by Artefact Heritage. Minister's Condition of Approval (CoA) E17 refers to the pre-excavation reporting requirements prior to construction:

> *The Archaeological Assessment Research Design Report (AARD) in the PIR must be implemented. Final Archaeological Method Statements must be prepared in consultation with the Heritage Council of NSW (or its delegate) before commencement of archaeological excavation works. The final methodology must:*
> *(a) provide for the detailed analysis of any heritage items discovered during the investigations;*
> *(b) include detailed site specific archaeological management and artefact management strategies;*
> *(c) include cored soil samples for soil and pollen for the Pitt Street site within the Tank Stream Valley; and*
> *(d) provide for a sieving strategy.*

Prior to the construction of the Station Box and tunnelling works at the Barangaroo Metro site, Casey & Lowe Archaeology & Heritage prepared an Archaeological Method Statement (AMS) for the Station Box excavations which, with the results of the Casey & Lowe excavations supercede the AARD prepared by Artefact Heritage (Artefact; 2016) (Casey & Lowe, 2017). This Archaeological Method Statement (AMS) builds on that document and assesses the archaeological potential of areas of proposed works associated with the COP outside the Station Box and provides a research design and methodology for the management and mitigation of those works.

Although it is within the scope of the current works, the area of the Station Box has been excluded from this archaeological assessment and research design. The area of the station box was the subject of an extensive open area archaeological excavation in 2018 (Casey & Lowe, 2019) and the resource has been removed from the footprint of the station. The preliminary results of the excavation have informed the assessment of archaeological potential in this document.

1.1 Study Area

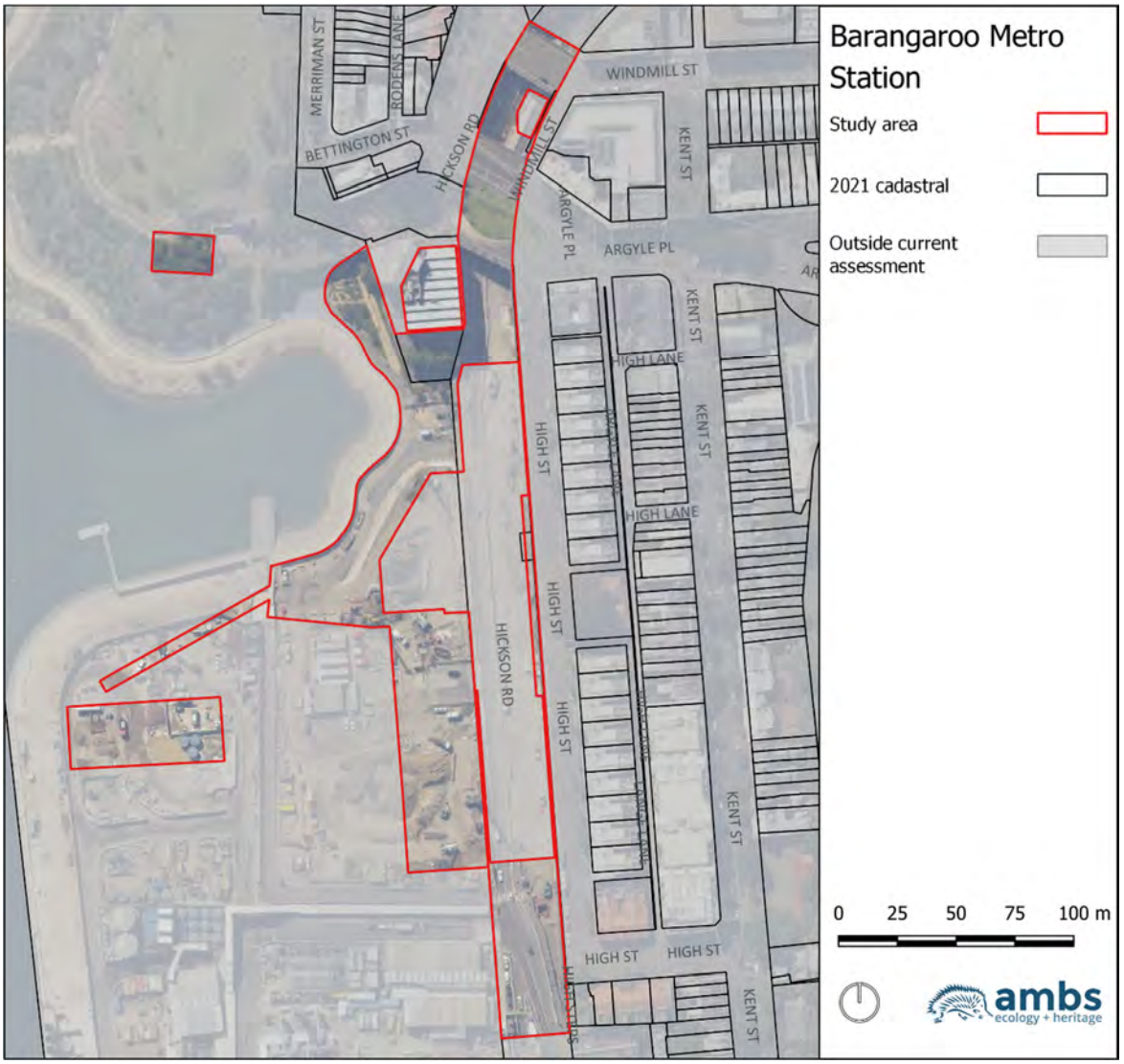


Figure 1.1: The study area excludes the station box which has already been archaeologically excavated.

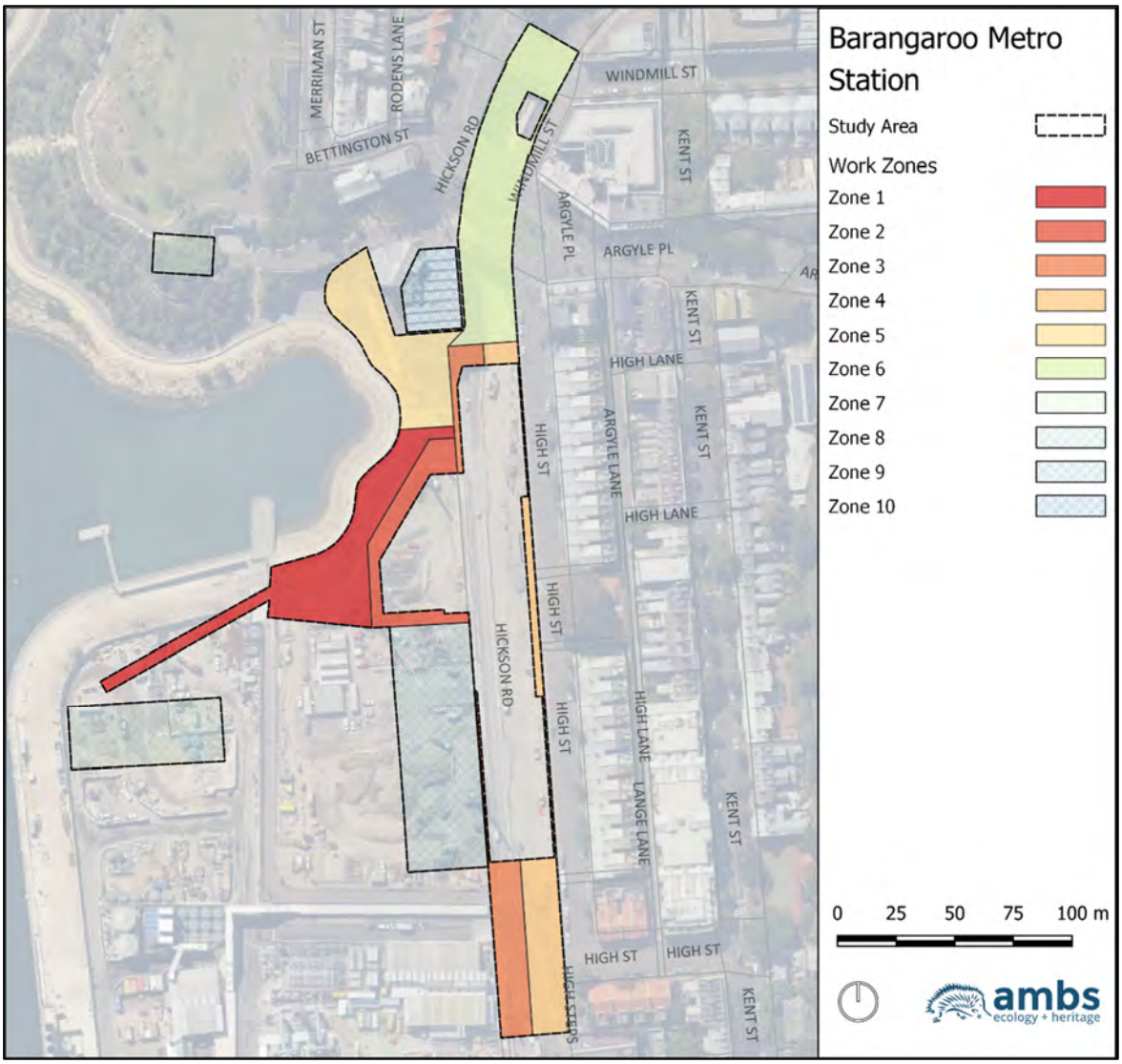


Figure 1.2 Study area showing work zones.

The study area is split into 10 work zones (Table 1.1). The assessment of impact will address the activities in each work zone:

Table 1.1: Work Zones and Activities at Barangaroo Metro Station

Zone	Activity
Zone 1	Stormwater installation
Zone 2	Waterproofing of station concrete roof, backfill and installation of landscaping and station entrance cladding, escalators and lifts
Zone 3 and Zone 4	Demolition and removal of the existing red steel girders and road deck. Relocation of services. Complete concrete structure of ventilation pods, waterproof station concrete roof, backfill, install services and relocate the road, kerb and guttering. Install street trees / landscaping and clad the station ventilation and emergency egress stair pods
Zone 5	Excavation of existing carpark, removal of existing surfaces, installation of new services to the chilled water plant room under Headland Park
Zone 6	Removal of the northern shaft acoustic shed, infill of the northern shaft with sand; replacement of the road, kerb and landscaping works
Zone 7	Connecting up and commissioning plant and pipework which is already in place. All works are within existing man-holes.
Zone 8	Site sheds / canteen / change rooms

Zone 9	Temporary laydown area used to store material and plant / equipment
Zone 10	Site offices

1.2 Methodology & Authorship

This report is consistent with the principles and guidelines of the *Burra Charter: The Australian ICOMOS Charter for the Conservation of Places of Cultural Significance 2013* (Burra Charter). The report has been prepared in accordance with current best practice guidelines as identified in the *NSW Heritage Manual* (1996), published by the Heritage Office and Department of Urban Affairs and Planning, and associated supplementary publications.

This assessment aims to identify the historic archaeological potential and significance associated with the study area to ensure the protection of its archaeological values. This report has been written by Mike Hincks, AMBS Senior Historic Heritage Consultant with additional historical research by Madeline Rodwell, AMBS Historic Heritage Consultant. Jennie Lindbergh, AMBS Director Historic Heritage reviewed the final draft of the report for quality and consistency.

2 Historical Context

2.1 Overview

The study area encompasses Hickson Road from High Street to Windmill Street, and the eastern foreshore of Nawi Cove, almost all of which has been reclaimed from the waters of Darling Harbour. The development of the site has been greatly influenced by its topography, which allowed some parts of the study area to flourish, and others to remain largely undeveloped for most of its history. In 1911 the construction of Hickson Road dramatically altered the landscape and permitted easy access to the foreshore from different parts of the city. There are therefore two histories to the site – pre- and post-1911 – in some cases the latter completely obliterated any evidence of the former.

A comprehensive history of the entire northeastern foreshore of Darling Harbour was prepared for the Barangaroo Metro project Archaeological Method Statement in 2017 by Casey & Lowe (Casey & Lowe, 2017). This chapter does not intend to replicate that history, but rather augments it with detailed analysis of the historical plans in the areas of proposed works for the Barangaroo COP. Table 2.1 is a summary of the general development of the area based on the Casey & Lowe document. Additional land titles research has been done for Lots 3,4 and 5 of Section 93 which was not covered by the previous Archaeological Method Statement.

Table 2.1: Phases of development at the Barangaroo Metro Station site

	Overview of Development
Early 1800s	• Early occupation of Darling Harbour set on western ridge, related to military barracks (officer's quarters, magazine, etc.) • Original shoreline line shown on maps and plans from 1788 o No buildings are shown on the 1807 or 1823 plans but the original foreshore had been subdivided into three grants • Millers Point became centre of small-scale shipbuilding • 1802: A track was established along the ridge to serve the allotments and premises on the shore of Cockle Bay • 1811: First wharf in Cockle Bay ordered in 1811 – Market Wharf o Serviced Parramatta trade, provided shipping of food to the newly opened market on Market Street o Located at the base of Market Street (outside of study area), began to move commercial activity away from Sydney Cove
1820s	• James Munn established the earliest yards, included a floating dry dock o Lawrence Corcoran took over after death
1830s	• Land at Millers Point granted – large grants along waterfront for maritime activities, smaller grants towards headlands for individual dwellings • 1830s parish maps show modified shoreline for wharfage • Government to improve roads, quarryman employed to cut into the western face of the hill • 1839: Kent Street passable along the whole length of Argyle Street • Numerous small quarries established along Millers Point, local buildings sought permissions to utilise local sandstone in construction • Surge of private wharf and warehouse building, wharves constructed through infilling shoreline • Australian Gas Light Company's works (est. 1843) was the exception to private development
1840s	• 1849: John Cuthbert bought waterfront south of Munn's

1850s	• 1856: Munn's property acquired by Cuthbert
Late 1800s	• Most wharves within Darling Harbour unsuitable for modern shipping and in dilapidated condition • 1870s: older wharves demolished for larger, modern facilities • Cuthbert's yard was first to be redeveloped, Thomas Dibbs acquired property and rebuilt for large-scale wharfage and goods storage • 1870s-1880s: small boat builders left the area as demands for wharfage grew
Early 1900s	• 1900: Bubonic Plague – harbour side areas (The Rocks, Millers Point and Darling Harbour) put under quarantine • Government resumed and demolished houses and whares deemed substandard o Allowed government to develop along Darling Harbour foreshore previously restricted by private property boundaries • Sydney Harbour Trust established – substantially altered the original landscape of Miller's Point o Complete redevelopment of a number of areas o 1901: older homes demolished including in Clyde and Merriman Streets o 1910: forty buildings removed from Thornton, Munn and Argyle Streets for wharf expansion o 1909 – construction of Hickson Road to link new wharves at Welsh Bay with new and existing wharves at Darling Harbour • Works included decommissioning and dismantling gas works site, area without solid bedrock required pouring 15cm thick concrete foundation over 10cm thick blue metal o 1924 – Hickson Road through gasworks complete, wharves nearing completion
Late 1900s	• Post-war period: cargo transport by road, rail and container ship overtook smaller shipping o Containers allowed faster loading and unloading, reducing need for warehouse space o Required larger mechanized shipping terminals • 1950s: existing finger wharves infilled – creation of concrete decking, cranes and lighting for larger shipping facilities
2000s	• 2006: container terminal at Barangaroo shut down • 2008: redevelopment of Barangaroo foreshore o Substantial construction to south o Landscaping of headland after removal of port hardstand o Area mixed urban precinct – public parkland, commercial buildings o Barangaroo Central (former gas works) development planned

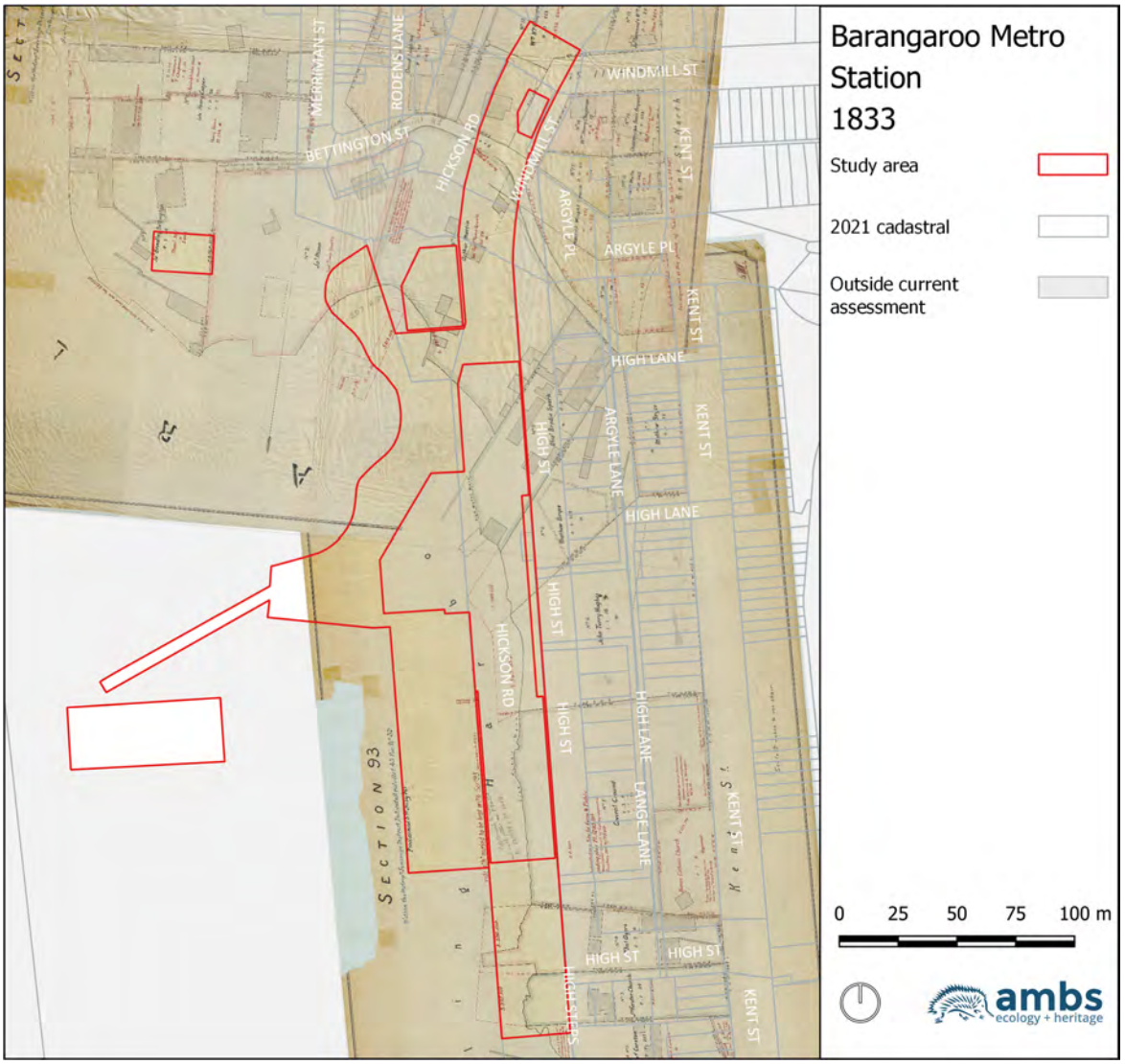


Figure 2.1; The study area shown relative to Sections 92 and 93 of the 1833 City of Sydney survey (City Engineer and City Surveyors Department, 1833).

2.1.1 Aboriginal/European interaction

Millers Point (or nearby – the location is only described as "behind the point on which the Hospital is built" (White, 1790, p. 190)) is probably the place where there was an exchange of goods between Aboriginal and European people that was described by John White on 29 July 1788:

> *We gave them some bread, which they received with apparent pleasure, but did not eat any of it while in our presence. We likewise presented them with a looking-glass, but this they received with indifference, and seemed to hold in no kind of estimation. I gave one of the women a pocket handkerchief, which she immediately tied round her head, and shewed great satisfaction. She had a young child between her knees in the canoe (the way in which they always carry their infants), for whom she solicited something, in the most suppliant tone of voice I ever heard. The only thing I had about me was a narrow slip of linen, which I gave her; and, trifling as it was, she appeared to be perfectly satisfied with it, and bound it round the child's head. (White, 1790, p. 191)*

The journal entry is very early evidence of not only the exchange of goods, but also of selective use of and selective value attribution to foreign materials by Aboriginal people. It indicates that we can expect to find European cultural items in Aboriginal archaeological contexts from the earliest days of the colony. It also demonstrates that utility was not necessarily the prime motivator behind the

acquisition of European material, and that we may find non-Aboriginal items in Aboriginal archaeological contexts that do not fall into familiar or intuitive use-categories.

Notably, in the same day's journal entry White records the spearing of a convict by Aboriginal people elsewhere on the waterfront (White, 1790, p. 189). The contrast between the two events is not remarked upon by White and we can only assume that to experience such extremes in relations in the same day was commonplace in the early months of the colony. Just shy of one month later, White describes the spearing and carrying away of a young goat by Aboriginal men (White, 1790, p. 213). The incident was also close to the hospital but probably nearer Dawes Point than the earlier encounter.

In the first year of the colony, the western side of the Cove was seemingly a porous edge of the settlement and was the location of both aggressive and friendly encounters between Aboriginal and European people. Cockle Bay was separated from the Cove by a high ridge that meant that the town expanded primarily to the south and east. This idea of the western ridge being a frontier or permeable boundary in the first years is echoed in paintings from 1802 and 1803. Both show the settlement from its western edge, and both depict a liminal space in which Aboriginal people are undertaking traditional activities alongside the buildings and people of the colony. Although the depiction of the Aboriginal people throwing spears in close proximity to the chatting and seated Europeans in Evans' painting appears fanciful, the choice of location and its cleared but uncultivated and undeveloped appearance is instantly recognisable as a frontier between wild and managed. The Aboriginal people depicted here are symbolic of that frontier, and of what lies on its other side. The use of colour and shade to emphasise the darkness of the untamed foreground and the light and order of the town beyond are easily read and understood by the viewer in both images.



Figure 2.2: An 1802 painting by Edward Dayes looking south-southeast from near Dawes Point (Dayes and Jukes, 1804).



Figure 2.3: An 1803 painting by G.W. Evans looking east from the high ridge that runs between Millers Point and Sydney Cove (Evans, 1803).

Understanding this context is useful for interpreting the only contact-period archaeological site in the vicinity of the Barangaroo COP works, which is located around 180m north of the study area at Moore's Wharf (Lampert and Truscott, 1984).

The Aboriginal archaeology consisted of the partial remains of a campsite. A 500mm x 500mm deposit of sandy brown soil averaging 310mm thick was excavated from within a natural depression in the bedrock. The excavated material contained 392 stone artefacts and was sealed by a midden layer 100mm thick. The midden material was in turn sealed by a rubble construction layer for the wharf buildings that were built in the 1830s. Four sherds of blue and white transfer print ceramic were found within the artefact-bearing soil beneath the midden (Lampert and Truscott, 1984, p. 1 Appendix 1). The ceramic was not modified, but this unexplained presence or utility is evocative of interactions of the kind described by White, and also of the liminal space depicted in the paintings of Evans and Dayes.

Aboriginal people undoubtedly continued to be present in Millers Point in the subsequent decades, as Kass (1987) has noted. Aboriginal people were employed in various ways in the colony, including the maritime trades that were centred around Millers Point and the harbour:

> *In 1845, Mahroot, one of the few survivors of the original inhabitants was interviewed during an enquiry into the state of the Aboriginal people. He lived by catching and selling fish. With the proceeds of this he bought clothes, meat, flour and sugar. He had never worn the traditional native dress but had always dressed in coat and trousers… To make some money, Mahroot had signed on for five or six whaling voyages (Kass, 1987, p. 11)*

The interactions that these activities would have generated were surely numerous, including Mahroot's descriptions of drinking with his European companions after coming ashore. However the probability of being able to identify the traces of these kinds of interactions archaeologically is slim to none.

2.1.2 Study Area North - Overview

The relatively unmodified shorelines of Lots 1 and 2 in Section 92, initially granted to Joseph Munn and Arthur Martin respectively; are partially represented within the study area. The development of the foreshore of these lots and their transformation through extensive reclamation and wharf

building is the focus of the historical context of this part of the site. The establishment of Munn Street to the northwest allowed important road access to the foreshore and increased its usability and value. Access to Munn Street was paramount as it was the only reasonably traversable road to the high ground of Argyle and Kent Streets. It meant that the huge filled-in wharfs between Clyde Street and Munn Street were never subdivided, as access would be cut off from all but the northwestern parts. These wharfs, covering much of the northern part of the study area were utilised first by Cuthbert's shipbuilding business and later by Dibbs, who owned large portions of the foreshore by the 1880s.

In the extreme north of the study area, the footprint of the project crosses the original alignment of Windmill Point Road into William Henry Chapman's grant on Lot 12 of Section 92. However, as the study area has been cut down some 14m from its original height for the construction of Hickson Road in this location, Chapman's grant and its subsequent development is not relevant to this archaeological assessment beyond its destruction, and is therefore not discussed further. Likewise, the part of the study area (Work Zone 7) that is within Bettington's grant on Lot 3 is not discussed. Archaeological and historical analysis is of no benefit to this part of the site as works in this area are confined to connections within existing service pits.

Work Zone 10 is the site offices at Dalgety Bond Stores. Although there will be no excavation in this area, it has been included in the discussion of historical context because historical surveys and overlays are not always accurate, and some of the features and structures that appear to be within the footprint of this building may in fact be in adjacent areas of excavation. This includes early structures associated with Munn and Martin (Figure 2.4).

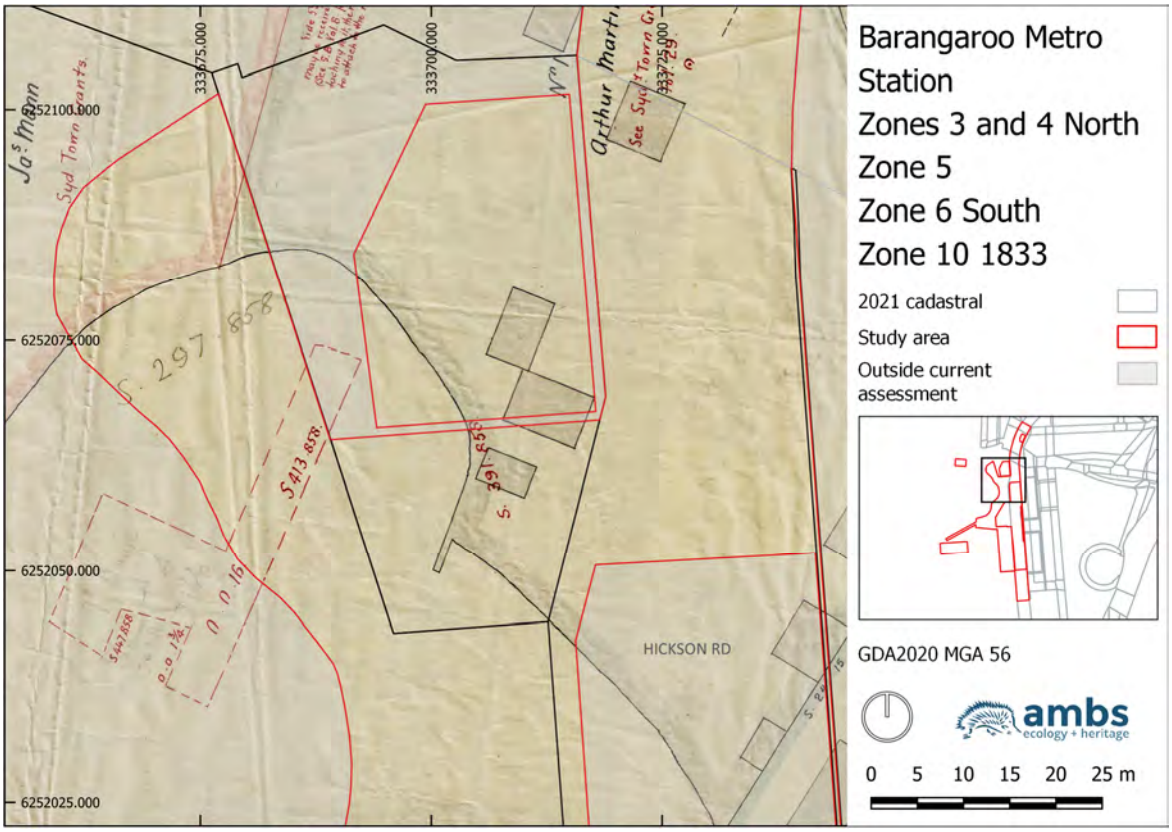


Figure 2.4: The 1833 foreshore of Munn and Martin's land showing up to five structures and a narrow jetty within the footprint of the study area (City Engineer and City Surveyors Department, 1833).

2.1.3 Early development of the shoreline

In 1833, a dispute between grantees Munn and Martin over land in Lot 2, Section 92 had been settled in Martin's favour , and Arthur Martin was afterwards in possession of three structures on the foreshore, along with a narrow jetty protruding southwest into the bay (Casey & Lowe, 2017, p. 54) (Figure 2.4). The construction of two of these structures had been commenced by Munn during his occupancy of the land (Casey & Lowe, 2017, pp. 54-55). A lime kiln in their midst (Casey & Lowe, 2017, p. 56), indicated these were probably utilitarian buildings. The 1833 survey (City Engineer and City Surveyors Department, 1833) positions the main structures and kiln around 15m distant from the high water line, and partly beneath the Dalgety Bond Stores (Figure 2.5). Contours recorded in 1887 give an indication of the slope in this part of the study area, which had probably changed little since 1833. The contours suggest that Martin's foreshore buildings and kiln were built on a strong slope of 27% (Figure 2.5). The largest of the three buildings was constructed across the slope and was surveyed as being around 8m x 6m. The contours indicate that the ground may have dropped considerably across the width of the building (possibly 1.5m if the slope was even), and so the structure may have had a partial basement, or have been built on land that was cut back into the slope to produce a level surface. In either case, it suggests that building on the Millers Point landform was not necessarily straightforward, and choices were probably deliberate and considered.

The 1833 survey shows that larger buildings on Martin's land that may have been residential were located further up the slope towards the present location of Argyle Street. With the exception of the narrow jetty, the foreshore appeared largely unmodified, and remained this way until after 1855 (Figure 2.6).

By 1855, development upslope had increased considerably. Wentworth Street and Unwin Street had been established, and residential buildings of modest size had begun to fill the space between. Some houses were depicted as small as 3m x 4m, they were tightly packed, and may have consisted of little more than a single room. Nine such structures flanked a yard 3m wide crossed by an open drain and shared 2 cesspits between them (City Engineer and City Surveyors Department, 1855).

The lack of development of the shoreline despite the crowded nature of Wentworth Street and Unwin Street at this time is symptomatic and indicative of the topography close to the shore. Despite the close proximity of the residences and streets to the water's edge, the significant difference in height limited its engagement with the residential neighbourhood above. This is well demonstrated by the results of the 2018 archaeological excavation in the station box (summarised in section 3.4), which show two very distinct levels of development at the foot of the slope. The change is embodied by the base of a deep cistern on Wentworth Street and the floor of a storehouse on the wharf occurring at a similar height (Casey & Lowe, 2019, pp. 44, Figure 3.64). It wasn't until Cuthbert acquired the land along the waterfront and began to construct his filled-in wharf that the shoreline was finally connected to the streets above by the circuitous route of Munn Street to the northwest.

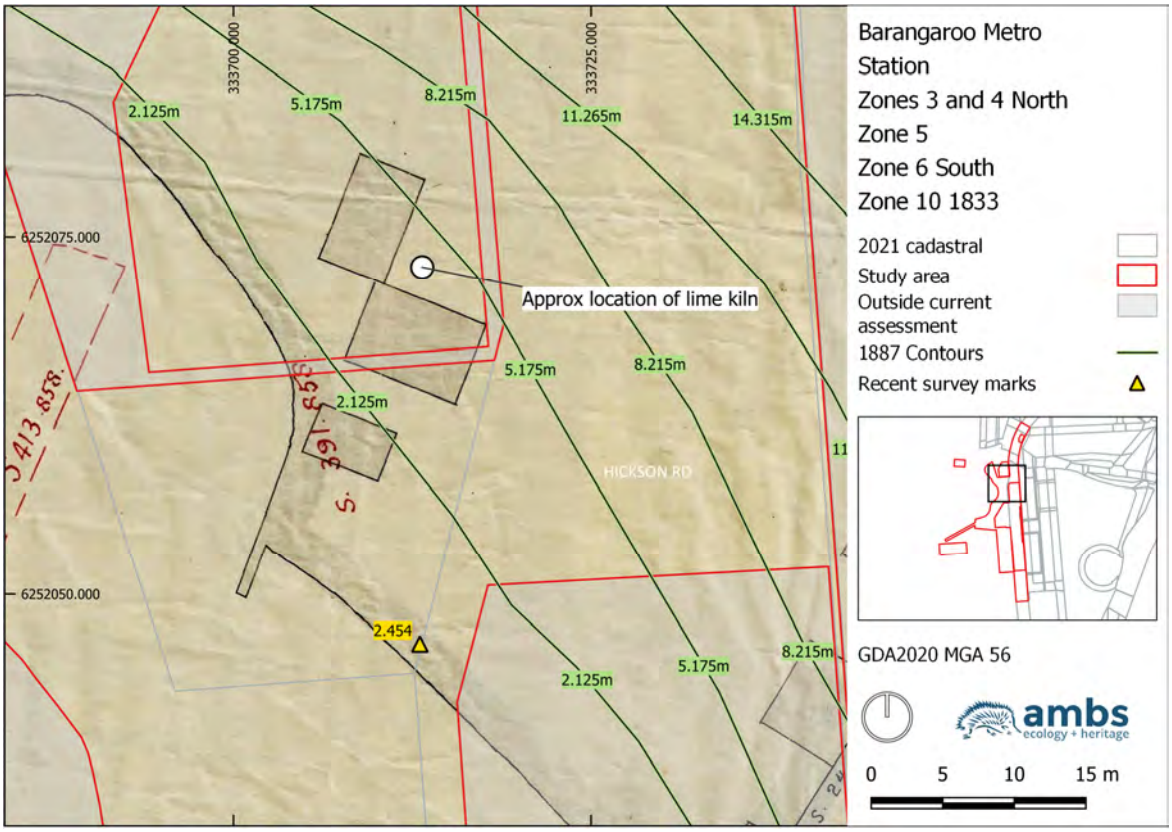


Figure 2.5: Contours recorded in 1887 (Moriarty, 1887) give an impression of the early landform and are shown here relative to structures surveyed in 1833 (City Engineer and City Surveyors Department, 1833) and a twentieth century survey mark at the level of Hickson Road (46693, 1988, LPI NSW).

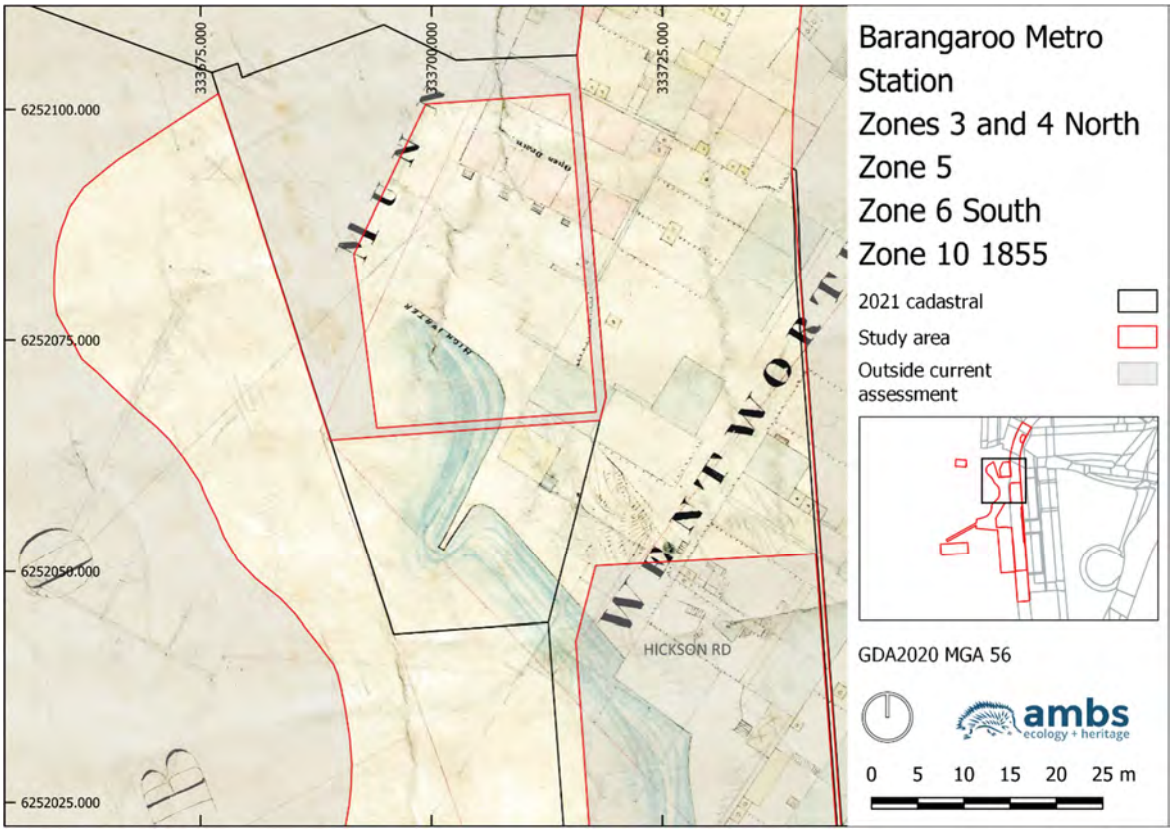


Figure 2.6: The foreshore in the northern part of the study area in 1855. Wentworth and Unwin (here shown as Munn) Street have already been established on the higher ground but the foreshore remains largely unmodified (City Engineer and City Surveyors Department, 1855).

2.1.4 Cuthbert's Shipbuilding Yard

Cuthbert's wharf was constructed in two stages. The first stage had been completed by 1863, when Cuthbert was granted the reclaimed land that formed the wharf (NSW LRS, 1863). The first stage included a single slipway and a narrow dock 17ft 5in (5.3m) wide (Figure 2.7). Most of the narrow dock is included within the study area. Although constructed with long stone walls that would have required considerable expense and labour, the dock appears to have been short-lived. It was filled in to create a more extensive wharf within two years of the grant.

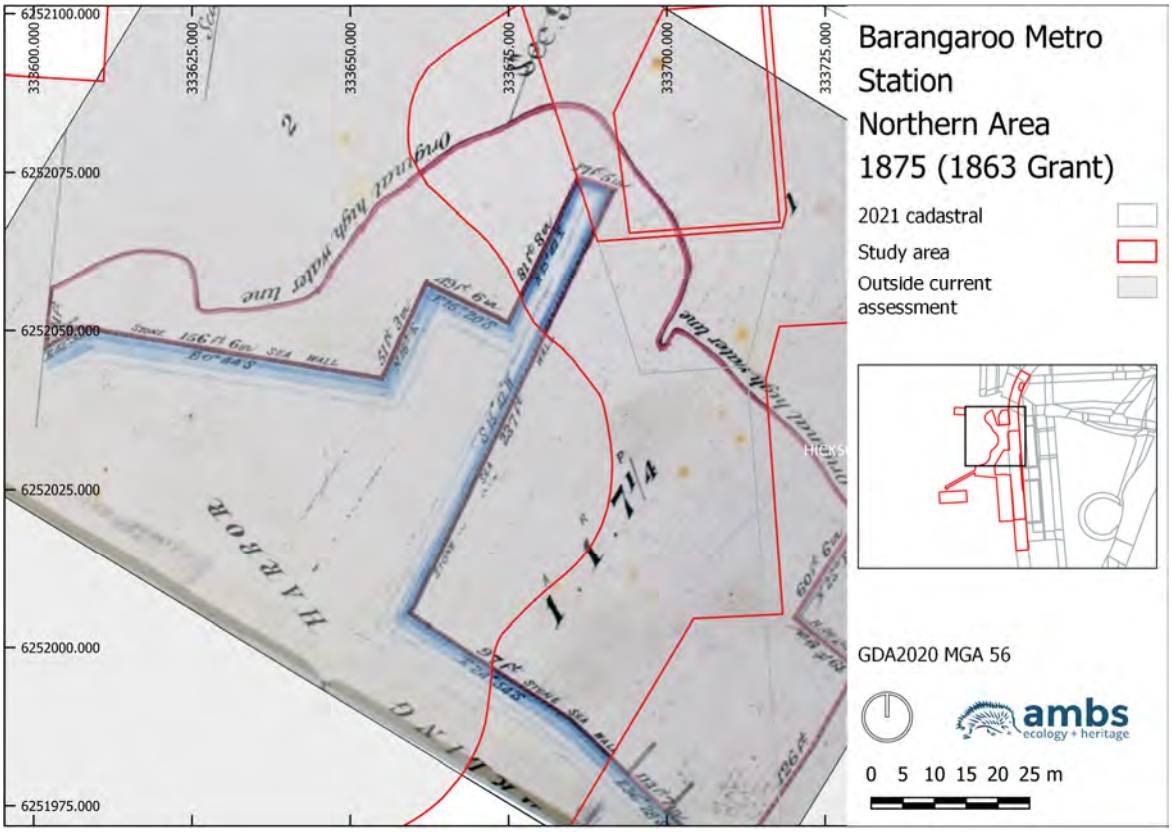


Figure 2.7: Cuthbert's 1863 grant of reclaimed land showing the narrow dock crossing the study area. This image is from an 1875 transmission of estate (NSW LRS, 1875) which shows measurements of the dock and the stone sea wall.

By 1865, Cuthbert had constructed a filled-in wharf of some 8581m^2 (calculated from the 1865 survey), incorporating three slipways, a timber jetty, and containing a large saw shed and numerous other wharf buildings. The wharf was fringed with a stone seawall that ran from Clyde Street in the southeast to Munn Street in the northwest. The impracticality of Clyde Street's gradient for use by the wharf is indicated by Cuthbert's decision to place his large saw shed at the point where the street met his wharf, effectively cutting off access between the two.

The study area includes the southeastern work area of Cuthbert's wharf, between the two southern slipways, as well as parts of several wharf structures at the periphery in the north and east (Figure 2.9). It was a part of Cuthbert's original (pre-1863) wharf, and as the largest open space at the time, and containing the only slipway, would have been the central work area. With the saw shed located in the southeast, this part of Cuthbert's wharf is likely to have been the favoured building location even after the wharf was expanded. The study area also encompasses what became the rear ground of the third slipway after the dock was filled in, and includes the footprint of a large structure that was built against the retaining wall of Munn Street. With the exception of the saw shed, this building was the largest on Cuthbert's wharf. A contemporary painting by Samuel Elyard (Figure 2.8) appears to show the structure in a stylised ramshackle state, with the Munn Street houses on the higher ground beyond. It is a tall open-sided structure with strong vertical supports and a large amount of timber stacked against it. This building was probably the store for cut timber, the large and long planks required for the biggest vessels would account for its oversized nature. The 1865 survey depicts it as around 18m long and 8m deep. Over 10m of this structure is included within the study area.



Figure 2.8: Painting titled *Boat Shed, Darling Harbour* by Samuel Elyard dating from 1862-1875 showing the large northern structure on Cuthbert's wharf in the centre of the image (Elyard, 1862).

The footprint of several more residences fronting Unwin and Wentworth Streets are also within the study area by 1865, in the present location of Hickson Road and the Dalgety Bond Stores. The remains of many of these residences are likely to have been removed during the construction of Hickson Road. The 1887 contours indicate that most of the structures on Unwin and Wentworth Streets were located over 3m above the twentieth century level of Hickson Road (2.454m AHD71 recorded at Dalgety Bond Stores at Survey Mark 46693, 1988 [LPI NSW]).

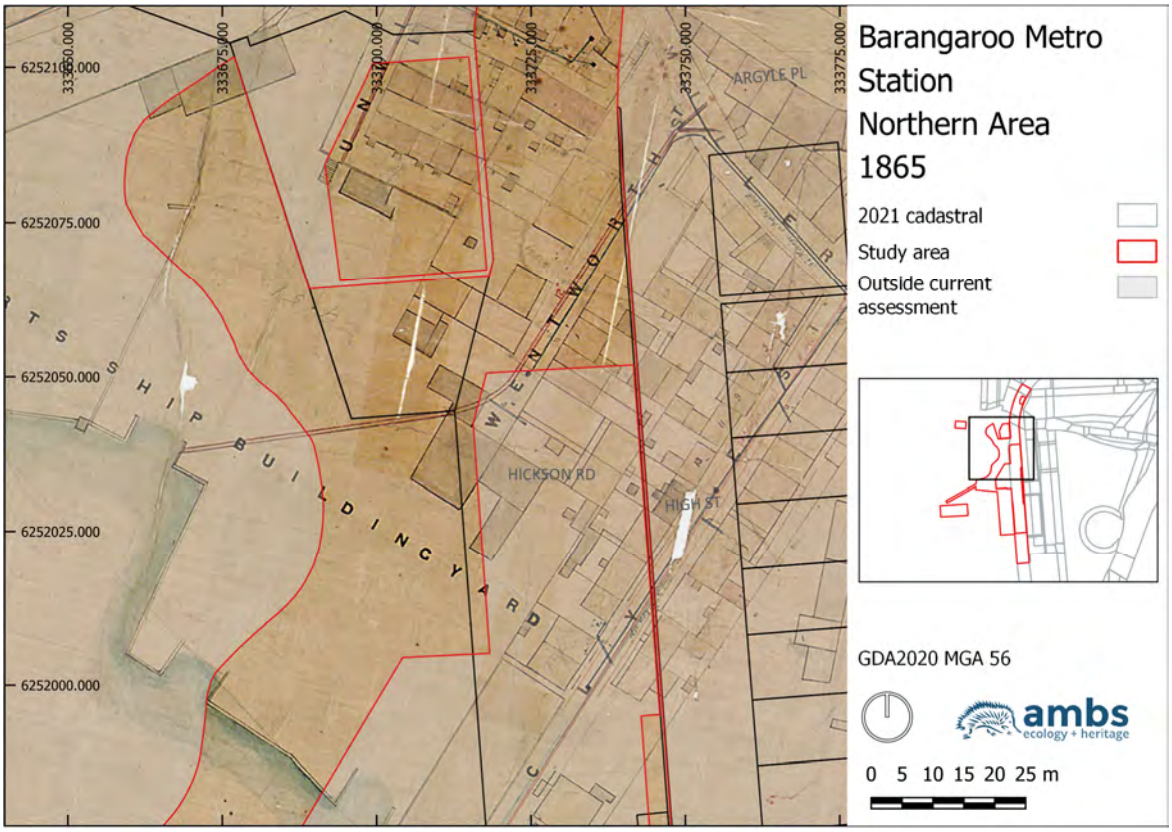


Figure 2.9: 1865 Plan of the northern part of the site showing part of Cuthbert's wharf (including the large northern structure) and residences on Unwin and Wentworth Streets within the study area (City Engineer and City Surveyors Department, 1865).

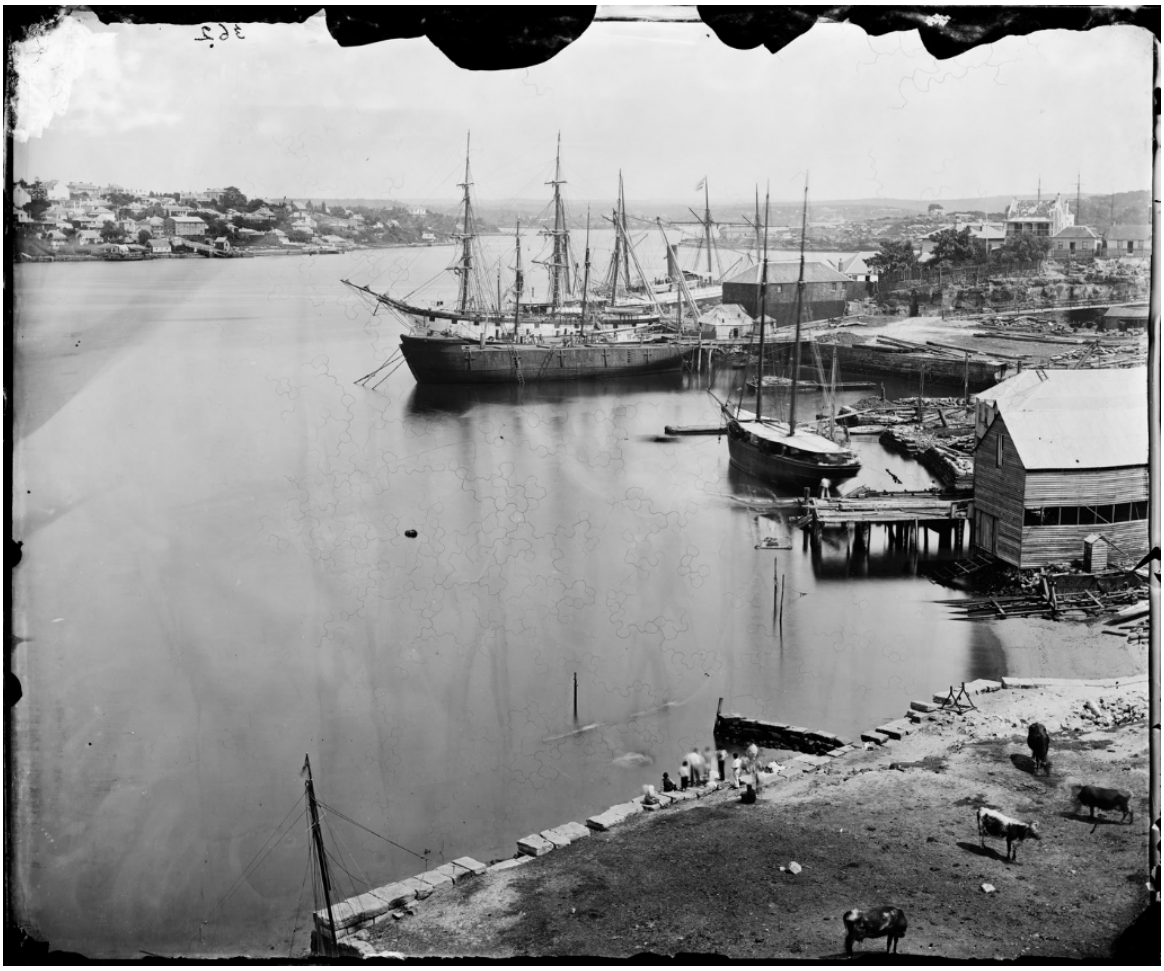


Figure 2.10: A c.1875 image looking northwest from Osborne's wharf, just south of Clyde Street. Cuthbert's shipbuilding yard is shown at the right beyond the boat shed (Mitchell Library, SLNSW, Shipyards at Millers Point looking across to Balmain, digital ID: a2825073).

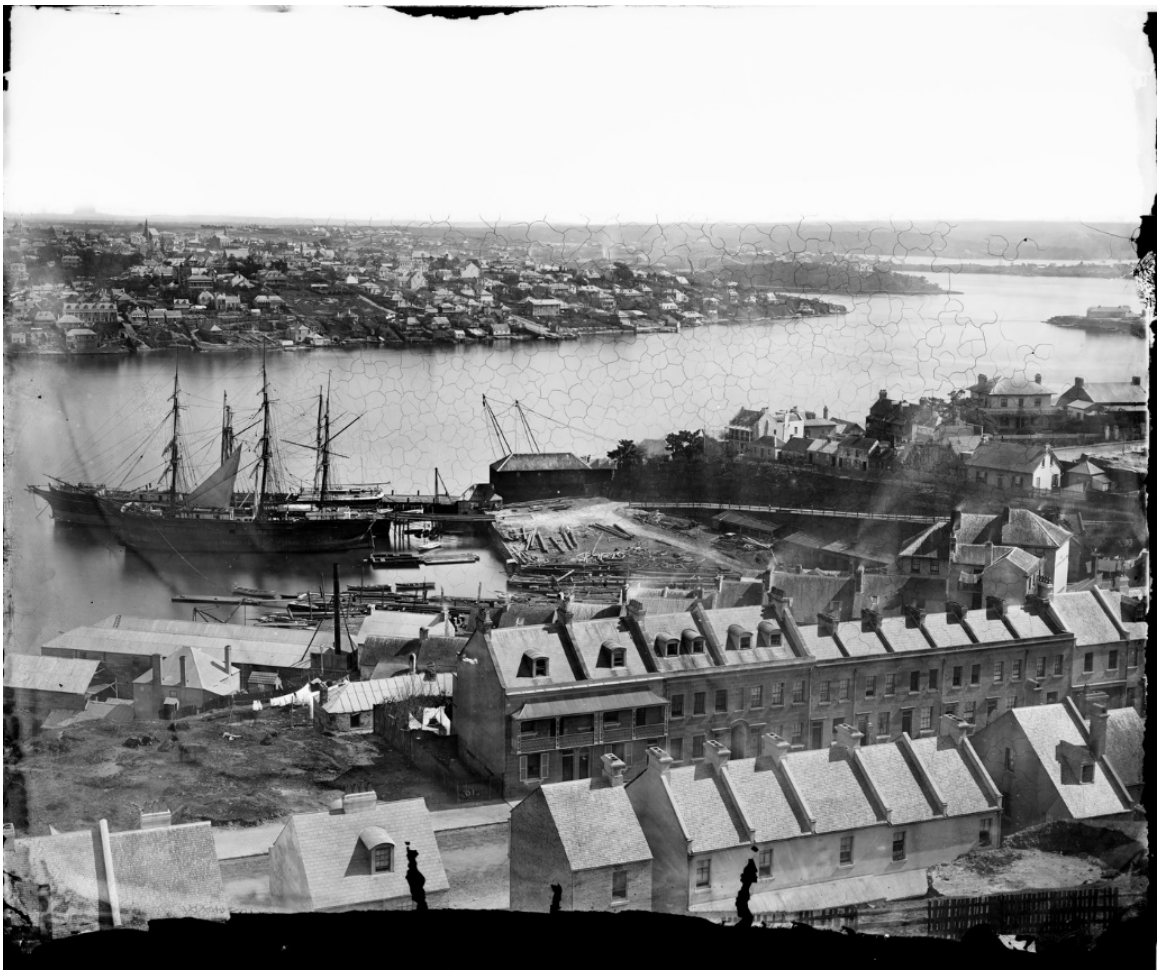


Figure 2.11: Looking over Cuthbert's yard from Observatory Hill sometime between 1870 and 1875. This image can be compared with Figure 2.13, taken from the same vantage point some 10 years later (Mitchell Library, SLNSW, Miller's Point and Balmain from the Observatory, digital ID: a2824955).

2.1.5 Dibbs' Wharf and Gibbs Bright & Co.

By the late 1870s Thomas Alwright Dibbs was occupying and modifying Cuthbert's wharf. Cuthbert had constructed a flat filled-in wharf with three slipways and only a short jetty. It was purpose-made for shipbuilding but had no berths at which ships of deep draught could load or unload. Upon possession of the wharf, Dibbs began constructing long finger wharfs which projected out into deep water and which were suitable for receiving and loading goods (Figure 2.12). The large structure in the north was either converted to or rebuilt as a flour store and was recorded as 'iron' suggesting that the open sides of the shed had been covered in with galvanised sheeting.

In 1894 a survey of the bond stores in Sydney (Mahlstedt, 1894) recorded several substantial structures on the wharf, which was by this time being operated by Gibbs Bright & Co. A large brick woolstore dominated the northern end of the wharf and had replaced Dibbs' iron flour shed. In addition, two small stone structures were located at the rear of the wharf near the current location of Dalgety's stores, and a large iron shed stood in the location of Cuthbert's narrow dock (Figure 2.15).

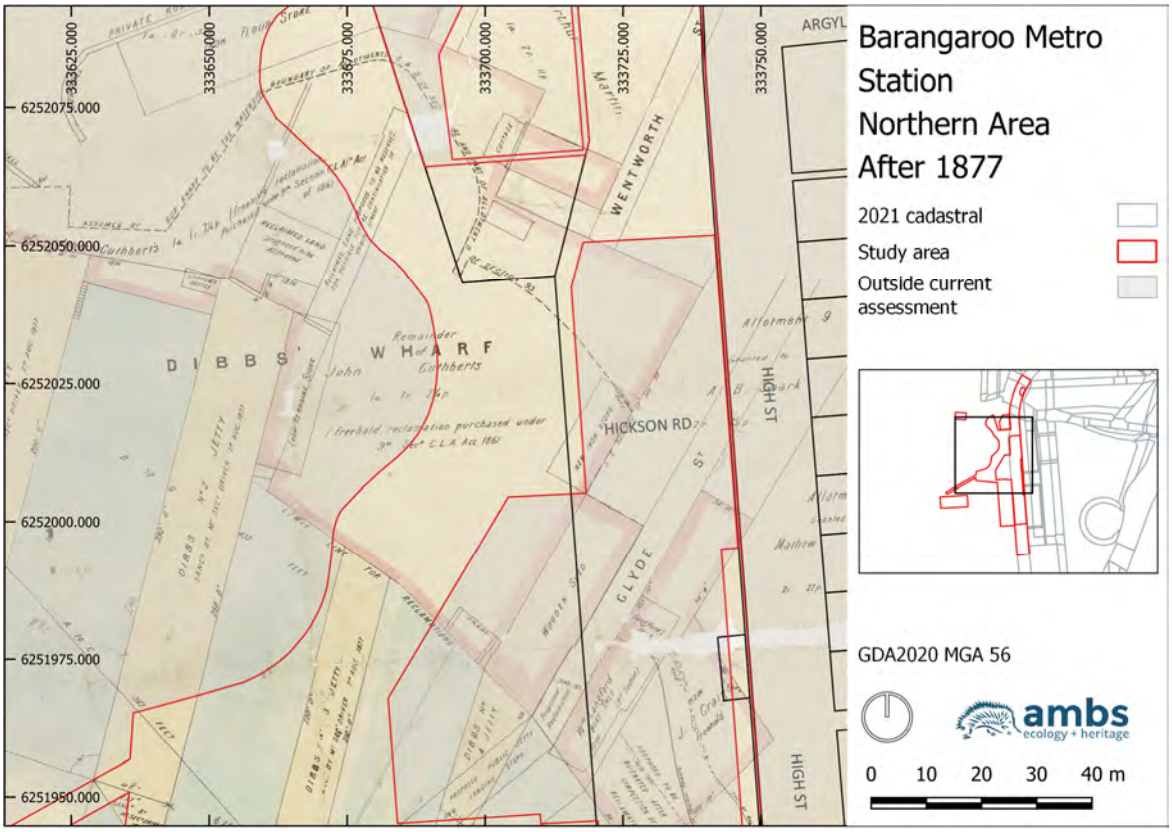


Figure 2.12: A c. 1877 plan showing Dibbs' modifications to Cuthbert's wharf including constructing long jetties and filling in the slipways (Norton and Co, 1877).



Figure 2.13: an 1882 photograph looking over Dibbs' wharf from Observatory Hill towards Balmain. The large iron-clad flour store can be seen at the right (City of Sydney Archives, A-00016724, https://archives.cityofsydney.nsw.gov.au/nodes/view/574116).

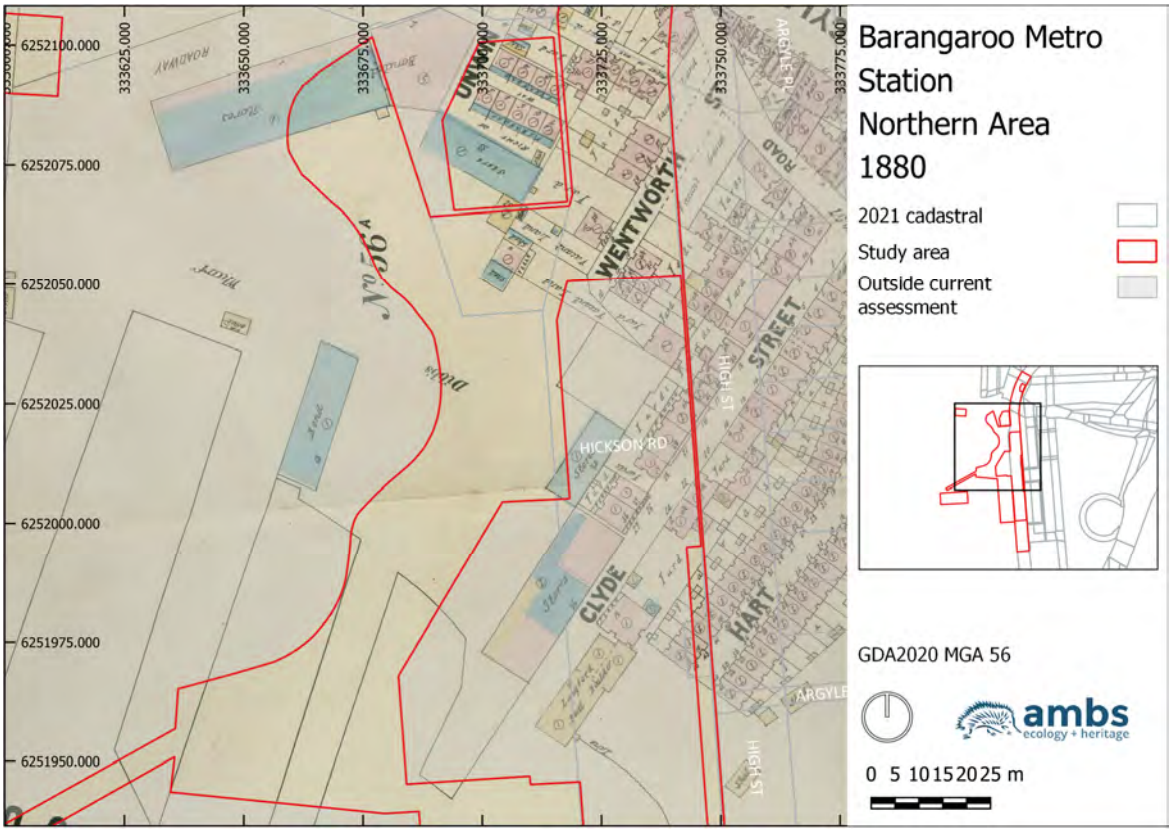


Figure 2.14: Dove's 1879-80 survey showing Dibbs' wharf and finger jetties (Dove, 1879).

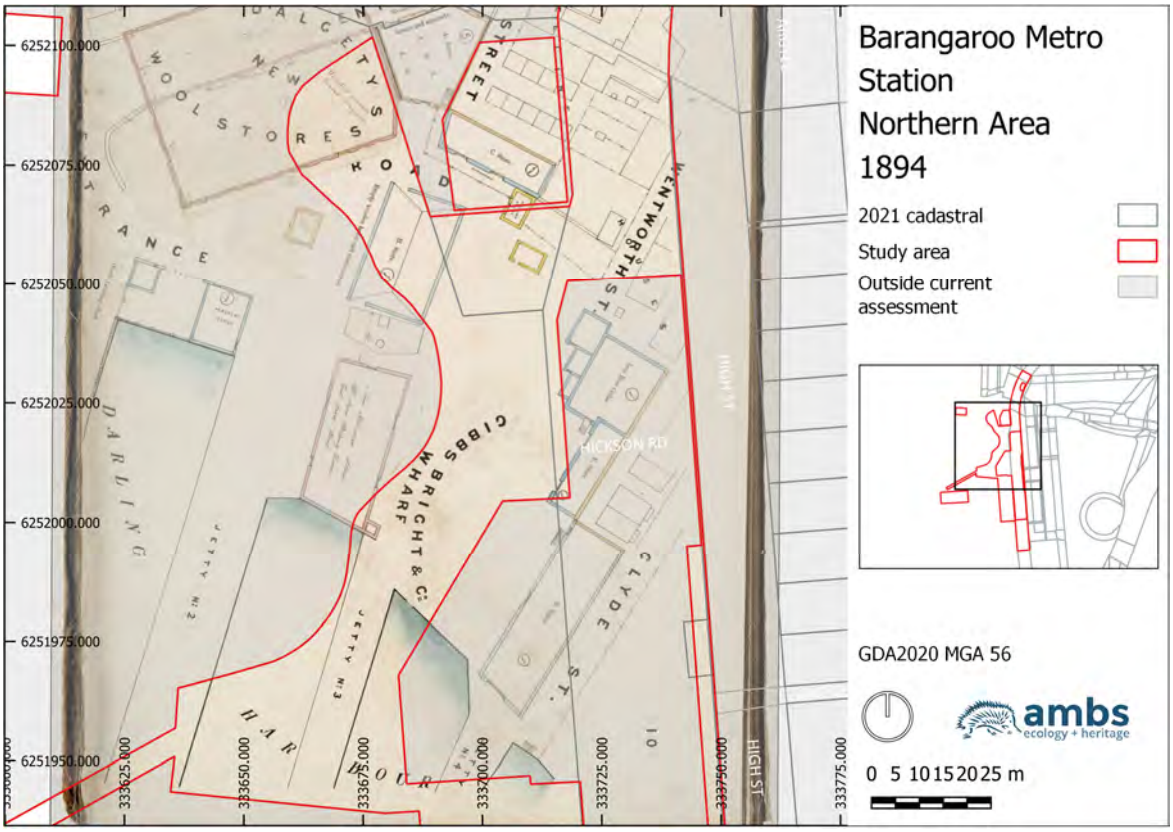


Figure 2.15: Mahlstead's 1984 survey of the wharf showing substantial stores occupying the former shipyard (Mahlstedt, 1894).

2.1.6 Study Area South

To the south of the study area, the steep and rocky topography of the slope from the top of the Kent Street ridge to the shoreline of Darling Harbour significantly affected the development of this part of the site. The ground was no steeper than that to the north, but without the kind of access that Munn Street provided for the shoreline in Section 92, the waterfronts were cut off from the streets on the ridge above, and were not fully developed until the construction of Hickson Road in 1911.

2.1.7 Early development

Within the study area are the shoreline portions of Lots 3, 4 and 5 of Section 93. Initial grants of lots 3 and 4 were to John Forster Church and Thomas Agars respectively. By 1833, Agars had constructed a projecting filled-in jetty that was depicted by the survey as 7m wide and extending 21m into the bay from what appeared to be a rocky shore. The 1887 contours indicate that the slope of the land closest to the shore was similar to that on Martin's parcel, and Agars constructed two buildings at about 3-4m above high water at a distance of around 26m from his wharf, on a strong slope of around 21%. Like Martin to the north, Agars had also built what was probably a residence on the much higher ground fronting Kent Street.

On Lot 3, John Church had not begun to develop the waterfront part of his property by 1833, and it was drawn on survey as rocky and protruding into the bay. However, he had constructed a considerable-sized building on the lower parts of his land and left the higher street frontage vacant, suggesting that this was the more important part of his property.

Lot 5 was reserved as government land and the higher ground close to Kent Street was quarried from an early date. The portion of this lot within the study area remained almost completely undeveloped until the construction of Hickson Road commenced in 1909. The foreshore remained a beach that by 1887 had a relatively gentle slope that was exposed at low water across the study area.

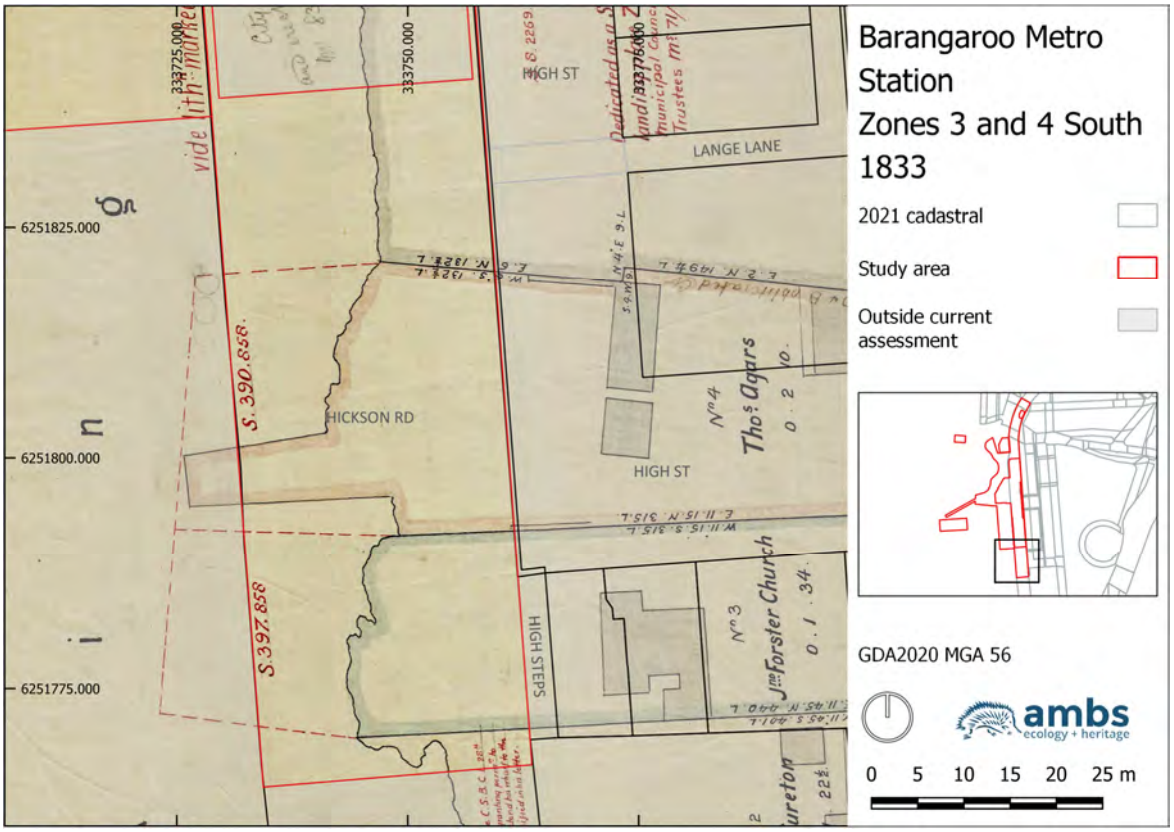


Figure 2.16: 1833 survey of the shoreline portions of Lots 3, 4 and 5 of section 93 (south to north) (City Engineer and City Surveyors Department, 1833).

2.1.8 Mid-century boat sheds and wharfage

By 1855, Thomas Agars had passed away and his land was put up for auction in 1853. In the following decades the land was continually subdivided, with a general division remaining between the higher ground close to Kent Street and the portion which addressed the water. Annotations to the 1855 plan indicate that activity intensified along the shoreline after Agars' death, and three structures were added to the jetty before the compilation of the 1865 survey. Church's foreshore to the south is depicted as rocky and steep and remains undeveloped in 1855, but annotations indicate that structures were built at the water's edge shortly after (Figure 2.17).

By 1865 there was still no substantial wharfage at either property, but several structures had been built at the waterline. Their depiction on plan at high water indicates that they were probably sheds on stilts. Steps are drawn indicating the steepness of the slope at the water's edge. Annotations indicate that a northern extension was added to the jetty after the survey was complete (Figure 2.18).

In 1876, Staunton Spain applied to reclaim 17 perches at the edge of Agars' grant. By 1880, the boat sheds had been demolished and adjoining filled-in wharfs covering a total of 800m^2 fronted the properties at Lots 3 and 4. By the time the land was resumed by the government in 1901, the Lot 4 wharf had been extended by a further 574m^2 to the north and west, and a dotted line at the end of the Lot 3 wharf suggested that a similar extension was underway at the time of resumption (Figure 2.21).

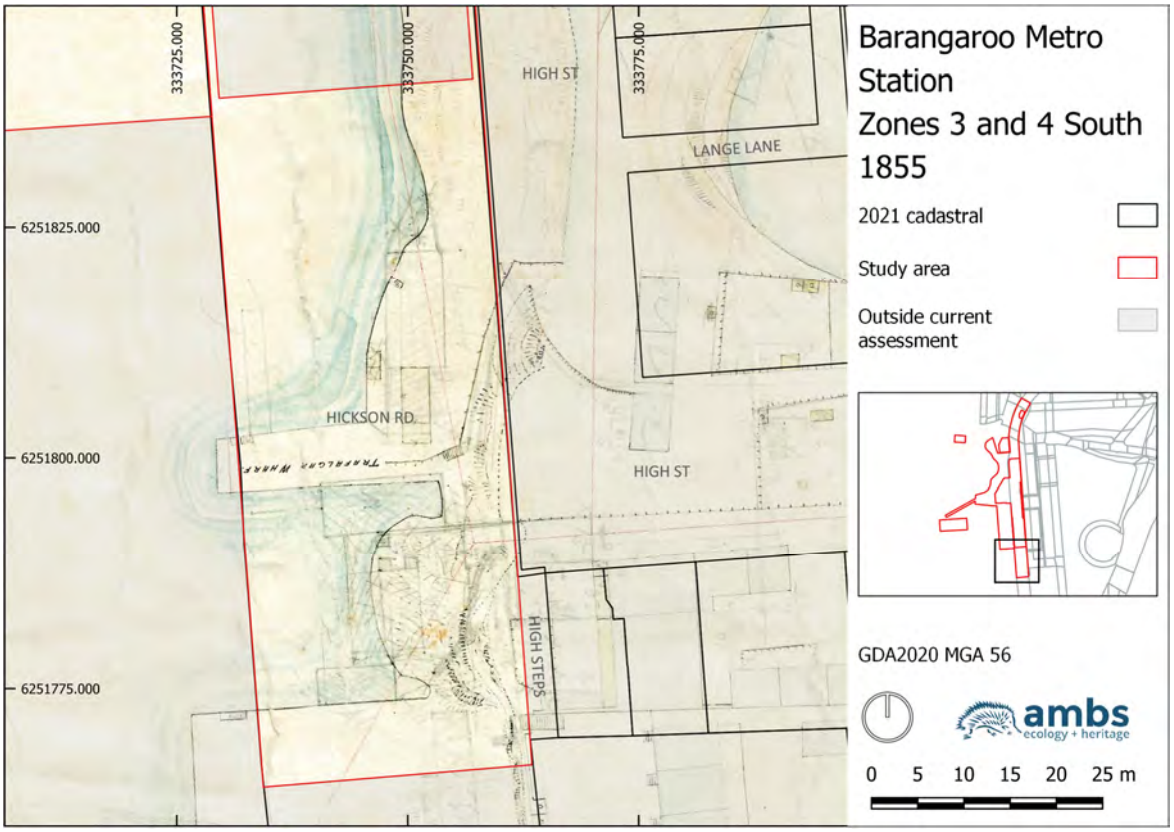


Figure 2.17: 1855 plan showing development of the foreshore in the south of the study area (City Engineer and City Surveyors Department, 1855).

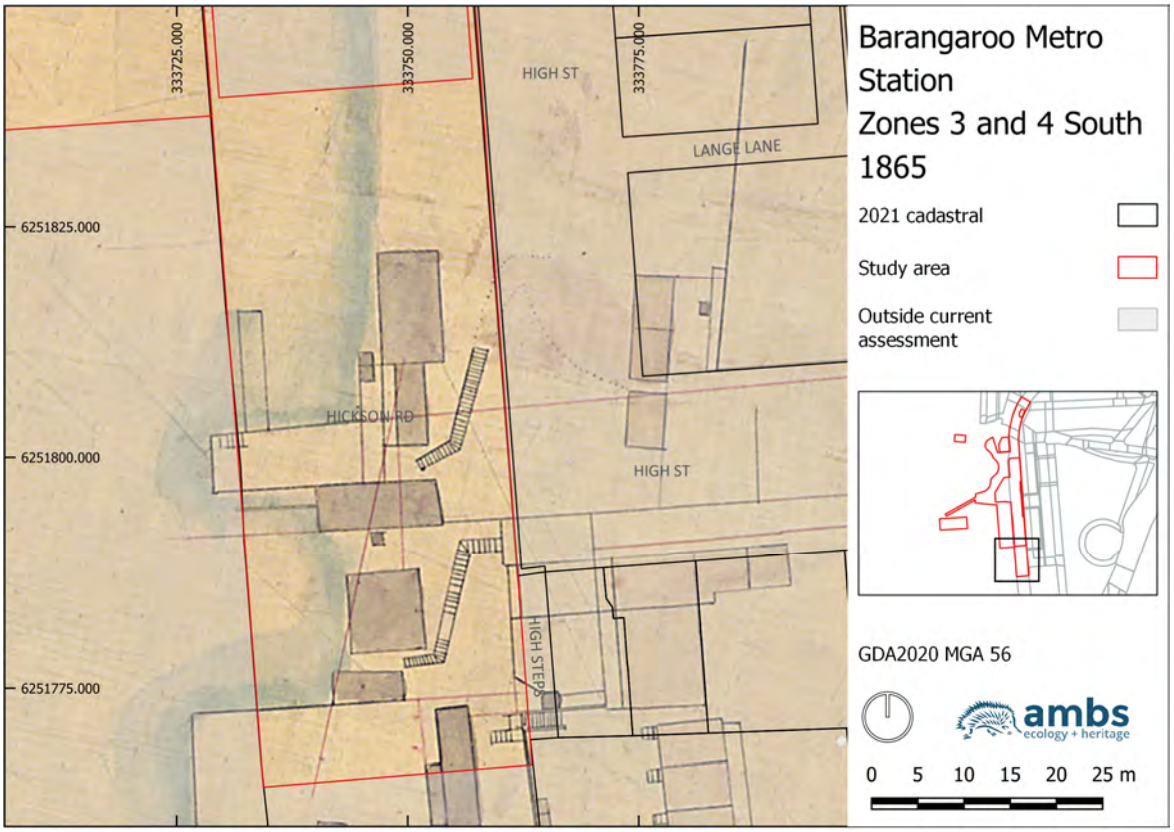


Figure 2.18: 1865 Trig Survey showing boat sheds at the water's edge on Lots 3 and 4 (City Engineer and City Surveyors Department, 1865).



Figure 2.19 c.1870 artist's painting of Darling Harbour (Allotment 5/Government Ground/Quarry left of image) (SLNSW, View of Miller's Point and Darling Harbour, ca. 1870/ artist unknown, digital ID: 825789).

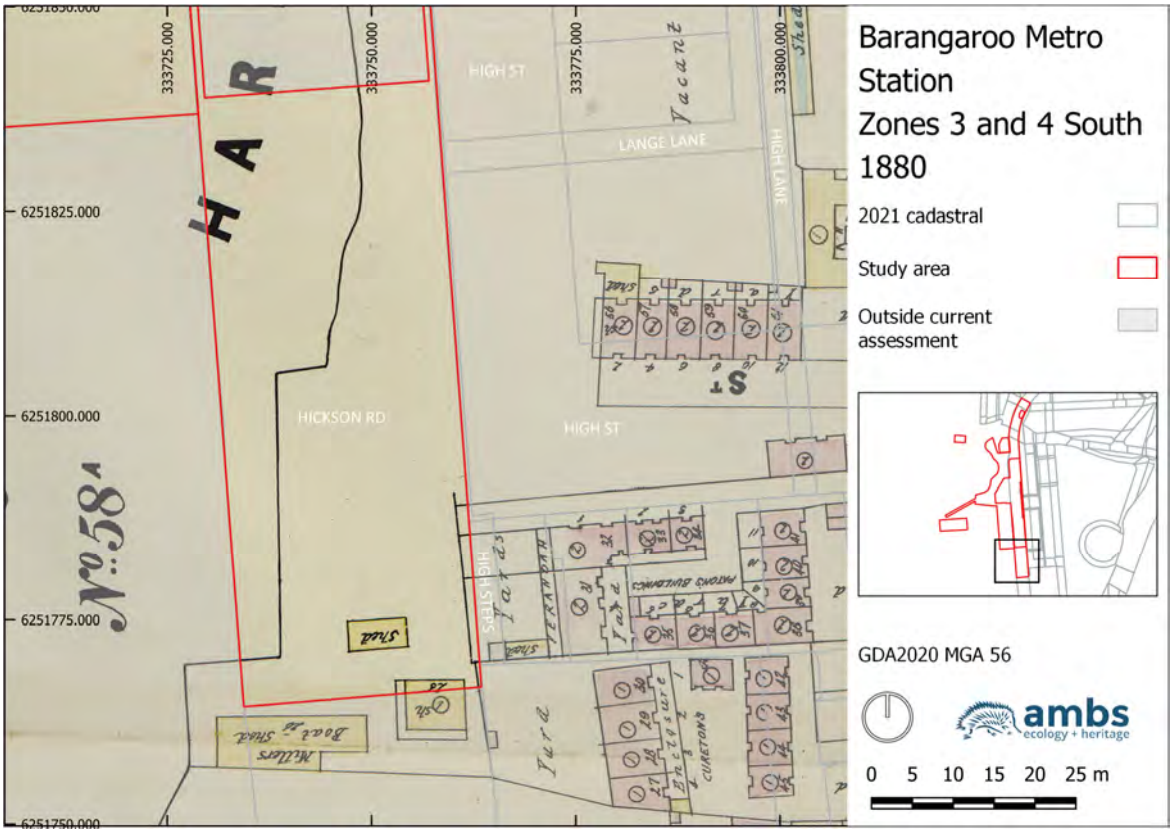


Figure 2.20: Dove's 1879-1880 survey showing an amalgamated wharf fronting Lots 3 and 4 (Dove, 1879).

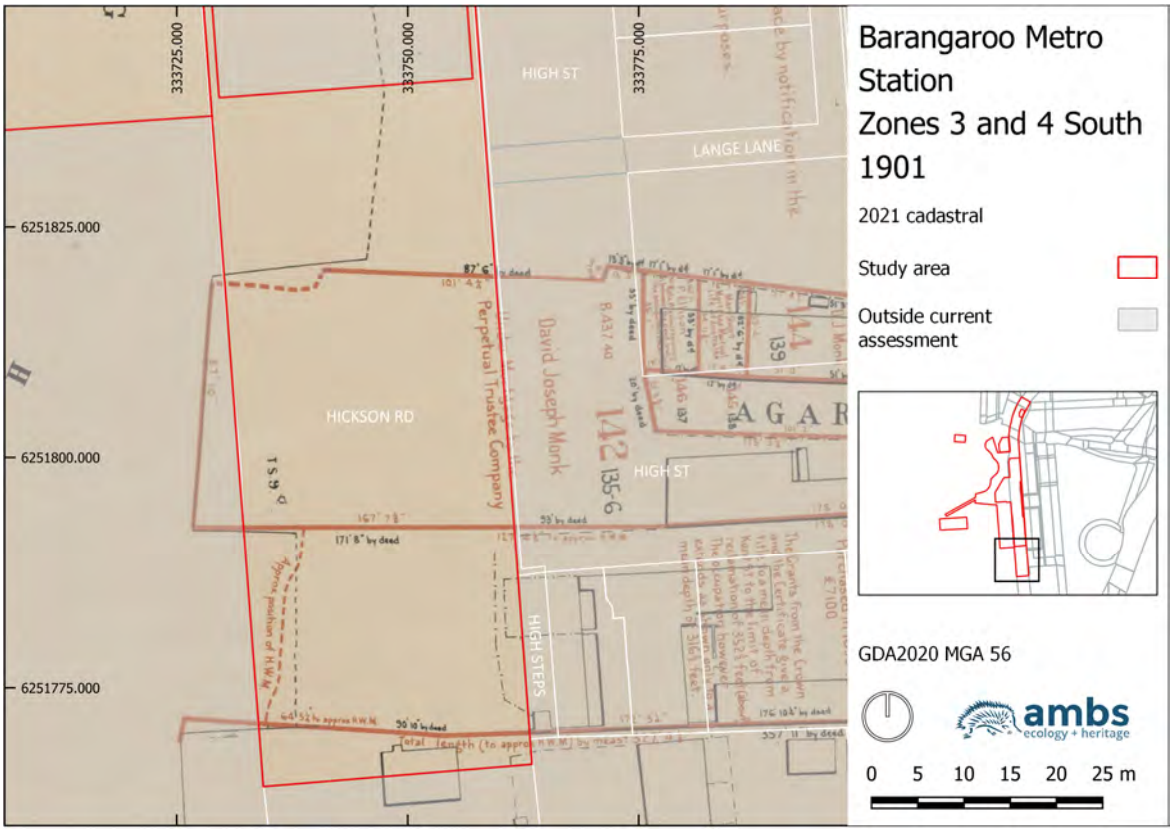


Figure 2.21: 1901 resumption plan showing extensions to the wharfs in Lots 3 and 4 are underway (Gullick, 1901).

2.1.9 Construction of Hickson Road

The construction of Hickson Road followed the resumption of wharfage along the eastern shore of Darling Harbour after an outbreak of bubonic plague in 1900. In combination with the road construction and the cutting back of the rock face along Hickson Road, the upgrades of the wharfs resulted in a total transformation of the study area.

Throughout the nineteenth century, the nature of development along the northeastern shore of Darling Harbour had been determined by the topography and the rocky quality of the steep slopes. The ground was not easily modified, and the street layouts were forced to follow the ridgelines or else create roads and lanes that were too difficult for carts to use. The creation of Hickson Road at wharf level, and cutting a straight line north along the shore, changed the way in which the properties addressed the harbour and formalised the divide between high and low ground that many of the lots had struggled to overcome.

In the north of the study area, much of the intermediate ground between Argyle Street and the waterfront was removed to level the 28m-wide road. In some locations up to 12m of rock and soil was removed to keep the road at wharf-height. The new wharfage was suspended on substantial piles and rat-proofed with Monier plates (Figure 2.23).

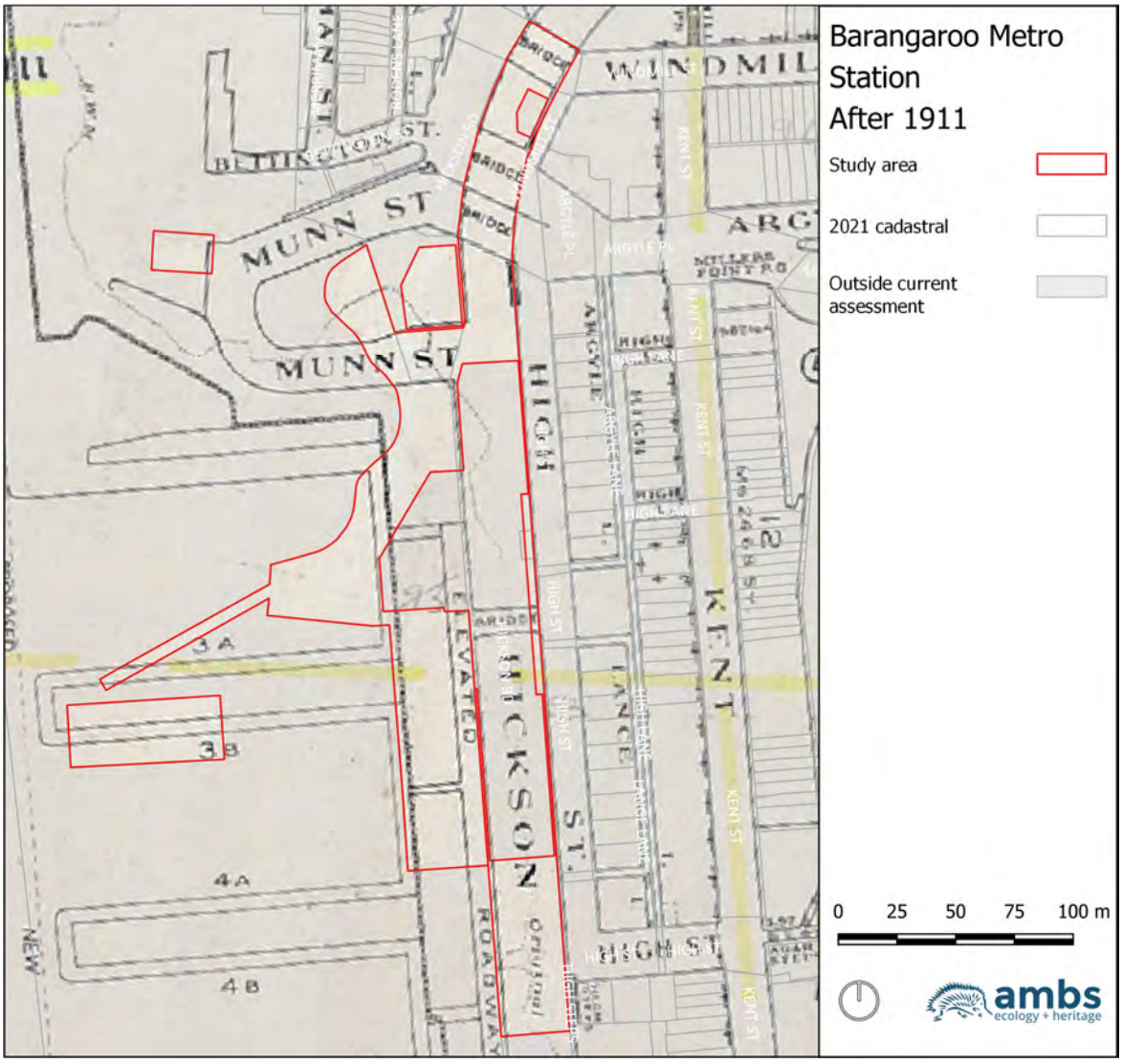


Figure 2.22: An undated parish map of St Philip showing the orientation of the wharfage after the construction of Hickson Road.

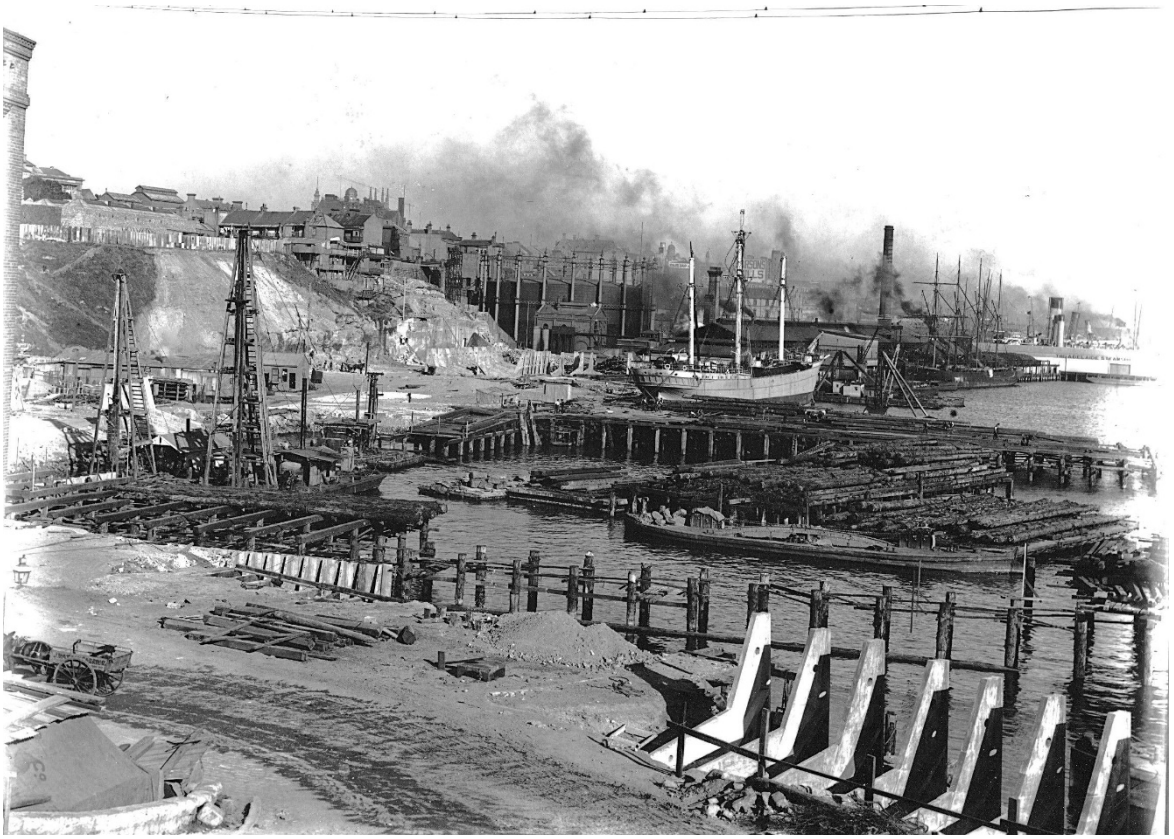


Figure 2.23: 1909 East Darling Harbour (from approximately Munn Street) (City of Sydney Archives, A-00077313, https://archives.cityofsydney.nsw.gov.au/nodes/view/698395).



Figure 2.24 1930s Hickson Road looking southwest from near the Argyle Street Bridge (City of Sydney Archives, A-00077266, https://archives.cityofsydney.nsw.gov.au/nodes/view/698327).

2.2 Lots and Grantees within the Study Area

Lot/Section	Grantee	Description
Allotment 5 Section 93, 1 acre 3 roods 5 perches	Government Land	Allotment 5, abutting the land grant of John Terry Hughes was nominated Government Ground covering 1 acre 3 roods 5 perches, of which 1 acre 1 rood 39 perches were dedicated as a site for ferry and public landing on 15 August 1871. On the southern portion of the allotment fronting Kent Street there was a Roman Catholic Church, the land of the church accounted for 1 rood 6 perches of the Government Ground. By 1855, the Government Ground was still mostly a quarry, extending from Allotment 6 (grant to John Terry Hughes).
Allotment 4 Section 93, 2 roods 10 perches	Thomas Agars	Thomas Agars arrived in Australia in 1820 at the age of 30, he was noted on the 1828 census as a convict serving a seven year sentence and had been employed as a gardener (SANSW, 1828 Census Book 1, pp. 8-9). On 29 April 1837, Agars received his official land grant of 2 roods 10 perches which had been announced in the Government Notice on 22 July 1835 (NSW HLRV, Grant Register, Serial 47-90; *New South Wales Government Gazette*, 22 July 1835, p. 493). He was to pay a Quit Rent or sum of four pounds ten shillings from July 1836 until June 1849, after which it was reduced to two pounds five shillings. Based on the 1833 map, it is assumed Agars took possession of the land a number of years before the grant was received as there were already four structures noted on the map, the two larger structure were located close to Kent Street while the smaller two were situated closer to the centre of the grant. • 1837: Newspaper advertisements list Thomas Agars, Trafalgar Warehouse, Kent Street and on the Wharf of Thomas Agars (*Colonialist*, 25 May 1837, p. 8; *Commercial Journal and Advertiser*, 24 October 1838, p. 1). • 26 April 1841: Thomas Agar ceased partnership of stock and capital with Charles W. Roemer (*New South Wales Government Gazette,* 20 April 1841, p. 612). • April 1842: allotments of land for sale situated in Kent Street and Darling Harbour (proprietor Thomas Agars), adjoining stores and residence of Thomas Agars: o Lot 1: frontage to Kent Street, 19 ½ perches, neat cottage known as Trafalgar cottage (4 rooms, kitchen, cellar, pantry, gardens in front and rear, well of water, other conveniences, verandah fronting Darling Harbour) o Lot 2: land rear of Lot 1, 8 ¾ perches, suitable for erection of store, dwelling house or both o Lot 3: water frontage to Darling Harbour with wharf, 13 perches, suitable for erection of large store (*Sydney Herald*, 23 April 1842, p. 4). • November 1852: death of Thomas Agars, merchant, aged 63, George Stabler named one of executors in will (*People's Advocate and New South Wales Vindicator*, 6 November 1852, p. 14; *Sydney Morning Herald* 17 November 1852, p. 3).

Lot/Section	Grantee	Description
		• 14 September 1853: sale by auction, Lot 1: block of land, 1 ½ acres in Kent Street, nearly adjoining premises of late Thomas Agars, suitable for erection of wharves and water-side premises (*Sydney Morning Herald*, 15 August 1853, p. 8). • 25 August 1876: Staunton Spain, application to reclaim and purchase land fronting Thomas Agars allotment 4 (*New South Wales Government Gazette*, 25 August 1876, p. 3366; NSW HLRV, Old Form Torrens Register, Vol-Fol 473-144). o 4 November 1879: Grant for Staunton Spain of 16 perches for £56 o 6 February 1880: transfer to David Joseph Monk (Vinegar Manufacturer) o 26 November 1888: transfer to Mutual Provident (?) Land Investing and Building Society Limited ▪ 26 November 1888: mortgage to David Joseph Monk o 10 April 1890: transfer to David Joseph Monk ▪ 24 December 1891: mortgage to James Marks ▪ 22 April 1898: discharge of mortgage ▪ 22 April 1898: mortgage to the Perpetual Trusted Company Limited ▪ 2 April 1902: discharge of mortgage o 1902: Notice of Resumption o 1911: vested in Sydney Harbour Trust o 25 January 1923: land proclaimed public highway, vested in Council of the City of Sydney (Hickson Road)
Allotment 3 Section 93, 1 rood 34 perches	John Forster Church	• 4 May 1836: grant to John Forster Church of 1 rood 34 perches (NSW HLRV, Grant Register, Serial 39-165). • August 1844: death of John Forster Church, wife Barbara Ann Church named executrix (*Sydney Morning Herald*, 14 October 1844, p. 3). • June 1862: death of Barbara Ann Church, John George Church, Walter Marshall Church and Bartholomew O'Brien named executors (*Sydney Morning Herald*, 12 June 1862, p. 8; *New South Wales Government Gazette*, 17 June 1862, p. 1104). • 15 November 1878: Under *Crown Lands Alienation Act* 1861, Theophilus Paton permitted to reclaim and purchase 17 perches of land – reclaimed extension of Allotment 3 (*New South Wales Government Gazette*, 21 July 1876, p. 2810; 15 November 1878, p. 4583).

Lot/Section	Grantee	Description
		• 22 March 1880: Grant of reclaimed land to Theophilus Paton for £60 (NSW HLRV, Old Form Torrens Register, Vol-Fol 493-242). o 16 May 1889: mortgage to William McGee, discharged 29 December 1891 o 29 December 1891: mortgage to William McGee, discharged 3 August 1893 o 5 September 1893: mortgage to Jane Railton ▪ Transfer of mortgage to William McGee • 5 November 1894: transfer from Theophilus Paton to Henry Elliot and Andrew Fenwick o 10 June 1895: mortgage discharged o 4 June 1895 mortgage to Stephen Freeman • 8 July 1895: Certificate of Title (joint tenancy) granted to Henry Elliot and Andrew Fenwick (NSW HLRV, Old Form Torrens Register, Vol-Fol 1168-65). o 14 January 1896: mortgage to Jane Foreman(?) ▪ February(?) 1899: transfer of mortgage to Joseph Foreman, discharged 27 April 1899 • 26 April 1899: transfer from Henry Elliot and Andrew Fenwick to Eva Connell Hordern • 8 June 1900: Certificate of Title granted to Eva Connell Hordern for combined portions including part Allotment 3, part Allotment 4 and 17 perches (NSW HLRV, Old Form Torrens Register, Vol-Fol 1318-29). • 31 January 1901: Notice of Resumption by Minister of Public Works • 6 February 1911: Sydney Harbour Trust proprietors • 25 January 1923: land proclaimed as public highway, vested in the Council of the City of Sydney – Hickson Road (3 April 1925, Fol 1691, MSB Plan StP. 162A) and High Street (steps at High Street, 25 January 1923, no. 9 Fol 347, MSB plan StP. 102A) • 26 May 1939: Maritime Services Board of NSW proprietors

Lot/Section	Grantee	Description
		○ January 1985: 115 Kent Street leased to Housing Commission of NSW, expires 25 March 2004 ○ January 1985: 121 Kent Street leased to Housing Commission of NSW, expires 25 March 2004 ○ January 1985L 119 Kent Street leased to Housing Commission of NSW, expires 25 March 2004
Allotment 1 Section 92, 1 acre 2 roods 11 perches	Arthur Martin	• Arrived in Australia in 1792 as a convict serving a life sentence and received a Conditional Pardon 1 December 1809 (SANSW 1828 Census Book 4, pp. 224-225; NSW HLRV, Grant Register Index of Pardons Serial 4-M;NSW HLRV, Grant Register of Pardons Serial 4-19) • Arthur Martin is listed as either an overseer or superintendent of Lime Burners in five Government House funding and salary lists between 1818 and 1820 (*Sydney Gazette and New South Wales Advertiser*, 4 March 1815, p. 1; 12 June 1919, p. 3; 28 August 1919, p. 2; 8 June 1820, p. 3; 18 March 1820, p. 3; 29 July 1820, p. 3) • Martin, who had worked government overseer, was granted permission by Governor Macquarie in 1813 to occupy land on Cockle Bay in recognition of his ten years of service (1795 to 1805) and his good conduct (*Australian*, 29 June 1832, p. 4). • Governor Thomas Brisbane had promised land to James Munn to commence a ship-building business, part of which was the land Arthur Martin had his limekiln. In 1832, Martin brought action against Munn for trespass, he sought possession of the land which he claimed had been promised to him by Governor Macquarie. The case was tried twice and in both instances the verdict was in favour of Martin. • On 15 January 1834, 1 acre 2 roods 11 perches (Allotment 1 Section 92) was formally granted to Arthur Martin; however, he had already conveyed the property to Frederick Wright Unwin on 8 and 9 November 1833 through a deed of Lease and release including the houses and limekiln (NSW HLRV, Grants, Serial 31-243; NSW HLRV, Old System Deed, Book F-492; Book F-767). • An auction on 20 January 1834 advertised 24 building lots at Darling Harbour, two of which fronted the water and claimed to be ideal for a wharf or a boat builder and another two had stone buildings already erected, while the exact location of the allotments is unknown, it is likely the subdivision occurred between what

Lot/Section	Grantee	Description
		would become Unwin and Wentworth Streets and the stone buildings are likely those constructed by Munn (*Sydney Herald*, 20 January 1834, p. 4). • Through a deed of Lease and release, Frederick Wright Unwin sold back some of the land to James on 15 and 16 May 1834 (NSW HLRV, RPA 4494).
Allotment 2 Section 93, 1 acre 32 perches	James Munn	• Arrived as a free settler 1824 on Brig Amity with wife Ann, noted as ship builder owning 800 acres of land total (James (45) Ann (32) in 1828) (SANSW, 1828 Census Book 4, pp. 346-347) • December 1825: had set up ship-building business, was advertising for youths (14-15yr) as apprentices, Millport, Cockle Bay (*Australian*, 1 December 1825, p. 1) • 12 March 1830: report of attempted theft from ship-building premises at Millport (name of his building yard), Cockle Bay (*Sydney Gazette and New South Wales Advertiser*, 16 March 1830, p. 4) • February 1834: Abstract of sales by auction list six allotments in Darling Harbour near Mr. Munn and an allotment in Darling Harbour near Miller's Point sold by private contract to Mr James Munn (about 70 perches) [Martin's land?] (*Sydney Herald*, 6 February 1834, p. 2) • May 1834: 15 valuable building allotments near the Miller's Point, running from the residence of Mr James Munn to that of J B Bettington and most of them having a frontage to the main road near the property of F W Unwin [Munn's subdivision?], these were sold at auction in June for a sum of £800 (*Australian*, 6 May 1834, p. 3; *Sydney Gazette and New South Wales Advertiser*, 3 June 1834, p. 3)) • 6 June 1840: Grants of Town Allotments, Section 92, 1. Arthur Martin (Grantee) Deed already issued; 2. James Munn (Grantee) Deed already issued (*New South Wales Government Gazette*, 6 June 1840, p. 562) • June 1840: while providing advice, he was noted to be a ship builder for 45 years (*Sydney Monitor and Commercial Advertiser*, 22 June 1840, p. 5) • 26 February 1848: Death of Mr James Munn, native of Irvine, aged 68, 'oldest ship builder in Sydney, and a much respected colonist', private invitations not

Lot/Section	Grantee	Description
		being issued for funeral (*Sydney Morning Herald,* 28 February 1848, p. 3)

3 Archaeological Context

3.1 Areas of Archaeological Potential Assessed in the AARD (Artefact Heritage, 2016)

Artefact's assessment of archaeological potential at the site has been superceded by the results of the archaeological excavations within the station box area (Casey & Lowe, 2019) which have demonstrated higher potential for remains to survive in the east of the site below Hickson Road. This has raised the level of potential for Agar's wharf and Martin's lime kilns. A revised assessment of archaeological potential is set out in section 4.1.

Table 3.1: Artefact assessment of archaeological potential for the study area.

Phase	Potential	Archaeological Resource
1 (1788-1830)	Nil-Low	Evidence relating to early lime kilns in the northwest of the study area
	Low	Evidence of environmental change, pollution and landscape modification such as quarrying
	Low-Moderate	Potential archaeological resources relating to early use of Agar's wharf in the southern part of the study area
2 (1830-1900)	Moderate	Potential archaeological resources relating to the growth and operation of Agar's and Sparks wharf, and later of Cuthbert's shipyard in the northwest of the study area
	Moderate-High	Potential archaeological resources relating to the growth and operation of Cuthbert's shipyard
	Moderate	Potential for timber or stone jetty remains and associated deposits

3.2 Archaeological Excavations at Barangaroo Headland and Barangaroo Station

Two large-scale open area archaeological excavations have taken place within and adjacent to the study area in the last 8 years. In 2013 Austral Archaeology undertook archaeological investigations within Hickson Road and to the northwest of the study area as part of the construction of Nawi Cove. In 2018, Casey & Lowe undertook open area investigation of the station box for Barangaroo Metro station (Figure 3.1).

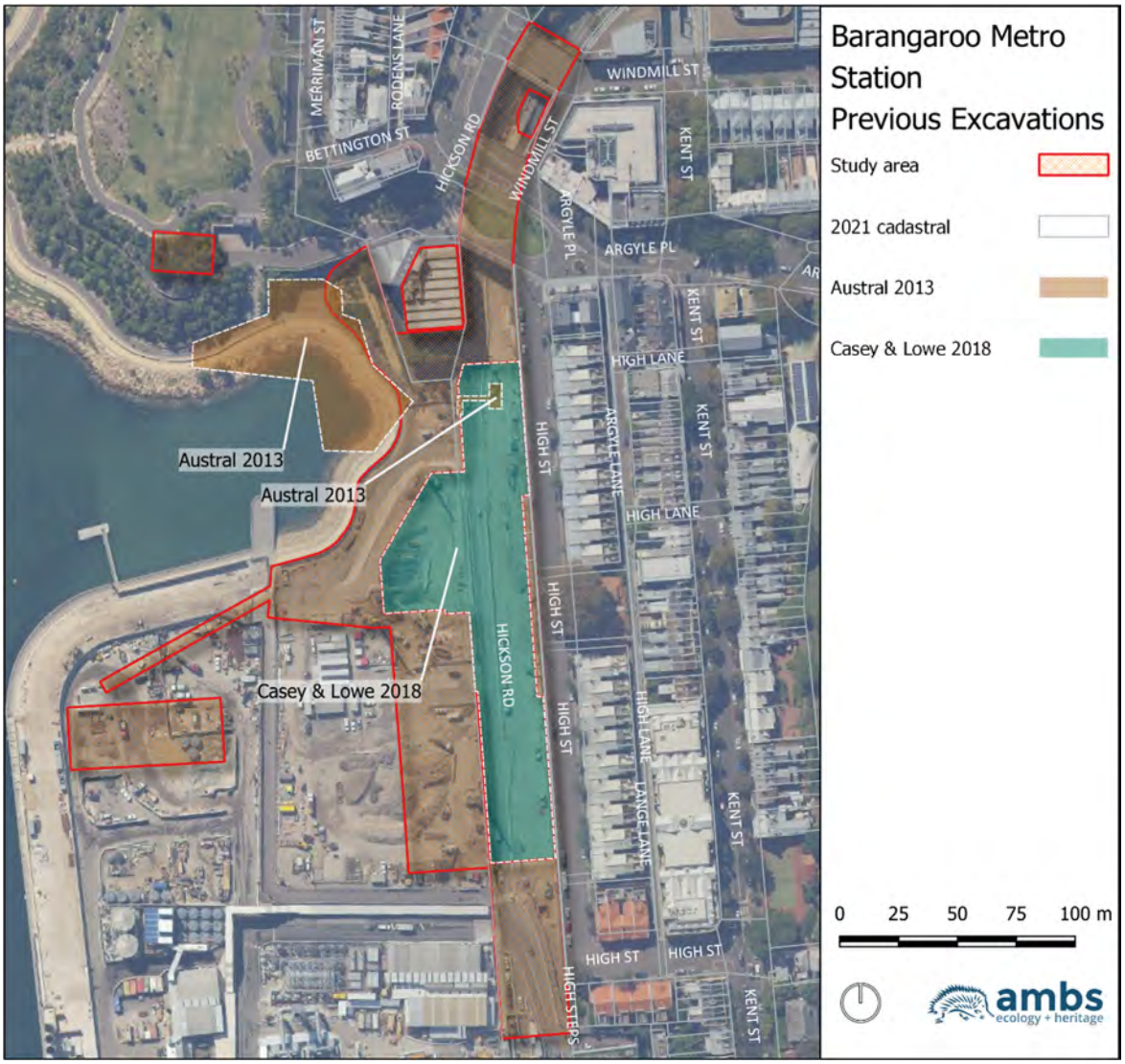


Figure 3.1: Previous archaeological investigations within and adjacent to the study area.

3.3 Barangaroo Headland Park Historical Archaeological Excavations (Austral Archaeology 2016)

Austral Archaeology (Austral) was engaged by Laing O'Rourke and Baulderstone (later Lend Lease) on behalf of the Barangaroo Delivery Authority to complete archaeological investigations as part of the Barangaroo Headland Park project. Austral completed archaeological investigations on site in 2013, working in two broad areas across the site, the Wharves Site, at the northern end of the Headland, and the Shipyards Site, within and adjacent to the present Nawi Cove.

Two of Austral's excavation areas overlap or are directly adjacent to the current study area: The Northern Cove Excavation Area and the Hickson Road Excavation area.

Archaeological excavations within the Northern Cove Excavation area primarily identified remains associated with shipbuilding and maintenance and land reclamation, firstly, relating to Munn's (1824-1848) occupation of the site, then to Cuthbert's Shipbuilding Yard (1854-1875). Following this was the construction of Dibbs' Wharves (c.1875-1899), then the resumption of the land followed by the establishment of a concrete seawall (1900-1907) (Austral 2016a: 9-10).

The eastern portion of the excavation area overlaps with the boundary of the current study area adjacent to Nawi Cove. Along the eastern boundary of the site, a thick deposit of wooden shavings

was identified in the large slipway, the deposit was of varying thicknesses, with a maximum recorded depth of 530mm. Its extent continued to the north and east beyond the excavation area. Underlying this deposit near the eastern boundary of the site was a timber boardwalk overlying a grey sand deposit. Under the sand deposit was a packed sandstone and bluestone rubble deposit in the slipway, which in turn overlay a grey silty sand fill on the natural sandy shore (Austral 2016b: 149-156).

The eastern slipway wall also extends north-east through the excavation area, continuing beyond its eastern extent, suggesting it may still be extant within the current study area (Austral 2016b:160). To the east of the slipway wall a working area was identified, comprising a series of layered occupation deposits, with few identified archaeological features except for disturbance from later services. The occupation deposits were assessed as being indicative of a working area within the shipyard, as evidenced by an orange brown sandstone and clay surface, which may have been used as a solid surface to support working structures (Austral 2016b: 349).

Archaeological monitoring was undertaken in the Hickson Road monitoring area, with Austral noting that the nature of the works, which related to modifying and introducing new services, meant that many of the trenches they monitored were very narrow and deep. Across the area, the upper strata consisted of asphalt road surface overlying concrete or finely crushed gravel. In the eastern part of the monitoring area, missed fills and demolition rubble were present to a depth of over 2m, overlying sandstone rubble fill and bedrock. The western part of the study area contained layered fills overlying a concrete surface which was poured over a brick floor. One brick footing was also identified along with a small sump in the concrete surface. Underlying the brick floor was sandstone rubble, a disturbed deposit with building materials, and then bedrock. All features were identified as being associated with twentieth century uses of the study area, with the brick and concrete features forming part of a basement to an early-twentieth century warehouse. It was also identified that no nineteenth century 'shaping' was identified in the bedrock, which appears to have been truncated in the twentieth century (Austral 2016b:302-304).



Figure 3.2: Dibbs' seawall to the northwest of the study area (Austral Archaeology, 2016, p. 99)



Figure 3.3: Dibbs' seawall looking northeast towards Dalgety stores (Austral Archaeology, 2016, p. 99)

3.4 Barangaroo Metro TSE Works: Barangaroo Station Archaeological Investigations (Casey & Lowe, 2019)

Casey & Lowe were commissioned by AMBS Ecology and Heritage, on behalf of John Holland CPB Ghella JV, to undertake historical archaeological investigations at the Barangaroo Station site,

Sydney. The following summary has been based on the preliminary results report (Casey & Lowe, 2019). The final report is in progress at the time of writing (May 2021).

The staged excavation was undertaken wholly within the footprint of the station box for the Barangaroo Metro Station. The archaeological remains included evidence of mid-nineteenth century wharfage, an 1830s house, seawalls, a slipway, and the remains of a wrecked abandoned vessel (Unidentified Darling Harbour Boat 1 [UDHB1]).

In Areas R and T (immediately adjacent to Work areas 1 and 2 in the current project), the investigations found evidence of Cuthbert's shipbuilding yard and wharf (1854-1875) and Dibbs's seawalls and wharfage (c.1875-1899). The remains included timber debris, extensive evidence of woodworking and distinct areas of activity on Cuthbert's wharf surface. Cuthbert's seawalls and a slipway, and piles for suspended wharfage were also found in good condition. Modifications to the walls and slipway that were undertaken by Dibbs, and contemporary public steps and paving were found at the termination of Clyde Street. Cuthbert's wharf and shipbuilding yard, and buildings associated with Dibbs' use of the wharf are also partly located within Work Zones 1, 2 and 5 of the current project.

The remains of a rocky and sandy intertidal zone that predated the extension of Clyde Street was found beneath Hickson Road (in Area X), next to the foundations of an 1830s house. Partly buried by the beach sand was the remains of a 30ft boat that had been abandoned prior to the construction of Cuthbert's wharf. Similar intertidal environments are thought to have existed within the current study area adjacent to boatbuilding businesses in Work Zones 3 & 4 South.

In Areas Y and Z were the remains of late nineteenth century wharf structures, built on the outcropping sandstone and reclaimed land beneath Hickson Road. The truncated remains of a well or cistern associated with housing on Wentworth Street was located in Area Z adjacent to Work Zones 3 & 4 North, and Work Zone 6.



Figure 3.4: Orthophoto of Area T showing timber debris on Cuthbert's Wharf (Casey & Lowe, 2019, p. 18)



Figure 3.5: Remains of vessel UDHB1, Area X (Casey & Lowe, 2019, p. 36)



Figure 3.6: Foundations and floors of late nineteenth century wharf structures, Area Z (Casey & Lowe, 2019, p. 43)

4 Assessment of Archaeological Potential

The archaeological resources of any site are finite but have the potential to provide insights into everyday life that are not available from any other resource. Archaeological resources may provide evidence that will enhance the historical record and, as such, make a contribution to an understanding of the history and settlement of a local region. In view of the substantial costs involved in archaeological excavation of a site, a clear justification for any archaeological excavation needs to include the following considerations:

- What is the likely integrity of the archaeological resource? Is it likely that largely intact physical evidence would be exposed during excavations such as structural features, artefacts from underfloor deposits, rubbish- or cess-pits, wells or other features with an ability to contribute meaningfully to an understanding of the development of the site as part of the wider development of Darling Harbour?
- What is the research potential of the archaeological resource? Is it likely that the results of the excavation make a significant or important contribution to an understanding of wider research issues regarding the early settlement and development of Darling Harbour?

4.1 AMBS Assessment of Archaeological Potential

Areas of archaeological potential have been mapped in Figure 4.1 and are discussed in

Table **4.1**. Archaeological potential has been assessed as a combination of known structures or activities and likelihood of survival. There are five levels of potential within the Study Area:

- Nil
- Nil to Low
- Low
- Moderate
- Moderate to High

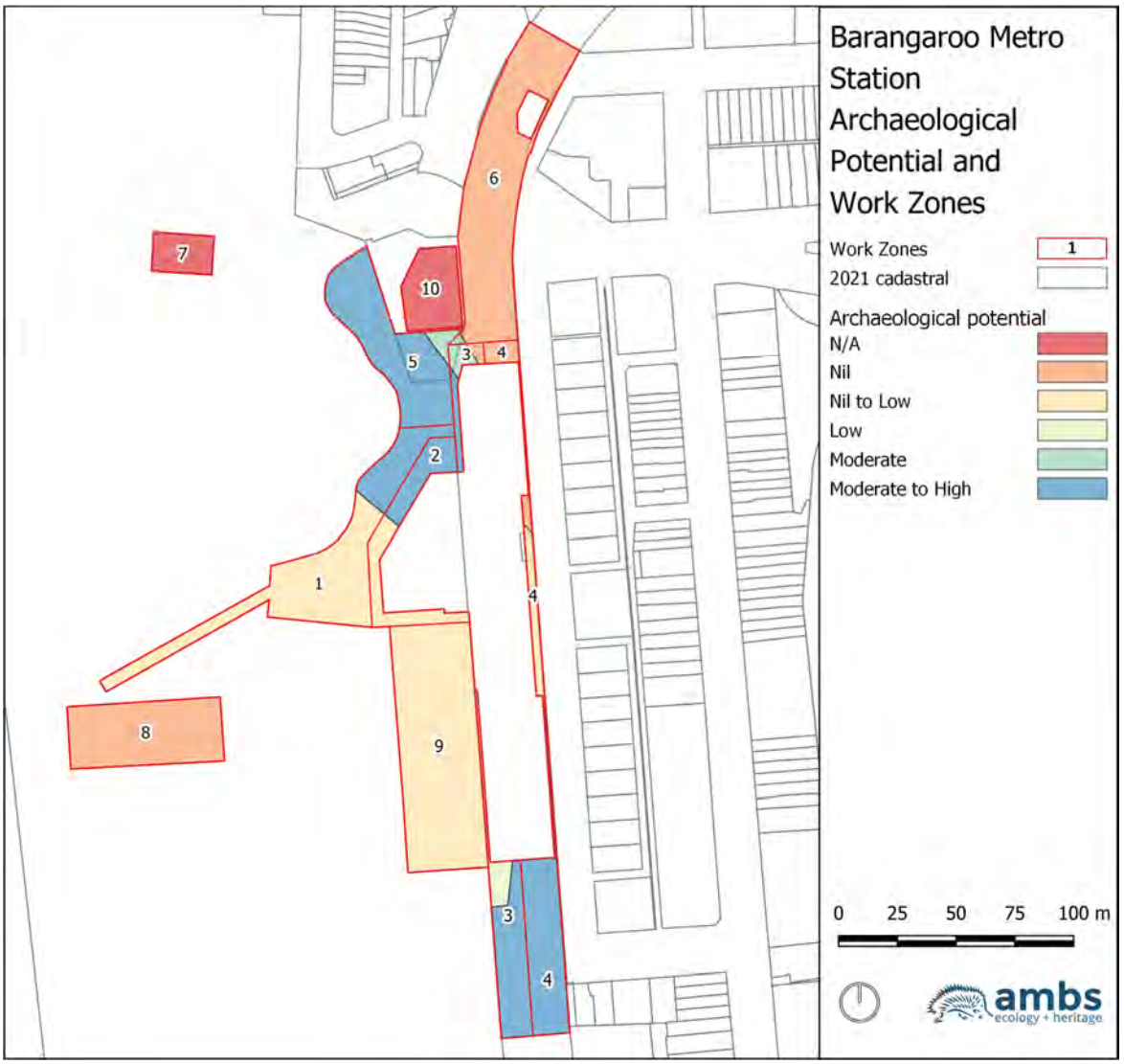


Figure 4.1: Areas of archaeological potential within the study area relative to Work Zones (numbered).

Table 4.1: Assessment of archaeological potential by area, work zone and phase.

Work Zone	Phases represented	Archaeological potential	Comments
3 and 4 (south)	• Early development of the foreshore (Phase 1: 1788-1830) • Mid-century boat sheds (Phase 2: 1830-1900) • Late nineteenth-century wharf construction (Phase 2: 1830-1900)	Moderate-High	This area has Moderate to high potential for evidence of Thomas Agars' pre-1833 infilled jetty including cut stone or rubble walls and working surfaces. The empty beachfront of the adjacent government land is likely to have been permissively used and may contain residential or commercial refuse or offcuts and discards from nearby boatbuilding activities. The low water and undeveloped beach in the northern part of this area is likely to have been a similar environment to that in which UDHB1 was found during the Station Box excavations. There is potential for the remains of abandoned vessels to have been buried by the estuarine sands along this stretch of beach. The mid-century boat sheds depicted on the 1865 survey were demolished prior to the construction of the filled-in wharf (c.1876). It is possible that the structural material of the sheds was used as part of the infill and highly likely that the foundational piles of these structures will remain buried beneath the wharf fills. There may be evidence of partially completed seawalls which were not finished prior to resumption in 1901.
1, 2 and 5	• Early foreshore (Phase 1: 1788-1830) • Cuthbert's shipbuilding yard (Phase 2: 1830-1900)	Moderate-High	This area has Moderate potential for evidence of the early foreshore including Martin's narrow jetty (it may be located further to the northeast). There is High potential for evidence of Cuthbert's shipbuilding yard and wharf including a narrow dock that was constructed prior to 1863, evidence of the 1863 and 1865 stone seawalls, and moderate potential for the large timber store and the footings of several peripheral structures. The narrow dock appears to have been short-lived, and its infill and construction methods may contain evidence of why that was so. It is also likely to contain evidence

Work Zone	Phases represented	Archaeological potential	Comments
	• Dibbs' wharf and stores (Phase 2: 1830-1900) • Gibb & Bright's bond and wool stores (Phase 2: 1830-1900)		of boatbuilding such as offcuts and abandoned boat parts that found their way into the dock while it was in use. Previous excavations by Austral and Casey & Lowe suggest that there is a high potential for evidence of boatbuilding activity in the form of discarded boat parts, timber offcuts and tools on the wharf surface. There is moderate potential for evidence of Dibbs' modification of the wharf including changes to seawalls and fills to raise the height of the wharf, as well as Dibbs' flour shed and several peripheral structures at the rear of the wharf. The scale of the woolstore recorded in 1894 suggests that this is the most likely structure to have left substantial evidence.
1, 2 and 9	• Construction of Dibbs' finger wharfs	Nil-Low	This part of the study area was not infilled until the second half of the 20th century and was deep water throughout the 19th century. Although evidence of Dibbs' finger wharfs may remain, it is likely to only be in the form of cut-down timber piles, which have no research potential or significance of their own. The archaeological potential of this area is therefore considered to be Nil-Low.
8	None	Nil	This part of the study area was deep water until the second half of the twentieth century and has no archaeological potential.
10	N/A	N/A	This part of the study area is Dalgety's stores which will be used as a site office without modification. An assessment of archaeological potential for this area is not relevant to the project.
7	N/A	N/A	This part of the study area is the site of service connection works in existing service pits without modification. An assessment of archaeological potential for this area is not relevant to the project.
3	• Early development of the foreshore (Phase 1: 1788-1830) • Mid-century boat sheds (Phase 2: 1830-1900)	Low	This area is on the periphery of the activity associated with the foreshores of Lots 3, 4 and 5 of Section 93. However, in 1887 it was recorded as being at Low Water and may contain intertidal refuse and other peripheral evidence of activities on the shore. This area is considered to have Low potential for significant archaeology.

Work Zone	Phases represented	Archaeological potential	Comments
	• Late 19th century wharf construction (Phase 2: 1830-1900)		
3 and 4 (north), 6	• Hickson Road construction	Nil	This area has no potential for pre-Hickson Road archaeology. The original landform in this area has been completely removed.
4 (north)	• Early shoreline (Phase 1: 1788-1830)	Nil-Low	1887 contours suggest that remnants of unmodified outcropping sandstone or evidence of wells or other deep features cut into it may survive. However, this is considered unlikely and the potential for this area is Nil to Low.
3 (north) and 5	• Early foreshore, Martin's jetty and buildings (Phase 1: 1788-1830)	Moderate	There is Moderate potential for evidence of the early shoreline and Martin's Jetty, limekiln or structures to survive beneath this part of Hickson Road. 1887 contours suggest that the surface of the landform prior to the construction of Hickson Road may be partially preserved in this area.

5 Archaeological Significance

The physical evidence of past activities is a valuable resource that is embodied in the fabric, setting, history and broader environment of item, place or archaeological site. The above evaluation of the study area has identified the potential for relatively intact archaeological resources. The value of this resource to the community can be evaluated by assessing its cultural heritage values. 'Cultural heritage significance' and 'heritage value' are terms used to express the tangible and intangible values of an item, place or archaeological site, and the response that it evokes in the community. Identification of this value, the significance of the archaeological resources is assessed against the SHR criteria. There are no known assessments of the historic archaeological significance of the study area.

5.1 Assessment of Archaeological Significance

An item will be considered to be of State or local heritage significance if, in the opinion of the Heritage Council, it meets one or more of the following criteria. Historical archaeological relics assessed as having State or local significance should be managed under the 'relics' provisions of the *NSW Heritage Act* 1977.

NSW Criterion (a) an item is important in the course, or pattern, of NSW's cultural or natural history (or the local area);
The record of adaptation to, and transformation of the landscape at Millers point has been demonstrated archaeologically by previous excavations in adjacent areas by Austral in 2013 and Casey & Lowe in 2018. The site has the potential to contribute to our understanding of the early European settlement of Millers point, and the importance of the shipbuilding industry to the growth and development of the area. The site has significance under Criterion (a) at a local level for its ability to represent successive phases of development and change along the eastern shore of Darling Harbour throughout the nineteenth century.

The site has the potential to represent these changes as they occurred both through the large-scale developments of Cuthbert and Dibbs, and also through the piecemeal undertakings and modest ambitions of the small landholders on Lots 3 and 4 at the southern end of the site. The study area has the ability to produce data at both ends of the scale within a small geographic area. The methods of construction, quantities of material and labour represented by the archaeological resource will be able to demonstrate what was achievable for some of the largest businesses within the colony as well as its smaller entrepreneurs. It also has the ability to illustrate the contingent and ad-hoc development of the Darling Harbour shoreline which was always limited by what the topography would allow. If evidence of Agar's pre-1833 wharf survives it would demonstrate early, small-scale wharf-building and reclamation and would be of local significance for its ability to demonstrate early adaptation and use of the shoreline.

If the original shoreline of Lot 2, section 92 (Martin's grant) survives within the study area it may contain evidence of the lime kiln, associated structures, or associated activities. If evidence of the lime kiln survives it would be of State significance for its ability to represent the exploitation of naturally occurring shell beds and middens along the shores of Cockle Bay (Darling Harbour) in the early decades of the colony, and as a rare example of early lime-burning technology in Australia.

Evidence of the day-to day workings of Cuthbert's shipyard would be of local significance for its ability to illustrate working conditions in nineteenth century Darling Harbour, and would be comparable with similar wharf and maritime industry sites that have been excavated in Darling Harbour in recent years.

Evidence of the later stores on Dibbs' and Gibb's wharf have the ability to represent the importance of the import and export industries through the scale and investment of materials apparent in their construction and layout, and the beginnings of the mercantile domination of the eastern shore of darling Harbour, which would reach its apex with the construction of Hickson Road and the system of two-level roads and wharfs.

The archaeological remains of the wharfs, and the shipbuilding and mercantile activities are of local significance for their ability to contribute to our understanding of the development of Millers Point and Darling Harbour. If remains of Martin's lime kilns and associated structures are found to survive within the study area with good integrity they would be of State significance.

NSW Criterion (b) an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the local area);
Although John Cuthbert was a notable shipbuilder and his success was well-known in the colony and in Britain (Nairn, 1969), the connection between the individual and the site is not strong or special. Archaeological evidence of Cuthbert's shipbuilding wharfs and yards may tell us something of the level of investment and capital behind his operation but as they are likely to be limited to footings, seawalls and evidence of day-to-day workings at the site, they would not necessarily contribute to our knowledge of the life or works of the individual. Likewise, the association with Cuthbert is unlikely to contribute meaningfully to the interpretation or significance of the artefacts at the site. The archaeological resource is unlikely to meet the threshold for significance under this criterion.

NSW Criterion (c) an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area);
Although the construction of seawalls and wharfs demonstrates a particular type of engineering, particularly on a large scale, the archaeological evidence for these works is unlikely to be a unique or remarkable example of its type and is not expected to meet the threshold for significance under this criteria.

NSW Criterion (d) an item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons (or the local area);
While no consultation has been undertaken with the local community in relation to the values of the archaeology, it is acknowledged that local communities are interested in the archaeology of their local area and its development. Should archaeological resources associated with the nineteenth century occupation of the study area be present, they may have interest or value to the local community.

The threshold for significance against this criterion has not been met at this time.

NSW Criterion (e) an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the local area);
The research potential of the site is related to the adaptation and development of the eastern shore of the bay, the day-to-day working conditions of the shipyard, the scale of the undertakings in wharf-building and reclamation, and the inertia and resistance to change that becomes manifest in the material culture of created landforms, and not least of all the environmental and social dynamics that they influence and perpetuate once in place.

The site has the potential to augment existing data from comparable maritime sites in Darling Harbour and elsewhere in NSW, and also to generate intra-site comparisons of activities at different temporal and material scales. The physical and perceptual experience of the original landform has been so disrupted by the construction of Hickson Road and the apron wharfs that it is no longer detectable in the streetscapes and contours of the existing landscape. The

archaeological resource at the site has the potential to provide evidence of that original landscape and the material narrative of its development and change that cannot be provided by any other resource. The research potential of the site is significant at a local level.

NSW Criterion (f) an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the local area);
If the lime kiln recorded on Martin's land survives within the study area it would be a rare example of the exploitation of naturally occurring shell beds and middens in Darling Harbour for the production of lime, and a rare example of the use of early lime-burning technology in Sydney. If the kiln survives with good integrity and interpretable deposits and associated contexts it would be of State significance under this criterion.

NSW Criterion (g) an item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places or cultural or natural environments (or the local area).
Evidence of seawall and wharf construction is likely to be representative of mid-nineteenth century reclamation and wharf building in Darling Harbour and would be significant at a local level.

5.2 Statement of Archaeological Significance

The site is significant at a local level for its ability to contribute to our understanding of development and change in Darling Harbour throughout the nineteenth century, including working conditions and day-to-day life in the shipyards, investment and change in the material culture of altered landscapes and land creation, the influence of topography as a delimiter on construction and the material manifestation of commercial ambition in wharf creation and building construction. The site has the potential to represent these changes as they occurred both through the large-scale developments of Cuthbert and Dibbs, and also through the piecemeal undertakings and modest ambitions of the small landholders on Lots 3 and 4 at the southern end of the site.

The research potential of the site is related to the adaptation and development of the eastern shore of the bay, the day-to-day working conditions of the shipyard, the scale of the undertakings in wharf-building and reclamation, and the inertia and resistance to change that becomes manifest in the material culture of created landforms, and not least of all the environmental and social dynamics that they influence and perpetuate once in place. The site is significant at a local level for its ability to represent these changes as they occurred in the nineteenth century development of Darling Harbour and Millers Point.

Evidence of the early nineteenth century occupation and exploitation of the resources in and around Darling Harbour would be rare and would offer a unique representation of these activities that could not be gained from other sources. If remains of Martin's lime kiln and associated contexts or structures survive with good integrity at the site they may be of State significance for their ability to represent early lime-burning technologies in Sydney and the use of naturally occurring shell beds and middens in Darling Harbour for lime burning.

6 Assessment of Heritage Impact

6.1 Impact of the COP works

Final detailed design of some works is not complete and as suchthe following is a preliminary assessment of impact.

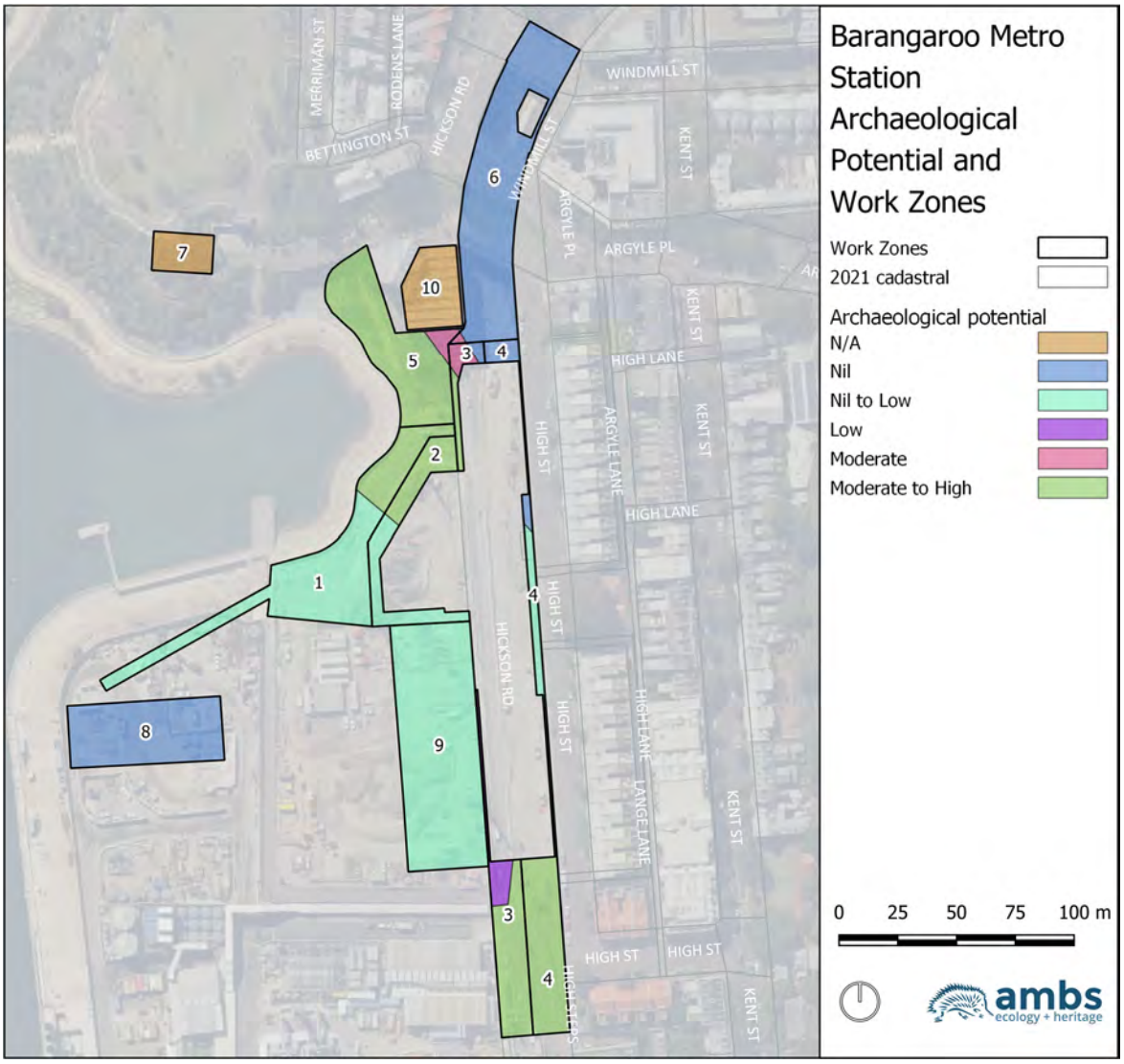


Figure 6.1: Work Zones and archaeological potential.

Table 6.1: Assessment of potential impacts relative to areas of archaeological potential.

Work Zone	Activity	Archaeological Potential	Potential Impact
1	Stormwater installation	Contains areas of: Moderate-High (NE) Nil-Low (SW)	Stormwater installation in the northeast of Work Zone 1 has the potential to impact on seawalls, Cuthbert's wharf, Dibbs wharf and structures, and Gibb & Bright structures
2	Waterproofing of station concrete roof, backfill and installation of landscaping and	Contains areas of: Moderate-High (N) Nil-Low(S)	Landscaping works in the northern half of Work Zone 2 have the potential to impact on the remains of Cuthbert's

Work Zone	Activity	Archaeological Potential	Potential Impact
	station entrance cladding, escalators and lifts		shipbuilding wharf, seawalls, Dibbs' wharf, and structures associated with Gibb & Bright
3 and 4	Demolition and removal of the existing red steel girders and road deck. Relocation of services. Complete concrete structure of ventilation pods, waterproof station concrete roof, backfill, install services and relocate the road, kerb and guttering. Install street trees / landscaping and clad the station ventilation and emergency egress stair pods	Contains areas of: Moderate-High (S) Low (S) Nil (N) Moderate (N)	Works in the south to relocate the road, guttering and services have the potential to impact Agars' jetty and associated boat sheds, evidence of permissive use of the beach and shoreline of the vacant government lands, and later wharfs and seawalls. Works in the north to relocate the road, guttering and services have the potential to impact the remains of the original shoreline and structures and possibly lime kiln on Martin's land.
5	Excavation of existing carpark, removal of existing surfaces, installation of new services to the chilled water plant room under Headland Park	Contains areas of: Moderate-High (W) Moderate (E)	Removal of surfaces and installation of services has the potential to impact the original shoreline of Martin's land and associated structures, evidence of Cuthbert's wharf and seawalls including the pre-1863 dock and timber store shed, Dibbs' wharf and associated structures, and Gibb & Bright's stores.
6	Removal of the northern shaft acoustic shed, infill of the northern shaft with sand; replacement of the road, kerb and landscaping works	Nil	No impact
7	Connecting up and commissioning plant and pipework which is already in place. All works are within existing man-holes.	N/A	No impact
8	Site sheds / canteen / change rooms	Nil	No impact
9	Temporary laydown area used to store material and plant / equipment	Nil-Low	No impact
10	Site offices	N/A	No impact

7 Archaeological Method Statement

Archaeological remains can enhance the historical record and as such make a contribution to an understanding of the history and settlement of a local area. The archaeological resource within the study area, if present with good integrity, has moderate to high research potential and local (and possibly State) significance. In view of the substantial costs involved in the archaeological excavation of a site, the research design should be problem-oriented; however, allowance should always be made for new questions to respond to unexpected archaeological evidence. Archaeological research questions provide a framework for an archaeological investigation and for the analysis of the results of the excavation and artefacts recovered during excavations.

The research design and methodology has been designed to build upon the results of archaeological excavations that have already taken place within the Barangaroo station project area, and Darling Harbour more widely, and to produce a comparable dataset for cohesive and coherent interpretation at the site.

7.1 Casey & Lowe Research Questions (AMS, 2017)

Casey & Lowe added a number of research questions to those put forward by Artefact in 2016:

7.1.1 Shipbuilding

Archaeological remains of Cuthbert's shipyard, which eventually covered the whole of the excavation area, should be examined to determine if they can reveal information about the variety and quality of shipbuilding that took place on the site over time. This in part can be answered by the examination of discarded fittings and tools on the site, as well as timber off-cuts. The arrangement of the work space such as the relationship of the slipway(s), sail loft, saw pits, forges and other features can say much about organisation and efficiency. It would be of interest to see if some features such as saw pits and forges were absent from the site as this would demonstrate the interconnectedness, or otherwise, of the shipyards in Darling Harbour with other local businesses. It is noted that often the archaeology of ship building is limited to ephemeral remains of the odd copper nail and part of a slip.

How did boatbuilding change across the site and how did it relate to changing economic concerns of the colony with the development of the colonial economy with the shipping wool to Britain the Goldrush as well as the shipping to the northern coast of NSW?

7.1.2 Maritime Infrastructure

Barangaroo Station site provides an opportunity to explore the transformation of a section of the Darling Harbour waterfront from the early 19th century to the government takeover in 1900 and then into the 20th century. The focus on this theme is on capitalism, evolving nature of the maritime infrastructure, and how these two themes shaped choices made in relation to individual site development? The nature of private v public construction of wharfage and seawalls and how it relates.

Of interest would be the comparison between the quality of public versus private infrastructure, quality both in materials and construction. For example, was turpentine, an excellent hardwood resistant to marine borers, consistently used? If lesser quality timbers such as ironbark were used as piles, were they copper sheathed (a protection against marine borers)?

- Documenting the quality of the jetties, seawalls and other maritime infrastructure constructed by private firms would provide insight into the attitudes of those firms.

- Did high quality structures indicate confidence and a willingness to invest for the long term?
- Did poor quality and poorly maintained structures reflect a struggling owner or one that did not see it economically beneficial to build durable infrastructure on their property or lease? Did the maintenance and condition of the waterfront infrastructure drop off towards the start of the 20th century?
- If so, how much was this due to the 1890s depression and/or to owners realising that the government was looking at resumptions cause them to reduce expenditures in maintaining their structures, thereby providing the government more justification for taking over?
- Other relevant questions will be addressed as they arise.

7.1.3 Industrial Archaeology

The questions relating to the industrial sites within the Barangaroo Station study area relates to both the technological nature of the sites and the evidence for work place practices as well as issues of urbanisation and concentration of work and living arrangements in close proximity. A set of questions were developed by Casey & Lowe in 1995 for an iron foundry site in Pyrmont and also for a brickmaking area in Surry Hills on three different archaeological projects during the 1990s and in 2005. These questions relate to the exploration of the layout of the industrial set up, and how work moved through the site. These have been explored successfully at the Darling Quarter and Barangaroo South archaeology projects and subsequent reporting. The type of research questions which would be used to address the potential mills and lime kiln sites within the Barangaroo Station site are:

- Spatial use of the workspace, identification of activity area?
- Levels of technology evident in the various processes of the industrial activities undertaken within the kilns?
- Evidence for the type of items produced by the individual company?
- Evidence for the working conditions of the staff?
- Were these exclusively male workplaces, if so do they help us understand the construction of male gender roles and relationships?
- How the landscape or landform was transformed to allow for the operations of the kiln, factory or workshop, i.e. the casting of moulds in the ground, the creation of a mill pond or the construction of a building?
- Relationship between the workshop/foundry/factory/kiln and any associated residential accommodation:
- How was the life in the residences affected by being in such close proximity to an industrial complex?
- Is this relationship exemplified by the presence or evidence of pollution within close proximity to the house? In the case of the Bulwarra Road house the whole backyard was overlain with metal dross, suggesting that it was used as an extension of the industrial premises. The proximity of the foundry meant that there were no windows in the northern side of the house, the sunny side, so as to stop any smoke and soot on furnace firing days from entering into the house through the windows. Also, no washing would have been done on furnace firing days.

7.1.4 Landscape Archaeology

The exploration of how the landform of Darling Harbour was altered between c.1820 and 1980s is fascinating as it testifies to the need for more land in specific locations and to provide adequate drafts for shipping. This represents the development of urban pressures as early as the 1830s to concentrate local industry around the main transport network, shipping, so as to aid distribution of their products and the importation of the goods as needed. The ability of entrepreneurs to

transform mud flats into useful land, to build wharfage far enough into the harbour to provide safe mooring for ships bringing in cargo and taking away goods. The alteration and manipulation of the landform of Darling Harbour has been part of its story of Sydney for the last two centuries. The methods and means by which the landform was altered can tell us much about attitudes to waste and rubbish disposal, particularly the deposition of waste from other construction projects, such as the reclamation of nearby areas in the 1920s and the study area in the 1950s and 1960s with material excavated from elsewhere and dredged from the harbour.

- What was the nature of the original landform?
- Evidence for shells, such as cockles and oysters, and what plant species were found in this area?
- How has this part of Darling Harbour evolved over time?
- How many times was the landform remade within the study area?
- What different materials and means were used, and what was the depth of the reclamation at each stage? How different was this to the practices at the Darling Quarter, Barangaroo South, Darling Harbour Live and the KENS sites?
- Were the phases of reclamation successful or not?
- Were the different properties reclaimed at different times?
- Where did the reclamation fill come from?
- How was the new landform used?
- What was the relationship between the reclaimed land and the wharfage?
- Other relevant questions will be addressed as they arise.

7.2 AMBS Research Questions

The current project aims to produce a dataset coherent with the research themes and questions already investigated at the Barangaroo Station site and will adopt the research questions posed by Casey & Lowe with the following additions:

7.2.1 Cuthbert's Shipbuilding Yard

- What evidence is there for Cuthbert's pre-1863 design of the wharf with a narrow dock? Is there evidence for its failure structurally or from silting?
- What can we tell about the changes that occurred between the two phases of Cuthbert's wharfage? Is there a different quality to the engineering and seawall construction that differentiates the two phases in terms of investment of capital and labour?
- Is there evidence of the worker's day to day lives in the shipyard? Can we see evidence of eating, drinking and smoking in the artefacts that build up with the timber and detritus on the surface of the wharf?
- Are there unexpected artefacts from domestic or other settings at the wharf or is the assemblage related to a work environment only? What can we tell about the close-knit nature of residences and industry in this part of the harbour? Is there evidence to suggest that the occupants of the houses on Wentworth, Unwin, Clyde and Munn Streets overlooking the wharf are disposing of rubbish at the edge of the high ground, or that drains and storm events are bringing detritus down from the streets above? What is the nature of the interaction between the two environments that is suggested by the artefact assemblage at the wharf?

7.2.2 Landscape Archaeology

- There is the potential to encounter wharf and jetty structures of small and large proportions at the site. Is there evidence of changes in the estuarine environment due to their construction, such as increased shoaling, changing erosion or deposition patterns? Do the structures progressively respond to the changes that they cause by redesign or

simply by pushing further into deep water? What evidence is there for change and response in the construction methods of the wharfs and what does it tell us about the ability of the designers to read the landscape or to respond appropriately? Are there signs of success or failure and what was the engineering response?

- How have the builders of structures at the edge of the steep and rocky ground adapted to or modified the landform to achieve their goals? What is the balance between adaptation and modification? Do we find evidence of opportunistic use of natural quirks in the shoreline to construct the initial jetties and wharfs on Agar's and Martin's properties? What can we tell about the decision-making processes and the choices that were made by the initial grant holders in relation to their land and its challenging form?

7.3 Archaeological Management

The day-to-day management of the archaeological excavations will be undertaken by Primary Excavation Director, Mike Hincks and Secondary Excavation Director Lian Ramage. Key members of the team will be Guy Hazell, surveyor, who will set out the site grid and survey all site features to contribute to the overall plan of the site in its entirety and in accordance with each identified phase of the site. James Cole, AMBS Archaeologist, will be important in assisting in the day to day management of the site.

The archaeological investigations program will comprise:

- Testing and monitoring of the slab and overburden removal to determine the extent, integrity, and potential significance of the underlying archaeology (Section 7.3.2).
- If archaeological remains are present with good integrity open area stratigraphic excavation would proceed to salvage all archaeological remains within areas of impact.

The significance and research potential of the archaeological resource associated with the wharfs and associated structures means that these buildings will be excavated using both mechanical and manual techniques. The following methodology addresses all potential instances where archaeological investigations will be required within this site.

7.3.1 Heritage Induction

AMBS will prepare a document that addresses the project scope, identifying the sensitivities of the site and the relevant heritage requirements of the project and will be presented to all on-site personnel. The induction will be approved by the Primary Excavation Director (ED) and presented by the Secondary Excavation Director (ED). The induction/toolbox will include an illustrated easy to understand hard copy outlining the main points and procedure, which will include:

- Understanding the heritage significance of the anticipated archaeological resource, including:
- Repercussions of any breaches to the approved archaeological strategy
- Understanding the unexpected finds procedures
- The nature of the archaeological resource
- Maps showing location of anticipated archaeological features
- Photographs of the types of anticipated archaeological features

Additional toolbox meetings will be given each day, as required, to provide an overview and management of the anticipated archaeological resource for that day and in the event of unanticipated relics or features being exposed.

7.3.2 Archaeological Testing & Monitoring

Archaeological testing will be undertaken in areas of Moderate-high potential to establish the depth of archaeology and to confirm its integrity in those areas. If it is found that the impacts will exceed the depths of the top of the nineteenth century archaeology, then open area stratigraphic excavation would proceed to salvage all archaeological remains within areas of impact. The testing will be directed by Mike Hincks, primary excavation director for the project.

Three trenches of 10m x 2m are proposed to be excavated within areas of Moderate to High archaeological potential. If the results are ambiguous, a fourth trench may be needed in either the southern area of Work Zones 3 and 4 or in Work Zones 2 and 5. The proposed locations are shown in Figure 7.1.

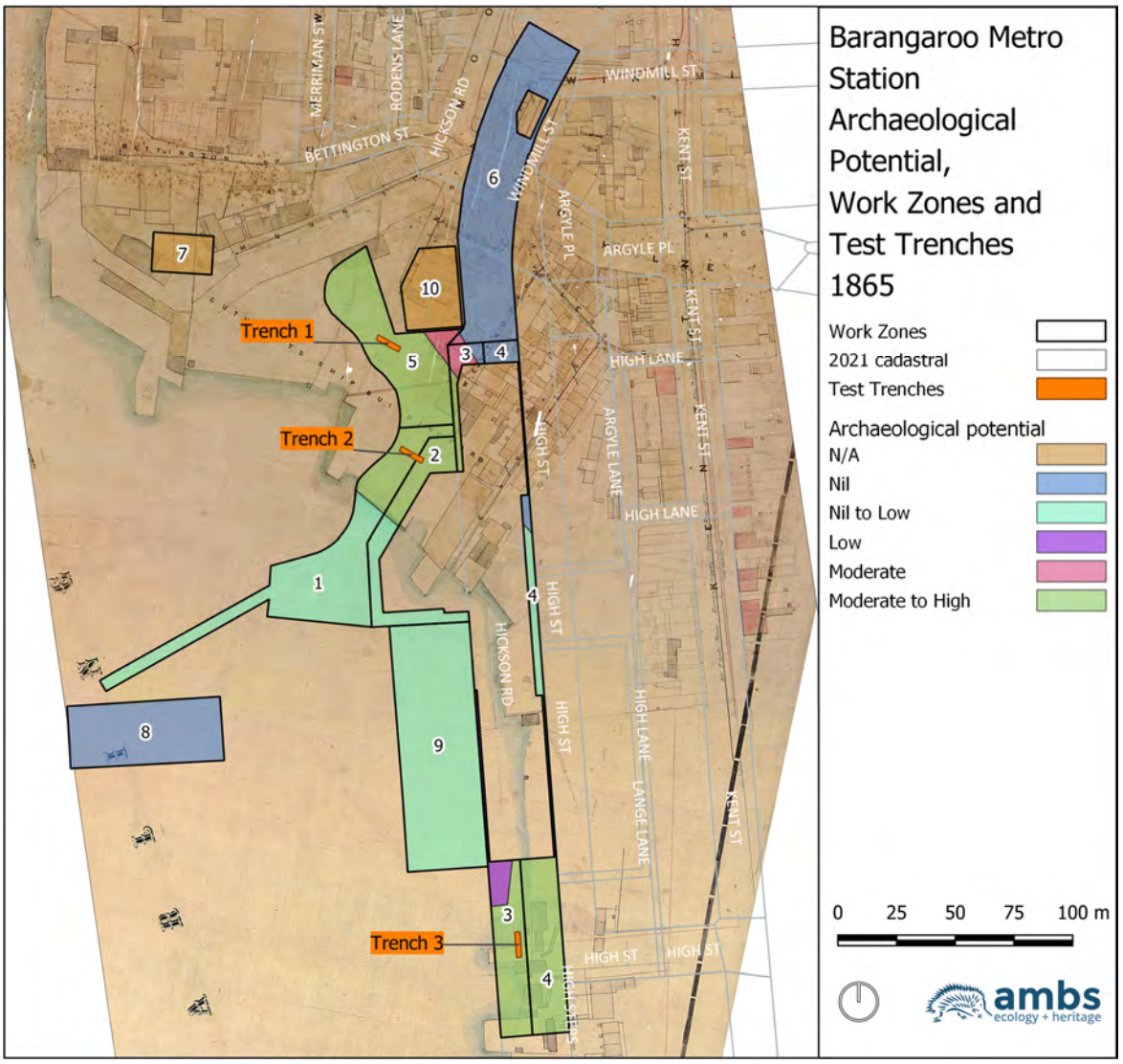


Figure 7.1: Proposed archaeological test trenches in areas of Moderate-High potential

If no evidence of significant archaeology is encountered in the test trenches in areas of Moderate to High potential, the works may proceed under the unexpected finds procedure. If isolated areas of significant archaeology are encountered they will be excavated and recorded archaeologically and salvaged from the areas of impact.

Archaeological monitoring will be undertaken in areas of Moderate archaeological potential. If significant archaeology is encountered then open area stratigraphic excavation would proceed to

salvage all archaeological remains within areas of impact. Monitoring will be undertaken by Mike Hincks.

If there are no underlying archaeological relics, features or deposits in the areas under investigation, the Primary ED will attend the site to verify and a ***Clearance Certificate*** will be prepared by the Primary ED to inform the project team and Proponent in writing.

There is potential that unexpected relics may be exposed during site works, which will be addressed by the Primary ED (see Section 7.7 below).

Where a significant archaeological resource with good integrity is exposed, open area excavation will proceed following removal of the overburden and once the area has been made safe to salvage the archaeological remains.

7.4 Open Area Stratigraphic Excavation

The extent that open area excavation will be required will not be known until the specific area of impact and the depth and nature of significant archaeology is established. Excavations will be directed by the Primary ED, Mike Hincks, assisted by Secondary ED Lian Ramage and Archaeologist James Cole. The team may comprise up to 20 archaeologists if large areas of the site are required to be salvaged, though this may increase or reduce in accordance with the site archaeology.

Excavation will be in accordance with the following methodology to ensure that all significant archaeological relics, features and deposits are appropriately managed and recorded:

- Establish a site datum and lay out a grid, relevant to the size of the site, 10m, 20m or 50m, across the site in order to record the levels of extant deposits, features and relics;
- Significant features will be recorded in detail and excavated manually under the supervision of the excavation director
- All significant archaeological deposits, features and relics that are exposed during the excavations will be recorded in accordance with heritage best practice standards.

  Recording will include:
  - Cleaning features to facilitate photographic recording;
  - Scale plans;
  - Elevations of features, if relevant;
  - Digital photographs (in JPG and RAW format); and
  - Photogrammetry
  - Site survey; and
  - Detailed description of the feature, deposit or relic to ensure that a clear and comprehensive record of the archaeological resource of the site is preserved for the future.
- Sequential numbering of features and deposits to facilitate preparation of a Harris Matrix and artefact labelling;
- Preparation and development of a Harris matrix, to show stratigraphic relationships between all recorded archaeological features and deposits;
- All information regarding the location, dimensions and characteristics of all recorded archaeological features and deposits will be recorded on pro-forma context sheets;
- Collection of all significant artefacts for analysis, except from non-significant unstratified fill. Samples of bricks and mortar will be collected from each structure, as relevant;

Soil samples will be taken from topsoils, cesspits and other relevant deposits for analysis by a palynologist. The results of the analysis should provide an insight into the indigenous and introduced flora of the locality and diet of the local community.

A ***Clearance Certificate*** will be issued by the Historic Excavation Director for each site requiring archaeological testing or excavation and recording after investigations are completed at that particular location.

7.5 Archaeological Excavation and Sampling Strategy

7.5.1 Wharfs and jetties

All wharf surfaces will be exposed and recorded. Activity areas will be identified where possible and any large scale working surfaces or yard deposits will be sample excavated and recorded. All significant features will be fully excavated and recorded. Artefacts from large scale wharf deposits, wharf fills or surfaces will be sampled to demonstrate the variety and type, favouring diagnostic and datable items. Not all artefacts will be collected from these contexts. Elevations of sea walls will be drawn in representative sections and in sections which demonstrate change, repair, modification or unusual use of methods or technology.

Positions of piles and remains of other timber fittings will be recorded and sampled where appropriate

7.5.2 Early shorelines and areas of low water

Intertidal zones and areas of low water will be sample excavated by machine to investigate the possibility of buried early structures or degraded or abandoned vessels, evidence of rubbish accumulation and tidal deposition of artefacts and shipbuilding discard.

7.5.3 Buildings and sub-surface structures

All footings will be exposed and recorded and dateable materials (such as bricks and mortar) will be sampled. Interior occupation or working surface deposits will be hand excavated and artefacts will be 100% recovered. In the unlikely event that underfloor deposits are present within the structures, all underfloor areas will be excavated within a 500mm grid, using 50mm spits, and wet sieved. Cesspits and rubbish pits (if present) will be excavated along tip lines (if identifiable).

7.6 Sieving Strategy

Evidence of past activities is provided by artefacts recovered during archaeological excavation, in particular from occupation deposits. Occupation deposits with potential to allow for conclusions to be drawn as to standards of living and access to goods occur beneath floors, within cesspits, rubbish pits, wells or cisterns, and yard deposits. Occupation deposits would be wet or dry sieved, in accordance with the density of the soil matrix and the likely improved retrieval of significant artefacts.

Where relevant, sample sieving of deposits will be done to determine whether a deposit warrants sieving and if so, this should be wet or dry sieving. Two recycling wet sieving systems have been constructed by the TSE team to facilitate that wet sieving is environmentally compliant.

Each room of each house under investigation and that has underfloor deposit will be gridded into 1m squares. The deposit within each square will be excavated and sieved to ensure that all evidence of material culture is retrieved for analysis, no matter how small. The purpose of this process is to spatially map areas of activity as demonstrated in the material assemblage. Similarly, dense deposits from other structures or features such as cesspits and wells or cisterns will also be sieved, if this is deemed to be the best strategy for retrieving all possible artefacts.

7.7 Unexpected Heritage Finds

The archaeological methodology outlined in this report is anticipated to record and sample all of the significant archaeology at the site.

However, there is potential that physical evidence associated with the early occupation of the site may be present but not recorded on maps or in early documents; unexpected heritage finds. The unexpected heritage find may include, but not be limited to:

- Artefacts derived from housing, shipbuilding and industrial contexts.
- Isolated rubbish pits or dumps of rubbish within reclamation or wharf fills
- Remnants of former maritime infrastructure.
- Sunken objects
- Other unexpected heritage finds.

Work will cease within the immediate environment of the find and the ED Mike Hincks will attend the site to determine its integrity and significance and to determine the appropriate management for the find. If considered to be of local significance they will be managed in accordance with this AMS. If deemed to be of state heritage significance, the Secretary and the Heritage Council will be informed, in accordance with Section 146 of the NSW Heritage Act, 1977. The Excavation Director will provide written confirmation of the relics of state significance and management and work will proceed

Following completion of the appropriate management of the unexpected heritage find, the Primary ED will provide written advice that all archaeological investigations within an area have been completed and issue a ***Clearance Certificate*** to allow works to commence or resume.

7.8 Archaeological Relics Management Plan

As identified in this report, there is potential for State significant relics to be present within the Barangaroo Station site. However, if the unexpected heritage find is assessed by the Primary ED, Mike Hincks, as having State significance, an Archaeological Relics Management Plan will be prepared, in consultation with the Heritage Council and in accordance with Condition E20.

Should unexpected State significant archaeological relics or features be identified, work would cease in the vicinity and the Heritage Council of NSW and the Secretary would be informed in writing concerning the find. The Primary ED would consult with the Heritage Council to determine the appropriate management for the find. This may include manual excavation to determine the full extent of the find and recorded in accordance with the methodology identified in Section 7.4 above.

The Primary ED will provide the Heritage Council and the Secretary, with a brief summary of the investigations on completion and application of the relic/feature to the relevant research themes and questions.

In the event that an early burial(s) is/are unexpectedly exposed, this/these will be managed in accordance with the Sydney Metro *Exhumation Management Plan* (2017) and the NSW Heritage Office *Skeletal Remains; Guidelines for Management of Human Skeletal Remains* (1998). The Primary ED will inform the Secretary and the Heritage Council of the discovery in the first instance.

Following completion of the appropriate management of the State significant archaeological relic, the Primary ED will provide written advice that all archaeological investigations within an area have been completed and issue a ***Clearance Certificate*** to allow works to commence or resume.

7.9 Post-Excavation Management

7.9.1 Artefact Management

Artefacts will be cleaned, bagged, and labelled in accordance with archaeological context, and appropriately stored for analysis so that any information that can contribute to the understanding

of the site and its historical development is not lost. Artefact processing and analysis will be in accordance with the system developed by AMBS and currently in use for the other Metro sites excavated by AMBS; Crows Nest, Chatswood, Sydney Metro South and Waterloo.. The database for the site will be included in the Excavation Report for that site.

Processing, analysis and storage of the artefacts for the duration of the project will be conducted at AMBS premises. However, a repository for the long-term storage of the artefacts from the Sydney Metro project will be required to be provided by Sydney Metro.

7.9.2 Final Excavation Report

At completion of the archaeological investigation program a report will be prepared detailing the results of the fieldwork and post-excavation analysis. The report will be prepared in accordance with current heritage best practice and the requirements of a standard excavation permit and will include:

- An executive summary of the archaeological programme;
- Due credit to the client paying for the excavation, on the title page;
- An accurate site location and site plan (with scale and north arrow);
- Historical research, references and bibliography;
- Detailed information on the excavation, including the aim, the context for the excavation, procedures, treatment of artefacts (cleaning, conserving, sorting, cataloguing, labelling, scale photographs and/or drawings, location of repository) and analysis of the information retrieved;
- Nominated repository for the items;
- Detailed response to research questions (at minimum those stated in the approved Research Design);
- Conclusions from the archaeological programme. The information must include a reassessment of the site's heritage significance, statement(s) on how archaeological investigations at this site have contributed to the community's understanding of the site and other comparable archaeological sites in the local area and recommendations for the future management of the site;
- Details of how information about this excavation has been publicly disseminated (for example provide details about Public Open Days and include copies of press releases, public brochures and information signs produced to explain the archaeological significance of the site).

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Norton, S. and Co, c. (1877) *Barangaroo and Millers Point, Sydney, showing Dibbs Wharf and Wentworth Street*. [Sydney, N.S.W.] [James Norton & Co.], [1877?].
NSW LRS (1863) *Grant Upon Purchase of Reclaimed Crown Lands Vol 1 Fol 192.* Granted by Governor of NSW Sir John Young 21 October 1863.
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White, J. (1790) *Journal of a Voyage to New South Wales / with sixty-five plates of non descript animals, birds, lizards, serpents, curious cones of trees and other natural productions.*

Appendix B
AMBS Excavation Directors

[redacted]

DIRECTOR, ABORIGINAL HERITAGE

Qualifications Bachelor of Arts (Hons) Archaeology, Flinders University of SA, 2001

Employment History

2016 – Present	AMBS Ecology & Heritage - Director, Aboriginal Heritage
2006 – 2015	Australian Museum Business Services - Project Manager, Aboriginal Heritage
2004 – 2006	Environmental Resources Management – Archaeologist/Project Manager
2002 – 2004	Tasmanian Cultural Heritage Office – Project Officer
2001 – 2002	Independent Archaeological Consultant

Expertise

- Aboriginal heritage assessment
- Multi-disciplinary project management
- Aboriginal community consultation
- Local, State & Federal Government liaison
- Archaeological report preparation
- Archaeological & cultural heritage management
- Archaeological excavation methodology design
- Direction of archaeological excavations
- Analysis of faunal & lithic cultural materials
- Provision of Aboriginal heritage advice

Professional Experience

Chris Langeluddecke is an archaeologist with twenty years' experience working in Aboriginal archaeology, community consultation and heritage management planning, and is a founding director of AMBS Ecology & Heritage. Prior to 2016 he was Australian Museum Consulting's senior Aboriginal heritage Project Manager from 2006 to 2015, and was a project manager/archaeologist for ERM from 2004 to 2006. Before moving to NSW, he was a project officer with the Tasmanian Aboriginal Heritage Office, establishing site maintenance programs within Tasmania's World Heritage Wilderness Area. Past clients have included the Department of Defence, NSW Roads and Maritime Services, NSW Parks and Wildlife Service, Transport for NSW, UrbanGrowth NSW, Australian Rail and Track Corporation, Sydney Trains, Rio Tinto Coal & Allied, Centennial Coal, ERM Energy, Ausgrid, John Holland, Thiess, KMH, Parsons Brinckerhoff, APP Corporation, SMEC, and numerous local councils.

Chris has a comprehensive knowledge of current Australian Aboriginal heritage management practices and archaeological methodologies, and has extensive experience working with State and Commonwealth heritage legislation and management planning requirements. He has prepared and carried out Aboriginal heritage assessments, archaeological excavations, heritage management planning, and provided heritage management advice and strategies to clients nationally. He has extensive experience consulting and negotiating with government and community interest groups on heritage matters, particularly Aboriginal groups.

Chris has undertaken consultation with Aboriginal communities across Australia, working with stakeholders during archaeological and heritage assessments, consulting with Elders and community groups on heritage studies, and consulting, liaising and negotiating with stakeholders on behalf of clients to achieve positive and equitable outcomes for all parties. He specialises in providing advice to clients to ensure that heritage values are addressed in a holistic, inclusive manner, taking into account not only the requirements and views of developers, managers and administrators, but also local community, government and Aboriginal community stakeholders.

Select Key Projects

Heritage Studies & Management Plans

Bankstown and Campsie Aboriginal Culture and Heritage Study for Canterbury Bankstown Council

Long Island Nature Reserve Aboriginal Cultural Values Assessment for NSW National Parks and Wildlife Service

Wollongong Botanic Gardens Aboriginal Archaeological Assessment for Wollongong City Council

Clarence Valley Aboriginal Heritage Study for Clarence Valley Council

Hungry Point Reserve Conservation Management Plan: Aboriginal Heritage Assessment for Hungry Point Reserve Trust

Tenterfield LGA Aboriginal Heritage Study for Tenterfield Shire Council

Goulburn Mulwaree LGA Aboriginal Heritage Study for Goulburn Mulwaree Council

Glen Innes Aboriginal Heritage Study for Glen Innes Shire Council

Walgett Shire Aboriginal Heritage Study for Walgett Shire Council

Port Douglas Waterfront Masterplan: Indigenous Cultural Heritage Assessment for Cairns Regional Council

Aboriginal Heritage Study; Illawarra Escarpment for Wollongong City Council

Heritage Management Plans for Defence Sites in the Wet Tropics World Heritage Area, Queensland for Department of Defence

HMAS Albatross Naval Base Heritage Management Plan for Department of Defence

Wargatta Mina & Ballawine Rock Art Monitoring & Cyclical Management Plan, World Heritage Area for Tasmanian Parks and Wildlife Service

Tasmanian Aboriginal Places Cyclical Maintenance Project for Tasmanian Heritage Office & Tasmanian Parks & Wildlife Service

Archaeological Excavations

Sydney Metro Tunnels and Stations Excavations Project Aboriginal heritage excavations and management planning for John Holland CPB Ghella Joint Venture

Captain Cook Drive, Kurnell assessment and archaeological excavations for Taleb Properties

Hamilton Road, Thirroul Aboriginal Heritage Test Excavation for the Institute of Sisters of Mercy Australia and New Zealand

Blacktown Animal Holding Facility Cultural Heritage Assessment and Test Excavation for APP on behalf of Blacktown City Council

Bungarribee Precinct 6: Archaeological Excavation for APP Corporation Pty Ltd, on behalf of UrbanGrowth NSW

Hexham Relief Roads Aboriginal Heritage Test Excavations for Upper Hunter Valley Alliance

Glenfield to Leppington Rail Line Aboriginal Heritage Salvage Excavation for John Holland

South West Rail Link: Preliminary Aboriginal Heritage Test Excavation for NSW Transport Construction Authority

Kurri Kurri to Rutherford Aboriginal Archaeological Excavation for Energy Australia

Currarong Sewerage Scheme Archaeological Excavation for NSW Department of Commerce

Wallaga Lake Midden Excavation for Bega Shire Council

Heritage Assessments

Mudies Creek Bridge & Unexploded Ordnance Clearance Aboriginal Cultural Heritage Assessment for Transport for NSW

Kyeemagh Public School Aboriginal Cultural Heritage Assessment for NSW Department of Education

Peri Urban Greenhouse & Solar Farm Heritage Assessment for Western Sydney University

Beach Road Berry Aboriginal Cultural Heritage Assessment and excavations for Shoalhaven Council

Golden Highway Upgrade project for SMEC on behalf of Roads and Maritime Services

Hamilton Rd Thirroul Aboriginal Cultural Heritage Assessment for the Institute of Sisters of Mercy Australia and New Zealand

Hungry Point Reserve Aboriginal Cultural Heritage Assessment & AHIP Application for Hungry Point Reserve Trust

Aboriginal Heritage Specialist Study, Environmental Survey of Commonwealth Land at Badgerys Creek, for SMEC Australia on behalf of the Department of Infrastructure and Regional Development

Mt Peake Mining Project Archaeological Assessment, Northern Territory for TNG

South West Rail Link – Glenfield to Leppington Rail Line: Aboriginal Heritage Assessment for NSW Transport Construction Authority

Wellington Gas Pipeline, Power Station & Compressor Station Heritage Assessment for ERM Power Pty Ltd

Split Rock Dam Preliminary Heritage Impact Assessment for State Water

Angus Place Colliery - Construction of dewatering borehole, air ventilation hole & infrastructure Heritage Assessment for Angus Place Coal

Sunshine Track Investigation (assessment & expert witness) for Tasmanian Aboriginal Heritage Office

RAAF Base Amberley Heritage Impact Assessment for Department of Defence

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SENIOR HISTORIC HERITAGE CONSULTANT

QUALIFICATIONS

Master of Sciences, Palaeoanthropology – University of Sheffield - 2011

Post Graduate Diploma, Human Osteology and Paleopathology – University of Bradford - 2006

Bachelor of Sciences (Hons), Bioarchaeology – University of Bradford- 2005

EMPLOYMENT HISTORY

2018 – Present	AMBS Ecology and Heritage – Senior Historic Heritage Consultant
2014 – 2018	Biosis Pty Ltd – Consultant Archaeologist
2013 – 2014	Kelleher and Nightingale Consulting
2013 – 2014	Godden Mackay and Logan
2013 – 2014	Archaeological and Heritage Management Solutions
2013 – 2014	Apex Archaeology
2013 – 2013	Tardis Archaeology
2011 – 2012	Alpha Archaeology
2008 – 2009	York Archaeology Trust

PROFESSIONAL AFFILIATIONS

- Australian Archaeological Association (AAA)
- Australasian Society for Historical Archaeology (ASHA)
- American Association for the Advancement of Science (AAAS)
- Archaeological and Anthropological Society of Victoria (AASV)
- International Council for Archaeozoology (ICAZ)
- Association for Environmental Archaeology (AEA)

SELECT BIBLIOGRAPHY & PRESENTATIONS

2018 **Flannery, L.** *The archaeological works at the former dog cemetery, Moorebank*. Presented to the Australasian Society for Historical Archaeology Conference at the University of New England, Parramatta.

2017 **Flannery, L.** *Results of the excavations at 31 Crown and 16 Burelli Street*. Presented at the National Archaeology Week conference at the Wollongong Art Gallery.

2017 **Flannery, L.** *Results of the excavations at 31 Crown and 16 Burelli Street*. Presented at the Sydney Historical Archaeology Practitioners workshop.

2016 **Flannery, L.** *The archaeological investigations and artefact results from the former Oxford on Crown site.* Presented at the National Archaeology Week conference at the Old Court House, Wollongong.

2016 **Flannery, L.** *The preliminary artefact analysis for the archaeological excavations undertaken on the former Oxford on Crown site*. Presented to the Sydney Historical Archaeology Practitioners workshop.

PROFESSIONAL EXPERIENCE

Lian Ramage is an archaeologist with over ten year's archaeological experience and has participated in heritage projects across Australia and internationally in the UK and Italy. She has experience in the successful completion of Historical assessments, archaeological surveys, excavations, and post excavation analysis of Historical artefactual material. She has authored reports including Historical Impact Assessments, Statements of Heritage Impact, Archaeological Assessments and Historical

Archaeological Excavation reports and written the artefactual analysis components for Historical Archaeological Excavation reports.

Her specialist skills include the excavation and analysis of human osteological material and analysis of Australian faunal skeletal material. She has extensive experience in archaeological surveys and historical excavations on sites dating from early colonisation to later European settlements. She is an experienced project manager and specialises in large scale historical excavations successfully running field teams and training student archaeologists in historical excavation methods. She has proven historical expertise and meets the Heritage Council's Excavation Director's Assessment Criteria for section 140 archaeological excavations.

SELECT KEY PROJECTS

Large Scale Archaeological Excavations

Sydney Metro City and Southwest – Tunnel, Stations and Excavation works. Open area archaeological excavations of station sites for the new metro network for JHCPBG Joint Venture.

Civic Place Commercial Development. Open area archaeological excavations undertaken under a section 140 approval at 37 Burelli Street Wollongong for Piruse Constructions.

Kiama Blowhole Point Carpark development. Archaeological testing trench excavations undertaken under a section 140 permit for Kiama Municipal Council.

Darcoola West Water Efficiency Scheme. Historical and Aboriginal heritage assessment and test excavations for the Office of Environment and Heritage.

Moorebank Intermodal Development. Archaeological excavation program for multiple sites located within the decommissioned Moorebank Army Barracks for Liberty Industrial.

Crown Commercial Development. Open area archaeological excavations at 31 Crown and 16 Burelli St, Wollongong for Nicolas Daoud & Co.

Oxford Crown Mixed Use Development. Open area archaeological excavations at 47-51 Crown St, Wollongong for PSR Crown Investments.

New Grafton Rail Bridge. Archaeological unexpected finds inspections and excavations for Fulton Hogan.

Specialist Artefactual Analysis

Full cataloguing, analysis and reporting of Australian historical artefactual material collection for *Moorebank Intermodal Development*, NSW.

Cataloguing and analysis of Australian historical artefactual material for *Kiama Blowhole carpark development,* NSW

Cataloguing, analysis and specialist reporting of canine osteological material for *Moorebank Intermodal Development,* NSW.

Full cataloguing and analysis of Australian historical artefactual collection for *Darcoola West Water Efficiency Scheme,* NSW

Full cataloguing, analysis and specialist reporting of Australian historical artefactual collection for *Oxford on Crown Artefact Collection,* NSW

Human osteological analysis of unexpected human and faunal remains for FMG, Pilbara, WA.

Human osteological cataloguing and analysis of human material from excavations undertaken at Queen Victoria Markets, Alpha Archaeology, VIC.

Human osteological analysis and cataloguing of the *Inhouse teaching collection of Sheffield University*, UK.

Ecological analysis of small osteological finds for the *Anglo-American Project in Pompeii*, Italy.

Human osteological analysis and cataloguing for *Bradford University Inhouse teaching collection,* UK.

Heritage Impact Assessments and Archaeological Assessments

Statement of Heritage Impact for Meadowbank Education Precinct for Gray Puksand.

Statement of Heritage Impact for the Glenbrook to Lapstone Rail Cuttings remediation for GHD.

Archaeological Assessment for the Arms of Australia for TDK Architects.

Statement of Heritage Impact for Grafton South Railway Turntable Rejuvenation for Roads and Maritime Services.

Statement of Heritage Impact for Macdonaldtown Stabling Yard for Sydney Trains.

Statement of Heritage Impact Dibble Avenue Waterhole on behalf of Inner West Council.

Statement of Heritage Impact for Hawkesbury River Rail Bridge for SMEC.

Statement of Heritage Impact for Lapstone Station refurbishment works for SNC Lavalin.

Statement of Heritage Impact for Narrabeen Education Precinct for OCP Architects.

Statement of Heritage Impact for 251 Princes Highway Bulli for Alex Urena Design Studios.

Statement of Heritage Impact for proposed upgrades to Wombarra Scarborough Cemetery for Wollongong City Council

Historical heritage and Aboriginal assessments for the Stage 1 Station Street development, Menangle for Calibre on behalf of Mirvac.

EXCAVATION DIRECTOR APPLICATION

[redacted]

AMBS ECOLOGY AND HERITAGE

1. A TERTIARY PASS DEGREE WITH SUBJECTS IN ARCHAEOLOGY OR A RELATED DISCIPLINE AND FOUR YEARS PROFESSIONAL EXPERIENCE IN HISTORICAL ARCHAEOLOGY OR A RELATED ARCHAEOLOGICAL FIELD

Tertiary Pass Degree:

Master of Sciences, Palaeoanthropology – University of Sheffield - 2011
Post Graduate Diploma, Human Osteology and Paleopathology – University of Bradford - 2006
Bachelor of Sciences (Hons), Bioarchaeology – University of Bradford- 2005

11 Years Professional Experience in Historical Archaeology:
October 2018-present: Senior Historical Heritage Consultant, AMBS Ecology & Heritage
January 2014-October 2018: Consultant Archaeologist, Biosis Pty Ltd
January 2012-January 2014: Sub-contractor Archaeologist (various projects and roles)
July 2011-January 2012: Archaeologist, Alpha Archaeology
2008-2009: Archaeologist, York Archaeological Trust

I have been employed as an osteoarchaeologist/archaeologist in either full time, sub-contractor and permanent positions continually since 2006 with the University of Bradford, UK (2006-2007), York Archaeological Trust, UK (2008-2009), the University of Sheffield, UK (2010-2011), Alpha Archaeology Vic, Aus (2011-2013), Apex Archaeology, NSW Aus (2013-2014), Kelleher and Nightingale Consulting, NSW Aus (2013-2014), Biosis Pty Ltd, NSW Aus (2014-2018) and my current position at AMBS Ecology and Heritage. I have 6 years' experience at a supervisor level or above in historical archaeology in NSW. I have managed/supervised the excavation of a range of site types; residential, commercial, defence and industrial. I have been secondary Excavation Director for open area excavation at locally significant sites and site supervisor at State significant sites.

2. A DEMONSTRATED UNDERSTANDING OF NSW HERITAGE LEGISLATION ASSESSING HERITAGE SIGNIFICANCE CRITERIA AND RELEVANT ARCHAEOLOGICAL GUIDELINES/BEST PRACTICE METHODS AND STANDARDS INCLUDING, BUT NOT LIMITED TO, RELEVANT ARCHAEOLOGY PUBLICATIONS ISSUED BY THE HERITAGE COUNCIL OF NSW.

I have been employed as an archaeologist within Australia for 10 years where I have also been the primary author and contributed to archaeological assessments, research designs and final excavation reports. Developing appropriate excavation methodologies and strategies for individual sites requires an understanding of the potential significance and archaeological resource integrity. Resources essential to ensure compliance with best practice methodologies include the Heritage Division guidelines, specifically; *Assessing Significance for Historical Archaeological Sites and 'Relics'* (2009) and *Archaeological Assessment*s (1996). I also have a working knowledge of the requirements of Sections 139 to 146 of the *Heritage Act 1977*, for locally significant archaeological sites, and Sections 57 to 69 of Part 4, for state significant sites.

3. DEMONSTRATED EXPERIENCE IN THE INVESTIGATION OF COMPARABLE OR RELEVANT HISTORICAL ARCHAEOLOGICAL SITES (ESPECIALLY AUSTRALIAN HISTORICAL ARCHAEOLOGY) PROJECT MANAGEMENT AND PREPARING WRITTEN ARCHAEOLOGICAL ASSESSMENTS/SITE MANAGEMENT RECOMMENDATIONS.

I commenced my career in the UK with York archaeological trust working as a site assistant on the Hungate city centre development that included 2000 years of occupational history, with deeply stratified and complex archaeology that included Roman (late 1st to early 5th century), Anglo-Saxon (mid 6th to late 8th centuries), Viking age (late 8th to mid-11th centuries), Medieval (12th to 16th centuries), Post medieval (late 16th to early 19th centuries) and Modern (19th to mid-20th centuries) deposits. This included the excavation of human remains, hearths, rubbish and cess pits, wells lined with wicker and stone footings for a variety of former residential and commercial buildings. I was employed by the University of Bradford to undertake archaeological

excavations in Pompeii, Italy where I undertook supervisor duties in the excavation and analysis of sub floor deposits of residential occupational areas of Regio VI Insula 1. I was also employed as a teaching assistant for the Osteological classes assisting in the instruction of the human musculoskeletal system.

Since commencing my archaeological career in Australia, I have worked on historical archaeological excavations of local and state significance in both New South Wales and Victoria. I have supervised the excavation of human osteological material, whilst mentoring junior archaeologists and students during trench excavations at Queen Victoria Markets in Melbourne, Victoria. I have been the site supervisor and Secondary Excavation Director for Civic Place archaeological works and Kiama Blowhole investigations (s140 permits). I have undertaken supervision of archaeological monitoring at 5 Harbour Street (s140 permit) and been the site supervisor and project manager for salvage excavations of WWI isolation camp and military service dog cemetery at the former Moorebank School of Military Engineering (SSI) and undertaken archaeological monitoring and salvage excavations for the Duplicate Crossing at Grafton (SSI).

I have managed projects from the initial site assessment phase through to the final excavation and interpretation stages including archaeological testing programs and have authored the associated reports which have included the preparation and implementation of project and site management strategies. I have also undertaken artefactual analysis of recovered material from these excavations including the preparation of analysis reports for final excavation reports.

4. Ability to demonstrate that work under any approvals previously granted by the Heritage Council has been completed in accordance with the conditions of that approval and the final report has been submitted to the Heritage Council.

I was site supervisor/secondary excavation director on projects based in the Illawarra and western Sydney including the following projects; *Civic Place* in Wollongong CBD, *Kiama Blowhole* in Kiama, *Moorebank Intermodal project* in Moorebank, Liverpool, *47-51 Crown Street* in Wollongong CBD and *Crown and Burelli Street* in Wollongong CBD. I was secondary excavation director on the civic place archaeological works and the Kiama Blowhole project. I ran a team of 8 archaeologists on site for the civic place excavations undertaking initial monitoring to investigate the level of preservation before undertaking the full excavation program. The Moorebank excavations involved the management of a team of up to 12 archaeologists on site over two separate archaeological programs. The excavation at Crown and Burelli Street involved the running of the site and management of a team of 5 archaeologists. During the excavations at 47-51 Crown Street I undertook the artefact management on site and supervised the archaeological team of 4 archaeologists.

Final reports to approved applications under s140 of the Heritage Act include:

- 5 Harbour Street, Wollongong NSW monitoring, 2015 prepared for Derek Sheppard.
- 47-51 Crown Street Archaeological Excavation, 2016 prepared for PSR Crown Developments.
- Crown and Burelli Archaeological Excavation, 2017 prepared for Nicolas Daoud & Co. Pty Ltd.
- Civic Place Archaeological Excavation, 2019 prepared for Piruse Constructions

5. Historical Archaeological Fieldwork Experience

Test Excavation	
• Excavation Director needs to demonstrate his/her understanding of the meaning (date, type, common application in the past) of basic fabric types likely to be encountered • Excavation Director needs to demonstrate his/her ability to recognize and interpret taphonomic processes and his/her meaning; • Recognition by the Excavation Director of any limitations of the above	• I have been involved in the assessment, survey and excavation of a range of industrial, defence, commercial and residential site types to sufficiently identify the date and provenance of basic finds and materials likely to be encountered within the study area. I have undertaken a range of assessment and excavation projects which has resulted in my ability to identify basic fabric types. Assessments include the Corrimal coke ovens Assessment (Industrial

• Excavation Director needs to demonstrate his/her ability to complete adequate recording of stratigraphy, soil, features without needing to re-excavate previous trenches; and • Excavation Director needs to demonstrate his/her ability to prepare a report that clearly identifies what was done, why, what new information was recovered and what it means	built heritage), Harbour Street (judicial/administrative and correctional remains), Oxford-On-Crown (residential and commercial remains), Crown and Burelli Streets (residential and commercial remains), Moorebank Intermodal Terminal (military/defence remains) Kiama Blowhole (government residential and commercial remains) Civic Place (residential remains) and Pitt Street South (mixed residential and commercial remains). • I have extensive experience in identifying and interpreting taphonomic processes on both rural and complex urban archaeological sites. Examples include Oxford-on-Crown, Burelli and Crown Street, Moorebank Intermodal Terminal, Civic Place and Pitt Street South where complex urban deposits were present. • Whist I am confident in undertaking the excavation of the study area, should any fabric or materials be identified which I cannot Identify, these will be examined by the Primary Excavation director and/or a relevant specialist. • I have a high degree of competency in recording archaeological sites using single and multiple context recording systems and training others how to do so. I have experience in preparing harris matrices, scale plans and sections and photographic recording to a level which does not require the re-excavation of trenches. I have never had to undertake the latter. • In the UK I was trained in utilising single and multi-context recording systems and have honed these skills on a diverse range of urban and rural sites with a diverse range of archaeological features dating to various periods of occupation. This has assisted me in undertaking similar archaeological projects in NSW. • I have previously submitted the excavation reports for 31 Crown and 16 Burelli Street and Moorebank Intermodal Terminal and the final report for Civic Place to NSW Heritage Council which clearly outlines the excavation program and results. • I have authored in excess of 50 Aboriginal and Historical assessment reports, including test and salvage excavation reports. Please see my CV for a comprehensive list of reports prepared for clients, many of which have been submitted to regulatory bodies.

Monitoring	•
• Excavation Director needs to meet ALL of the requirements listed for "Test Excavation" above, AND Excavation Director needs to demonstrate: • Previous experience with and demonstrated understanding of how to use a machine excavator effectively and safely; • Demonstrated ability to understand when it is necessary to change from machine to manual investigation.	• I have over ten years' experience in undertaking archaeological excavations with a mechanical excavator. All projects I participated in the UK involved the use of machine excavation to reveal archaeological structures and deposits. • Projects undertaken in Australia which demonstrate this experience include Queen Victoria Market, Oxford on Crown, Harbour Street, Crown and Burelli Moorebank Intermodal Terminal, Kiama Blowhole, Civic Place and Pitt Street South. • The experience demonstrated above demonstrates the successful implementation of mechanical excavation prior to commencing hand excavation.
Larger Scale/Complex Excavation	•
• Documentation showing the nominee has been approved as Excavation Director on five (5) or more prior permits for excavation of lesser scope such as archaeological testing or monitoring permits (and/or section 63 approvals) • Excavation Director needs to demonstrate that ALL the abovementioned projects have been completed in accordance with the permit consent conditions; • Excavation Director needs to demonstrate his/her excavation experience as a Site Director or Trench/Area supervisor on at least three (3) sites subject to open area excavation; • Excavation Director needs to demonstrate his/her experience and/or clear evidence of a capacity to: (a) manage project timeframes, budgets, client's requirements; as well as (b) manage community interest/Public Relations issues; AND • Excavation Director needs to demonstrate his/her ability to synthesise excavation and post excavation analysis/historical research into a report that responds to identified research questions and makes a positive contribution to community understanding of the history and significance of the place.	• This is my third application as a secondary Excavation Director for a permit approval under the *Heritage Act 1977*, the previous two were approved. I believe that elsewhere in this document I have demonstrated my experience in undertaking open area excavations within different legislative contexts. • I would also like to submit that in accordance with the NSW Heritage Directors Criterion the purpose of being named secondary excavation director is to build evidence of such approvals. • As mentioned previously, this is my third application as a Secondary Excavation Director. However, the Primary Excavation Director, Mike Hincks has experience in completing projects in accordance with permit conditions. • I have acted as trench or site supervisor/ project director on Oxford-on-Crown, Crown and Burelli, Harbour Street, Moorebank Intermodal Terminal, Kiama Blowhole, Civic Place and Pitt Street South. The Moorebank excavation was a large-scale testing and salvage program which resulted in opening up one open area (approx. 100m x 200m) and nine trenches (average size approx. 30m x 10m). Each area was excavated initially by machine and then by archaeological hand techniques. All underwent full archaeological recording. • I believe that this experience makes me innately familiar with the techniques and

	requirements of open area excavation and associated recording practices. • As mentioned previously, since 2014 I have managed multiple Aboriginal and European heritage projects with budgets exceeding $100k. These have all included large fieldwork and excavation components, often with logistical difficulties. I have provided a selection of assessments under the above heading which demonstrate my ability to produce written assessments. • I have been involved in multiple projects which have required me to manage community relations. Particularly, I have undertaken archaeological projects within Defence bases which required consultation with the Defence community, particularly the collection of oral histories. • As project manager and site supervisor I played a key role in instigating the public open day for both the Crown and Burelli site and the Civic Place site and have fostered on-going media relations for both projects. This involved follow up media interviews outlining the results of the excavations, a newspaper article in the Wollongong Advertiser detailing a short presentation of results and public presentation of the Crown and Burelli results as part of National Archaeology Week in May 2016. The latter was undertaken in partnership with the Southern Committee of the National Trust and other local organisations. I have fostered a close relationship with the clients to ensure that the interpretation works for the projects form a central part of the building designs and eventual aesthetics.

[redacted]

SENIOR HISTORIC HERITAGE CONSULTANT

QUALIFICATIONS Bachelor of Arts (Archaeology and Art History/Theory) - 2003

EMPLOYMENT HISTORY

2020 - Present	AMBS Ecology & Heritage, Australia – Senior Historic Heritage Consultant
2016-2020	Casey & Lowe Archaeology and Heritage - Senior Archaeologist/Manager
2014-2016	Self Employed - Heritage Consultant
2013-2014	Artefact Heritage Services – Senior Heritage Consultant
2009-2013	Casey & Lowe Archaeology and Heritage – Senior Archaeologist
2008	Casey & Lowe Archaeology and Heritage – Archaeologist
2003-2008	Self-Employed – Field Archaeologist

PROFESSIONAL AFFILIATIONS

- Australasian Society for Historical Archaeology (ASHA)

SELECT BIBLIOGRAPHY & PRESENTATIONS

2018 **Hincks, M.** *The Archaeology of Idleness*. Presented to the Australasian Society for Historical Archaeology Conference at the University of New England, Parramatta.

2017 **Hincks, M.** *Interpreting Transience at Cumberland hospital, north Parramatta*. Presented at the Australasian Society for Historical Archaeology Conference at Brickendon Estate, Tasmania.

PROFESSIONAL EXPERIENCE

Mike Hincks is a Senior Heritage Consultant with over 15 years' experience in commercial heritage management in NSW, including over 9 years' experience as a Senior Archaeologist and Heritage Consultant in historical archaeology in Sydney and over 5 years' experience in Aboriginal archaeology across NSW. Mike has been Primary Excavation Director for locally significant projects in Sydney and Parramatta, and Secondary Excavation Director for state significant projects in Western Sydney and Parramatta including testing at the Female Factory site, Cumberland Hospital, North Parramatta, and open area excavation of the 1813 Market/Annual Feasts site at 7PS, Parramatta. Mike has managed excavations at World Heritage listed Cockatoo Island and Old Government House. He has managed large teams and multiple trenches on complex maritime industrial sites at Barangaroo and Darling Quarter. Mike has written excavation reports, assessments, SoHIs and interpretive works for many archaeological and built heritage sites in NSW.

SELECT KEY PROJECTS

Large Scale Archaeological Excavations

7 Paramatta Square, Parramatta. Secondary Excavation Director, open area excavation of the State significant 1813 Market site for City of Parramatta Council, 2020.

Prince of Wales Hospital: Randwick Campus Redevelopment. Primary Excavation Director, open area archaeological excavation of a locally significant 1850s homestead and grounds for NSW Health/Lend Lease, 2019.

Sydney Metro City and Southwest – Tunnel, Stations and Excavation works. Secondary Excavation Director, open area archaeological excavation of Barangaroo Station site for JHCPBG Joint Venture, 2018.

Paramatta North Program, North Parramatta. Secondary Excavation Director, archaeological testing for the State significant 1821 Female Factory, 1803 Mill Race, Parramatta Girls Industrial School and Parramatta Lunatic Asylum, for NSW DPIE, 2016-2020.

47-53 Wentworth Ave, Surry Hills. Secondary Excavation Director, archaeological testing for

the State significant Leak Pottery site for Time and Place, 2019.

Ascham School Redevelopment. Primary Excavation Director, open area excavation of late 19th-century estate house and grounds for EPM, 2014.

2 Morton Street, Parramatta. Primary Excavation Director, open area excavation of 1830s homestead and grounds, for RCP 2014.

Specialist Artefact Analysis

Cataloguing, analysis and reporting of faunal material from *Day Street, Haymarket*, for Artefact Heritage Services, 2016.

Selected Report Writing

Parramatta North Growth Centre, Parramatta North: Archaeological Management Strategy and Archaeological Research Framework. Report to UrbanGrowth NSW Development Corporation, Casey & Lowe July 2019

PNGC Cumberland Hospital (East Campus) Site & Norma Parker Centre/Kamballa Site Historical Archaeology Testing Report, Report to UrbanGrowth NSW Development Corporation, Casey & Lowe November 2018 Vols. 1 & 2

Archaeological Testing Report: Mount Pleasant Homestead Site, Soling Crescent, Cranebrook, Report to Penrith City Council, Casey & Lowe June 2016

Archaeological Testing Report, 30-42 Oxford Street, Epping, Report to Grocon, Casey & Lowe November 2016

Archaeological Excavation: Ascham School Redevelopment, Report to EPM, Artefact Heritage March 2015

Archaeological Excavation: 2 Morton Street, Parramatta, Report to RCP, Artefact Heritage July 2014

Archaeological Test Excavation: 2 Morton Street, Parramatta, Report to RCP, Artefact Heritage January 2014

EXCAVATION DIRECTOR APPLICATION

[redacted]

AMBS ECOLOGY AND HERITAGE

1. A TERTIARY PASS DEGREE WITH SUBJECTS IN ARCHAEOLOGY OR A RELATED DISCIPLINE AND FOUR YEARS PROFESSIONAL EXPERIENCE IN HISTORICAL ARCHAEOLOGY OR A RELATED ARCHAEOLOGICAL FIELD

Tertiary Pass Degree:
2003: University of Sydney Bachelor of Arts (Archaeology (Prehistoric and Historical) and Art History/Theory)

12 Years Professional Experience in Historical Archaeology:
November 2020-present: Senior Historical Heritage Consultant, AMBS Ecology & Heritage
January 2016-November 2020: Senior Archaeologist, Casey & Lowe Pty Ltd
October 2014-January 2016: Sub-contractor Archaeologist (various projects and roles)
July 2014-October 2014: Senior Archaeologist, Casey & Lowe Pty Ltd
October 2013-May 2014: Senior Archaeologist, Artefact Heritage Services Pty Ltd
August 2008-October 2013: Archaeologist/Senior Archaeologist, Casey & Lowe Pty Ltd

I have had 11 years' experience at a supervisor level or above in historical archaeology in NSW. I have managed the excavation of a range of site types including residential, industrial, institutional, and land-creation sites. I have been primary Excavation Director for open area excavation at locally significant sites and secondary Excavation Director at State significant sites.

2. A DEMONSTRATED UNDERSTANDING OF NSW HERITAGE LEGISLATION ASSESSING HERITAGE SIGNIFICANCE CRITERIA AND RELEVANT ARCHAEOLOGICAL GUIDELINES/BEST PRACTICE METHODS AND STANDARDS INCLUDING, BUT NOT LIMITED TO, RELEVANT ARCHAEOLOGY PUBLICATIONS ISSUED BY THE HERITAGE COUNCIL OF NSW.

In my 12 years' experience in historical archaeology in NSW I have written many excavation reports, managed and directed excavations, and contributed to a variety of heritage reports including archaeological assessments, management strategies, impact statements, CMPs, and built heritage assessments. I have also reviewed and edited archaeological and heritage reports of all types. I understand that assessing the significance of archaeology in NSW requires the recognition of values that contribute to the cultural significance of a place, as defined by the Burra Charter 2013. I also understand that the values-based principles and processes outlined in the Burra Charter and expanded upon in *Assessing Heritage Significance* and *Assessing Significance for Historical Archaeological Sites and 'Relics'* remain the foundation of a significance assessment regardless of the development pathway in NSW.

The significance of a site is the defining quality that determines how the Heritage Act applies to it, and which will also guide the recommendations under the relevant state planning instrument if applicable.

While a significance assessment is most commonly associated with an initial archaeological assessment for any given project, I understand that significance is assessed before, during and after an excavation. The cultural significance of a place may be both tangible and intangible, and any assessment of significance must take this into consideration. A key example of my understanding of assessing archaeological significance throughout the archaeological process concerns objects that were found beneath the basement floor of the former Parramatta Girls Industrial School (SHR 00811, Archaeological Testing 2016-2017 Casey & Lowe). The objects were demonstrated to have multiple meanings that defied a traditional artefactual analysis and were only revealed through oral histories and interviews. I had a key role in this process. As the secondary ED I was managing the excavation of the site on a day-to-day basis. I recognised the limits of a traditional type/function analysis of the objects that were being recovered from the trench. With permission from the client and the Primary ED, I contacted former resident Bonnie Duric and invited her to visit the location of the excavation with an artefact specialist present.

The contradictions that became apparent in the competing interpretations of modified ceramic objects and combs between the artefact specialist and the former resident emphasised the importance of understanding significance through multiple value systems. In this case they were social values (as represented by Criterion [d]), and established comparative archaeological artefact analysis techniques developed in line with Criterion (e). It highlighted the need to recognise other sources of knowledge outside of the discipline and, most importantly, to recognise the limits of my knowledge and know when to engage other voices during the archaeological process to get the best outcome for the archaeology.

Only a significance assessment process that is values-based, and allows for significance to be expressed through competing but equally valid meaning systems (such as historical, aesthetic, and social), can ensure that all aspects of the cultural significance of an archaeological assemblage or site are accounted for and represented. The assessment of the finds during the excavation resulted in the site being recognised as containing State significant archaeology, which had been considered locally significant during the baseline assessment process. The re-assessment occurred in the field during excavation and was a response to the archaeological context, an awareness of the ongoing Royal Commission that involved former residents of the site, and new information from interviews with stakeholders. Understanding significance and how it is properly assessed was critical, and it guided the way that I managed the test excavation and was able to recommend changes in excavation and research strategy to the primary ED.

3. Demonstrated experience in the investigation of comparable or relevant historical archaeological sites (especially Australian Historical Archaeology) project management and preparing written archaeological assessments/site management recommendations.

My career in archaeology has been built on my skills as a field archaeologist and my ability to manage and direct sites, trenches, and large, complex investigations. Since 2008 I have worked almost exclusively on historical archaeological sites in the greater Sydney area, and have worked mostly on State significant archaeological sites in the Sydney CBD and Parramatta. These sites have been residential, industrial, institutional, and maritime in nature and have ranged from monitoring slot trenches in the course of a single night through to large-scale open area investigations covering 22,000m^2 that have been excavated over months and years.

When I worked at Artefact Heritage, I was the most senior historical archaeologist in the company and was responsible for project management, excavation direction, mentoring early-career archaeologists, budgets and timeframes and management recommendations.

Since then, on the projects I have been involved in, I have been the most senior archaeologist on site most if not all of the time. The day-to-day running of the site, excavation strategy and execution, safety audits and protocols, weekly client reports and summaries, and accountability for time and staff has all been my responsibility.

My extensive field experience augments my significance assessment skills and legislative knowledge. In 2019 I wrote the impact statement, s140 application and research design for 7 Parramatta Square (7PS). This had been a drawn-out project for the client and they had been unable to obtain approval. I was responsible for the renewed assessment strategy which involved extensive services location, in-depth consideration of the nature of the archaeology and its survivability, and I also negotiated the redesign of services and a commitment to conservation areas which I identified. I was wholly responsible for this report and strategy, which had a foundation in field experience and understanding significance.

4. Ability to demonstrate that work under any approvals previously granted by the Heritage Council has been completed in accordance with the conditions of that approval and the final report has been submitted to the Heritage Council.

All reports for which I have been nominated Primary Excavation Director have been submitted within the time stipulated in the approval. I have written many other reports as Secondary Excavation Director which are still awaiting review by the Primary ED (Dr Mary Casey, Director Casey & Lowe).

5. ADDITIONAL INFORMATION: PERMITS HELD UNDER THE HERITAGE ACT 1977:

Primary Excavation Director:

- S140/2021/012 Excavation Permit- S140 for archaeological monitoring and testing at Mudies Creek, Golden Highway Upgrade, Wittingham.
- 2018/s140/035 Prince of Wales Hospital Randwick Campus Redevelopment, Casey & Lowe
- 2014/s140 Ascham School Redevelopment; Artefact Heritage Services
- 2014/s140 2 Morton Street, Parramatta; Artefact Heritage Services
- 2013/s139 2 Morton Street, Parramatta; Artefact Heritage Services
- 2014/s139 Church Street Mall Redevelopment, Parramatta; Artefact Heritage Services
- 2013/s57 Oatley Station Redevelopment; Artefact Heritage Services

Secondary Excavation Director:

- S140/2020/004 85-97 Macquarie Street, Parramatta NSW 2150, Casey & Lowe
- 2019/s140/026 7PS &Parramatta Square Parramatta, Casey & Lowe
- 2019/S140/018 37-39 Smith Street Parramatta, Casey & Lowe
- s60/2019/038 (Norma Parker Correctional Centre SHR 000811), Casey & Lowe
- s60/2019/037 (Cumberland District Hospital Group SHR 000820), Casey & Lowe
- 2018/s140/019 47-53 Wentworth Ave, Surry Hills, Casey & Lowe
- 2017/s60/31 (Norma Parker Correctional Centre SHR 00811), Casey & Lowe
- 2016/s65a/30B (Cumberland District Hospital Group SHR 00820), Casey & Lowe
- 2016/s65a/31B (Norma Parker Correctional Centre SHR 00811), Casey & Lowe
- 2016/s65a/32B (Parramatta Correctional Centre SHR 00812), Casey & Lowe
- 2016/s140/11 Mount Pleasant Farm, Soling Crescent, Cranebrook; Casey & Lowe
- 2015/s140/29 Darling Harbour Live - Darling Square South East Plot, cnr Hay and Haymarket Streets, Haymarket, Casey & Lowe
- 2014/s140/04 Bicentennial Square (Church Street Mall), 188 Church Street Parramatta, Artefact Heritage Services

6. ADDITIONAL INFORMATION: SELECTED REPORTS

The following are reports that have either been authored solely by me, or to which I have made a significant and meaningful contribution (synthesis, analysis, assessment of potential and significance, recommendations or reporting of results). This list is not exhaustive, but provides a selection of reports from the last 10 years.

AMBS (2021a) *Addendum to Mudies Creek Golden Highway Upgrade Historical Archaeological Assessment S140 Application, Statement of Heritage Impact and Archaeological Research Design*, Report to SMEC on behalf of Transport for NSW.

AMBS (2021b) *Barangaroo Metro Station Construct Only Package (COP) Historical Archaeological Method Statement*, Report to BESIX Watpac May 2021.

AMBS (2021c) *Golden Highway Upgrade, Mudies Creek, Historical Archaeological Assessment*, Report to SMEC on behalf of Transport for NSW.

AMBS (2021d) *Sydney Gateway Road Project, Historical Archaeological Assessment & Research Design*, Report to John Holland.

AMBS (2021e) *Sydney Gateway Road Project Non-Aboriginal Heritage Management Sub Plan*, Report to John Holland Seymour Whyte Joint Venture on behalf of Transport for NSW.

AMBS (2021f) *Sydney Metro Baranagaroo COP Works Heritage Sub Management Plan*, Report to BESIX Watpac on behalf of TfNSW.

AMBS (2021g) *Sydney Metro Barangaroo COP Works Aboriginal Archaeological Method Statement*, Report to BESIX Watpac May 2021.

AMBS (2021h) *The Rocks Police Station, Historical Archaeological Assessment*, Report to Tanner Kibble Denton Architects (TKD).

Artefact Heritage (2014) *2 Morton Street Parramatta Non-Indigenous Archaeological Excavation*, Report to RCP.

Artefact Heritage (2015a) *Ascham School Redevelopment: Non-Indigenous Archaeological Excavation and Monitoring*, Report to EPM.

Artefact Heritage (2015b) *East Balmain Wharf Turning Circle Non-Indigenous Archaeological Assessment*, Report to Transport for NSW.

Artefact Heritage (2015c) *Old Parramatta Gaol Switching Station Archaeological Monitoring Report*, Report to Endeavour Energy.

Artefact Heritage (2015d) *Statement of Heritage Impact for CR0685 Wolli Creek to Banksia 702 and 690 Feeder Relocation*, Report to Rail NSW.

Casey & Lowe (2011a) *Archaeological Investigation 710-722 George Street, Haymarket, Sydney*, Report to Inmark.

Casey & Lowe (2011b) *Archaeological Testing Report Discovery Point Stage 1 Gardener's Cottage and Pine House, Tempe House, Wolli Creek*, Report to Australand.

Casey & Lowe (2011c) *Macquarie Lightstation South Head Remediation Monitoring Report*, Report to Sydney Harbour Federation Trust.

Casey & Lowe (2012a) *Archaeological excavation of structural remains within the Cookhouse at the Convict Precinct, Cockatoo Island*, Report to Sydney Harbour Federation Trust.

Casey & Lowe (2012b) *Archaeological Monitoring Report Richard Johnson Square, Corner of Bligh and Hunter Streets, Sydney*, Report to Ausgrid.

Casey & Lowe (2013a) *Archaeological Investigation Darling Quarter (formerly Darling Walk), Darling Harbour, Sydney*, Report to Lend Lease Development.

Casey & Lowe (2013b) *Archaeological Monitoring of Alterations to the Turning Circle, Old Government House, Parramatta*, Report to Government Architects Office.

Casey & Lowe (2013c) *Archaeological Testing, George Street Gatehouse, Parramatta Park, Parramatta*, Report to Government Architects Office on behalf of Parramatta Park Trust.

Casey & Lowe (2014) *Non-Indigenous Archaeological Testing: Darling Square East & Boulevard*, Report to Lend Lease Development Pty Ltd.

Casey & Lowe (2016a) *Archaeological Testing Report 30-42 Oxford Street, Epping*, Report to Greaton Epping Holdings Pty Ltd.

Casey & Lowe (2016b) *Archaeological Testing Report Mount Pleasant Homestead Site, Soling Crescent, Cranebrook*, Report to Penrith City Council.

Casey & Lowe (2016c) *Historical (Non-Aboriginal) Archaeology Impact Statement: Development Application (Subdivision, Public Domain, Infrastructure and Demolition DA1) Parramatta North Urban Transformation*, Report to UrbanGrowth NSW.

Casey & Lowe (2018a) *Parramatta North Growth Centre (PNGC) Cumberland Hospital East Campus Site & Norma Parker Centre/Kamballa Site Historical Archaeology Testing Report*, Report to UrbanGrowth NSW Development

Corporation.

Casey & Lowe (2018b) *Prince of Wales Hospital Randwick Campus Redevelopment Stages 1 & 2 Historical Archaeology Assessment, Archaeological Research Design & S140 Application, NSW Heritage Act 1977*, Report to Lendlease Building on behalf of Health Infrastructure NSW.

Casey & Lowe (2019a) *Parramatta North Growth Centre, Parramatta North: Archaeological Management Strategy and Archaeological Research Framework*, Report to UrbanGrowth Development Corporation.

Casey & Lowe (2019b) *Sydney Metro City & Southwest - TSE Works Barangaroo Station, SSI 15_7400 Preliminary Report*, Report to John Holland CPB Ghella JV.

Casey & Lowe (2020a) *North East Plot, Darling Square, Haymarket SSD 6626 Historical Archaeological Investigation*, Report to Lendlease & Infrastructure NSW.

Casey & Lowe (2020b) *Prince of Wales Hospital Randwick Campus Redevelopment Historical Archaeology Excavation Report*, Report to Lendlease Building on behalf of Health Infrastructure NSW.

Casey & Lowe and Hincks, M. (2009) *Trench Report Area 8: Workers' Housing Darling Walk, Darling Harbour, Sydney*.

Casey & Lowe and Hincks, M. (2012) *Trench Report: Area M Barangaroo South*.

Casey & Lowe, Hincks, M., Dusting, A., Spry, B. and Cryerhall, A. (2011) *Trench Report: Archaeological Monitoring and Excavation, Public Domain Civil Works, darling Walk, Darling Harbour, Sydney*.

Casey & Lowe, Hincks, M. and Harrop, N. (2013a) *Trench Report Lot 6, 15 Macquarie Street, Parramatta, Sydney*.

Casey & Lowe, Hincks, M. and Harrop, N. (2013b) *Trench Report Lot 7, 15 Macquarie Street, Parramatta*.

Narrativ Archaeology and Hincks, M. (2015) *168-190 Day Street, Sydney: Analysis of Archaeologically Excavated Animal Bone and Shell*, Report to Artefact Heritage Services.

TEST EXCAVATION

LOCAL SIGNIFICANCE

1. EXCAVATION DIRECTOR NEEDS TO DEMONSTRATE HIS/HER UNDERSTANDING OF THE MEANING (DATE, TYPE, COMMON APPLICATION IN THE PAST) OF BASIC FABRIC TYPES LIKELY TO BE ENCOUNTERED

I have managed and directed the excavation of a variety of historical archaeology sites in NSW including institutions, residences, industries, and convict sites. These site types all have different material signatures, and in practice many of them overlap in their own idiosyncratic way.

I understand that structural fabrics and techniques can be critical to dating a site, particularly in identifying modifications to a building or separating phases of construction. During archaeological testing at SHR 00820 Cumberland Hospital (2016-2017 Parramatta North Program), identification of building fabric was key to distinguishing early female factory remains from later institutions. Understanding the re-use value of certain fabrics was also critical in explaining their absence in an institutional environment that went through several phases of structural change and reconfiguration. The testing report which I wrote for this site demonstrates my knowledge of a variety of fabrics and construction and engineering techniques, which had to be recognised in small test trenches that contained multi-phase remains.

I understand that artefact types and uses can also be critical in the interpretation of a site, and can affect significance assessments during excavation as described in the example from item 2 above. This case demonstrates that the relationship between fabric/type and context must be considered because traditional analyses of fabric, function and type alone may exclude some values. This was equally true for objects recovered

from the sub-floor cavity of the former Criminal Ward of the Parramatta Lunatic Asylum/Hospital for the Insane at SHR 00820 during the same testing program. The institutional and penal nature of the building meant that objects had to be considered in terms of their contraband/dual use value which transcended traditional type/function analysis.

2. EXCAVATION DIRECTOR NEEDS TO DEMONSTRATE HIS/HER ABILITY TO RECOGNISE AND INTERPRET TAPHONOMIC PROCESSES AND HIS/HER MEANING.

I have managed and directed many sites for which an understanding of site formation processes is critical. At Darling Square, South East Plot, which I managed and wrote the excavation report for (2020), this involved interpretation of estuarine mudflats including the synthesis of RXF data, artefact dating and stratigraphic relationships to create a new narrative for land creation and residential subdivision at the site. These were large scale processes over long time periods that were discussed along with the day-to day data of the residential archaeology. My synthesis was able to incorporate a discussion of dramatic environmental change side by side with the relatively micro-timescales of decades and years that were discernible in the formation of underfloor deposits and building alterations.

I have also demonstrated the value of experimental archaeology on taphonomic processes for specific conditions, as at Cuddie Springs megafauna site, Brewarrina for Dr. Judith Field, University of Sydney, in 2003-2005. The site contains the remains of megafauna accumulated over several thousand years. The site showed negative selection against the preservation of certain skeletal elements, as well as unusual orientation of some bones. I conducted an archaeological experiment to test taphonomic processes at nearby Brewon Station, where a considerable number of native and domesticated animals had died in similar conditions. The experiment considered the varying morphology of the animals whose remains were preserved at the tank, the positions of the bones, known scavengers in the area, as well as dessication and articulation. The experiment showed that the skeletal morphology of the animal often affected what elements were preserved, and in what position. Scavenger preference for certain body parts also contributed significantly to the results of the taphonomic process.

3. EXCAVATION DIRECTOR NEEDS TO DEMONSTRATE HIS/HER ABILITY TO COMPLETE ADEQUATE RECORDING OF STRATIGRAPHY, SOILS, FEATURES WITHOUT NEEDING TO RE- EXCAVATE PREVIOUS TRENCHES;

AND

4. EXCAVATION DIRECTOR NEEDS TO DEMONSTRATE HIS/HER ABILITY TO PREPARE A REPORT THAT CLEARLY IDENTIFIES WHAT WAS DONE, WHY, WHAT NEW INFORMATION WAS RECOVERED AND WHAT IT MEANS.

I have written many testing reports which demonstrate this. The best example is 2 Morton Street, Parramatta (Artefact Heritage 2014), because the testing strategy was written by me, the testing was directed by me, the testing report was written by me, the research design for open area excavation was written by me, the open area excavation was directed by me (primary ED), and the final excavation report was written by me. The whole process and combined reports demonstrate my ability to design a testing strategy, undertake testing, recognise what the results mean and design an appropriate open area excavation strategy based on the results.

STATE SIGNIFICANCE

1. EXCAVATION DIRECTOR NEEDS TO DEMONSTRATE HIS/HER ABILITY TO MANAGE/WORK WITHIN A MULTI-FACETED TEAM OF HERITAGE PROFESSIONALS;

Parramatta North Program, North Parramatta (Testing, AMS)

- Working closely with heritage architects, ecologists, arborists and engineers to manage the archaeological resource.

Barangaroo Metro Station (Open Area Excavation)

- Recovery of an 1830s boat with teams of maritime archaeologists, conservators and interpretation specialists.

Old Government House, Parramatta (Testing and Monitoring)

- Working closely with Government Architects Office to achieve suitable outcomes regarding heritage aesthetics and conservation of vegetation at the site

Graythwaite House (Monitoring)

- Working with the Shore School and Robyn Stocks to create an interpretive environment incorporating archaeology from the site

MCA (Monitoring)

- Liaising with Monique Galloway and Wayne Johnson of the Sydney Harbour Foreshore Authority regarding conservation of building materials on and off site

Cockatoo Island (Excavation) and Macquarie Lightstation (Monitoring)

- Liaising with Libby Bennett of Sydney Harbour Federation Trust to achieve suitable interpretation outcomes

Cuddie Springs (Open Area Excavation)

- Working with conservators and paleontologists of The Australian Museum to effectively manage excavation of sensitive and poorly preserved items

2. EXCAVATION DIRECTOR NEEDS TO DEMONSTRATE HIS/HER COMMITMENT TO OPERATING WITHIN THE PRINCIPLES OUTLINED IN RELEVANT HERITAGE COUNCIL'S GUIDELINES AND POLICIES, INCLUDING BUT NOT LIMITED TO: HISTORICAL ARCHAEOLOGY CODE OF PRACTICE AND THE BURRA CHARTER

The example of managing the project at 2 Morton Street Parramatta (Artefact Heritage 2014), from assessment through research design, testing and excavation, writing all reports, liaising with client, the NSW Heritage Office, designing and executing budget, and directing all excavation demonstrates a commitment to the principles of the Historical Archaeology Code of Practice and the Burra Charter.

MONITORING

LOCAL SIGNIFICANCE

1. PREVIOUS EXPERIENCE WITH AND DEMONSTRATED UNDERSTANDING OF HOW TO USE A MACHINE EXCAVATOR EFFECTIVELY AND SAFELY;
AND
2. DEMONSTRATED ABILITY TO UNDERSTAND WHEN IT IS NECESSARY TO CHANGE FROM MACHINE TO MANUAL INVESTIGATION.

- 30-tonne excavator – has the advantage of being very stable, giving more accuracy under certain conditions (able to remove 100mm steadily in compact industrial fills). Used at Darling Walk Area 6, Area 8, Area 4
- 4-tonne excavator – easy to communicate with the operator. High maneouverability. Low impact. Used at many sites including Old Government House, Parramatta where it was able to perform sensitive work around the portico.
- 13-tonne excavator – facilitates good communication and reasonable stability and manoeuvrability. Able to remove reasonably large volumes without having the power to damage large structures. Used in the vicinity of the 1850s sea wall at the MCA among other locations.

Knowing when to change from machine to manual investigation is different for every site, and can also depend on non-archaeological factors such as services or toxic contaminants. However, it is always best achieved through effective communication with the operator. I always discuss with the operator prior to excavation:

- the fabric we are likely to encounter
- the power of the excavator
- how the operator understands different types of resistance in terms of different deposits
- the type of bucket to be used
- how I will communicate to the operator when I want him or her to stop excavation
- where I will stand
- what he or she can see from the cab

- the manoeuvrability of the arm and bucket head

This ensures that I know the limitations of the machine and can make a call before it is too late. Many operators have a good sense of the fabric or the nature of the deposit they are excavating by the resistance that they get from the machine. This can often be an effective tool in informing when to change from machine to manual excavation as the operator is often aware of a change in resistance before the result is visible to the archaeologist.

LARGER SCALE / COMPLEX EXCAVATION

LOCAL SIGNIFICANCE

DOCUMENTATION SHOWING THE NOMINEE HAS BEEN APPROVED AS EXCAVATION DIRECTOR ON FIVE (5) OR MORE PRIOR PERMITS FOR EXCAVATION OF LESSER SCOPE SUCH AS ARCHAEOLOGICAL TESTING OR MONITORING PERMITS (AND/OR SECTION 63 APPROVALS)

I have been primary ED for 3 open area investigations of Local significance and one test excavation:

- 2018/s140/035 Prince of Wales Hospital Randwick Campus Redevelopment, Casey & Lowe (local significance, open area excavation)
- 2014/s140 Ascham School Redevelopment; Artefact Heritage Services (local significance, open area excavation)
- 2014/s140 2 Morton Street, Parramatta; Artefact Heritage Services (local significance, open area excavation)
- 2013/s139 2 Morton Street, Parramatta; Artefact Heritage Services (local significance, testing)

All reports for the above excavations have been submitted to Heritage NSW within the timeframe stipulated in the approval.

I have been secondary ED for the following State significant sites:

- S140/2020/004 85-97 Macquarie Street, Parramatta NSW 2150, Casey & Lowe
- 2019/s140/026 7PS &Parramatta Square Parramatta, Casey & Lowe
- 2019/S140/018 37-39 Smith Street Parramatta, Casey & Lowe
- s60/2019/038 (Norma Parker Correctional Centre SHR 000811), Casey & Lowe
- s60/2019/037 (Cumberland District Hospital Group SHR 000820), Casey & Lowe
- 2018/s140/019 47-53 Wentworth Ave, Surry Hills, Casey & Lowe
- 2017/s60/31 (Norma Parker Correctional Centre SHR 00811), Casey & Lowe
- 2016/s65a/30B (Cumberland District Hospital Group SHR 00820), Casey & Lowe
- 2016/s65a/31B (Norma Parker Correctional Centre SHR 00811), Casey & Lowe
- 2016/s65a/32B (Parramatta Correctional Centre SHR 00812), Casey & Lowe

EXCAVATION DIRECTOR NEEDS TO DEMONSTRATE HIS/HER EXPERIENCE AND/OR CLEAR EVIDENCE OF A CAPACITY TO:

(A) MANAGE PROJECT TIMEFRAMES, BUDGETS, CLIENT'S REQUIREMENTS;

The 2016-2017 PNUT testing program was delivered within the predicted timeframe in co-ordination with testing for heritage repairs, maintaining access to hospital buildings, avoiding live services, taking road possession, and working with NSW Health to ensure full operation of the facility. I was secondary Excavation Director on this project and was responsible for the excavation timeframes and co-ordination, interpretation of the archaeology, and the day to day running of the site.

AS WELL AS

(B) MANAGE COMMUNITY INTEREST/PUBLIC RELATIONS ISSUES;

At Prince of Wales Hospital Randwick Campus Redevelopment I initiated and facilitated community involvement in the interpretation process while the excavation was in progress. This had a few immediate and positive effects. It diffused negative sentiment by the community towards the development, it raised the profile of the developer in the community generally, and it was a rewarding experience for the local historical society.

MANAGE AND IMPLEMENT PERMIT CONDITIONS (WHEN TRIGGERED) INCLUDING RELATIONSHIP TO OTHER LEGISLATIVE REQUIREMENTS (E.G. ABORIGINAL HERITAGE LEGISLATION AND WORK HEALTH AND SAFETY LEGISLATION)

At Randwick Campus Redevelopment (2019) I was an Excavation Director on a site where the historical archaeology was assessed as being locally significant. The site was located within a dune environment, which had been assessed as being a highly sensitive landscape for Aboriginal archaeology. Another consultant was managing the Aboriginal archaeology. There were several legislative considerations that influenced the way that the site was to be excavated:

- The project was awaiting SSD determination
- The Aboriginal archaeology was intended to be managed under the conditions of the SSD, eliminating the need for approval under the NPW Act
- The investigation and removal of the historical archaeology was covered by an s140 approval
- An AHIP (for testing only) had been issued for one part of the site
- An early works DA for demolition and excavation of peripheral areas had been approved by Council and did not require an AHIP

This meant that early works could proceed, and the historical archaeological excavation could get under way. However, the Aboriginal archaeological investigations were limited to testing in one part of the site.
The historical archaeology that I was managing was situated on the dune sands. The location of the historical archaeology corresponded to the part of the site for which the AHIP had been issued, and our works were able to proceed and be managed under the conditions of the AHIP where parts of the dune risked being disturbed. This project required me to be highly aware of the various statutory controls and planning instruments in place and how the Acts related to the planning pathway.

AND
EXCAVATION DIRECTOR NEEDS TO DEMONSTRATE HIS/HER ABILITY TO SYNTHESISE EXCAVATION AND POST EXCAVATION ANALYSIS/HISTORICAL RESEARCH INTO A REPORT THAT RESPONDS TO IDENTIFIED RESEARCH QUESTIONS AND MAKES A POSITIVE CONTRIBUTION TO COMMUNITY UNDERSTANDING OF THE HISTORY AND SIGNIFICANCE OF THE PLACE.

I have written many excavation reports for sites that in themselves lack self-evident meaning, or lack easily interpretable archaeology. However, my ability to synthesise historical records, environmental data, theoretical concepts and shifts in social attitudes has resulted in successful outcomes that are able to bring new perspectives to sites through the interpretation of the archaeology. A recent example of this is the excavation report for Darling Harbour Live: Darling Square South East Plot. Excavation revealed that most of the anticipated residential and industrial archaeology had been removed from the site. However, synthesis of the artefact data from the reclamation and interpretation of the environmental results from boreholes and excavation combined with historical accounts of the area resulted in a change in the narrative of subdivision and reclamation at the site, contradicting contemporary map and survey records and revealing clues to the squalid living conditions and piecemeal approaches to foreshore reclamation that occurred at the head of the bay.

STATE SIGNIFICANCE

EXCAVATION DIRECTOR NEEDS TO CLEARLY DEMONSTRATE HIS/HER UNDERSTANDING OF THE SIGNIFICANCE AND ARCHAEOLOGICAL RESEARCH POTENTIAL OF SITES OF STATE SIGNIFICANCE AND OF THE LOSS OF INFORMATION THAT CAN BE INCURRED BY APPLICATION OF LESS THAN BEST PRACTICE AND/OR RIGOROUS METHODS BOTH ON-SITE AND DURING PREPARATION OFF SITE (INCLUDING REVIEWS OF THE SITE ASSESSMENT).
AND
EXCAVATION DIRECTOR NEEDS TO CLEARLY DEMONSTRATE HIS/HER EXPERIENCE IN PROJECT MANAGEMENT OF ON-SITE INTERPRETATION.

As discussed above, I have a demonstrated understanding of the need to constantly re-assess significance and strategy during excavation, and have shown that I understand the loss that can occur if a reflexive and adaptive attitude is not adopted by the ED. I have shown that I understand when to change tactic and methodology to ensure the best archaeological outcomes. I have also demonstrated that I understand archaeological significance to be values-based and highly contextual, and have shown this in the context of the excavation of a State significant site.

I have been secondary excavation director on 6 testing permits in SHR items 00811 and 00820, which contain State and nationally significant archaeology. Conditions of all of the permits for these sites indicated that State significant archaeology was not to be disturbed. The Primary ED was on call but was not present on site during excavation. This required me to identify and interpret State significant archaeology in each case without disturbing it, which I was able to do and which is demonstrated most clearly in the PNUT Testing Report (2017). I have shown that I can identify, interpret and understand significance in the field, and understand how significance is represented in archaeological contexts and objects. This has been demonstrated in previous sections, particularly item 2, page 1.

At Cockatoo Island (2009-2010) I worked on site with Libby Bennett of Sydney Harbour Trust during excavation of the convict solitary cells, tanks and cookhouse to achieve good interpretation outcomes. This required an excavation strategy that responded to the exposure of contemporary phases across the three features that were evocative and that also satisfied research and conservation requirements.

Independently I have provided historical and archaeological interpretation advice to renowned Australian contemporary artist Mikala Dwyer on a number of projects including her work *An Apparition of a Subtraction (2010)* at the 17th Biennale of Sydney on Cockatoo Island, which incorporated waste material from the excavation of the solitary cells.

Appendix C
Compliance Matrix

Compliance Matrix

Table 5 Compliance Matrix – Consolidated Conditions of Approval

Condition	Requirement	Document Reference
C4	The CEMP sub-plans must state how: (a) the environmental performance outcomes identified in the EIS as amended by the documents listed in A1 will be achieved; (b) the mitigation measures identified in the EIS as amended by documents listed in A1 will be implemented; (c) the relevant terms of this approval will be complied with; and (d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	(a) Table 7 (b) **Error! Reference source not found.** (c) Appendix C (d) Table 3
C5	The CEMP sub-plans must be developed in consultation with relevant government agencies. Where an agency(ies) request(s) is not included, the Proponent must provide the Secretary justification as to why. Details of all information requested by an agency to be included in a CEMP sub-plan as a result of consultation and copies of all correspondence from those agencies, must be provided with the relevant CEMP sub-plan.	Appendix D
C8	Construction must not commence until the CEMP and all CEMP sub-plans have been approved by the Secretary. The CEMP and CEMP sub-plans, as approved by the Secretary, including any minor amendments approved by the ER (or AA in regards to the Noise and Vibration sub-plan), must be implemented for the duration of construction. Where the CSSI is being staged, construction of that stage is not to commence until the relevant CEMP and sub-plans have been approved by the Secretary.	Section 1.4
E10	The Proponent must not destroy, modify or otherwise physically affect any Heritage item not identified in documents referred to in Condition A1.	Section 3
E13	The Proponent must prepare a Heritage Archival Recording Report, including photographic recording of the heritage items identified in documents referred to in Condition A1. Archival recording must include but not be limited to the following heritage items: (a) any component of the Blues Point Waterfront Group and the McMahons Point South heritage conservation area to be directly affected or altered, including vegetation and significant landscape features; (b) Hickson Road wall in the vicinity of proposed ventilation risers and skylights for Barangaroo Station or any other project elements to be located in front of the Hickson Road wall; (c) Martin Place, between Elizabeth and Castlereagh Streets, Sydney; (d) the Rolling Stock Officers' Garden, Rolling Stock Officers' Building and Cleaners' Amenities Building in Sydney Yard and any other component of the Sydney Terminal and Central Railway Stations group to be removed or altered; (e) any component of Sydenham Station or Sydenham Pit and Pumping Station to be removed or altered; (f) views from Mortuary Station before construction of the Sydney Yard Access Bridge; and (g) Former "Metro Goldwyn Mayer' building including interior, 22-28 Chalmers Street, Surry Hills. The archival recording must be undertaken by a suitably qualified heritage specialist and prepared in accordance with NSW Heritage Office's How to Prepare Archival Records of Heritage Items (1998) and Photographic Recording of Heritage Items Using Film or Digital Capture (2006). Within two (2) years of completing the archival recording, or any other later time agreed by the Secretary, the Proponent must submit the Heritage Archival Recording Report to the Department, the OEH, Heritage Council of	Only Item (b) is applicable to this project. Archival recording of this item has already been undertaken by Sydney Metro. 4.1.2.1

Condition	Requirement	Document Reference
	NSW, Relevant Council(s), relevant local libraries and local historical societies in the respective local government area(s).	
E14	In addition to the archival recording as required by Condition E13, the Proponent must, prior to demolition, undertake external photography of all buildings and structures to be demolished, in consultation with and to the standards of the relevant Council. The recordings must be made available to the relevant Council.	Not relevant to this plan. No buildings or structures are being demolished during construction
E15	The Proponent must salvage items of heritage value from heritage listed buildings and structures to be demolished before demolition, and assess options for its sympathetic reuse (including integrated heritage displays) on the project or other options for repository, reuse and display. Suitable repository locations must be established in consultation with Relevant Council(s). Any State listed items or elements suitable for salvage must be determined in consultation with the Heritage Division of the OEH.	Not relevant to this plan. No buildings or structures are being demolished during construction
E16	The Proponent must prepare a Salvage Report, including photographic recording of the heritage items identified for salvage in Condition A1. The Salvage Report must include: a) the internal heritage fabric removed from within the curtilage of Mowbray House, Chatswood; b) the interior, exterior and setting of the shop at 187 Miller Street, North Sydney; c) the fabric and setting of the North Sydney bus shelters; d) the interior, exterior and setting of the 'Flat Building' at 7 Elizabeth Street, Sydney; e) the heritage fabric of the existing Martin Place Station affected by the project; f) the heritage fabric of the existing Sydenham Station affected by the project; g) directly impacted parts of the Congregational Church at Waterloo; and the former 'Metro Goldwyn Mayer' building including interior, 22-28 Chalmers Street, Surry Hills.	Not relevant to this plan.
E17	The Archaeological Assessment Research Design Report (AARD) in the documents listed in PIR must be implemented. Final Archaeological Method Statements must be prepared in consultation with the Heritage Council of NSW (or its delegate) before commencement of archaeological excavation works. The final methodology must: (a) provide for the detailed analysis of any heritage items discovered during the investigations; (b) include detailed site specific archaeological management and artefact management strategies; (c) include cored soil samples for soil and pollen for the Pitt Street site within the Tank Stream Valley; and (d) provide for a sieving strategy.	Historical and Aboriginal Archaeological Method Statements provided with this Plan Section 6, Section 8.1.2
E18	Before excavation of archaeological management sites, the Proponent must nominate a suitably qualified Excavation Director who complies with the Heritage Council of NSW's Criteria for Assessment of Excavation Directors (July 2011) to oversee and advise on matters associated with historic archaeology and advise the Department and OEH. Where archaeological excavation is required, the Excavation Director must be present to oversee excavation and advise on archaeological issues. The Excavation Director must be given the authority to advise on the duration and extent of oversight required as informed by the provisions of the approved AARD and Excavation Methodology. A final archaeological report must be submitted to the Heritage Council of NSW within two (2) years of the completion of archaeological excavation on	Section 5.1.1 and 7.1.4. Barangaroo is the only archaeological management site relevant to this report

Condition	Requirement	Document Reference
	the project. The report must include information on the entire historical archaeological program relating to the CSSI.	
E19	An Unexpected Heritage Finds Procedure must be prepared: (a) to manage unexpected heritage finds in accordance with any guidelines and standards prepared by the Heritage Council of NSW or OEH; and (b) by a suitably qualified and experienced heritage specialist. The procedure must be included in the AARD and must be implemented for the life of the project.	Sydney Metro Unexpected Heritage Finds Procedure [SM-18-00105232] Section 7 this plan
E20	In the event that a potential relic/s is/are discovered, relevant construction must cease in the affected area and the Excavation Director must be notified and assess the significance level of the find/s and provide mitigation advice according to the significance level and the impact proposed. The Excavation Director must attend the site in accordance with E18 to oversee the excavation where relics of State significance are found. The Secretary must be notified at the same time as the Heritage Council of NSW (or its delegate) of any relic of State significance found. An Archaeological Relic Management Plan specific to the relic of State significance must be prepared in consultation with the Heritage Council of NSW (or its delegate) to outline measures to be implemented to avoid and/or minimise harm to and/or salvage the relic of State significance. Construction in the vicinity of the discovery must not recommence until the requirements of the ARMP have been implemented, in consultation with the Excavation Director. The Proponent must notify the Secretary in writing of the outcome of consultation on the Archaeological Relic Management Plan with the Heritage Council of NSW.	Section 7 Unexpected heritage finds, Section 7.1.1 Archaeological Relics Management Plan, AMS
E21	The Proponent must prepare a Heritage Interpretation Plan which identifies and interprets the key Aboriginal and Non-Aboriginal heritage values and stories of heritage items and heritage conservation areas impacted by the CSSI. The Heritage Interpretation Plan must inform the Station Design and Precinct Plan referred to in Condition E101. The Heritage Interpretation Plan must be prepared in accordance with the NSW Heritage Manual, the NSW Heritage Office's Interpreting Heritage Places and Items: Guidelines (August 2005), and the NSW Heritage Council's Heritage Interpretation Policy and include, but not be limited to: (a) a discussion of key interpretive themes, stories and messages proposed to interpret the history and significance of the affected heritage items and sections of heritage conservation areas including, but not limited to the Sydney Terminal and Central Railway Stations Group, Martin Place Station, Sydenham Station and Sydenham Pit and Drainage Pumping Station Precincts; (b) identification and confirmation of interpretive initiatives implemented to mitigate impacts to archaeological Relics, heritage items and conservation areas affected by the CSSI including; i. use of interpretative hoardings during construction ii. community open days iii. community updates iv. station and precinct design; and (c) Aboriginal cultural and heritage values of the project area including the results of any archaeological investigations undertaken.	Section 9.2 Section 3.2.2
E23	The Proponent must take all reasonable steps so as not to harm, modify or otherwise impact any Aboriginal object associated with the CSSI except as authorised by this approval.	Section 6.5 Heritage induction Section 8.1.2
E24	Before excavation, the Proponent must implement the Aboriginal Cultural Heritage Assessment prepared for the CSSI and included in the PIR. Excavation and/or salvage must be undertaken by a qualified archaeologist in consultation with the Registered Aboriginal Parties for the CSSI.	Section 6.0 Aboriginal AMS prepared in accordance with ACHA, 6.1 Excavation Director
E25	Where previously unidentified Aboriginal objects are discovered during construction of the CSSI, construction must stop in the vicinity of the affected area and a suitably qualified and experienced Aboriginal heritage expert must	Section 6.3 Unexpected heritage finds

Condition	Requirement	Document Reference
	be contacted to provide specialist heritage advice, before works recommence. The measures to consider and manage this process must be specified in the Heritage Management sub-plan required by Condition C3 and, where relevant, include registration in the OEH's Aboriginal Heritage Information Management System (AHIMS).	
E26	This approval does not allow the Proponent to harm, modify, or otherwise impact human remains uncovered during the construction and operation of the CSSI, except in accordance with the Exhumation Management Plan (Condition E27).	6.3 Unexpected heritage finds 8.5 Exhumation Management
E27	An Exhumation Management Plan must be prepared to guide the relocation of recovered human remains. The Exhumation Management Plan must be prepared: (a) in consultation with, and meeting the requirements of, the OEH and NSW Health; and (b) in accordance with the Guidelines for Management of Human Skeletal Remains (NSW Heritage Office, 1998b) and NSW Health Policy Directive – Exhumation of human remains (December, 2013), and other relevant guidelines and standards prepared by the Heritage Council of NSW or OEH. The Exhumation Management Plan must be provided to the Secretary for information before the commencement of excavation works. Note: Human remains that are found unexpectedly during works are under the jurisdiction of the NSW State Coroner and must be reported to the NSW Police immediately	Section 8.5 : Sydney Metro Exhumation Management Plan to be implemented in event of human remains being uncovered.
E30	The Proponent must conduct vibration testing before and during vibration generating activities that have the potential to impact on heritage items to identify minimum working distances to prevent cosmetic damage. In the event that the vibration testing and monitoring shows that the preferred values for vibration are likely to be exceeded, the Proponent must review the construction methodology and, if necessary, implement additional mitigation measures.	Section 4.1 and addressed in the CNVMP
E31	The Proponent must seek the advice of a heritage specialist on methods and locations for installing equipment used for vibration, movement and noise monitoring of heritage-listed structures	Section 4

Table 6 Revised Environmental Mitigation Measures (REMMs)

Condition	Requirement	
NAH1	Archival recording and reporting of the following heritage items would be carried out in accordance with the NSW Heritage Office's How to Prepare Archival Records of Heritage Items (1998a), and Photographic Recording of Heritage Items Using Film or Digital Capture (2006): • The internal heritage fabric and any non-original elements removed from within the curtilage of Mowbray House, Chatswood • The interior, exterior and setting of the shop at 187 Miller Street, North Sydney • The fabric and setting of the North Sydney bus shelters requiring removal and temporary relocation at Victoria Cross Station and Blues Point temporary site • Any component of the Blues Point Waterfront Group and the McMahons Point South heritage conservation area to be directly affected or altered, including vegetation and significant landscape features • Hickson Road wall in the vicinity of proposed ventilation risers and skylights for Barangaroo Station • The interior, exterior and setting of the 'Flat Building' at 7 Elizabeth Street, Sydney • Martin Place, between Elizabeth and Castlereagh streets, Sydney • The heritage fabric of areas of the existing Martin Place Station affected by the project • The Rolling Stock Officers Garden, Rolling Stock Officers Building and Cleaners Amenities Building in Sydney Yard and any other component of the Sydney Terminal and Central Railway Stations group to be removed or altered • The Bounce Hostel building (former MGM building) • Directly impacted parts of the Congregational Church at Waterloo	Archival recording and reporting has previously been undertaken by Sydney Metro as outlined in 4.3.1.

	• Sydenham Pit and Drainage Pumping Station 1 • Sydenham Railway Station Group: Platform 6 building and Platform 1 Parcels Office	
NAH2	The archaeological research design would be implemented. Significant archaeological findings would be considered for inclusion in heritage interpretation (as per NAH8) for the project and be developed in consultation with the relevant local council.	To be undertaken in accordance with Sydney Metro City and Southwest Heritage Interpretation Plan [SM ES-PW-316/1.0] Section 9.1.2
NAH3	An Exhumation Policy and Guideline would be prepared and implemented. It would be developed in accordance with the Guidelines for Management of Human Skeletal Remains (NSW Heritage Office, 1998b) and NSW Health Policy Directive – Exhumation of human remains (December, 2013). It would be prepared in consultation with NSW Heritage Office and NSW Health.	Sydney Metro Exhumation Management Plan to be implemented in event of human remains being uncovered. Section 7 and 8.1.4
NAH4	The method for the demolition of existing buildings and / or structures at Chatswood dive site, Victoria Cross Station, Martin Place Station, Pitt Street Station, Central Station, Waterloo Station and Sydenham Station would be developed to minimise direct and indirect impacts to adjacent and / or adjoining heritage items.	Not relevant to this plan
NAH5	Prior to total or partial demolition of heritage items at Victoria Cross and Martin Place stations, and the Bounce Hostel building (former MGM building at Central Station), heritage fabric for salvage would be identified and reuse opportunities for salvaged fabric considered. This would include salvage and reuse of heritage tiles to be impacted at Martin Place Station.	Not relevant to this plan
NAH6	An appropriately qualified and experienced heritage architect would form part of the Sydney Metro Design Review Panel and would provide independent review periodically throughout detailed design.	Section 3.2.2
NAH7	The project design would be sympathetic to heritage items and, where reasonable and feasible, minimise impacts to the setting of heritage items. The detailed design for Martin Place Station and Central Station, Sydenham Station and the aqueduct over the Sydenham Pit and Drainage Pumping Station would be developed with input from a heritage architect.	Not relevant to this plan
NAH8	Appropriate heritage interpretation would be incorporated into the design for the project in accordance with the NSW Heritage Manual, the NSW Heritage Office's Interpreting Heritage Places and Items: Guidelines (August 2005), and the NSW Heritage Council's Heritage Interpretation Policy.	Section 3.2.2
NAH9	A Central Station heritage interpretation plan would be developed and implemented. It would be consistent with the Central Station Conservation Management Plan (Rappoport and Government Architects Office, 2013) and in accordance with the guidelines identified in NAH8.	Not relevant to this plan
NAH10	The detailed design of the Sydney Yard Access Bridge would be carried out in accordance with the relevant specific element principles in the Design Guidelines.	Not relevant to this plan
NAH11	Except for heritage significant elements affected by the project, direct impact on other heritage significant elements forming part of the following items would be avoided: • The Blues Point Waterfront Group (including the former tram turning circle, stone retaining wall, bollards and steps) • The Millers Point and Dawes Point Village Precinct • The existing Martin Place Station • Sydney Terminal and Central Railway Stations group • Sydney Yard (including the Shunters Hut and Prince Alfred Sewer). • The existing Sydenham Station • Brick retaining walls near Sydenham Station.	The Miller's Point and Dawes Point Village Precinct is relevant to this project. Refer to Section 4.1 Adjacent Historic Heritage Items
NAH12	Power supply works would be designed and constructed to avoid impacts to the Tank Stream and Bennelong Stormwater Channel.	Not relevant to this plan
NAH13	The design and detailed construction planning of work at Central Station would consider the requirements of the Central Station Conservation Management Plan (Rappoport and Government Architects Office, 2013) and include consideration of opportunities for the retention, conservation and / or reuse of original and significant heritage fabric and movable heritage items. Consultation would be carried out with Sydney Trains and the Heritage Council of NSW during design development.	Not relevant to this plan
NAH14	The final design and location of the new connection and opening at Martin Place Railway Station would minimise removal of the significant red ceramic tiling where feasible and reasonable.	Not relevant to this plan

NAH15	Opportunities for the reuse of any tiles at Martin Place Railway Station that are removed would be investigated.	Not relevant to this plan
NAH16	Opportunities for the reuse of the circular seating within Martin Place Station would be investigated.	Not relevant to this plan
NAH17	Opportunities for the salvage and reuse of the bus shelters temporarily removed at Victoria Cross and Blues Point would be investigated in consultation with North Sydney Council.	Not relevant to this plan
NAH18	Works at Central Station would be carried out with the oversight of heritage specialists.	Not relevant to this plan
NAH19	Subject to outcomes of consultation with the church, temporary and permanent works at the Congregational Church would: › Minimise impacts to heritage fabric › Be sympathetic to the heritage values and architectural form of the building.	Not relevant to this plan
AH1	Aboriginal stakeholder consultation would be carried out in accordance with the NSW Office of Environment and Heritage's Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010.	Section 2.1.5
AH2	The cultural heritage assessment report would be implemented.	Section 8.1.3 Scope of Aboriginal archaeological investigation
AH3	Archaeological test excavation (and salvage when required) would be carried out where intact natural soil profiles with the potential to contain significant archaeological deposits are encountered at the Blues Point temporary site, Barangaroo Station, Martin Place Station, Pitt Street Station, Central Station, Waterloo Station and Marrickville dive site. Excavations would be conducted in accordance with the methodology outlined in the Aboriginal cultural heritage assessment report	Section 8.1.3 Scope of Aboriginal archaeological investigation
AH3	Appropriate Aboriginal heritage interpretation would be incorporated into the design for the project in consultation with Aboriginal stakeholders.	Section 9.1.2

Table 6 Construction Environmental Framework (CEMF)

Condition	Requirement	Document Reference
10.1	Heritage Management Objectives a. The following heritage management objectives will apply to construction: i. Embed significant heritage values through any architectural design, education or physical interpretation; ii. Minimise impacts on items or places of heritage value; iii. Avoid accidental impacts on heritage items; and iv. Maximise worker's awareness of indigenous and non-indigenous heritage.	i: Section 9.2 ii: Table 3 in Section 4 iii: Section 6.1.2 and 8.1.7 Heritage induction
10.2	Heritage Management Implementation a. Principal Contractors will develop and implement a Heritage Management Plan which will include as a minimum: i. Evidence of consultation with Registered Aboriginal Parties and the NSW Heritage Council; ii. Identify initiatives that will be implemented for the enhancement of heritage values and minimisation of heritage impacts, including procedures and processes that will be used to implement and document heritage management initiatives; iii. The heritage mitigation measures as detailed in the environmental approval documentation; iv. The responsibilities of key project personnel with respect to the implementation of the plan; v. Procedures for interpretation of heritage values uncovered through salvage or excavation during detailed design; vi. Procedures for undertaking salvage or excavation of heritage relics or sites (where relevant), consistent with and any recordings of heritage relics prior to works commencing that would affect them; vii. Details for the short and / or long term management of artefacts or movable heritage; viii. Details of management measures to be implemented to prevent and minimise impacts on heritage items (including further heritage investigations, archival recordings and/or measures to protect unaffected sites during construction works in the vicinity); ix. Procedures for unexpected heritage finds, including procedures for dealing with human remains; x. Heritage monitoring requirements; and xi. Compliance record generation and management.	i: Section 2.1.5 ii: Section 9.2 and the Sydney Metro City and Southwest Heritage Interpretation Plan (Section 5.6) iii: Section 1.1 iv: Sections 5.1.1,8.1.1 and Table 1 in Section 2.4 v: Sydney Metro City and Southwest Heritage Interpretation Plan and Section 9.2 vi: Sections 6.1.1 and 8.1.3 and AMS vii: Section 9 viii: Section 4 ix: Section 7 and Appendix E x: Section 2.6.1 xi. Section 2.6.2 b. Section 2.6.1 c. Section 2.6.2

Condition	Requirement	Document Reference
	b. The Contractor's regular inspections will include checking of heritage mitigation measures. c. Compliance records will be retained by the Contractor. These will include: i. Inspections undertaken in relation to heritage management measures; ii. Archival recordings undertaken of any heritage item; iii. Unexpected finds and stop work orders; and iv. Records of any impacts avoided or minimised through design or construction methods.	
10.3	Heritage Mitigation a. Examples of heritage mitigation measures include: i. Any heritage item not affected by the works will be retained and protected throughout construction; ii. During construction undertake professional archaeological investigation, excavation, and reporting of any historical Indigenous heritage sites of state significance which will be affected. Reporting may be completed as construction progresses; iii. Undertake archival recordings of all non-Indigenous heritage items affected by the works prior to commencement of works; and iv. Implement unexpected heritage find procedures for Indigenous and non-Indigenous heritage items.	i. Section 4.1.1 ii: Sections 6.1.1 and 8.1.3 iii: Section 4.3 iv: Follow Sydney Metro Unexpected Heritage Finds Procedure [SM-18-00105232] and Section 7

Table 7 Revised Environmental Performance Outcomes

Condition	Document Reference
Non-Aboriginal Heritage The Project would be sympathetic to heritage items and, where feasible and reasonable, avoid and minimise impacts to non-Aboriginal heritage items and archaeology	This Plan Section 4
The design of the project would reflect the input of an independent heritage architect, relevant stakeholder and the design review panel	Section 4
Aboriginal Heritage The project would be sympathetic to heritage items and, where feasible and reasonable, avoid and minimise impacts to Aboriginal heritage items and archaeology	Section 8
The design of the project would reflect the input of an independent heritage architect, relevant stakeholders and the design review panel	Section 4

Appendix D
Consultation Matrix

Table 8 Heritage Management Plan Consultation Matrix

Authority / Organisation	Contact(s)	Date Issued	Status
Heritage Management Plan – C3(g)			
Heritage Council (Heritage NSW)	Rajeev Maini Siobhan Lavelle	8-06-21	The Heritage Council responded on 6th August 21 finding the Heritage Management Plan to be "fit for purpose" document.
City of Sydney Council	Elise Webster	11-06-21	City of Sydney responded 6th of July 2021 finding the plan satisfactory (accepted)
Darug Land Observations	Gordon Workman Jamie Workman	18-06-21	No comments received. Follow up phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Murra Bidgee Mullangari Aboriginal Corporation	Ryan Johnson	18-06-21	Endorsement received on the 21st of June 21 (accepted)
Tocomwall	Danny Franks Sarah Franks Scott Franks	18-06-21	Endorsement received on 14th July 21 (accepted)
Kamilaroi-Yankuntjatjara Working Group	Pollowan Phillip Kahn	18-06-21	Endorsement received on the 29th of June 21 (accepted)
Woronora Plateau Gundangarra Elders Council	Kayla Williamson	18-06-21	No comments received. Follow up phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Aboriginal Archaeology Service	Tony Williams Andrew Williams	18-06-21	No comments received. Follow up phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Metropolitan Local Aboriginal Land Council	Nathan Moran	18-06-21	No comments received. Follow up phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Gundungurra Tribal Technical Services	Christopher Payne Peter Foster David Bell	18-06-21	No comments received. Follow up phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Darug Aboriginal Cultural Heritage Assessments	Celestine Everingham	13-07-21	No comments received. Follow up phone call on the 20th of July 21. Plan issued by mail on 13th July 2021.
Bilinga Cultural Heritage Technical Services	Robert Brown Wandai Kirkbright	18-06-21	No comments received. Follow up phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Gunyuu Cultural Heritage Technical Services	Darlene Hoskins-McKenzie	18-06-21	No comments received. Follow up phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Munyunga Cultural Heritage Technical Services	Robert Brown Suzanne McKenzie Levi McKenzie-Kirkbright	18-06-21	No comments received. Follow up phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Wingikara Cultural Heritage Technical Services	Suzannah McKenzie Wandai Kirkbright	18-06-21	No comments received. Follow up phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Duncan Suey & Associates	Darren Duncan	18-06-21	No comments received. Follow up phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)

Table 9 Heritage Management Plan Comment Log

Authority / Organisation Providing Comment	Date	Comment Received (Email)	Response
Murra Bidgee Mullangari Aboriginal Corporation	21-06-21	I have read the project information and Heritage Management Plan for the above project (Barangaroo). I endorse the recommendations made.	No action required
Tocomwall	14-07-21	Thank you for your time on the phone today regarding the Barangaroo Metro Station Heritage Management Plan. As advised, I reached out to Chris Langeluddecke, as you would be aware Chris was the consultant that provided the draft document that was sent to Tocomwall for review. After talking with Chris and having him go over his findings and recommendations for the Barangaroo Metro Station and to save time with responding, Tocomwall accepts and agrees with the recommendations contained within the Barangaroo Metro Station – Heritage Management Plan provided by Chris Langeluddecke.	No action required
Kamilaroi-Yankuntjatjara Working Group	29-06-21	Thank you for your HMP for Barangaroo Metro Station and associated civil and landscaping works. The whole study areas is highly important to us Aboriginal people. As we have walked this land for tens of thousands of years and continue to do so. We look to the skies for guidance and we follow the water ways, we care of the land as she cares of us. We would like to agree to your heritage management plan.	No action required
Heritage Council NSW	06-08-21	p. 8 relevant guidelines, should reference NSW Heritage Council's Criteria for Assessment of Excavation Directors (2019) as these are updated from the prior 2011 version. p.9 the Primary Excavation Director should be responsible for all archaeological works, so the identified responsibility for 'testing and monitoring of historical archaeological sites by secondary excavation/site director' is unclear	Comments adopted and HMP revised

Appendix E
Procedures & Plans

Sydney Metro Unexpected Heritage Finds Procedure

[SM-18-00105232]

Sydney Metro Integrated Management System (IMS)

Applicable to:	Sydney Metro
Document Owner:	Author/Document owner
System Owner:	IMS element owner (generally a member of the Executive)
Status:	Draft/Final
Version:	2.0
Date of issue:	19 March 2019
Review date:	22 March 2020

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1. Purpose

This procedure is applicable to the Sydney Metro program of works including major projects delivered under Critical State Significant Infrastructure Planning Approvals (CSSI), early CSSI minor and enabling works and works that are subject to the NSW Heritage Act (1977) including s57/139 and s60/140 exemptions and permit approvals.

This procedure has been prepared for Sydney Metro programs to provide a method for managing unexpected heritage items (both Aboriginal and non-Aboriginal) that are discovered during preconstruction (pre-Construction Heritage Manage Plan approval), construction phases (post Construction Heritage Manage Plan approval) and for works subject to the NSW Heritage Act (1977).

An 'unexpected heritage find' can be defined as any unanticipated archaeological discovery, that has not been previously assessed or is not covered by an existing approval under the Heritage Act 1977 (Heritage Act) or National Parks and Wildlife Act 1974 (NPW Act).

In NSW, there are strict laws to protect and manage heritage objects and relics. As a result, appropriate heritage management measures need to be implemented to minimise impacts on heritage values; ensure compliance with relevant heritage notification and other obligations; and to minimise the risk of penalties to individuals, Sydney Metro and its contractors. This procedure includes Sydney Metro's heritage notification obligations under the Heritage Act, NPW Act and the Coroner's Act 2009 and the requirements of the conditions of approval(CoA) issued by NSW Department of Planning and Environment.
Note that a Contractor must not amend the Sydney Metro Unexpected Finds Procedure without the prior approval of Sydney Metro.

It should be noted that this procedure must be read in conjunction with the relevant CCSI conditionals of approval (if applicable), the contract documents and other plans including the Sydney Metro Exhumation Management Plan and procedures developed by the contractor during the delivery of the Sydney Metro works.

1.1. Legislation that does not apply

The following authorisations are not required for Sydney Metro approved Critical State Significant Infrastructure (and accordingly the provisions of any Act that prohibits an activity without such an authority do not apply):

- Division 8 of Part 6 of the Heritage Act 1977 does not apply to prevent or interfere with the carrying out of approved State significant infrastructure.
- An approval under Part 4, or an excavation permit under section 139, of the Heritage Act 1977,
- An Aboriginal heritage impact permit under section 90 of the National Parks and Wildlife Act 1974,

This document provides relevant background information in Section 4, followed by the technical procedure in Sections 6 and 7. Associated guidance referred to in the procedure can be found in Appendices 1-6.

2. Scope

Despite earlier investigation, unexpected heritage items may still be discovered during works on a Sydney Metro site. When this happens, this procedure must be followed. This procedure provides direction on when to stop work, where to seek technical advice and how to notify the regulator, if required.
This procedure **applies to**:

- the discovery of any unexpected heritage item, relic or object, where the find is not anticipated in an approved Archaeological Assessment Design Report (AARD) or Archaeological Method Statements (AMS) that are prepared as part of the planning approval for that project.

This procedure must be followed by all Sydney Metro staff, contractors, subcontractors or any person undertaking works for Sydney Metro. It includes references to some of the relevant legislative and regulatory requirements, but is not intended to replace them.
This procedure **does not apply** to:

- The discovery and disturbance of heritage items as a result of investigations being undertaken in accordance with the Office of Environment and Heritage's (OEH) *Code of Practice for Archaeological Investigations of Aboriginal Objects in NSW 2010*[1]; an Aboriginal Heritage Impact Permit (AHIP) issued under the NPW Act; or a permit approval issued under the Heritage Act.
- the discovery and disturbance of heritage items as a result of construction related activities, where the disturbance is permissible in accordance with an AHIP; or an approval issued under the Heritage Act or CSSI /CSSD planning approval;

3. Definitions

All terminology in this procedure is taken to mean the generally accepted or dictionary definition with the exception of the following terms which have a specifically defined meaning:

	Definitions
AHIP	Aboriginal Heritage Impact Permit
Aboriginal object	An Aboriginal object is any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains. An Aboriginal object may include a shell midden, stone tools, bones, rock art, Aboriginal-built fences and stockyards, scarred trees and the remains of fringe camps.
CEMP	Construction Environmental Management Plan
CoA	Conditions of Approval
CSSD	Critical State Significant Development
CSSI	Critical State Significant Infrastructure
EP&A Act	**NSW *Environmental Planning and Assessment Act 1979***
Excavation	A person that complies with the Heritage Council of NSW's Criteria for Assessment of

[1] An act carried out in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* as published by the Department in the Gazette on 24 September 2010 is excluded from the definition of ***harm*** an object or place in section 5 (1) of the NPW Act.

Director	Excavation Directors (July 2011) to oversee and advise on matters associated with historic archaeology. Note this applies to a specific project/program and requires consultation and/or approval by OEH.
Heritage Act	NSW *Heritage Act 1977*
NPW Act	NSW *National Parks and Wildlife Act 1974*
OEH	Office of Environment and Heritage
SM	Sydney Metro
Relic (non-Aboriginal heritage)	A relic means any deposit, artefact, object or material evidence that: a) relates to the settlement of the area that comprises NSW, not being Aboriginal settlement, and b) is of State or local significance. A relic may include items such as bottles, utensils, remnants of clothing, crockery, personal effects, tools, machinery and domestic or industrial refuse.
TfNSW	Transport for New South Wales
Work (non-Aboriginal heritage)	Archaeological features such as historic utilities or buried infrastructure that provide evidence of prior occupations such as former rail or tram tracks, timber sleepers, kerbing, historic road pavement, fences, culverts, historic pavement, buried retaining walls, cisterns, conduits, sheds or building foundations, but are also subject to assessment by the Excavation Director to determine its classification

4. Types of unexpected heritage items and corresponding statutory protections

The roles of project, field and environmental personnel (including construction contractors) are critical to the early identification and protection of unexpected heritage items.

Appendix 1 illustrates the wide range of heritage discoveries found on Sydney Metro projects and provides a useful photographic guide. Subsequent to confirmation of a heritage discovery it must then be identified and assessed by Excavation Director. An 'unexpected heritage item' means any unanticipated discovery of an actual or potential heritage item, for which Sydney Metro does not have approval to disturb[2] and/or have an existing management process in place.

These discoveries are categorised as either:

(a) Aboriginal objects

(b) Historic (non-Aboriginal) heritage items

(c) Human skeletal remains.

The relevant legislation that applies to each of these categories is described below and is also addressed in the Sydney Metro Exhumation Management Plan).

4.1. Aboriginal objects

The NPW Act protects Aboriginal objects which are defined as:

[2] Disturbance is considered to be any physical interference with the item that results in it being destroyed, defaced, damaged, harmed, impacted or altered in any way (this includes archaeological investigation activities).

> *"any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains"*[3].

Examples of Aboriginal objects include stone tool artefacts, shell middens, axe grinding grooves, pigment or engraved rock art, burials and scarred trees.

IMPORTANT!

All Aboriginal objects, regardless of significance, are protected under law.

If any impact is expected to an Aboriginal object, an AHIP is usually required from OEH Also, when a person becomes aware of an Aboriginal object they must notify the Director-General of OEH about its location[4]. Assistance on how to do this is provided in Section 7 (Step 5).

4.2. Historic heritage items

Historic (non-Aboriginal) heritage items may include:

- Archaeological 'relics'
- Other historic items (i.e. works, structures, buildings or movable objects).

4.2.1. Archaeological relics

The Heritage Act protects *relics* which are defined as:

> "*any deposit, artefact, object or material evidence that relates to the settlement of the area that comprises NSW, not being Aboriginal settlement; and is of State or local heritage significance*"[5].

Relics are archaeological items of local or state significance which may relate to past domestic, industrial or agricultural activities in NSW, and can include bottles, remnants of clothing, pottery, building materials and general refuse.

IMPORTANT!

All relics are subject to statutory controls and protections.

If a relic is likely to be disturbed, a heritage approval is usually required from the NSW Heritage Council[6]. Also, when a person discovers a relic they must notify the NSW Heritage Council of its location[7].

4.2.2. Other historic items

Some historic heritage items are not considered to be 'relics', but are instead referred to as works, *buildings, structures or movable objects. Examples of these items that may be encountered include culverts, historic pavements, retaining walls, tramlines, rail tracks, timber sleepers, cisterns*, fences, sheds, buildings and conduits. Although an approval under the Heritage Act may not be required to disturb these items, their discovery must be managed in accordance with this procedure.

[3] Section 5(1) NPW Act.
[4] This is required under section 89(A) of the NPW Act and applies to all Sydney Metro projects.
[5] Section 4(1) Heritage Act.

[7] This is required under section 146 of the Heritage Act and applies to all Sydney Metro projects.

As a general rule, an archaeological relic requires discovery or examination through the act of excavation. For an unexpected find an archaeological excavation permit under section 140 of the Heritage Act may be required to do this. In contrast, 'other historic items' either exist above the ground surface (e.g. a shed), or they are designed to operate and exist beneath the ground surface (e.g. a culvert).

4.3. Human skeletal remains

Also refer to Sydney Metro Exhumation Management Plan for a more detailed explanation of the approval processes.

Human skeletal remains can be identified as either an Aboriginal object or non-Aboriginal relic depending on ancestry of the individual (Aboriginal or non-Aboriginal) and burial context (archaeological or non-archaeological). Remains are considered to be archaeological when the time elapsed since death is suspected of being 100 years or more. Depending on ancestry and context, different legislation applies.

As a simple example, a pre-European settlement archaeological Aboriginal burial would be protected under the NPW Act, while a historic (non-Aboriginal) archaeological burial within a cemetery would be protected under the Heritage Act. For a non-Aboriginal archaeological burial, the relevant heritage approval and notification requirement described in Section 3.1 would apply. In addition to the NPW Act, finding Aboriginal human remains also triggers notification requirements to the Commonwealth Minister for the Environment under section 20(1) of the Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Commonwealth).

IMPORTANT!

All human skeletal remains are subject to statutory controls and protections.

All bones must be treated as potential human skeletal remains and work around them must stop while they are protected and investigated urgently.

However, where it is suspected that less than 100 years has elapsed since death, the human skeletal remains come under the jurisdiction of the State Coroner and the Coroners Act 2009 (NSW). Such a case would be considered a 'reportable death' and under legal notification obligations set out in section 35(2); a person must report the death to a police officer, a coroner or an assistant coroner as soon as possible. This applies to all human remains less than 100 years old8 regardless of ancestry (i.e. both Aboriginal and non-Aboriginal remains). Public health controls may also apply.

Guidance on what to do when suspected human remains are found is provided in Appendix 5.

5. Legislative Requirements

Table 1 identifies some of the relevant legislation/regulations for the protection of heritage and the management of unexpected heritage finds in NSW. It should be noted that significant

[8] Under section 19 of the *Coroners Act 2009*, the coroner has no jurisdiction to conduct an inquest into reportable death unless it appears to the coroner that (or that there is reasonable cause to suspect that) the death or suspected death occurred within the last 100 years.

penalties exist for breaches of the listed legislation as a result of actions that relate to unauthorised impacts on heritage items. Further, it is noted that heritage that has been assessed and is being managed in accordance with relevant statutory approvals(s) is exempt from these offences.

To avoid breaches of legislation, it is important that Sydney Metro and its contractors are aware of their statutory obligations under relevant legislation and that appropriate control measures are in place to ensure that unexpected heritage items are appropriately managed during construction. Contractors/Alliances will need to ensure that they undertake their own due diligence to identify any other legislative requirements that may apply for a given project.

Table 1 Legislation and guidelines for management of unexpected heritage finds

Relevant Requirement	Objectives and offences
Environmental Planning and Assessment Act 1979 (EP&A Act)	Section 115ZB Giving of approval by Minister to carry out a project.
Environmental Planning and Assessment Act 1979 (EP&A Act)	Requires heritage to be considered within the environmental impact assessment of projects. This guideline is based on the premise that an appropriate level of Aboriginal and non-Aboriginal cultural heritage assessment and investigations and mitigation have already been undertaken under the relevant legislation, including the EP&A Act, during the assessment and determination process. It also assumes that appropriate mitigation measures have been included in the conditions of any approval.
Heritage Act 1977 **(Heritage Act)**	The Heritage Act provides for the care, protection and management of heritage items in NSW. Under section 139, it is an offence to disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed, unless the disturbance or excavation is carried out in accordance with an excavation permit issued by the Heritage Division of the OEH. Under the Act, a relic is defined as: *'any deposit, artefact, object or material evidence that: (a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and (b) is of State or local heritage significance.'* A person must notify the Heritage Division of OEH, if a person is aware or believes that they have discovered or located a relic (section 146). Penalties for offences under the Heritage Act can include six months imprisonment and/or a fine of up to $1.1million.

Relevant Requirement	Objectives and offences
National Parks and Wildlife Act 1974 **(NPW Act)**	The NPW Act provides the basis for the care, protection and management of Aboriginal objects and places in NSW. An Aboriginal object is defined as: *'any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains'*. An 'Aboriginal place' is an area declared by the Minister administering the Act to be of special significance with respect to Aboriginal culture. An Aboriginal place does not have to contain physical evidence of occupation (such as Aboriginal objects). Under section 87 of the Act, it is an offence to harm or desecrate an Aboriginal object or place. There are strict liability offences. An offence cannot be upheld where the harm or desecration was authorised by an AHIP and the permit's conditions were not contravened. Defences and exemptions to the offence of harming an Aboriginal object or Aboriginal place are provided in section 87, 87A and 87B of the Act. A person must notify OEH if a person is aware of the location of an Aboriginal object. Penalties for some of the offences can include two years imprisonment and/or up to $550,000 (for individuals), and a maximum penalty of $1.1 million (for corporations).

6. Unexpected heritage finds protocol

6.1. What is an unexpected heritage find?

An 'unexpected heritage find' can be defined as any unanticipated archaeological discovery that has not been identified during a previous assessment or is not covered by an existing permit under the Heritage Act. The find may have potential cultural heritage value, which may require some type of statutory cultural heritage permit or notification if any interference of the heritage item is proposed or anticipated.

The range of potential archaeological discoveries can include but are not limited to:

- remains of rail infrastructure including buildings, footings, stations, signal boxes, rail lines, bridges and culverts
- remains of other infrastructure including sandstone or brick buildings, wells, cisterns, drainage services, conduits, old kerbing and pavement, former road surfaces, timber and stone culverts, bridge footings and retaining walls
- artefact scatters including clustering of broken and complete bottles, glass, ceramics, animal bones and clay pipes
- Archaeological human skeletal remains.

6.2. Managing unexpected heritage finds

In the event that an unexpected heritage find (the find) is encountered on a Sydney Metro site, the flowchart in Figure 1 must be followed. There are eight steps in the procedure. These steps are summarised in Figure 1 and explained in detail in Table 2.

Figure 1 Overview of steps to be undertaken on the discovery of an unexpected heritage item

IMPORTANT!

Sydney Metro may have approval to impact on certain heritage items during construction. If you think that you may have discovered a heritage item and you are unsure whether an approval is in place or not, **STOP** works and follow this procedure.

Table 2 Specific tasks to be implemented following the discovery of an unexpected heritage item

Step	Task	Responsibility	Guidance and tools
1	**Stop work, protect item and inform the Excavation Director**		
1.1	Stop all work in the immediate area of the item and notify the Project Manager	Contractor/ Supervisor	**Appendix 1** (Identifying Unexpected Heritage items)
1.2	Establish a 'no-go zone' around the item. Use high visibility fencing, where practical. No work is to be undertaken within this zone until further investigations are completed and, if required, appropriate approvals are obtained. Inform all site personnel about the no-go zone.	Project Manager/ Contractor/ Supervisor	
1.3	Inspect, document and photograph the item.	Archaeologist and or Excavation Director	**Appendix 2** (Unexpected Heritage Item Recording Form) **Appendix 3** (Photographing Unexpected Heritage items)
1.4	Is the item likely to be bone? If **yes**, follow the steps in Appendix 4 – 'Uncovering bones'. Where it is obvious that the bones are human remains, you must notify the local police by telephone immediately. They may take command of all or part of the site. Also refer to the Sydney Metro Exhumation Management Plan If **no**, proceed to next step.	Excavation Director	**Appendix 4** (Uncovering Bones)

Step	Task	Responsibility	Guidance and tools
1.5	Inform the Excavation Director of the item and provide as much information as possible, including photos and completed form (**Appendix 2**). Where the project has a Sydney Metro Environmental Manager, the Environmental Manager should be involved in the tasks/process.	Contractors Project Manager	
1.6	Can the works avoid further disturbance to the item? Project Manager to confirm with Sydney Metros Environment Manager. Complete the remaining tasks in Step 1.	Contractors Project Manager	
1.7	Excavation Director and Sydney Metro Environmental Manager to advise the Project Manager whether Sydney Metro has approval to impact on the 'item'. Does Sydney Metro have an approval or permit to impact on the item? If **yes**, work may recommence in accordance with that approval or permit. There is no further requirement to follow this procedure. If **no**, continue to next step.	Contractors Project Manager	
1.8	Has the 'find' been damaged or harmed? If **yes**, record the incident in the Incident Management System Implement any additional reporting requirements related to the planning approval and CEMP, where relevant.	Contractors Project Manager, Excavation Director	
2	**Contact and engage an archaeologist and/or an Aboriginal heritage consultant**		
2.1	If an archaeologist and/or Aboriginal heritage consultant has been previously appointed for the project, contact them to discuss the location and extent of the item and arrange a site inspection, if required. The project CEMP may contain contact details of the archaeologist/Aboriginal heritage consultant. Where there is no project archaeologist engaged for the works engage a suitably qualified consultant to assess the find: if the find is a non-Aboriginal deposit, engage a suitably qualified and experienced archaeological consultant if the find is likely to be an Aboriginal object, engage an Aboriginal heritage consultant to assess the find.	Contractors Project Manager, Excavation Director	
2.2	If requested, provide photographs of the item taken during Step 1.3 to the archaeologist or Aboriginal heritage consultant.	Contractors Project Manager, Excavation Director	**Appendix 3** (Photographing Unexpected Heritage items)

Step	Task	Responsibility	Guidance and tools
3	**Preliminary assessment and recording of the find**		
3.1	In a minority of cases, the archaeologist/Aboriginal heritage consultant may determine from the photographs that no site inspection is required because no heritage constraint exists for the project (*e.g. the item is not a 'relic', a 'heritage item' or an 'Aboriginal object'*). Any such advice should be provided in writing (e.g. via email or letter with the consultant's name and company details clearly identifiable) to the Sydney Metro Project Manager.	Archaeologist/ Aboriginal heritage consultant/ , Excavation Director	Proceed to Step 8
3.2	Arrange site access for the archaeologist/Aboriginal heritage consultant to inspect the item as soon as practicable. In the majority of cases a site inspection is required to conduct a preliminary assessment.	Contractors Project Manager, Excavation Director	
3.3	Subject to the archaeologist/Aboriginal heritage consultant's assessment, work may recommence at a set distance from the item. This is to protect any other archaeological material that may exist in the vicinity, which may have not yet been uncovered. Existing protective fencing established in Step 1.2 may need to be adjusted to reflect the extent of the newly assessed protective area. No works are to take place within this area once established.	Archaeologist/ Aboriginal heritage consultant Contractors Project Manager, Excavation Director	
3.4	The archaeologist/Aboriginal heritage consultant may provide advice after the site inspection and preliminary assessment that no heritage constraint exists for the project (e.g. the item is not a '*relic*' or a '*heritage item'* or an '*aboriginal item'*. Any such advice should be provided in writing (e.g. via email or letter with the consultant's name and company details clearly identifiable) to the Metro Project Manager. Note that : a relic is evidence of past human activity which has local or State heritage significance. It may include items such as bottles, utensils, remnants of clothing, crockery, personal effects, tools, machinery and domestic or industrial refuse an Aboriginal object may include a shell midden, stone tools, bones, rock art or a scarred tree a "work", building or standing structure may include tram or train tracks, kerbing, historic road pavement, fences, sheds or building foundations.	Archaeologist/ Aboriginal heritage consultant/ Contractors Project Manager, Excavation Director	Proceed to Step 8 Refer to **Appendix 1** (Identifying heritage items)

Step	Task	Responsibility	Guidance and tools
3.5	Where required, seek additional specialist technical advice (such as a forensic or physical anthropologist to identify skeletal remains). The archaeologist/Aboriginal heritage consultant can provide contacts for such specialist consultants.	Excavation Director Archaeologist	
3.6	Where the item has been identified as a 'relic' or 'heritage item' or an 'Aboriginal object' the archaeologist should formally record the item.	Archaeologist/ Aboriginal heritage consultant	
3.7	OEH (Heritage Division for non-Aboriginal relics and Planning and Aboriginal Heritage Section for Aboriginal objects) can be notified informally by telephone at this stage by the Sydney Metro Environmental Manager Any verbal conversations with regulators must be noted on the project file for future reference.	Contractors Project Manager, Excavation Director	
4	**Section 4 not used**		
5	**Notify the regulator, if required.**		
5.1	Based on the findings of the archaeological or heritage management plan and corresponding legislative requirements, is the find required to be notified to OEH and the Secretary? If **no**, proceed directly to Step 6 If **yes**, proceed to next step.	Sydney Metro Environmental Manager Excavation Director	
5.2	If notification is required, complete the template notification letter, including the archaeological/heritage management plan and other relevant supporting information and forward to the Sydney Metro Principal Manager Sustainability Environment and Planning (Program) for signature.	Sydney Metro Environmental Manager Excavation Director	**Appendix 6** (Template Notification Letter)
5.3	Forward the signed notification letter to OEH and the Secretary. Informal notification (via a phone call or email) to OEH prior to sending the letter is appropriate. The archaeological or heritage management plan and the completed site recording form (Appendix 2) must be submitted with the notification letter (for both Aboriginal objects and non-Aboriginal relics). For Part 5.1 projects, the Department of Planning and Environment must also be notified.		

Step	Task	Responsibility	Guidance and tools
5.4	A copy of the final signed notification letter, archaeological or heritage management plan and the site recording form is to be kept on file and a copy sent to the Sydney Metro Project Manager.	Contractors Project Manager, Excavation Director	
6	**Implement archaeological or heritage management plan**		
6.1	Modify the archaeological or heritage management plan to take into account any additional advice resulting from notification and discussions with OEH.	Contractors Project Manager, Excavation Director	
6.2	Implement the archaeological or heritage management plan. Where impact is expected, this may include a formal assessment of significance and heritage impact assessment, preparation of excavation or recording methodologies, consultation with Registered Aboriginal Parties, obtaining heritage approvals etc., if required.	Contractors Project Manager, Excavation Director	
6.3	Where heritage approval is required contact the Sydney Metro Environment Manager for further advice and support material. Please note there are time constraints associated with heritage approval preparation and processing.	Contractors Project Manager, Excavation Director	
6.4	Assess whether heritage impact is consistent with the project approval or if project approval modification is required from the Department of Planning and Environment.	, Excavation Director/Sydney Metro Environmental Manager	
6.5	Where statutory approvals (or project approval modification) are required, impact upon relics and/or Aboriginal objects must not occur until heritage approvals are issued by the appropriate regulator.	Contractors Project Manager, Excavation Director	
6.6	Where statutory approval is not required but where recording is recommended by the archaeologist/Aboriginal heritage consultant, sufficient time must be allowed for this to occur.	Contractors Project Manager, Excavation Director	
6.7	Ensure short term and permanent storage locations are identified for archaeological material or other heritage material removed from site, where required. Interested third parties (e.g. museums, local Aboriginal land councils, or local councils) should be consulted on this issue. Contact the archaeologist or Aboriginal heritage consultant for advice on this matter, if required.	Contractors Project Manager, Excavation Director	
7	**Section 7 Not Used**		

Step	Task	Responsibility	Guidance and tools
8	**Resume work**		
8.1	Seek written clearance to resume project work from the project Excavation Director/Archaeologist/Aboriginal heritage consultant. Clearance would only be given once all archaeological excavation and/or heritage recommendations and approvals (where required) are complete. Resumption of project work must be in accordance with the all relevant project/heritage approvals/determinations.	Contractors Project Manager, Excavation Director	
8.2	If required, ensure archaeological excavation/heritage reporting and other heritage approval conditions are completed in the required timeframes. This includes artefact retention repositories, conservation and/or disposal strategies.	Contractors Project Manager, Excavation Director	
8.3	Deleted		
8.4	If additional unexpected items are discovered this procedure must begin again from Step 1.	All	

7. Responsibilities

Table 3 Roles and Responsibilities

Role	Responsibility or role under this guideline
Contractor / Supervisor	Stop work immediately when an unexpected heritage find is encountered. Cordon off area until Environmental Manager /Excavation Director advises that work can recommence.
Contractor or Environment Manager	Manage the process of identifying, protecting and mitigating impacts on the 'find'. Liaise with Sydney Metro Project Manager and Environment Manager and assist the archaeologist/Aboriginal heritage consultant with mitigation and regulatory requirements. Complete Incident Report and review CEMP for any changes required. Propose amendments to the CEMP if any changes are required.
Contractor's or Project Heritage Advisor or Consultant	Provide expert advice to the Sydney Metro Environment Manager on 'find' identification, significance, mitigation, legislative procedures and regulatory requirements.
Environmental Representative	Independent environmental advisor engaged by Sydney Metro Ensures compliance with relevant approvals (new and existing).
Heritage Division of OEH	Regulate the care, protection and management of relics (non-Aboriginal heritage). Delegated authority for Heritage Council Issue excavation permits.

Role	Responsibility or role under this guideline
Registered Aboriginal Parties (RAPs)	Aboriginal people who have registered with Sydney Metro to be consulted about a proposed project or activity in accordance with the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*.
Sydney Metro Environment Manager	Notify the Sydney Metro Principal Manager, Environmental Management of 'find' and manage Incident Reporting once completed by Environmental Manager.
Contractors Project Manager	Ensures all aspects of this procedure are implemented. Advise Contractor / Supervisor to recommence work if all applicable requirements have been satisfied and the Excavation Director /Project Archaeologist has approved recommend of work.

8. Seeking Advice

Advice on this procedure should be sought from the Sydney Metro Environment a Manager in the first instance. Contractors and alliance partners should ensure their own project environment managers are aware of and understand this procedure.
Technical archaeological or heritage advice regarding an unexpected heritage item should be sought from a suitably qualified and experienced archaeologist/Aboriginal heritage consultant.

9. Related documents and references

- Environmental Incident Classification and Reporting – 9TP-PR-105
- Guide to Environmental Control Map – 3TP-SD-015
- NSW Heritage Office (1998), *Skeletal remains: guidelines for the management of human skeletal remains.*
- Roads and Maritime Services (2015), *Standard Management Procedure Unexpected Heritage Items.*
- Department of Environment and Conservation NSW (2006), *Manual for the identification of Aboriginal remains.*
- Sydney Metro Exhumation Management Plan

10. List of appendices

The following appendices are included to support this procedure:

Appendix 1: Examples of finds encountered during construction works
Appendix 2: Unexpected Heritage Item Recording Form
Appendix 3: Photographing Unexpected Heritage Items
Appendix 4: Uncovering Bones
Appendix 5: Archaeological Advice Checklist
Appendix 6: Template Notification Letter

11. Document history

Version	Date of approval	Notes
1.1		Incorporates ER comments 21/06/17
1.2		Amends p13 step 8 reference to s146 added
1.3		Incorporates Planning Mods 1-4 including amended CoA E20
1.4		Incorporates ER comments 21/03/18
2.0		Removes SSI 15-7400 COA reference

Appendix 1: Examples of finds encountered during construction works

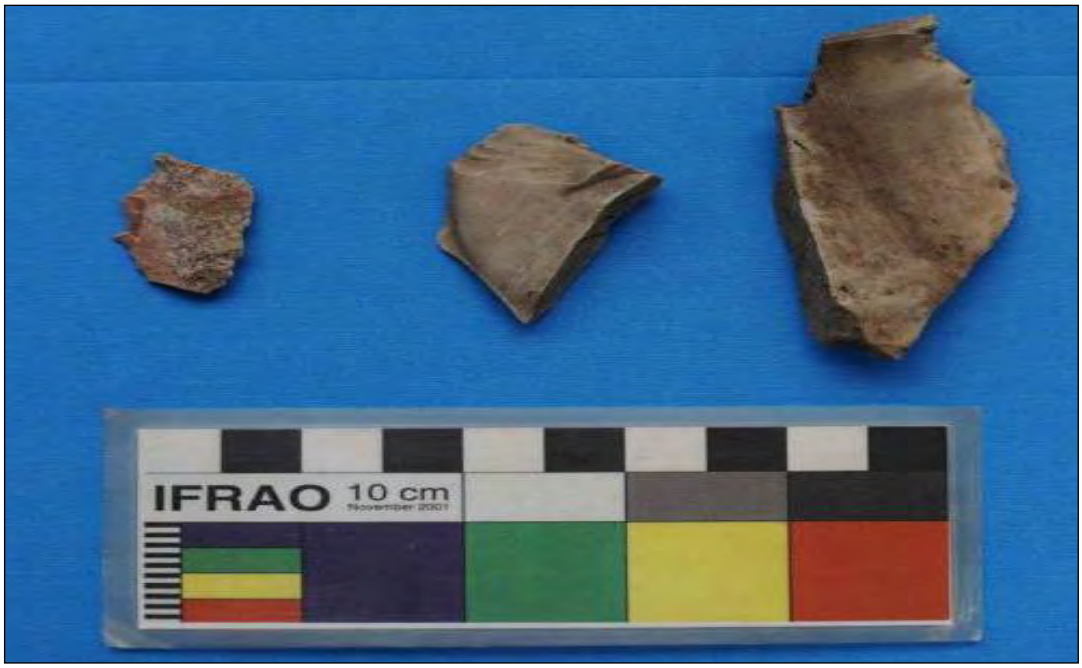


Photo 1 - Aboriginal artefacts found at the Wickham Transport Interchange, 2015



Photo 2 – Aboriginal artefacts (shell material) found at the Wickham Transport Interchange, 2015



Photo 3 1840s seawall and 1880s retaining wall uncovered at Balmain East, 2016



Photo 4 Sandstone pavers uncovered at Balmain East, 2016



Photo 5 - Platform structure at Hamilton Railway Station classified as a 'work' by the project archaeologist - Wickham Transport Interchange project, 2015

Photo 6 - Platform structure at Hamilton Railway Station classified as a 'work' by the project archaeologist - Wickham Transport Interchange project, 2015



Photo 7 - Sandstone flagging and cesspit - Wynyard Walk project, 2014



Photo 8 - Chinese Ming Dynasty pottery and English porcelain/pottery dating back to early 19th century - Wynyard Walk project, 2014



Photo 9 - Pottery made by convict potter Thomas Ball during the early settlement - Wynyard Walk project, 2014

The following images, obtained from the Roads and Maritime Services' *Standard Management Procedure for Unexpected Heritage items 2015,* can be used to assist in the preliminary identification of potential unexpected items during construction and maintenance works.



Photo 10 - Top left hand picture continuing clockwise: Stock camp remnants (Hume Highway Bypass at Tarcutta); Linear archaeological feature with post holes (Hume Highway Duplication), Animal bones (Hume Highway Bypass at Woomargama); Cut wooden stake; Glass jars, bottles, spoon and fork recovered from refuse pit associated with a Newcastle Hotel (Pacific Highway, Adamstown Heights, Newcastle area) (RMS, 2015).



Photo 11 - Top left hand picture continuing clockwise: Stock camp remnants (Hume Highway Bypass at Tarcutta); Linear archaeological feature with post holes (Hume Highway Duplication), Animal bones (Hume Highway Bypass at Woomargama); Cut wooden stake; Glass jars, bottles, spoon and fork recovered from refuse pit associated with a Newcastle Hotel (Pacific Highway, Adamstown Heights, Newcastle area) (RMS, 2015).

Appendix 2 - Unexpected heritage item recording form

Example of unexpected heritage item recording form:

This form is to be completed Excavation Director on the discovery of an archaeological heritage item during construction or maintenance works			
Date:		**Recorded by:** (include name and position)	
Project name:			
Description of works being undertaken:			
Description of exact location of item			
Description of item found *(What type of item is it likely to be? Tick the relevant boxes).*			
A. A relic	☐	A 'relic' is evidence of a past human activity relating to the settlement of NSW with local or state heritage significance. A relic might include bottle, utensils, plates, cups, household items, tools, implements, and similar items	
B. A 'work', building or structure'	☐	A 'work' can generally be defined as a form infrastructure such as track or rail tracks, timber sleepers, a culvert, road base, a bridge pier, kerbing, and similar items	
C. An Aboriginal object	☐	An 'Aboriginal object' may include stone tools, stone flakes, shell middens, rock art, scarred trees and human bones	
D. Bone	☐	Bones can either be human or animal remains. **Remember that you must contact the local police immediately by telephone if you are certain that the bone(s) are human remains.**	
E. Other	☐		
Provide a short description of the item *(E.g. metal rail tracks running parallel to the rail corridor. Good condition. Tracks set in concrete, approximately 10 cm below the current ground surface).*			

Sketch *(Provide a sketch of the item's general location in relation to other road features so its approximate location can be mapped without having to re-excavate it. In addition, please include details of the location and direction of any photographs of the item taken)*			
Action taken (Tick either A *or* B)			
A. Unexpected item **would not** be further impacts on by the works	☐	**Describe how works would avoid impact on the item.** *(E.g. the rail tracks would be left in situ and recovered with paving).*	
B. Unexpected item would be further impacted by the works	☐	**Describe how works would impact on the item**. *(E.g. milling is required to be continued to a depth of 200 mm depth to ensure the pavement requirements are met. Rail tracks would need to be removed.)*	
Excavation Director		Signature	
		Signature	

Important

It is a statutory offence to disturb Aboriginal objects and historic relics (including human remains) without an approval. All works affecting objects and relics must cease until an approval is sought.

Approvals may also be required to impact on certain works.

Appendix 3 - Photographing unexpected heritage items

Photographs of unexpected items in their current context (*in situ*) may assist archaeologists/Aboriginal heritage consultants to better identify the heritage values of the item. Emailing good quality photographs to specialists can allow for better quality and faster heritage advice. The key elements that must be captured in photographs of the item include its position, the item itself and any distinguishing features. All photographs must have a scale (ruler, scale bar, mobile phone, coin etc.) and a note describing the direction of the photograph.

Context and detailed photographs

It is important to take a general photograph (Figure 1) to convey the location and setting of the item. This will add value to the subsequent detailed photographs also required (Figure 2).

Removal of the item from its context (e.g. excavating from the ground) for photographic purposes is not permitted.





Figure 2: Close up detail of the sandstone surface showing material type, formation and construction detail. This is essential for establishing date of the feature.

Figure 1: Telford road uncovered on the Great Western Highway (Leura) in 2008 (RMS, 2015).

Photographing distinguishing features

Where unexpected items have a distinguishing feature, close up detailed photographs must be taken of these features, where practicable. In the case of a building or bridge, this may include diagnostic details architectural or technical features. See Figures 3 and 4 for examples.



Figure 3: Ceramic bottle artefact with stamp.



Figure 4: Detail of the stamp allows '*Tooth & Co Limited*' to be made out. This is helpful to a specialist in gauging the artefact's origin, manufacturing date and likely significance.

Photographing bones

The majority of bones found on site will those of be recently deceased animal bones often requiring no further assessment (unless they are in archaeological context). However, if bones are human, the police must be contacted immediately (see Appendix 6 for detailed guidance). Taking quality photographs of the bones can often resolve this issue quickly. The project archaeologist can confirm if bones are human or non-human if provided with appropriate photographs.

Ensure that photographs of bones are not concealed by foliage (Figure 5) as this makes it difficult to identify. Minor hand removal of foliage can be undertaken as long as disturbance of the bone does not occur. Excavation of the ground to remove bone(s) should not occur, nor should they be pulled out of the ground if partially exposed.

Where sediment (adhering to a bone found on the ground surface) conceals portions of a bone (Figure 6) ensure the photograph is taken of the bone (if any) that is not concealed by sediment.



Figure 5: Bone concealed by foliage.



Figure 6: Bone covered in sediment

Ensure that all close up photographs include the whole bone and then specific details of the bone (especially the ends of long bones, the *epiphysis*, which is critical for species identification). Figures 7 and 8 are examples of good photographs of bones that can easily

be identified from the photograph alone. They show sufficient detail of the complete bone and the epiphysis.



Figure 7: Photograph showing complete bone.



Figure 8: Close up of a long bone's epiphysis.

Appendix 4 - Uncovering bones

This appendix provides advice regarding:

- what to do on first discovering bones
- the range of human skeletal notification pathways
- additional considerations and requirements when managing the discovery of human remains.

1. First uncovering bones

Refer to the Sydney Metro Exhumation Management Plan

Stop all work in the vicinity of the find. All bones uncovered during project works should be **treated with care and urgency** as they have the potential to be human remains. The bones must be identified as either human or non-human as soon as possible by a qualified forensic or physical anthropologist.

On the very rare occasion where it is immediately obvious from the remains that they are human, the Project Manager (or a delegate) should **inform the police by telephone** prior to seeking specialist advice. It will be obvious that it is human skeletal remains where there is no doubt, as demonstrated by the example in Figure 1[9]. Often skeletal elements in isolation (such as a skull) can also clearly be identified as human. Note it may also be obvious that human remains have been uncovered when soft tissue and/or clothing are present.

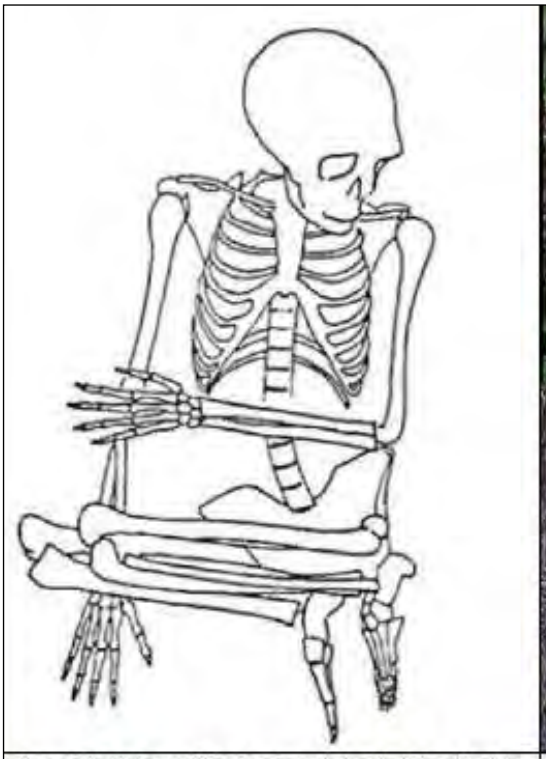


Figure 1: Schematic of a complete skeleton that is 'obviously' human [12].



Figure 2: Disarticulated bones that require assessment to determine species.

[9] After Department of Environment and Conservation NSW (2006), *Manual for the identification of Aboriginal Remains: 17*

This preliminary phone call is to let the police know that a specialist skeletal assessment to determine the approximate date of death which will inform legal jurisdiction. The police may wish to take control of the site at this stage. If not, a forensic or physical anthropologist must be requested to make an on-site assessment of the skeletal remains.

Where it is not immediately obvious that the bones are human (in the majority of cases, illustrated by Figure 2), specialist assessment is required to establish the species of the bones. Photographs of the bones can assist this assessment if they are clear and taken in accordance with guidance provided in Appendix 3. Good photographs often result in the bones being identified by a specialist without requiring a site visit; noting they are nearly always non-human. In these cases, non-human skeletal remains must be treated like any other unexpected archaeological find.

If the bones are identified as human (either by photographs or an on-site inspection) a technical specialist must determine the likely ancestry (Aboriginal or non-Aboriginal) and burial context (archaeological or forensic). This assessment is required to identify the legal regulator of the human remains so **urgent notification** (as below) can occur.

Preliminary telephone or verbal notification by the archaeologist to the Sydney Metro Principal Manager Sustainability Environment and Planning (Program) is appropriate. This must be followed up later by a formal letter notification to the relevant regulator when a management plan has been developed and agreed to by the relevant parties.

2. Range of human skeletal notification pathways

The following is a summary of the different notification pathways required for human skeletal remains depending on the preliminary skeletal assessment of ancestry and burial context.

A. Human bones are from a recently deceased person (less than 100 years old).

Action
A police officer must be notified immediately as per the obligations to report a death or suspected death under s35 of the *Coroners Act 2009* (NSW). It should be assumed the police will then take command of the site until otherwise directed.

B. Human bones are archaeological in nature (more than 100 years old) and are likely to be *Aboriginal* remains.

Action
The OEH (Planning and Aboriginal Heritage Section) must be notified immediately. The Aboriginal Cultural Heritage Advisor must contact and inform the relevant Aboriginal community stakeholders who may request to be present on site.

C. Human bones are archaeological in nature (more than 100 years old) and likely to be non-Aboriginal remains.

Action
The OEH (Heritage Division) must be notified immediately

Figure 3 summarises the notification pathways on finding bones.

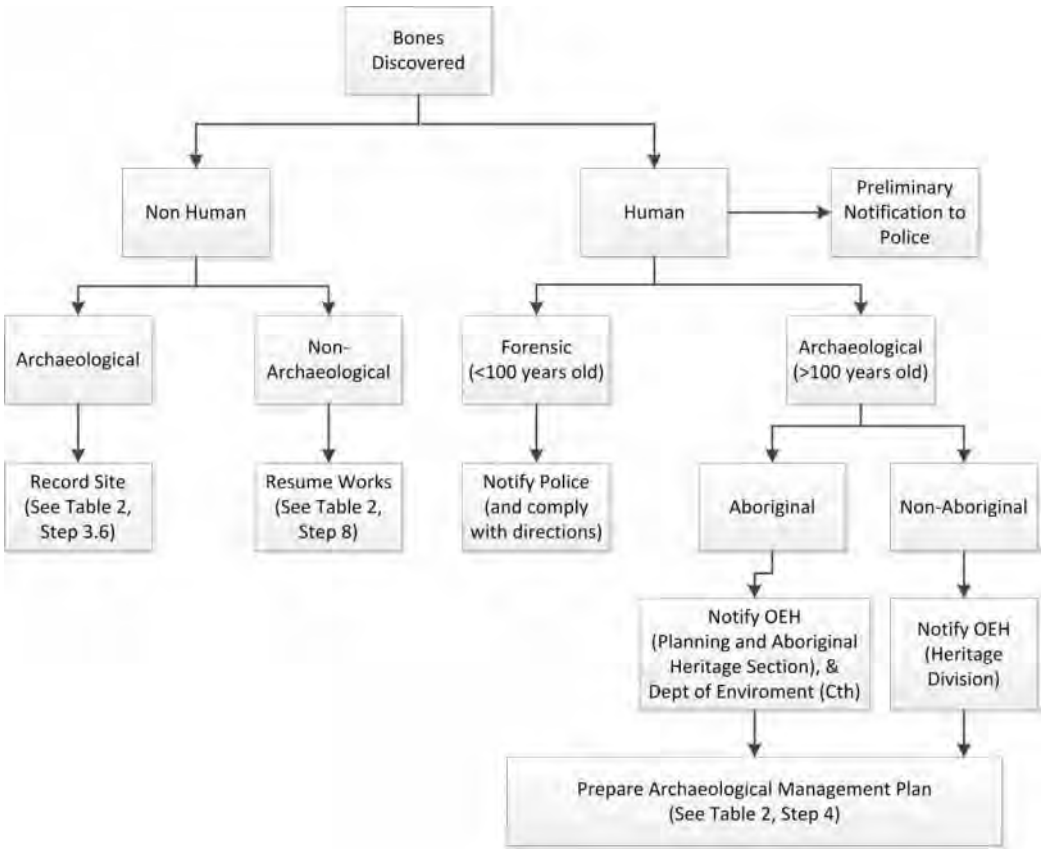


Figure 3 Overview of steps to be undertaken on the discovery of bones

After the appropriate verbal notifications (as described in 2B and 2C above), the Project Manager must proceed through the *Unexpected Heritage Items Exhumation Management Plan* (Step 4). It is noted that no *Exhumation Management Plan* is required for forensic cases (2A), as all future management is a police matter. Non-human skeletal remains must be treated like any other unexpected archaeological find and so must proceed to record the find as per Step 3.6.

3. Additional considerations and requirements

Uncovering archaeological human remains must be managed intensively and needs to consider a number of additional specific issues. These issues might include facilitating culturally appropriate processes when dealing with Aboriginal remains (such as repatriation and cultural ceremonies). Project Managers may need to consider overnight site security of any exposed remains and may need to manage the onsite attendance of a number of different external stakeholders during assessment and/or investigation of remains.

Project Managers may also be advised to liaise with local church/religious groups and the media to manage community issues arising from the find. Additional investigations may be required to identify living descendants, particularly if the remains are to be removed and relocated.

If exhumation of the remains (from a formal burial or a vault) is required, Project Managers should also be aware of additional approval requirements under the *Public Health Act 1991* (NSW). Specifically, Sydney Metro may be required to apply to the Director General of NSW

Department of Health for approval to exhume human remains as per Clause 26 of the *Public Health (Disposal of Bodies) Regulation 2002* (NSW)[10].

Further, the exhumation of such remains needs to consider health risks such as infectious disease control, exhumation procedures and reburial approval and registration. Further guidance on this matter can be found at the NSW Department of Health website.

In addition, due to the potential significant statutory and common law controls and prohibitions associated with interfering with a public cemetery, project teams are advised, when works uncover human remains adjacent to cemeteries, to confirm the cemetery's exact boundaries.

[10] This requirement is in addition to heritage approvals under the *Heritage Act 1977.*

Appendix 5 - Archaeological/heritage advice checklist

The archaeologist/Aboriginal heritage consultant must advise the Sydney Metro Principal Manager Sustainability Environment and Planning (Program) of an appropriate archaeological or heritage management plan as soon as possible after an inspection of the site has been completed (see Step 4). An archaeological or heritage management plan can include a range of activities and processes, which differ depending on the find and its significance.

In discussions with the archaeologist/Aboriginal heritage consultant the following checklist can be used as a prompt to ensure all relevant heritage issues are considered when developing this plan. This will allow the project team to receive clear and full advice to move forward quickly. Archaeological and/or heritage advice on how to proceed can be received in a letter or email outlining all relevant archaeological and/or heritage issues.

	Required	Outcome/notes
Assessment and investigation		
• Assessment of significance	Yes/No	
• Assessment of heritage impact	Yes/No	
• Archaeological excavation	Yes/No	
• Archival photographic recording	Yes/No	
Heritage approvals and notifications		
• AHIP, section 140, section 139 exceptions etc.	Yes/No	
• Regulator relics/objects notification	Yes/No	
• Notification to Sydney Trains for s170 heritage conservation register	Yes/No	
• Compliance with CEMP or other project heritage approvals	Yes/No	
Stakeholder consultation		
• Aboriginal stakeholder consultation	Yes/No	
Artefact/heritage item management		
• Retention or conservation strategy (e.g. items may be subject to long conservation and interpretation)	Yes/No	
• Disposal strategy	Yes/No	
• Short term and permanent storage locations (interested third parties should be consulted on this issue).	Yes/No	
• Control Agreement for Aboriginal objects	Yes/No	

Appendix 6 - Template notification letter

Insert on TfNSW letterhead
Select and type date]
[Select and type reference number]

XXX
Manager, Conservation
Heritage Division, Office of Environment and Heritage
Locked Bag 5020
Parramatta NSW 2124

[Select and type salutation and name],

Re: Unexpected heritage item discovered during Sydney Metro activities.

I write to inform you of an unexpected [select: relic, heritage item or Aboriginal object] found during Sydney Infrastructure and Services construction works at [insert location] on [insert date] in accordance with the notification requirement under select: section 146 of the *Heritage Act 1977* (NSW). [Where the regulator has been informally notified at an earlier date by telephone, this should be referred to here].

NB: On finding Aboriginal human skeletal remains this letter must also be sent to the Commonwealth Minister for the Environment in accordance with notification requirements under section 20(1) of the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Commonwealth).

[Provide a brief overview of the project background and project area. Provide a summary of the description and location of the item, including a map and image where possible. Also include how the project was assessed under the *Environmental Planning and Assessment Act 1979* (NSW) (e.g. Part 5). Also include any project approval number, if available].

Sydney Metro [*or contractor*] has sought professional archaeological advice regarding the item. A preliminary assessment indicates [provide a summary description and likely significance of the item]. Please find additional information on the site recording form attached.

Based on the preliminary findings, Sydney Metro *[or contractor]* is proposing [provide a summary of the proposed archaeological/heritage approach (e.g. develop archaeological research design (where relevant), seek heritage approvals, undertake archaeological investigation or conservation/interpretation strategy). Also include preliminary justification of such heritage impact with regard to project design constraints and delivery program].

The proposed approach will be further developed in consultation with a nominated Office of Environment and Heritage staff member.

Should you have any feedback on the proposed approach, or if you require any further information, please do not hesitate to contact [Environment and Planning Project Manager] on (02) XXXX XXXX.

Yours sincerely

[Sender name]

Sydney Metro Principal Manager Sustainability Environment and Planning (Program) [Attach the archaeological/heritage management plan and site recording form]

Integrated Management System

Exhumation Management Plan

SM ES-PW-315/1.0

Sydney Metro Integrated Management System (IMS)

Applicable to:	Sydney Metro
Document Owner:	Heritage Manager
System Owner:	Sustainability, Environment and Planning
Status:	Final issued for Implementation
Version:	3.0
Date of issue:	14 May 2019
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1. Introduction

Sydney Metro have developed this Exhumation Management Plan (ExMP) to provide Sydney Metro and their contractors with guidance on managing the discovery of human skeletal remains during the course of the Sydney Metro program of works.

Sydney Metro is Australia's biggest public transport project. From the northwest, metro rail is being extended under Sydney Harbour, through new underground city stations and beyond to the south west. In 2024, Sydney will have 31 metro railway stations and a 66km standalone metro railway system, revolutionising the way Australia's biggest city travels (refer to Figure 1).

The purpose of this ExMP is to address relevant planning conditions of approval where required, by providing a clear and concise process to follow in the event of the discovery of potential human remains during project works.

The policy document may be used for the Sydney Metro program, although there is a focus on human remains at Central Station (associated with the former Devonshire Street cemetery). Potential for human remains had been identified in the Archaeological Assessment and Research Design (AARD) for Sydney Metro – City & Southwest Chatswood to Sydenham (Artefact Heritage, 2016) and subsequently presence of human remains has been confirmed during archaeological investigation for the Central Station Main Works (CSMW).

This ExMP will be reviewed prior to its implementation on any future Sydney Metro project that has potential to impact on a known cemetery or burial ground. A review may require amendment the ExMP to tailor additional controls or management procedures that are specific to the impacted cemetery or burial ground. In addition, the requirements of the relevant Planning Approval, including consultation on any amendment, will be assessed during the review of this ExMP prior to its implementation.

2. Methodology

This ExMP satisfies the relevant planning requirements, by outlining the procedure for the discovery and management of human remains within the Sydney Metro program. The ExMP addresses the following:

- Discussion of relevant legislation and guidelines, (e.g. Coroners Act 2009, Heritage Act 1977, Guidelines for the Management of Human Skeletal Remains and the Public Health Regulations 2012).
- Archaeological methodology for excavation of remains including processes for appropriately handling remains in accordance with the relevant guidelines.
- Preparation of a flow chart process to be used by contractors to respond to the discovery of suspected human remains.
- Post-exhumation management primarily around relocation, processing and long-term arrangements.
- Process for nomination of a physical anthropologist and temporary storage location.
- Process for additional analysis including DNA testing, isotope analysis and environmental sampling, and discussion on requirements for public involvement.

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Figure 1: 2019 Sydney Metro Program Project overview and station locations

2.1. Overview of legislative requirements for dealing with human remains

The following section provides an overview of the various legislation that would apply to the discovery, management and relocation of human remains. A discovery of suspected human remains may be subject to different Acts and requirements, thereby triggering different notification pathways based on the specific circumstances involved.

For all areas other than Central Station within the CSMW boundary, the first step will always be to notify the NSW Police. Confirmation of the age (antiquity) and nature of the skeletal remains as well as the reasons for the disturbance will dictate which Act and provisions will be applicable. Note that provisions for Central Station would not require Police notification as it is confirmed by the Coroner that the remains are associated with the Devonshire Street Cemetery and would follow the requirements in Section 4, Central Station.

Although approval under the Heritage Act 1977 and the National Parks and Wildlife Act 1974, is not required for a Critical State Significant Infrastructure (CSSI) project, notification to the Heritage Council under s146 of the Heritage Act, and notification of an Aboriginal object under the National Parks and Wildlife Act is still required for discovery of archaeological human remains.

The provisions of the Coroners Act 2009 and Public Health Regulation 2012 apply under a CSSI approval. Compliance with this legislation would be fulfilled through adhering to the processes outlined in this plan, noting the special considerations for the CSMW site.

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2.2. Discovery of human remains and forensic cases: Coroners Act 2009 (NSW)

For a discovery of suspected human remains less than 100 years old, the remains would come under the jurisdiction of the State Coroner and the Coroners Act 2009 (NSW). Such a case would be considered a 'reportable death' and, under legal notification obligations set out in s35 (2); a person must report the death to a police officer, a coroner or an assistant coroner as soon as possible. This applies to all human remains less than 100 years old, regardless of ancestry (i.e. both Aboriginal and non-Aboriginal remains).

> *35 Obligation to report death or suspected death*
>
> *(1) This section applies to any person who has reasonable grounds to believe that a death or suspected death of another person:*
>
> *(a) is a reportable death or occurred in circumstances that would be examinable under Division 2 of Part 3.2, and*
>
> *(b) has not been reported in accordance with subsection (2).*
>
> *(2) A person to whom this section applies must report the death or suspected death concerned to a police officer, a coroner or an assistant coroner as soon as possible after becoming aware of the grounds referred to in subsection (1).*
>
> *Maximum penalty (subsection (2)): 10 penalty units.*
>
> *(3) A police officer to whom a death or suspected death is reported under this section is required to report the death or suspected death to a coroner or assistant coroner as soon as possible after the report is made.*
>
> *(4) An assistant coroner to whom a death or suspected death is reported under this section is required to report the death or suspected death to a coroner as soon as possible after the report is made.*
>
> *(5) A coroner to whom a death or suspected death is reported under this section is required to inform the State Coroner of the report as soon as practicable after the report is made.*

2.3. Historical human remains: Heritage Act 1977 and Guidelines for the Management of Human Skeletal Remains under the Heritage Act 1977

The Heritage Act 1977 and Guidelines for the Management of Human Skeletal Remains under the Heritage Act 1977[1] apply to historic burials in New South Wales. It should be noted that the Guidelines are outdated in terms of the current statutory framework.

The definition of an archaeological 'relic' under the Heritage Act changed in 2009. A relic is no longer defined as an object of at least 50 years of age, but is now defined as an archaeological deposit or artefact that has heritage significance at a local or State level. New guidelines, Assessing Significance for Historical Archaeological Sites and `Relics', have been endorsed by the Heritage Council and should be used to assess the level of heritage or archaeological significance of the remains. With reference to burial grounds, objects such as headstones, grave enclosures and grave goods, as well as buried human remains, may be a 'relic'.

[1] NSW Heritage Office, 1998.

If the project is approved as CSSI, an application to the NSW Heritage Council for an excavation permit (either Section 140 or Section 60) is not required. Notification to the NSW Heritage Council (or delegate) is required under the CSSI approval if unexpected relics of State significance or human remains are located.

2.4. Aboriginal human remains: National Parks and Wildlife Act 1974

The National Parks and Wildlife Act, administered by the NSW Office of Environment and Heritage (OEH), provides statutory protection for all Aboriginal 'objects' (consisting of any material evidence of the Aboriginal occupation of NSW) under Section 90 of the Act, and for 'Aboriginal Places' (areas of cultural significance to the Aboriginal community) under Section 84.

Discovery of Aboriginal burials and/or human remains would be addressed in the projects Aboriginal Cultural Heritage Assessment Report (ACHAR). ACHARs would be prepared in accordance with the OEH 'Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation'[2], the OEH 'Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW'[3] , the OEH 'Aboriginal cultural heritage consultation requirements for proponents 2010'[4], the OEH 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales'[5].

If suspected human skeletal remains are uncovered at any time during the archaeological management program, the process outlined in this ExMP and detailed in the flow chart is to be followed. Management of the remains would be guided by consultation with the nominated Registered Aboriginal Parties (RAPs) for the project, in adherence to the ACHAR.

2.5. Exhumation of human remains: Public Health Regulation 2012 (NSW) and the NSW Health Policy Statement – Exhumation of human remains (2013)

Public Health Regulation 2012 and the NSW Health Policy Statement – Exhumation of human remains of the Public Health Regulation 2012 provides specific regulation for the exhumation of bodies in NSW.

Under Clause 70, an application for approval to exhume the remains of a dead person may be made to the Director-General via an approved form to the Director of the local Public Health Unit that acts on behalf of the Director-General of NSW Health. Exhumation is not to take place unless an authorised officer or a NSW Health member of staff is present at the exhumation (the grave may be excavated to the lid of the coffin but nothing must be disturbed until the arrival of the authorised officer) (Clause 72). An authorised officer must be present at the exhumation to ensure the correct interment is opened and that all of the remains are exhumed, and to enforce the protection of public health should this be necessary.

Sydney Metro would be required to apply to the Secretary of Health for approval to exhume human remains as per Clause 26 of the Regulations.

[2] NSW Department of Environment and Conservation, 2005.
[3] OEH 2011.
[4] Department of Environment, Climate Change and Water 2010.
[5] OEH 2010.

Note that special consideration has been made for works at Central Station within the CSMW boundary that impact the former Devonshire Street Cemetery (Section 4).

2.6. NSW Ministry of Health Policy Statement – Exhumation of human remains (2013)

The NSW Ministry of Health Policy Statement on the exhumation of human remains provides the policy to be observed by Public Health Units located in Local Health Districts on receipt of an application to seek permission for approval of the exhumation of human remains under the Public Health Regulation 2012. Public Health Units (PHUs) of Local Health Districts (LHDs) in NSW facilitate the approval for an exhumation.
Under Clause 69 a person must not exhume a body unless the exhumation of the remains has been approved by the Director-General. An application for permission to exhume the remains of a deceased person is to be made to the Public Health Unit on the approved form which is contained at the NSW Health website.

The required form is appended to this ExMP for ease of reference.

Note that the title of Director General of Health was replaced with the Secretary of Health when the Public Health Act and Public Health Regulation were amended. However, the Policy Directive PD2013-046 has not been amended to reflect this change.

2.7. Work Health and Safety Act 2011

The Work Health and Safety Act 2011 provisions apply to protect personnel involved in the exhumation procedure by creating and maintaining safe and healthy work practices and are enforced by WorkCover NSW. Graves, crypts and vaults could be considered to be confined spaces in some circumstances under health and safety legislation. More information on safe work practices is available at or by contacting SafeWork NSW via their website or directly.

Health and safety aspects of working with human remains should be considered. Generally, working with archaeological human skeletal remains requires no extra precautions to be taken beyond normal health and safety regulations. Once any necessary site health and safety precautions have been taken, the exhumation of human remains can proceed.

3. Procedure for the discovery, management and relocation of human remains

This procedure provides project managers, principal contractors and the project archaeologist/Excavation Director with advice on the steps to follow upon uncovering suspected human remains. Information on the potential for burials and human remains would be included in the general project induction for all personnel. The induction would include the procedure to manage these finds as set out in this ExMP.

3.1. Initial discovery of bones: What do we do?

To avoid doubt, all suspected bone items must be treated as potential human skeletal remains, and work around them must stop while they are protected and investigated as a matter of urgency.

1. Stop Work and preliminary notification

Upon the discovery of bone (suspected human remains), all work in the area of the find must stop and the remains must be confirmed as being human or not.

The Project Archaeologist/Excavation Director must be notified

Preliminary notification must be made to the NSW Police in compliance with Section 35 of the Coroners Act 2009 (also refer to special conditions for Central Station noted in section 4).

What?	When bones are uncovered at a site, all work in the area the find must **stop immediately** and the site must be secured.
Who?	The discoverer will **immediately** notify machinery operators so that no further disturbance of the remains will occur, as well as notify the foreman/site supervisor, principal contractor, project archaeologist/Excavation Director and Sydney Metro Environmental Manager). Preliminary notification to the NSW Police will be undertaken by the Sydney Metro Environmental Manager. Notification should provide verbal description of the remains and inform the police that consultation with technical specialists is being undertaken to confirm that the remains are human, as well as the burial context (archaeological or less than 100 years old, refer Step 2).
How?	Inform all site personnel of restricted access to the area of the discovery until further notice. Area must be fenced off (flagging or temporary exclusion fencing).
Actions	Notify site supervisor, principal contractor, project archaeologist / Excavation Director and Sydney Metro Environmental Manger of the find and protect the suspected remains until an initial assessment can be undertaken by a technical specialist. Preliminary notification to NSW Police.

2. Confirm human provenance

Skeletal remains could either be articulated and in a recognisable form of burial such as a coffin or common burial position of the body (e.g. supine, prone or flexed) or they could be disarticulated or fragmented remains. Within the boundaries of a known historic burial ground, there is a high probability of the remains being human. In a suspected forensic case (less than 100 years old), the remains may have clothing and/or human tissue. Disarticulated or fragmented bones are often uncovered and these may require specialist assessment to determine legal jurisdiction.

If suspected human remains are identified during the course of project works, preliminary notification must be made to the NSW Police in compliance with Section 35 of the Coroners Act 1999 (refer Step 1) (also refer to special conditions for Central Station noted in section 4, Central Station). NSW Police would be contacted immediately upon receipt of confirmation of human provenance (also refer to special conditions for Central Station noted in section 4).

What?	Confirmation that the remains are human, their burial context - whether they are forensic (less than 100 years) or archaeological (older than 100 years) and suspected ancestry (Aboriginal or non-Aboriginal).
Who?	Excavation Director and or Forensic or physical anthropologist, or archaeologist with specialist skills such as an osteoarchaeologist.
How?	Consultation could be undertaken as either an on-site inspection or via good quality photos sent to the nominated technical specialist of 1) the remains; and 2) the site general site location of the discovery.
Actions	Contact nominated technical specialists to confirm that the remains are: a) human, b) burial context (archaeological or forensic), and c) suspected ancestry (Aboriginal or non-Aboriginal). For the duration of the Sydney Metro project, the nominated technical specialists are: • Forensic Anthropologist – TBC by contractor for project area.

	• Nominated Excavation Director – TBC by contractor for project area. The archaeologist may be able to identify the nature of remains without input from the Forensic Anthropologist. The Forensic Anthropologist should be contacted as required.

3. Notification based on jurisdiction (forensic or archaeological)

Once confirmation is received from the technical specialist that the remains are of human origin, there are three possible statutory pathways to follow based on the assessment:

- **Forensic case (remains are less than 100 years old**): If it is determined by specialist assessment (Step 2) that the remains are forensic, the remains come under the jurisdiction of the State Coroner and the Coroners Act 2009. The NSW Police would likely secure the site and will advise on the procedure to be followed.
- **Archaeological – non-Aboriginal human remains (more than 100 years old).** Actions: Notification to OEH Heritage Division. Follow the Archaeology Exhumation Methodology as set out in Step 4.
- **Archaeological – suspected Aboriginal human remains (more than 100 years old).** The RAPs must be present where it is reasonably suspected that Aboriginal burials or human remains have been encountered. Recording of Aboriginal ancestral remains must be undertaken by, or be conducted under the direct supervision of a specialist. Actions: Notify RAPs and follow ACHAR Notification to OEH. Follow the Archaeology Exhumation Methodology as set out in Step 4.

4. Archaeological Exhumation Methodology

The following section provides the archaeological methodology for exhumation and the appropriate handling of human remains.

Securing the Site: The strategy for the excavation and removal of human remains must be sensitive to public opinion and ethical issues and exhumation activities should not be visible to the general public. The site may need to be screened off from public areas, not only with hoarding but also in some cases with a roof to screen the site off from overlooking buildings. At all times, human remains should be treated with respect and dignity. The perimeter of the excavation site should be demarcated by plastic tape or flagging, with only technical staff allowed within this area for the duration of exhumation activities.

The site should be protected from the elements including flooding, contamination with dust or debris, and other disturbance. These measures would be formulated by the Excavation Director in consultation with the contractor and Sydney Metro where required and may differ from site to site.

Excavation Director: Archaeological investigations are to be managed by a suitably qualified Excavation Director with experience in the historical archaeology of Sydney and management of human remains. For sites with potential for locally significant remains, the Excavation Director should meet the NSW Heritage Council criteria for locally significant archaeological sites. For sites with potential for State significant archaeology the Excavation Director should meet the NSW Heritage Council criteria for State significant archaeological sites.

Excavation and Recording: Exhumation and recording is to be undertaken in accordance with best practice forensic and Heritage Council guidelines. Prior to

removal, the remains should be fully recorded in situ to understand their surrounding archaeological context. This will include recording any disturbances to the burial, identification of bones present. In some cases, the deposit of bones may be a mixture of articulated and disarticulated remains. Care should be taken to distinguish articulated remains and to assess if they represent commingled individuals or disturbed remains belonging to one individual, and to record them accordingly.

Recording:

- A standard context recording system will be employed.
- Detailed survey and/or measured drawings would be prepared and include location of remains within the overall site (position of the body, the direction of the burial, noting any stratigraphic relationships with other archaeological features).
- Any associated artefacts (potential grave goods, burial furniture) would be recorded and collected by context for later analysis.
- Digital photography, in RAW format, using photographic scales and photo boards where appropriate. A photographic record of all phases of the work on site would be undertaken.
- Registers of contexts, photos, samples and drawings would be kept.

Excavation:

- Detection of the extent of the grave/remains (if disarticulated).
- Surface soils removed in excavation units of 100mm (site dependent) using small tools.
- Expose remains with soft paint brushes and pedestal the remains.
- Record position and depth of remains.
- Soil removed would be sieved through 3mm mesh to examine for teeth and bone fragments.
- Soil samples may be taken from the abdominal and/or chest areas of the body (articulated remains) to retrieve evidence of gallstones or worm infestations.
- Exhumation must be under the control of the Excavation Director,with the assistance of a Forensic Anthropologist if required. Exhumation permit/s, provided by NSW Ministry of Health may also require the presence of an authorised officer or a member of staff of the Ministry of Health.
- Further excavation of the bottom of the pit (grave) following removal to confirm the absence of further remains.

Relocation of bones:

- Removal and collection of skeletal remains to follow standard forensic practice of labelling.
- Remove remains from the ground systematically and place in plastic bags according to anatomical areas of the body.
- Bags should not be air-tight and should have ventilation holes to prevent deterioration of fragile skeletal material. Each bag should contain labels and

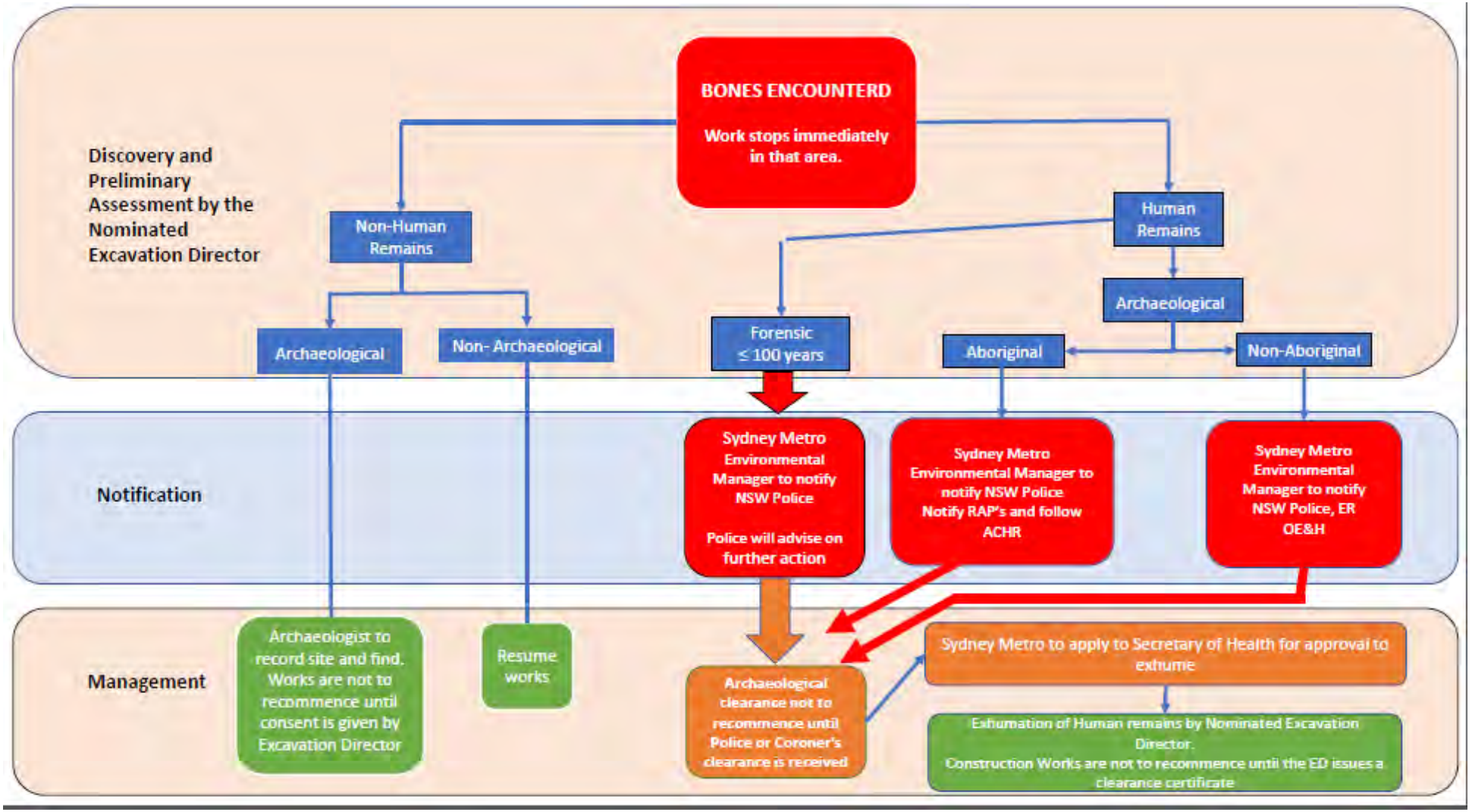
the separate bags should then be placed in a large plastic bag, crate or box, labelled with the context information.

- The remains should be placed in a sturdy, large cardboard box (approximately 600 x 300 x 200 mm) for relocation to off-site processing location.

Resume work: Construction work may only recommence upon receipt of clearance certificate from the Excavation Director and may require additional NSW Ministry of Health approval. If a forensic case, written authorisation from the NSW Police is required.

Reporting: A report would be prepared following the completion of the program of exhumation works, separate to the archaeological excavation report for the project. This report would include skeletal analysis catalogue, comprehensively describe the process of exhumation, detail the recording of the remains and synthesise the results of any further laboratory testing. An assessment of significance for the remains would be provided and interpreted within the context of the archaeological research design (response to research questions.)

Figure 2: Exhumation Policy flow chart



4. Central Station

4.1. Brief historical overview: Devonshire Street cemetery (Central Station)

The northern part of the Central Station site was formerly occupied by the nineteenth century Devonshire Street cemetery; specifically the Church of England, Presbyterian, Wesleyan and Roman Catholic burial areas. The burial grounds, called the Sandhills Cemetery or the Devonshire Street Cemetery, was consecrated in 1820[6]. The site was chosen due to the remote location of the cemetery compared to the growing town of Sydney. The cemetery was eventually declared at capacity, and took no more burials from 1865 onwards. Images from the 1890s, shortly before the cemetery was resumed for the expansion of the station, show that the original brick walls for the burial ground were still intact[7].

Proposals raised in the 1880s and 1890s for the construction of a larger station facility at Central Station were adopted, and the clearing of the Devonshire Street cemetery commenced in 1901. On 17 January 1901, the government issued a notice declaring that representatives of any deceased in the cemetery must remove their relatives within two months[8]. By 1902 clearing had been completed.



Figure 3: Plan of proposed Central railway station with Devonshire Street cemetery marked in red and the current station footprint indicated by the blue line[9]

[6] *The Sydney Gazette and New South Wales Advertiser*, 5 February 1820.
[7] Artefact Heritage, 2016. *Sydney Metro City & Southwest Chatswood to Sydenham Historical Archaeological Assessment & Research Design*. Report to Jacobs/Arcadis/RPS, pp.227-228.
[8] *The Sydney Morning Herald*, 25 January 1901.
[9] Source: State Records NSW, SR Map 6408 with overlay by Artefact Heritage 2016.

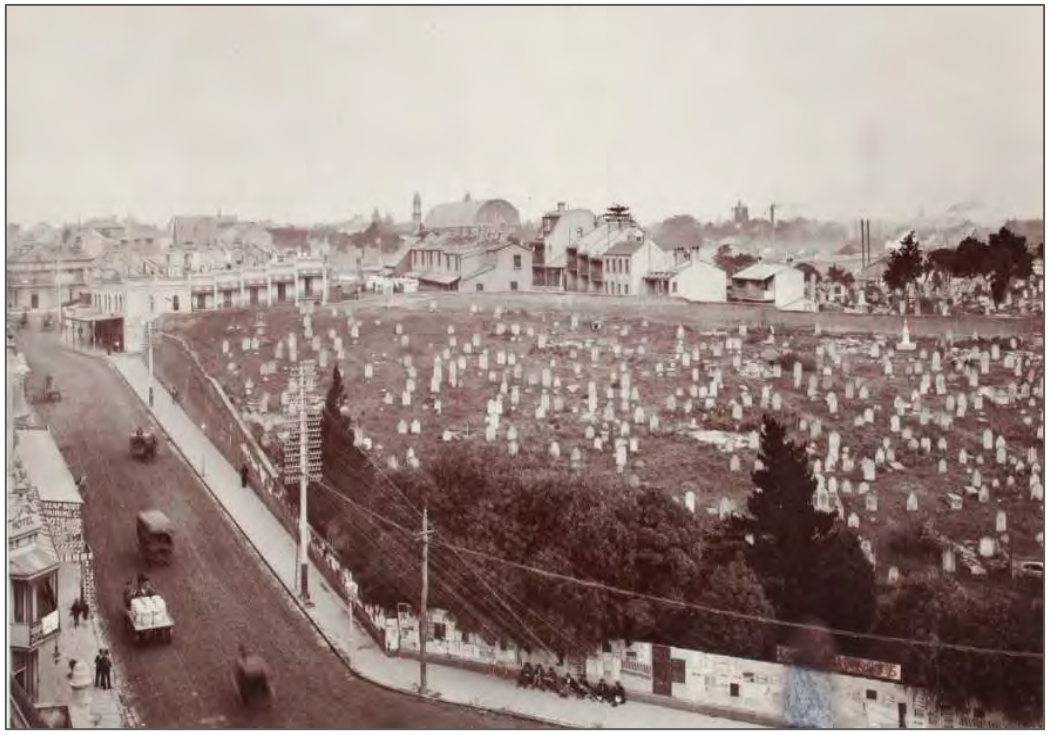


Figure 4: 1890s photo of the Church of England area of the Devonshire Street cemetery, facing south from north-eastern corner[10]

4.2. Archaeological potential of former Devonshire Street cemetery, Central Station

Artefact Heritage have prepared an historical AARD for the City & Southwest Chatswood to Sydenham project to assess archaeological potential and recommend appropriate management and mitigation measures. Central Station was assessed as having low potential for State significant archaeological remains associated with Devonshire Street cemetery as follows:

> *The Devonshire Street cemetery was located in the northern half of the Central Station site. Remaining material from the cemetery could include structural remains such as former footings for the deconstructed burial ground walls, residual brick and stone tombs, and tombstones. Coffins, coffin furniture and human skeletal remains and associated artefacts may also be preserved. Evidence of grave excavation in the form of cut soils and potential clay and sand backfill would be located from the base of the grave shaft to the top of the former ground level.*[11]

During works at the CSMW site, human remains were located in definable burials (including vaults) and scattered in redeposited fill. This ExMP applies to human skeletal remains or burial-related archaeological material.[12]

[10] Source: State Library of New South Wales
[11] Artefact Heritage 2016: 238.
[12] Ibid, pp.255-257

4.3. Special consideration for approvals at the CSMW site

4.3.1. Discovery of human remains and forensic cases: Coroners Act 2009 (NSW)

Consultation with the Coroner has confirmed that fragmented human remains discovered at the CSMW site do not require notification to the NSW Police, as the Coroners Act would not apply, if they meet **all** of the following criteria:

- They are disarticulated bone pieces or fragments, either within an identified burial site such as a grave cut or vault, or dissociated from their original context. For example disarticulated bones, bone fragments or teeth including those found in situ, in redeposited fill or when sieving deposits.
- Are not associated, in a definable burial site, with elements that could identify the interred such as a name plate, certain types of coffin goods such as personal effects, and or a headstone;
- They are more than 100 years old;
- They meet the requirements for exhumation under the Permit issued by SLHDPHU dated 21 January 2019; and
- They have been confirmed to meet the above criteria by a forensic or physical anthropologist, or archaeologist with specialist skills such as an osteoarchaeologist.

Exhumation of human remains: Public Health Regulation 2012 (NSW) and the **h.**

4.3.2. NSW Ministry of Health Policy Statement – Exhumation of human remains (2013)

Sydney Local Health District Public Health Unit has issued a permit, dated 21 January 2019, approving site wide (CSMW) exhumation of fragmented skeletal remains under certain conditions as outlined in the permit. This provides for the management of fragmented remains without the need to seek separate permits for scattered remains that are often only identified during the sieving process, or are not associated with definable burial sites (for example within redeposited fill).

Note that additional health permits may be required if substantial remains such as full or partial articulated skeletal remains, or other elements such as grave goods or coffin nameplates, are found on site.

5. Excavation and post-excavation tasks

The following tasks relate to responses to the identification of human remains on site. All management should be in accordance with the AARD and relevant Archaeological Method Statement (AMS), and be overseen by the Excavation Director. The Excavation Director would nominate a Forensic Anthropologist where required.

5.1. Research Questions

The following research questions should be used guide exhumations, should intact burials, disarticulated remain, burial cuttings or associated material culture be uncovered during works. These research questions are based on research undertaken for the Sydney Metro City & Southwest Chatswood to Sydenham AARD, and review of previous archaeological

excavations that involved recording and removal of human remains. Additional research questions may be provided in project specific AMS documents. Note that some of the questions particularly relate to the former Devonshire Street Century at Central Station.

The research questions are a guide only, and could be added to or amended by the Excavation Director, depending on the nature of the find.

Social History and Burial Practices

- Does the location of the burial/burial cutting correspond with historic plans/descriptions of the Devonshire Street Cemetery? Are these sources reliable?
- Is there evidence of exhumation?
- Do graves cut into older ones? What can this tell us about nineteenth century burial practices in Sydney, and how does this compare to other excavated cemetery sites in the region?
- What is the distance between burials (if multiple burials uncovered)? Does this conform to known nineteenth century burial practices?
- What type of fill was used within grave cuttings? What can this tell us about the surrounding environment and burial practices at the time?
- What materials/tree species were used to produce coffins? Can coffin manufacturing techniques or fastening methods (use of mortar, screws, nails, tacks) be identified? Does this match known burial practices of the time? If alternative methods are identified, what can this tell us about the manufacturer or economic/social landscape?
- Evidence of brick vaults were found during excavations at the Old Sydney Burial Ground in 1991 and 2003,13 is there evidence of similar practices at the Devonshire Street Cemetery?
- Can the class or rank of the individual be identified via coffin materials, grave goods or clothing/shrouds?
- Which direction is the burial orientated? How does this correspond with the known/hypothesised location of denomination areas?
- Previous excavations of historic cemeteries have noted the use of quicklime in burials,14 is there evidence for similar practices at the Devonshire Street Cemetery?
- If the burial is associated with additional individuals, can a familial relationship be assessed through DNA or other genetic markers identifiable within the skeletal remains (e.g. impacted third molar)?
- Can an exchange between burial practices in Britain and colonial Sydney be identified through the burial remains? Is there evidence for alternative burial practices associated with additional cultures?

[13] Godden Mackay, 1991. Old Sydney Burial Ground, Sydney Town Hall: Archaeological monitoring excavation. Prepared for the Council of the City of Sydney and the Heritage Council of NSW and Casey & Lowe, 2006. Recording of Graves, Old Sydney Burial Ground, Sydney Town Hall, 2003-2005, for Otto Cserhalmi i + Partners, on behalf of the City of Sydney.

[14] Hewitt, G. & Wright, R., 2004. Identification and Historical Truth: The Russell Street Police Garage Burials. Australasian Historical Archaeology, Vol. 22.

Environmental Factors and Scientific Analysis

- What is the condition of the bones? How does their condition compare to known or nearby burials of the same age? What environmental or man-made factors may have influenced the decomposition process?
- Can the health, nutrition, sex, race, stature or age be identified through the skeletal remains? Is there evidence of trauma on the bones? Is there evidence of pathology on the bones (e.g. syphilis, tuberculosis, tumours)?
- If archaeobotanical analysis is carried out, what can it tell us about the surrounding environment and nearby plant species? Can pre/post-European landscapes be determined within the archaeobotanical record?
- Can stable isotope analysis address any questions regarding diet, country of origin and nutrition?
- Can DNA testing address any questions not answerable by the skeletal remains themselves, such as sex, familial relationships (if buried with another individual/s) or race?
- Is there potential for DNA to be tested against any individuals who may come forward as a descendant of the deceased?

5.2. Process for DNA Testing, Isotope Analysis and Environmental Sampling

5.2.1. Pre-Excavation

The Excavation Director, in consultation with the Forensic Anthropologist, will nominate a suitable laboratory prior to works commencing. Approval for the analysis of skeletal remains, soil samples and material samples from the laboratory would also be sought prior to works commencing.

5.2.2. Excavation

In order to prevent cross-contamination, the following sample collection and excavation process should be followed:

- The location, quantity and material (bone, teeth, hair, soil, wood) of samples will be determined by the Excavation Director or Forensic Anthropologist prior to its collection;
- Samples would be stored in a safe, secure and climate controlled location while excavations are in progress. This would be chosen by the Excavation Director or Forensic Anthropologist on site;
- Each collected sample would be given a unique catalogue number and a sample register would be recorded throughout the excavation;
- “Clean Excavation’ procedures would be followed during the excavation of burials and during the sample collection process.15 This would include:

[15] Guidelines for ‘clean excavation’ are based on procedures outlined in: Yang, D. Y. & Watt, K. 2005. Contamination controls when preparing archaeological remains for ancient DNA analysis. Journal of Archaeological Science, vol. 32, pp. 331–336 and Society for Historical Archaeology, 2015-2017. Research and Analysis of Artefacts. Accessed online at: https://sha.org/conservation-facts/faq/analysis/#C on 25/5/2017.

- Latex gloves would be worn by individuals excavating and/or handling bone or soil samples. Gloves would be changed for each bone and/or individual to prevent cross-contamination;
- Excavation tools/brushes would be cleaned prior to and after the collection of each sample to prevent cross-contamination;
- In some cases, a face mask would be worn when samples for DNA analysis are being collected;
- Bone samples for DNA testing would be collected with surrounding in situ soil and should not be cleaned prior to bagging;
- It may be necessary for individuals involved in sample collection to submit DNA for comparison in the event of cross-contamination; and
- All bags containing samples for analysis would be bagged and labelled appropriately to prevent cross contamination and ensure they are handled and stored correctly.

5.2.3. Post-Excavation

Upon the completion of excavations, samples will be transported to nominated laboratories for analysis. A record of their location will be taken.

5.3. Reporting

The results of the investigation of human remains and the exhumation will be included in the archaeological reporting for the project in accordance with the project AARD.

Once finalised, all archaeological excavation and data analysis reports will be submitted to:

- The relevant local Council and Library;
- The Heritage Office Library;
- The State Library of NSW; and
- Made available online for public access and educational purposes.

Further, if significant remains are identified during excavations, the results and findings would be published in academic journals and conference papers where feasible.

5.4. Public Involvement

Archaeological excavations associated with the Devonshire Street Cemetery have uncovered remains directly associated with early settlement and burial practices in colonial Sydney. Such remains are likely to generate public interest. Therefore, public engagement and education would be incorporated into the Central Station project and other Metro projects, if relevant and feasible.

Public involvement may include:

- Media releases;
- Public Open Days;
- Preparation of brochures detailing the archaeological excavations;
- Interpretive signage and online blog posts or site diaries while excavations are taking place; and

- The preparation of a Heritage Interpretation Plan designed to provide interpretation of the site within the new development upon the completion of works.

Due to sensitive nature of human skeletal remains, these recommendations would be adapted and modified as appropriate under the direction of Sydney Metro and the Excavation Director.

Such recommendations would also be considered and require approval from relevant Stakeholder Groups such as known or potential descendants of the deceased, the NSW Heritage Division/Heritage Council, local Council and the Royal Australian Historical Society.

5.5. Temporary Storage and Permanent Repository or Resting Place for Remains

5.5.1. Temporary Storage

Upon the completion of archaeological excavations, skeletal remains should be boxed separately and temporarily stored within a safe, secure and temperature controlled environment to allow for further analysis of the remains. This location would be chosen by the Excavation Director and the Forensic Anthropologist and comply with NSW legislative requirements. Permanent Repository or Resting Place for Remains.

A permanent repository or resting place for remains is dependent on the nature and volume of skeletal remains. As this cannot be determined prior to excavations taking place, the following recommendations should act as guidelines only. Final arrangements would be dictated by Sydney Metro the Excavation Director, Forensic Anthropologist, identified descendants of the deceased and/or Stakeholder Groups upon the completion of excavations and subsequent analysis.

Recommendations for permanent repositories or resting places for remains include:

- Reinterment and Commemoration at:
  - Rookwood Cemetery (where many exhumed burials from the Devonshire Street Cemetery were historically re-buried);
  - An appropriate and respectful location within the former permitters of the Devonshire Street Cemetery; and
  - A cemetery chosen by descendants of the deceased (if identified and confirmed by DNA testing).

6. Accountabilities

The Sydney Metro Executive Director, Safety, Sustainability & Environment is accountable for this Plan including authorising the document, monitoring its effectiveness and performing a formal document review.

Direct Reports to the Program Director are accountable for ensuring the requirements of this Plan are implemented within their area of responsibility.

Direct Reports to the Program Director who are accountable for specific projects/programs are accountable for ensuring associated contractors comply with the requirements of this Plan.

7. Definitions

All terminology in this Plan is taken to mean the generally accepted or dictionary definition. Other terms and jargon specific to this Plan are defined within SM QM-FT-435 Integrated Management System (IMS) Glossary.

8. Related Documents and References

Related Documents and References
• n/a

9. Superseded Documents

Superseded Documents
Exhumation Management Plan Version 2.2

10. Document History

Version	Date of approval	Notes
1.1	May 2017	New IMS document.
2.0	July 2017	Incorporates Stage 2 (Section 3)
2.1	February 2019	Extended for Metro Program wide application, includes changes specific Central Station management, incorporates comments received from the State Coroner's Office, NSW Police, NSW Health, Sydney Metro Environmental, Environmental Representatives engaged on the Central site and the Office of Environment and Heritage.
2.2	February 2019	Incorporates comments received from Artefact Heritage and Denise Donlan issued to Health and OEH HD for consultation
3.0	May 2019	Incorporates Health, Coroner and OEH comments

11. Schedule of Acronyms

Acronym	Meaning
AARD	Archaeological Assessment and Research Design
ACHAR	Aboriginal Cultural Heritage Assessment Report
AMS	Archaeological Method Statement
CSMW	Central Station Main Works
CSSI	Critical State Significant Infrastructure
ER	Environmental Representative (Independent)
ExMP	Exhumation Management Plan (this plan)
OEH	Office of Environment and Heritage
PHU	Public Health Unit
RAPs	Registered Aboriginal Parties
SLHDPHU	Sydney Local Health District Public Health Unit
SMEM	Sydney Metro Environmental Manager

Appendix 1

NSW Heath Policy Directive for Exhumation of Human Remains

Policy Directive

Ministry of Health, NSW
73 Miller Street North Sydney NSW 2060
Locked Mail Bag 961 North Sydney NSW 2059
Telephone (02) 9391 9000 Fax (02) 9391 9101
http://www.health.nsw.gov.au/policies/

Exhumation of Human Remains

Document Number PD2013_046

Publication date 05-Dec-2013

Functional Sub group Population Health - Environmental

Summary This document provides the policy to be observed by NSW Health in receipt of an application to seek permission for approval of the exhumation of human remains under clauses 69-72 of the Public Health Regulation 2012. This Policy Directive will provide the conditions on which approvals may be granted for exhumation of human remains.

Replaces Doc. No. Burials - Exhumation of Human Remains [PD2008_022]

Author Branch Environmental Health

Branch contact Environmental Health 94245823

Applies to Local Health Districts, Environmental Health Officers of Local Councils, Ministry of Health, Public Health Units, Public Hospitals

Audience Authorised officers from Public Health Units and local councils

Distributed to Public Health System, Environmental Health Officers of Local Councils, NSW Ambulance Service, Ministry of Health, Public Health Units, Public Hospitals

Review date 05-Dec-2018

Policy Manual Patient Matters

File No. 08/1292

Status Active

Director-General

This Policy Directive may be varied, withdrawn or replaced at any time. Compliance with this directive is **mandatory** for NSW Health and is a condition of subsidy for public health organisations.

POLICY STATEMENT

EXHUMATION OF HUMAN REMAINS

PURPOSE

This document provides the policy to be observed by Public Health Units located in Local Health Districts, on receipt of an application to seek permission for approval of the exhumation of human remains under the *Public Health Regulation* 2012. Common reasons for exhuming bodies include to repatriate the remains overseas or to relocate the body to another cemetery plot or vault.

MANDATORY REQUIREMENTS

Under Clause 69 of the *Public Health Regulation 2012* a person must not exhume a body unless the exhumation of the remains has been approved by the Director-General.

An application for approval to exhume the remains of the body of a dead person may be made to the Director General by:

- An executor of the estate of the dead person
- The nearest surviving relative of the dead person
- If there is no such executor or relative available to make the application a person who, in the opinion of the Director-General, is a proper person may make the application.

An application is to be made in the approved form and it is to be accompanied by:

- A certified copy of the death certificate relating to the dead person
- A statutory declaration as to the relationship of the applicant to the dead person and the dead persons wishes, if any, regarding the disposal of his or her body
- An application fee.

Under Clause 71 of the *Public Health Regulation 2012* the Director-General may:

- Grant an approval to exhume the remains of a body
- Refuse the application.

Under Clause 72, an exhumation cannot take place without an authorised officer or a Ministry of Health staff member present. A person must not proceed with an exhumation if the authorised officer or Ministry of Health staff member who is present at the exhumation, orders the exhumation to stop.

Under Clause 78, if the applicant seeks to have the exhumed body cremated a separate application can be made for an exemption from providing the required cremation documentation, provided the body has been buried for longer than 10 years. The minimum 10 year period is strictly enforced. An application under this clause is to be accompanied by a fee of $100.

IMPLEMENTATION

Authorised officers in Public Health Units of Local Health Districts are responsible for assessing applications for exhumation of human remains and either approving with a set of conditions or rejecting the application. Authorised officers should ensure that all of the required document has been submitted with the application fee and that an appropriate person has applied for the application. The approval granted is valid for a period of three months after the approval is granted.

REVISION HISTORY

Version	Approved by	Amendment notes
December 2013 PD2013_046	Deputy Director-General, Population and Public Health	This document is an updating of the original document due to legal changes under the Public Health Regulation 2012
23 April 2008 PD2008_022	Director-General	This document provided the policy to be observed by NSW Health in receipt of an application to seek permission for approval of exhumation of human remains under clauses 25 – 28 of the Public Health (Disposal of Bodies) Regulation 2002. It provided the conditions upon which approvals could be granted for the exhumation of human remains.

ATTACHMENTS

1. Exhumation of Human Remains: Procedures

Exhumation of Human Remains

NSW GOVERNMENT Health

PROCEDURES

Issue date: December-2013

PD2013_046

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1 BACKGROUND

1.1 Introduction

Exhumation of human remains may occur for a number of reasons, including:

- To satisfy family wishes, where the family of the deceased person may want the remains to be moved to another burial ground, to another part of the state or country or abroad, or even to have the remains cremated
- To obey Coronial orders requiring exhumation for forensic (criminal) investigation
- To enable the use of closed cemeteries for redevelopment or for the construction of new infrastructure such as a road or airport.

A variety of people, including authorised officers, cemetery authorities, and funeral directors are involved at different stages of exhumation procedures.

Public Health Units (PHUs) of Local Health Districts (LHDs) in NSW facilitate the approval for an exhumation however there is no obligation to proceed with an exhumation once it has been approved.

The objectives of this document are:

- To assist authorised officers with processing applications to exhume
- To standardise the management of an exhumation so as to prevent a public health risk and protect community amenity in the handling of remains.

1.2 Key definitions

These definitions are repeated from the *Public Health Act 2010* and Public Health Regulation 2012 for clarity:

Body	Means the body of a dead person, but does not include the cremated remains of the person
Burial	Includes putting the body in a vault
Cemetery Authority	Means the person or body that directs the operations of a cemetery
Coroner	Means a person who exercises or performs the functions of a coroner in accordance with the *Coroners Act 2009*
Dead person	Includes a still-born child (see definition of Still birth)
Exhumation	Means the removal of a dead person's remains (not being cremated remains) from a grave or vault, but does not include their removal from one vault for immediate transfer to another vault in the same cemetery or their temporary removal for the purposes of reburial in the same grave or vault

Funeral director	Means a person (other than the operator of a mortuary transport service) who, in the conduct of the person's business, engages, for the purpose of burial, cremation or transport, in the collection, transport, storage, preparation or embalming of bodies or engages in the conduct of exhumations
Prescribed infectious diseases	Means any one of the following diseases: avian influenza in humans, diphtheria; plague, respiratory anthrax; smallpox; severe acute respiratory syndrome, tuberculosis and any viral haemorrhagic fever (including Lassa, Marburg, Ebola, and Congo-Crimean fevers)
Proper person	The Director General has the power to decide whether a person is a 'proper person' to make an application to exhume the remains of a dead person
Nearest surviving relative	Means: (a) In relation to a still-born child a parent, or sibling at or above the age of 16 years, of the child (b) In relation to a dead person who is not a still-born child – the spouse or de facto partner of the dead person immediately before death, a parent of the dead person, a child at or above the age of 16 years of the dead person or any relative of the dead person who was residing with the dead person when he or she died
Still-birth	Consistent with the *Births, Deaths & Marriages Act 1995*, means the birth of a child that exhibits no sign of respiration or heartbeat, or other sign of life, after birth and that: (a) Is of at least 20 weeks' gestation (b) If it cannot be reliably established whether the period of gestation is more or less than 20 weeks, has a body mass of at least 400 grams at birth

1.3 Legal and legislative framework

Public Health Regulation 2012

Division 4 of Part 8 of the Public Health Regulation 2012 provides specific regulation for the exhumation of bodies.

Clause 69 Exhumation without approval prohibited

(1) A person must not exhume the remains of a body unless the exhumation of those remains has been:

(a) Ordered by a coroner

(b) Approved by the Director-General.

(2) However, a funeral director may, without a coroner's order or Director-General's approval, transfer a coffin from a vault in a cemetery to a mortuary for the purpose of the coffin being immediately repaired and returned to the vault.

(3) A funeral director must return the coffin to the cemetery within 24 hours of its transfer.

Clause 70 Application to exhume remains

(1) An application for approval to exhume the remains of the body of a dead person may be made to the Director-General by:

(a) An executor of the estate of the dead person

(b) The nearest surviving relative of the dead person

(c) If there is no such executor or relative available to make the application a person who, in the opinion of the Director-General, is a proper person in all the circumstances may make the application.

(2) An application is to be made in the approved form and is to be accompanied by:

(a) A certified copy of the death certificate relating to the dead person

(b) A statutory declaration as to the relationship of the applicant to the dead person and the dead person's wishes, if any, regarding the disposal of his or her body (so far as any such wishes are known to the applicant)

(c) An application fee (please check with the PHU for the current fee).

(3) In this clause, death certificate means a certificate given by a medical practitioner as to the cause of death or issued under the *Births, Deaths and Marriages Registration Act 1995*.

All applications to exhume remains must be made in writing using an approved form to the Director of the local Public Health Unit that acts on behalf of the Director-General of the NSW Ministry of Health. The application fee may increase periodically in line with the Consumer Price Index.

Clause 71 Approval to exhume remains

(1) The Director-General may:

(a) Grant an approval to exhume the remains of a body, subject to any conditions specified in the approval

(b) Refuse the application.

(2) An approval granted under this clause remains valid for three months from the date of the approval or for a period agreed to by the Director-General.

The PHU is not bound to approve the application. The PHU may approve, subject to conditions, or refuse the application. An approval is normally given for 3 calendar months and this date will be specified in a schedule of conditions attached to the approval document. Any further extension of time may require re-application and re-approval. An approval initially for longer than three calendar months should be negotiated with the PHU.

Clause 72 Exhumation not to take place without authorised officer present

(1) A person must not proceed with an exhumation unless an authorised officer or a member of staff of the Ministry of Health is present at the exhumation.

(2) A person must not proceed with an exhumation if the authorised officer or Ministry staff member who is present at the exhumation orders the exhumation to stop.

The grave may be excavated to the lid of the coffin but nothing must be disturbed until the arrival of the authorised officer. An authorised officer must be present at the exhumation to ensure that the correct interment is opened, to ensure that all of the remains are exhumed and to enforce the protection of public health should this be necessary. The authorised officer has the power to order that the exhumation be stopped immediately under adverse circumstances. An example of where this may occur is where the weather is very poor with heavy rain. The initial order to stop is to be given verbally and then confirmed in writing to all parties involved, within 24 hours.

Division 5 of Part 8 of the Public Health Regulation 2012 provides for cremation of deceased persons.

Clause 78 No cremation without documentation

Clause 78 does not apply to a cremation of the body of a dead person that has been buried for at least 10 years if the cremation is carried out in accordance with an exemption granted by the Director-General following an application by:

1) An executor of the estate of the dead person
2) The nearest surviving relative of the dead person
3) If there is no such executor or relative available to make the application a person who, in the opinion of the Director-General, is a proper person in all the circumstances to make the application.

This is a new addition to the Exhumation section of the Regulation that may be used where a person makes a separate application to have the exhumed body cremated following the exhumation.

Note: The Director-General's authority under Clause 78 (4) of the Public Health Regulation 2012 (Delegations Manual page 8.66, delegation (PH590)) is the power to decide whether a person is a "proper person" to make an application in the absence of an executor or surviving relative.

Work Health and Safety Act 2011

The *Work Health and Safety Act 2011* and Code of Practice for Excavation provisions apply to protect personnel involved in the exhumation procedure by creating and maintaining safe and healthy work practices. Graves, crypts and vaults could be considered to be confined spaces in some circumstances under health and safety legislation. The *Work Health and Safety Act 2011* makes reference to working in confined spaces.

WH&S matters are enforced by WorkCover NSW. More information on safe work practices is available at http://www.workcover.nsw.gov.au/default or by contacting Workcover NSW direct on 13 10 50.

Heritage Act 1977

The *Heritage Act 1977* and Guidelines for the Management of Human Skeletal Remains under the *Heritage Act 1977* applies to relic burials. Any burial site over 50 years old is considered to be relic under the *Heritage Act*. If the site is listed on the State Heritage Register then approval is required from the Heritage Council of NSW.

An application must be made to the Heritage Office before any disturbance, removal or work commences on the site. Approval for an exhumation under the Public Health Regulation 2012 does not obviate the necessity to obtain approval under the *Heritage Act 1977*. For further information contact the Heritage Office of NSW or visit: http://www.heritage.nsw.gov.au.

Coroner's Act 2009

A coroner may order an exhumation for the purposes of forensic investigation or a criminal investigation. Such an order is outside the ambit of the Public Health Regulation 2012. The Police may request that an authorised officer from the Ministry of Health or the local Public Health Unit be present at the coronial exhumation.

Births, Deaths and Marriages Registration Act 1995

Section 41(2) of the *Births, Deaths and Marriages Registration Act 1995* requires that if human remains (other than cremated remains) are removed from NSW, the funeral director or other person who arranges for the removal of the remains from NSW must, within 28 days of disposal of the remains outside NSW, give the Registrar notice of the new location of interment. The act is available at: http://www.austlii.edu.au/au/legis/nsw/consol_act/bdamra1995383/. The Registry of Births, Deaths and Marriages may be contacted via: http://www.bdm.nsw.gov.au.

2 APPLICATION REQUIREMENTS

An application for permission to exhume the remains of a deceased person is to be made to the PHU on the approved form which is contained at the NSW Ministry of Health website at http://www.health.nsw.gov.au/environment/dotd/Documents/form-c70-application-to-exhume.pdf

The application must be made by either:

- An executor of the estate of the deceased
- The nearest surviving relative

- If there is no such executor or relative available to make the application a person who, in the opinion of the Director-General, is a proper person in all the circumstances to make the application.

The application must be accompanied by:

- A certified copy of the death certificate (death certificate issued by the Registry of Births, Deaths and Marriages)
- A statutory declaration that states:
  - The relationship between the applicant and the deceased or the reason the applicant is the proper person to make the application
  - If the deceased left any instructions regarding the disposal of their body/remains if known
  - In addition to the above an applicant should declare that he or she has consulted each nearest surviving relative and that they have no objection to the proposed exhumation
  - An application fee (please check with the PHU for the current fee).

Note: If there is no agreement amongst nearest surviving relatives, the applicant should seek independent legal advice regarding this issue. The applicant should advise if there is an intention to cremate the body following the body being exhumed, and the appropriate form completed.

3 APPROVAL BY PUBLIC HEALTH UNITS

Approval by PHUs for an exhumation must be given by formal correspondence.

3.1 Delegation

The Director-General's authority under clauses 69(1), 70(1)(c) and 71 of the Public Health Regulation 2012 has been delegated to the Chief Health Officer, Director Health Protection, Public Health Officer or Public Health Unit Director as appointed under Section 121 of the Act (delegation PH/308, PH309).

3.2 Special Considerations on Exhumation Approval

Special consideration should be given to the approval of an exhumation if the deceased was infected with a prescribed infectious disease. For example if the deceased was infected with diphtheria or tuberculosis, exhumation should not permitted in the first year of interment.

Although not prohibited, an exhumation of the remains of a body that was buried without a coffin will be approved only where the cemetery authority and funeral director have agreed to proceed with the exhumation, especially during the first three years of interment.

3.3 Conditions of Approval

After due consideration of the application and the statutory declaration(s), the PHU should then consider applying appropriate conditions to facilitate an approval.

There are two standard sets of approval conditions which can be applied as appropriate:

- Appendix 2 – Schedule A - Conditions of Approval for Exhumation from a Grave
- Appendix 3 – Schedule B - Conditions of Approval for Exhumation from an Above Ground Structure

Any other additional conditions that are deemed necessary to permit the exhumation may be added to schedule A or B based on the individual circumstances of the exhumation. If some conditions are unwarranted they may be removed from the relevant schedule.

3.4 Approval Instrument

An approval must be in writing and must be signed the Director General or their delegate. A template to assist in the approval process can be found at Appendix 4. This template is to be completed by the Authorised Officer in order to facilitate approval by the delegate.

3.5 Notification of Approval

The approval instrument is retained on file as a record that approval was granted by the Director General or their delegate. Therefore it is necessary to advise the applicant, the cemetery authority and the funeral director of the approval.

The attached letter templates may be used for approval notification of the exhumation to the applicant, funeral director and Cemetery Authority.

- Appendix 5 – Sample Letter to Applicant
- Appendix 6 – Sample Letter to the Cemetery Authority and Funeral Director

3.6 Refusals

If after due consideration the application is to be refused then the applicant should be notified in writing specifying the reasons for refusal. Ideally the applicant should consult the PHU in the first instance to discuss the requirements and possible restrictions on an application to exhume.

3.7 Cremation of Remains

Division 5 of Part 8 of the Public Health Regulation 2012 sets out the requirements for documentation for cremations in NSW and includes the requirement for a cremation application form, a cremation certificate and the cremation permit. The documentation confirms the identity of the body to be cremated and the cause of death and ensures that a coroner's investigation has been conducted where necessary.

After the body is exhumed the next of kin may wish to have the body cremated. However there may be cases whereby the body does not have the required paperwork necessary for cremation. Clause 78 of the Public Health Regulation 2012 provides an exemption for

the required documentation for cremation where the body has been buried for longer than 10 years. An application under this clause is to be accompanied by a fee.

The Director General has the power to approve an exemption and the executor or the nearest surviving relative or another proper person may make application on form 'Application for Exemption by the Director – General to the Requirement for Documentation for Cremation to Proceed: Permission for Cremation of Exhumed Remains of a Body Buried more than 10 years ago with statutory declaration'. The minimum 10 year period will be strictly enforced and this matter should be clarified prior to any exhumation approval where it is planned for the remains to be subsequently cremated. The application form is available at: http://www.health.nsw.gov.au/environment/dotd/Documents/form-c78-application-for-exemption.pdf

APPENDIX 1

Schedule A

CONDITIONS OF APPROVAL FOR EXHUMATION FROM GRAVE

1. The exhumation is to be carried out in the presence of a Public Health Unit's authorised officer or other authorised officer of the NSW Ministry of Health or Local Council authorised Officer and person appointed by Cemetery Authority.
2. At least 48 hours notice of the exhumation arrangements shall be given to the Public Health Unit.
3. Day and time of the exhumation shall be arranged by the participating parties and agreed to by the Public Health Unit.
4. The approval granted is valid for a period of three months and shall lapse on ___ /____/_____, unless a further approval is granted.
5. The presence of any relative of the deceased at the exhumation is strictly prohibited.
6. No animals are to be permitted within the exhumation site.
7. The cemetery authority and funeral director shall be responsible for the work health and safety of all persons involved in the exhumation and shall ensure that all NSW WorkCover requirements are complied with.
8. If, during the course of the exhumation, it is determined necessary to stop the exhumation by either the exhumation supervisor / cemetery manager or authorised Officer, for any valid reason e.g. work health and / or public health risk, then the exhumation must cease.
9. The remains of the deceased shall be enclosed in a body bag and placed into a new coffin with a name plate attached inscribed with the name of the deceased.
10. The remains of the original coffin are to be placed in the new coffin where possible. Where there is an excess of remains of the original coffin, these remains should be disposed in a sanitary and agreed manner.
11. Excavated soil should be back filled. The soil that was removed from immediately above and around the coffin should be replaced first.
12. If the exhumed remains are to be transferred to another cemetery, a funeral director shall be contracted to transfer the remains from the cemetery grounds or carry out preparatory work for the safe reinterment of the remains.
13. The exhumation will not proceed during or following a period of heavy rainfall within the preceding 24 hours of the appointed time of exhumation. The cemetery manager is to confirm that satisfactory conditions exist for the exhumation to proceed two hours prior to the commencement of the exhumation.
14. Used disposable protective equipment and materials are to be placed in a sealed plastic bag and disposed of in a sanitary manner.

APPENDIX 2

Schedule B

CONDITIONS OF APPROVAL FOR EXHUMATION FROM ABOVE GROUND STRUCTURE

1. The exhumation is to be carried out in presence of a Public Health Unit authorised officer or other authorised officer of the NSW Ministry of Health or Local Council authorised Officer and person appointed by Cemetery Authority.

2. At least 48 hours notice of the exhumation arrangements shall be given to the Public Health Unit.

3. Date and time of the exhumation shall be arranged by the participating parties and agreed to by the Public Health Unit.

4. An approval granted is valid for a period of three months and shall lapse on ___ /____/_____, unless a further approval is granted.

5. The cemetery authority and funeral director shall be responsible for the work health and safety of all persons involved in the exhumation and shall ensure that all NSW WorkCover requirements are complied with.

6. If, during the course of the exhumation, it is determined necessary to stop the exhumation by either the exhumation supervisor / Cemetery Manager or authorised officer, if for any valid reason e.g. worker health and/or public health risks, then the exhumation must cease.

7. Used disposable protective equipment and materials are to be placed in a sealed plastic bag and disposed in a sanitary manner.

APPENDIX 3

{LETTERHEAD}

APPROVAL INSTRUMENT TEMPLATE

Public Health Unit
Environmental Health Section

File Number: [XXXXX]

PURPOSE: To approve of the exhumation of the late _____

RECOMMENDATION:

Approval is granted by the Director General pursuant to clause 71(1)(a) Public *Health Regulation* 2012 to [NAME OF APPLICANT] to exhume the remains of the late [NAME OF DECEASED].

KEY ISSUES:

[DETAILS OF THE APPLICATION, STATUTORY DECLARATION, RELEVANT ISSUES, MANAGEMENT PLAN AND JUSTIFICATION OF SUGGESTED CONDITIONS ARE TO BE INCLUDED HERE]

BACKGROUND: (TO BE COMPLETED BY PHU)

CONSULTATION: (TO BE COMPLETED BY PHU WHERE APPROPRIATE)
The approval be subject to compliance with the conditions specified in *Schedule A / Schedule B and to expire on _____/____/_____.

Signature: Authorised officer

Author: **Telephone:** **Date:**

---

1 Authorised officer

2 Public Health Unit Director/ Public Health Officer [SIGN AND DATE]:
Approved via delegation from the Director-General PH308, PH309 page 8.63 Public Health Delegations Manual under clause 69(1) and 70(1) (C) *Public Health Regulation* 2012.

3. Authorised officer

APPENDIX 4

{LETTERHEAD}

SAMPLE LETTER TO APPLICANT

[APPLICANT'S NAME]
[ADDRESS]

Dear [APPLICANT'S NAME]

Reference is made to your application of [DATE] requesting approval to exhume the remains of late [NAME OF DECEASED] from *grave / vault / crypt No: _____, Section _____, [NAME OF PLACE OF INTERMENT OR CEMETERY] for the purpose of re-interment to [NAME OF PLACE FOR RE-INTERMENT].

Approval has been granted by the Director-General pursuant to clause 71 (1) (a) *Public Health Regulation* 2012, subject to compliance with the conditions specified in *Schedule A / Schedule B attached.

The funeral director and cemetery authority have been advised of the approval.

Should you have any inquiries please contact the authorised officer [EHO] on [TELEPHONE] or (EMAIL ADDRESS).

Yours sincerely,

[NAME]
Public Health Unit Director/Public Health Officer

APPENDIX 5

{LETTERHEAD}

SAMPLE LETTER TO CEMETERY AUTHORITY AND FUNERAL DIRECTORS

[NAME]
[ADDRESS]

[DATE]

Dear [NAME]

EXHUMATION OF THE REMAINS OF THE LATE [NAME OF DECEASED]

Approval has been granted for the exhumation of the late [NAME OF DECEASED] from *grave / vault / crypt No: _____, Section _____, [NAME OF PLACE OF INTERMENT OR CEMETERY] in accordance with clause 71(1) (a) of the *Public Health Regulation 2012,* and subject to compliance with the conditions specified in Schedule A / Schedule B attached.

A copy of the approval letter is attached for your information.

Should you have any inquiries please contact [Authorised Officer) on [TELEPHONE] or email address.

Yours sincerely,

[NAME]
Public Health Unit Director/Public Health Officer

Addendum 2

NSW Heath Permit Application form

APPLICATION TO EXHUME REMAINS

PUBLIC HEALTH REGULATION, 2012 Clause 70(2)

In accordance with the requirements of Clause 70 (2) of the Public Health Regulation 2012, I …….
(Full name of applicant)

…… of …… hereby
(Address)

apply for permission to exhume the remains of the late ……..
(Name of deceased)

from Grave No:…….., Section: ……, being a single

interment within the ……..……Cemetery, for the purpose of ……

……

I seek permission to exhume for the following reason/s:

……

The deceased: *(cross out which is not applicable)*

- was not known to be infected with a prescribed infectious disease as defined in clause 53 of the Public Health Regulation 2012; or
- was known to be infected with a prescribed infectious disease as defined in clause 53 of the Public Health Regulation 2012

I am entitled to make this application, because I am: *(tick one)*

1. [ ] The executor of the estate of the deceased; or
2. [ ] The nearest surviving relative of the deceased; or
3. [ ] If there is no such executor or relative available to make the application, another the proper person to make the application for the reasons set out below:

…….
(Full reasons for proper person to make application)

Attached is:

1. A certified copy of the death certificate of the deceased.
2. A statutory declaration as to:
   - My relationship to the deceased; and
   - the wishes of the deceased regarding the disposal of the body (if known);
   - the reasons why the Director-General may consider me the proper person in all the circumstances to make the application (if applicable)
3. The application fee of $……

The exhumation is to be supervised in strict accordance with the attached Plan of Management

by …….

employed with ……..(Funeral Director/Cemetery)

in the capacity of ……

Signature: ……. Date: ……..
(Applicant)

Addendum 3

Central Station Heath Permit

Public Health Unit

Health
Sydney
Local Health District

Fil Cerone
Director Environment, Sustainability and Planning Sydney Metro
Level 43, 680 George Street
SYDNEY NSW 2000

Dear Mr Cerone

Reference is made to your application of 16th January 2019 requesting approval to exhume the fragmented skeletal remains from an old burial vault at the former Devonshire Street Cemetery located at Central Railway Station near Platform 13. I note that this is for the purpose of salvage and reburial of the remains.

Approval has been granted pursuant to clause 71(1)(a) of the *Public Health Regulation 2012* to exhume and re-inter the remains, subject to the remains being treated with dignity and respect, and in compliance with Sydney Metro's *Exhumation Management Plan Version 2.0* (SMEMP2). If the remains are to be transferred to another cemetery for re-interment, a funeral director shall be contracted to transfer the remains to the cemetery and to carry out any necessary preparatory work for the safe reinterment of the remains. The remains are to be placed in a coffin for reinterment and an identifying plate with name (if known) or other identifying details should be attached. For example the plate might state "Unknown Burial from Former Devonshire St Cemetery, reinterred here on <date>".

This approval will extend to any further fragmented skeletal remains found at the former Devonshire Street Cemetery located at Central Railway Station in the areas being excavated for the new Sydney Metro, as shown on the site plan in Annexure A. Should any substantial remains, such as full or partial articulated skeletal remains, or other elements such as grave goods or coffin name plate be found on the site that could identify the interred, the Sydney Local Health District Public Health Unit (SLHDPHU) will need to be advised as soon as practicable. Additional assessment or further approvals may be required at that time subject to the nature of the discovery.

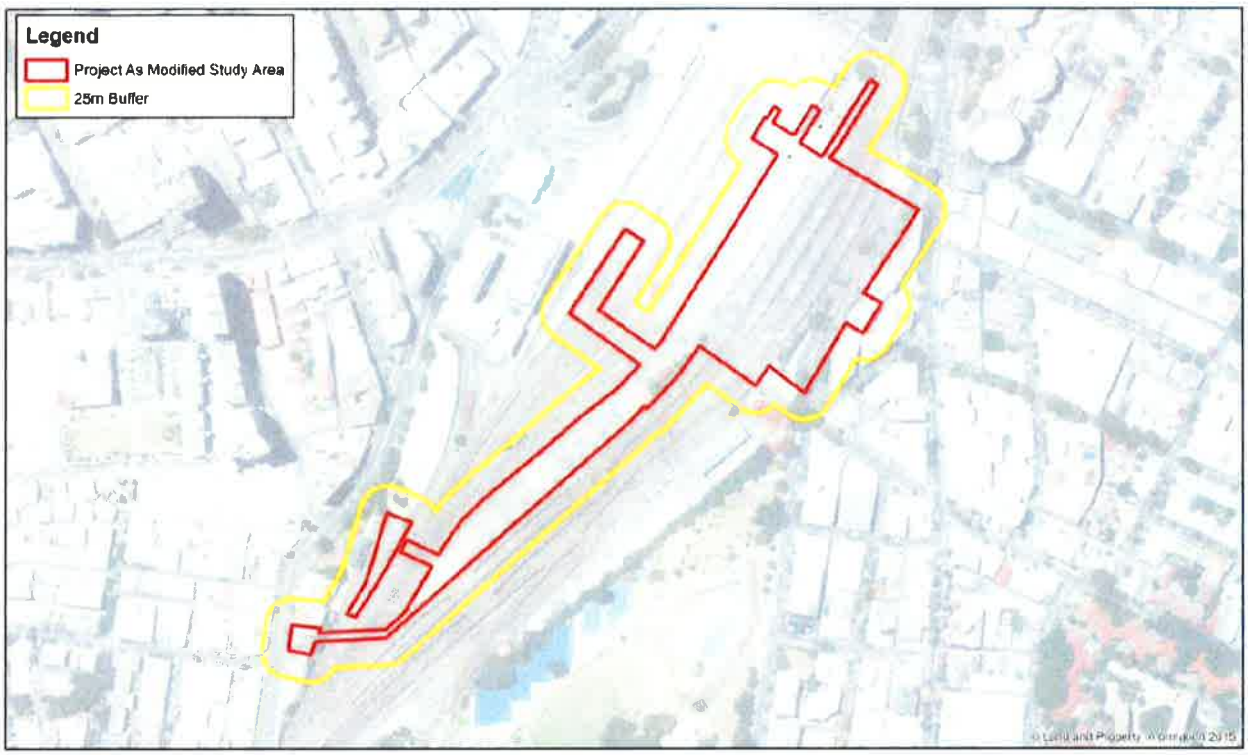
Should you have any enquiries, please do not hesitate to contact Geoff Tan, Environmental Health Officer on (02) 9515-9420.

Yours sincerely

Dr Zeina Najjar
Acting Director, Public Health

21st January 2019

Annexure A


Legend
Project As Modified Study Area
25m Buffer
N
Central Walk Project As Modified Study Area
Sydney Metro City and Southwest Chatswood to Sydenham
LGA: Sydney
SCALE
1:4,000
SIZE
@A4
DATE
12/04/2017
0
75
150
300
Metres
artefact

Appendix F
Heritage Wall Memo

MEMO

DATE: 4 July 2022 **AMBS Ref**: 20870M5

TO: [redacted]

FROM: [redacted]

SUBJECT: Statement of Heritage Impact: Installation of temporary stormwater pipes, High Street retaining wall and cutting, Barangaroo

The Sydney Metro & City Southwest project was approved by the Minster for Planning on 9 January 2017 as Critical State Significant Infrastructure. AMBS Ecology & Heritage (AMBS) was responsible for managing all heritage aspects of the Sydney Metro City & Southwest Chatswood to Sydenham Metro project TSE works, and production of the overarching Construction Heritage Management Plan for the project.

The construction of the new Barangaroo Station for the project involved substantial excavations for the station box in Hickson Road, adjacent to the High Street cutting and retaining wall. The Barangaroo Station site is within the *Millers Point & Dawes Point Village Precinct*, which is Item 01682 on the State Heritage Register (SHR). The Precinct has identified historical, associative, aesthetic, and social significance, research potential, rarity and representativeness. The High Street cutting and retaining wall (High Street wall) is a contributory element to item 01682 and shares its State significant heritage values.

In 2017 AMBS prepared the *Statement of Heritage Impact* (SoHI) for the protective measures; rock anchoring and protective mesh, used to protect the High Street Wall during construction of the station box under Hickson Road. Additionally, a memo prepared by AMBS in April 2018 outlined specific details regarding the method of fixing the rockfall protective mesh as well as recommendations surrounding its future removal. In 2021 AMBS prepared a management document for the removal of the protective mesh (20870M1).

The Minister's Condition of Approval relevant to the protection of heritage is:

> *E10 The Proponent must not destroy, modify or otherwise physically affect any Heritage item not identified in documents referred to in Condition A1 (which refers to the project EIS and PIR).*

The current proposal for temporary stormwater lines to be attached to the High Street wall is outside the scope of works covered by the project EIS and PIR. This SoHI has been prepared to address the potential heritage impact of the proposal.

This SoHI was written by Mike Hincks, AMBS Senior Historical Heritage Consultant, with advice from Jennie Lindbergh, AMBS Director Historic Heritage.

Proposal

The proposal is to temporarily divert stormwater lines that run between High Street and Hickson Road so that the drainage system can continue to function during the demolition of

the Hickson Road bridge. The Hickson Road bridge is a temporary structure that has been in place since 2018, and has allowed traffic to pass over the station box during construction. The stormwater lines that need to be diverted are vertical pipes that run down the face of the High Street wall. The lines have outlets into a large capacity pipe that is suspended beneath the Hickson Road bridge. The functioning of the suspended pipe cannot be maintained during demolition of the bridge.

The stormwater lines have been recessed into the retaining wall and cutting, and have been encased in concrete which has been rendered so that it is flush with the face of the wall. The proposed diversion involves cutting the concrete encasement to expose four of the pipes at four separate locations along the High Street wall. New connections will be added which will channel the stormwater into four PVC pipes that will be suspended along the length of the wall. The pipes are between 200mm and 350mm in diameter. These pipes will reconnect with the subsurface system at the northern end of the Hickson Road bridge.

Once the demolition is complete, and Hickson Road is permanently reinstated, the vertical stormwater lines will be directly reconnected with the large capacity system below ground, and the temporary pipes will be removed. It is expected that the temporary stormwater diversion will need to be in place for six months.

Heritage Context and Significance

The High Street retaining wall and cutting is a large-scale modification that was designed to allow the continuation of Sussex Street north along the steep and rocky shoreline to Miller's Point and Dawes Point. It incorporates both a cutting into sandstone bedrock and a retaining wall above. The wall and cutting together create a vertical face bordering the eastern side of Hickson Road for 300m from the Munn Street overbridge in the north, to the High Street Steps in the south. The wall forms the boundary between Barangaroo and Millers Point in the Sydney City Local Government Area (LGA).

The wall is a contributory element of the *Millers Point & Dawes Point Village Precinct* (SHR 01682). The Statement of Significance for the item makes particular reference to the setting and layout of the precinct, and the wall forms a distinctive landscape element in that setting. The Statement of Significance notes that the modifications and changes that have taken place in response to the engineering and building challenges on the peninsula have both capitalised on, and conflicted with its original form, which give it its unique character and are evidence of its development as a maritime cultural landscape:

> *The natural rocky terrain, despite much alteration, remains the dominant physical element in this significant urban cultural landscape in which land and water, nature and culture are intimately connected historically, socially, visually and functionally.*
>
> *…The postcolonial phase is well represented by the early 20th century public housing built for waterside workers and their families, the technologically innovative warehousing, the landmark Harbour Bridge approaches on the heights, the parklands marking the edges of the precinct, and the connections to working on the wharves and docklands still evident in the street patterns, the mixing of houses, shops and pubs, and social and family histories of the local residents.*
>
> *Millers Point & Dawes Point Village Precinct has evolved in response to both the physical characteristics of its peninsular location, and to the broader historical patterns and processes that have shaped the development of New South Wales*

since the 1780s… The whole place remains a living cultural landscape greatly valued by both its local residents and the people of New South Wales. (HO)

In February 2017, GML Heritage prepared a Heritage Assessment of the High Street wall. The report details the contributory value of the wall to the significance of the *Millers Point & Dawes Point Village Precinct.* The supporting Statement of Significance for the wall is:

> *The Hickson Road Retaining Wall is a significant, contributory built element within the Millers Point and Dawes Point Village Precinct and the Millers Point Conservation Area, an intact residential and maritime precinct of outstanding state significance. The retaining wall is a dominant and relatively intact component of the extensive alterations to the natural topography of Millers Point designed to facilitate the management of cargo into and out of the new two-level finger wharves. The wall incorporated steps at its northern and southern ends to provide improved access to the wharves for stevedores and wharf workers who resided in Millers Point.*
>
> *It provides a dramatic street edge to the eastern side of Hickson Road. The wall has landmark quality and displays an interface of fabrics, comprising the excavated rock face, cement render and masonry construction at the northern end of the wall. While there are varying degrees of erosion and deterioration to the stone/render, as well as intrusive fixtures, signage and penetrations, the retaining wall continues to define the edge of Millers Point and makes a positive contribution to the unique landscape character of Hickson Road.*
>
> *The Hickson Road Retaining Wall holds social significance as it forms part of the 'Hungry Mile', a historic stretch of Sydney's waterfront where men and women would walk from wharf to wharf in search of employment during the Great Depression of the 1930s* (2017:22-23)

Historical Context

A detailed history of the High Street wall and the surrounding area has been prepared by AMBS for the project in *High Street Cutting, Millers Point Statement of Heritage Impact* (AMBS Ecology & Heritage, 2017) and by GML in *Hickson Road Retaining Wall Heritage Significance Assessment* (GML Heritage, 2017). Comprehensive histories of the development of the Barangaroo station site and the local area including the High Street wall have also been prepared for the Barangaroo TSE works Archaeological Method Statement (Casey & Lowe, 2017) and the Barangaroo COP works Archaeological Method Statement (AMBS Ecology & Heritage, 2021).

These histories have been used to create and support the assessments and statements of significance which are referred to in this document and should be consulted if further background information is required. The below is a brief summary which contextualises the construction of the wall and its continued relevance to the local environment.

From the early nineteenth century, Millers Point was extensively quarried to supply the construction of housing and public infrastructure, such that the area around Kent and Windmill Streets was known as The Quarries. The quarry was worked by convicts who gradually formed the small local streets and modified the natural topography to form the escarpment which ran along Kent Street. The main access to the quarries and the few houses

in the area was a rough path along the Darling Harbour foreshore to the northern extremity of the Point and the three windmills.

As the shoreline around the town became increasingly developed, waterfront space was at a premium, and new wharfs and shipbuilding enterprises were forced to utilise the more difficult to access and less desirable parts of the harbour. As industry and trade intensified at the northern end of the eastern shore of Darling Harbour, pressures on the limited available access between - and to - the waterfront lots increased.

A new direct access was proposed from 1897 to connect the Maritime Services Board at West Circular Quay to the west side of the peninsular along Darling Harbour through Walsh Bay and Pyrmont to terminate at Harris Street. It was not until the establishment of the Sydney Harbour Trust that the proposal could be realised, and in 1909, work began on constructing Hickson Road. Between Munn Street and the present day location of the building at 30 Hickson Road, the process entailed cutting back the cliff face and constructing the retaining wall supporting High Street. The reinforced concrete bridges over Munn, Windmill and Argyle Streets were completed between 1910 and 1914.

The section along Hickson Road that is defined by the High Street wall is today representative of the depression-era district known as the 'Hungry Mile.' The name was given to the mile of wharves between Darling Harbour and Millers Point by the maritime workers who walked in the hope of casual low-paid work each day from the early twentieth century into the 1940s.

Analysis of the Proposed Works

Description of the works

The proposed works involve the temporary relocation of a stormwater line, which is currently suspended from the deck of the temporary bridge supporting Hickson Rd. The stormwater pipe is to be relocated to the side of the Hickson Road wall using existing rock anchor brackets, and connecting it to the existing downpipes which are located behind the wall encased in concrete. The stormwater line will be connected into an existing pit (SWP-4) and discharged through the existing stormwater drainage line to the north of the Hickson Road bridge.

The diverted stormwater line will be removed from the High Street wall prior to completion of the project, and the apertures in the High Street wall will be made good with like-for-like material.

Reason for the new works

The existing pipe that is suspended beneath the Hickson Road bridge has broken on three occasions due to failures at the joint connections and the increased volumes created by recent heavy downpours. The ruptures have caused flooding of the station box. If the suspended stormwater line were to remain active during the demolition, there would be considerable risk of increased damage to the connections, and further flooding.

The existing service cannot be protected in such a way that the Hickson Rd bridge can be safely demolished without damaging the stormwater pipe. The constraints at the site are such that it would not be possible to provide feasible safe access into the work area to rectify any damage that may be caused if the existing pipe failed during demolition.

This proposal allows for a temporary stormwater to be installed and left in situ until the permanent stormwater has been completed without having to break the line and create

multiple stages of temporary connections, which would also increase the risk of flooding in a heavy weather event.



Figure 1: Location of the High Street wall, downpipes (SBR) and length of the diversion.

Area to be affected

The diversion will run along 171m of the 300m-long wall and will involve attaching four PVC pipes. The pipes are between 200mm and 350mm in diameter. Each pipe will connect to a separate downpipe (Table 1).

Table 1: Length of diversion

Downpipe No.	Length of diversion	Location
SBR 3.2	171m	100m north of High Street Steps
SBR 3.3	127m	144m north of High Street Steps
SBR 3.4	110m	161m north of High Street Steps
SBR 3.5	47m	223m north of High Street Steps



Figure 2: Illustration of the diversion.



Figure 3: Location of downpipe SBR 3.2.



Figure 4: Location of downpipe SBR 3.3.



Figure 5: location of downpipe SBR 3.4.



Figure 6: Location of downpipe SBR 3.5.

Connection to the existing downpipes

The concrete covering the downpipes will be cut in an area of 400mm x 400mm to expose the existing pipe and allow a new connection to be made. The cutting methodology will utilise a stitch core method to ensure that only the concrete within the recess created for the downpipe is cut and that the cut does not extend into the adjacent sandstone. A stitch core

method involves drilling multiple holes which are overlapped to form a continuous cut. Typically, this method of core drilling replaces conventional concrete sawing when the overcutting of corners cannot be made either for structural or aesthetic reasons. The drilling of core holes in the corners of the concrete section to be removed means that a saw blade does not have to be passed beyond the margin of the corner. The method also makes a cleaner, more precise cut because there is no overcutting involved. Four holes in total will be cut in the location of four different downpipes along the length of the High Street wall.

Attaching the new pipes to the High Street wall

The 400mm x 400mm apertures will allow the connection of an L-shaped joint to each of the downpipes. The L-shaped joint will connect into a PVC pipe attached to the face of the wall by wire hung from the existing mesh anchors. The wire will have a safe working load of 2000kg and will utilise the existing rock bolts located at 3m intervals along the length of the diversion.

Removing the temporary stormwater diversion

The downpipe connections will be reinstated below ground and the apertures repaired with cement render to match the existing. The PVC pipes will be removed from the face of the wall. Full photo-documentation of the wall will be undertaken prior to installation of the diversion to ensure that the new render will replicate as best as possible the appearance of the wall before the works.

Physical Analysis of the Wall

The downpipes appear to have been installed when the retaining wall was constructed, as they have been covered with the same render to produce a uniform finish. The render has been scored to replicate large masonry blocks, and the scoring has been applied over the covered downpipes. At the location of SBR 3.2, the render has cracked around the downpipe, and the location of the service is visible at the surface. At the location of SBR 3.3, the location of the downpipe is not clearly visible at the surface, but the render is in poor condition, and is showing signs of water damage beneath the surface. Some render has come away from the underlying concrete.

At the location of SBR 3.4, the render is in extremely poor condition and is being undermined by water penetrating the concrete behind, and by vegetation growing in the increasingly cracked surface. At the location of SBR 3.5, the concrete encasing the downpipe has not been rendered in the same fashion, and the service cut is exposed in the sandstone bedrock of the cutting.

The concrete retaining wall is showing signs of water damage in many places in the form of staining and cracking of the render. Where patches have fallen off, the fabric of the structure of the wall is exposed. The original render has a high shell content, it is however also very strong indicating a mix of shell lime with Portland cement, unlike areas of modern patch repairs which appears to be a Portland cement without the inclusion of shell lime. The original render was applied in up to three layers, with each layer scored to provide purchase for the next layer. In addition, there at least some sections of concrete with a dense gravel aggregate.

There are also generations of attached services, including a series of relatively modern street lights, bolted to the face of the wall, and exposed gaps have been colonised by ferns and grasses.



Figure 7: Cracking at the location of SBR 3.2.



Figure 8: Cracks in the render at the location of SBR 3.3 (prior to the installation of the protective mesh).



Figure 9: Cracking and intrusive vegetation at the location of SBR 3.4.



Figure 10: Concrete within the service cut in the sandstone at the location of SBR 3.5.



Figure 11: A section of the cutting and wall. The render is scored to replicate masonry blocks and is aligned along the line of the natural bedrock, above which the underlying sandstone blocks have been exposed.



Figure 12: A patch of modern cement render surrounded by the original render. The white flecks are shell fragments.



Figure 13: Exposed patches of render indicate that at least some sections have three layers of render and the lower layers are pecked to create a rough surface for the next layer.



Figure 14: A collection of existing services attached to the wall.

Assessment of Heritage Impact

The proposed diversion of the stormwater along the High Street retaining wall and cutting has the potential to affect the State heritage significance of the *Millers Point & Dawes Point Village Precinct*. The High Street Retaining Wall has been identified as having historic, aesthetic and social significance, and should also be considered to have technical significance. The proposed temporary diversion represents a change to the High Street cutting and retaining wall, the impact of which is assessed below.

The following aspects of the proposal respect the heritage significance of the item or conservation area for the following reasons:

The proposal is to install temporary pipes along 171m of the wall in order to maintain active drainage of High Street during the demolition of the Hickson Road bridge. The provision of adequate, uninterrupted drainage to the higher ground is essential for the long-term preservation of the High Street wall, which is already showing signs of damage from groundwater penetrating the rock and concrete behind. The temporary diversion would ensure the maintenance of this service and avoid contingency works due to flooding of the station box during demolition of the bridge, which would involve unplanned works in the vicinity of the wall.

The methodology has been designed to avoid impacts to the wall by suspending the temporary lines from existing rock bolts that have been installed to hold the protective mesh in place. New penetrations have been limited to four 400mm x 400mm apertures in the concrete covering the downpipes, and will not damage either the structural concrete of the wall, or the sandstone of the cutting. This methodology respects the heritage significance of the wall. The apertures will be repaired with like material to minimise the visual effect on the retaining wall.

Overall, the proposal to maintain continuous active drainage of the high ground above and behind the wall, and the avoidance of unplanned contingency works due to flooding in the vicinity of the wall maintains the heritage significance of the contributory heritage items in the vicinity, and of the *Millers Point & Dawes Point Village Precinct* in general.

The following aspects of the proposal could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:

The temporary addition of four PVC pipes to the face of the wall will have an adverse effect on the aesthetic values of the wall. The assessment of significance for the wall recognises that:

> *The wall is aesthetically significant and exhibits landmark quality with its dominant, fortress-like scale and gradual dipping in response to the V-shaped original topography of what became High Street. It also displays an interesting interface of fabrics, comprising the excavated rock face, cement render and masonry construction at the northern end of the wall.*

The penetrations in the concrete surrounding the downpipes have been minimised to 400mmx 400mm and will have a minor or negligible impact on the wall, which will not affect the significant fabric of the structural concrete or sandstone, but may remove some damaged render which is in need of repair. However, these impacts will not affect the landmark aesthetic of the wall or reduce its readability and significance in the landscape.

Penetrations into the concrete encasing the services shall be limited to the smallest area possible, and those areas made good in a manner in keeping with the heritage significance of the wall.

The large pipes would disrupt the flat face of the wall, and the appearance of a hard edge to Hickson Road and the Miller's Point precinct in general, which the wall represents. The pipes would hide the interface of fabrics and rock face, and obfuscate the exposed construction techniques which are visible in the face of the wall.

However, the visual impacts should be considered in the context of the current Hickson Road environment. Approved construction works, including the demolition of the temporary bridge over Hickson Road immediately in front of the wall, will be taking place for the duration of the temporary stormwater diversion. Views to and from the item during this time will be obscured and limited by the lack of public access, and the movement, use and installation of plant and construction infrastructure that will be required to undertake the works. In this context, the new works are unlikely to significantly alter the existing approved visual impact. As such there will be a minor temporary impact on the aesthetic significance of the High Street wall as an integral element of the *Millers Point & Dawes Point Village Precinct*.

Statement of Heritage Impact

The High Street cutting and retaining wall is a contributory element of the state heritage significant *Millers Point & Dawes Point Village Precinct*. The cutting and retaining wall is a prominent landmark defining the separation of wharfage from the residential areas of Millers Point. The cutting and retaining wall has particular social significance as part of the 'Hungry Mile', the name given to the mile of wharves between Darling Harbour and Millers Point by the maritime workers who walked in the hope of casual low-paid work each day from the nineteenth century into the 1940s. As such, protection of the heritage significance of the High Street cutting and retaining wall as an element of the *Millers Point & Dawes Point Village Precinct* has been an important consideration in the design of the temporary stormwater diversion.

The temporary pipes would be in place only during the demolition of the Hickson Road bridge and the works to reinstate Hickson Road. These works will severely limit access and views to and from the item, minimising the visual impact that the installation of the pipes will create. The design which allows the pipes to be suspended from existing rock bolts means that the temporary impacts of the additional pipes are reversible. There is some potential for damage to the render of the retaining wall while cutting into the non-structural concrete surrounding the downpipes, which would be avoided by ensuring that the original fabric is protected against inadvertent damage wherever possible. The render in the locations of the penetrations is badly damaged and in need of repair. Any damaged render that is removed would be made good to match the surrounding colour and texture. Where significant damage exists, or there are intrusive discolourations, a selected section/component of original work will be nominated by the heritage consultant, in consultation with the contractor, as a suitable sample for matching. There will not be an impact on the historic, aesthetic or social significance of the High Street cutting and retaining wall in the long-term. There will be a minor short-term impact on the heritage significance of the *Millers Point & Dawes Point Village Precinct*, in its entirety.

The proposal to install a temporary stormwater diversion during the demolition of the Hickson Road bridge avoids unplanned contingency works in the vicinity of the wall, should the existing pipe fail again during demolition. The proposal will have a negligible effect on the heritage significance of the High Street cutting and retaining wall and no long-term effect on the state heritage significance of the *Millers Point & Dawes Point Village Precinct* in its entirety.

Mitigation

Article 3 of the Burra Charter recommends a conservation approach based on a respect for the existing fabric, use, associations and meanings. It requires a cautious approach of changing as much as necessary but as little as possible. Repairing any damaged render ensures that the least possible damage is done to the retaining wall, which is in accordance with Burra Charter principles. The repair material will be as near to the surrounding fabric in composition as possible to minimise an adverse effect on the aesthetic significance and to avoid damage to the original render.

The following recommendations are aimed at ensuring that heritage values are protected:

Recommendation 1

> *A photographic recording of the affected areas should be made prior to and on completion of works to ensure that there is a record of the changes to the face of the wall. The recording should be in accordance with the Heritage Council guideline publication* Photographic Recording of Heritage Items Using Film or Digital Capture *(revised 2006).*

The significance of the High Street cutting and retaining wall as a contributory item of the state heritage *Millers Point & Dawes Point Village Precinct* should be understood by all on-site staff and construction team to ensure that no inadvertent damage is done to the wall.

Recommendation 2

> *Prior to works commencing, all on-site staff should be briefed on the heritage requirements of the High Street Cutting and retaining wall, its heritage significance and the value of its fabric.*

There is potential for damage to the wall during the process of installing the temporary lines, and during the cutting of the concrete surrounding the downpipes. Care should be taken during the concrete cutting to avoid damage to the surrounding fabric .

Recommendation 3

> *The original fabric of the cement render has a high lime content. Any new render should be matched in the patches to ensure that the existing render does not crack or collapse due to the difference in hardness. Any inadvertent damage should be made good.*

Repairs should be made in accordance with the *Hickson Road Retaining Wall Barangaroo Conservation Policy and Guidelines* (GML Heritage 2021):

> *New render repairs are to involve only necessary patching which match in mix/composition, colour, grain and texture (note: the render has visible shell aggregate in the mix). Patch the wall with a matching render in colour and texture. All new render is to respect/recreate the scored ashlar pattern which imitates large blockwork units. A specification should be prepared for all future render repairs. This would involve, in the*

first instance, render sample analysis (to determine materials composition/mix), sourcing of matching materials (including visible shell aggregate) and application methodology.

A heritage architect should specify the mortar mix used in any repairs.

Statutory Obligations

The construction of the new Barangaroo Station is part of the Sydney Metro City & Southwest Project which has been approved as Critical State Significant Infrastructure. However, the current proposal for temporary stormwater lines to be attached to the High Street wall is outside the scope of works covered by the project EIS and PIR.

The Hickson Road Retaining Wall is within the SHR-listed *Millers Point and Dawes Point Village Precinct* (SHR 01682). As such, the provisions of the Heritage Act apply in regard to heritage impacts on the SHR item.

Standard exemptions under Section 57 (1) of the Heritage Act for works requiring Heritage Council of NSW approval may apply to works which are minor in nature and will have a minimal impact on the significance of the place.

Effective 1 December 2020, the Special Minister of State has granted new exemptions from subsection 57(1) of the Heritage Act. Standard exemptions do not permit the removal of any significant fabric. Significant fabric means all the physical material of the place/item, including elements, fixtures, landscape features, contents, relics and objects which contribute to the item's heritage significance. Standard exemptions also do not permit the removal of relics or Aboriginal objects.

These standard exemptions are available to the owner of a listed item or item subject to an Interim Heritage Order, or any person with the consent in writing of that owner, or if the item is situated on Crown Land, as defined in the Crown Land Management Act 2016, the lawful occupier.

The standard exemptions are self-assessed and involve the following process and responsibilities:

- It is the responsibility of a proponent to ensure that the proposed activities/works fall within the standard exemptions.
- The proponent is responsible for ensuring that any activities/works undertaken by them meet all relevant standards and have all necessary approvals.
- Proponents must keep records of any activities/works for auditing and compliance purposes by the Heritage Council. Where advice of a suitably qualified and experienced professional has been sought, a record of that advice must be kept. Records must be kept in a current readable electronic file or hard copy for a reasonable time.

The proposed works to the Hickson Road Retaining Wall are exempt from the need for approval under Section 60 of the Heritage Act as they satisfy Standard Exemption 5: Repair or Replacement of Non-Significant Services.

The proposed works will not impact the significant fabric of the High Street wall. Penetrations will be limited to the concrete encasement of existing services in areas where the render has been significantly damaged or is non-existent and does not contribute to the heritage values of the item. Impacts to significant views and landscapes are temporary and negligible in the context of approved works currently taking place along Hickson Road.
The temporary services will utilise existing hardware to attach to the High Street wall. The temporary pipes will be largely obscured by approved construction works along Hickson Road which will negate any visual impact.

All replacement services are temporary. There will be no permanent or long-term surface-mounted services. Existing service routes will be reinstated following the temporary works. Repairs to the penetrations will match the existing render in accordance with the *Hickson Road Retaining Wall Barangaroo Conservation Policy and Guidelines* (GML 2021).

The proposed works are minor in nature and will have a negligible impact on the significance of the *Millers Point and Dawes Point Village Precinct* (SHR 01682).

References

AMBS Ecology & Heritage (2017) *High Street Cutting, Millers Point Statement of Heritage Impact.* Consultancy report to John Holland CPB Ghella Joint Venture.

AMBS Ecology & Heritage (2018) *High Street Wall Rockfall Protective Mesh, Memo.* Prepared for John Holland CPB Ghella Joint Venture.

AMBS Ecology & Heritage (2017) *High Street Cutting, Millers Point Statement of Heritage Impact*, Report to John Holland CPB Ghella Joint Venture.

AMBS Ecology & Heritage (2021) *Barangaroo Metro Station Construct Only Package (COP) Historical Archaeological Method Statement*, Report to BESIX Watpac May 2021.

Casey & Lowe (2017) *Barangaroo Station Hickson Road, Barangaroo Sydney Metro Project Archaeological Method Statement*, Report to AMBS on behalf of John Holland CPB Ghella JV.

GML Heritage (2017) *Sydney Metro City & Southwest Technical Services: Hickson Road Retaining Wall Heritage Significance Assessment Technical Report* Report prepared for AECOM Australia and Parsons Brinckerhoff Australia on behalf of Transport for NSW Sydney Metro City & Southwest.

GML Heritage (2021) *Hickson Road Retaining Wall Barangaroo: Conservation Policy and Guidelines*, Report prepared for Sydney Metro April 2021.

Appendix G
Sandstone Block Removal Methodology

721 – Barangaroo Metro Station

21/09/2022

Ref: Removal of Sandstone Blocks in Zone 5 (Nawi Cove) – Construction Methodology

CONDENSED WATER – SANDSTONE BLOCK & STREET FURNITURE REMOVAL

1. OVERVIEW

The installation of the new condensed water line within zone 5 involves deep trenching and sheet piling within along Nawi Cove by the Cutaway. To commence these works, all sandstone blocks in the alignment of the sheet piles will need to be removed to prevent any damage that may occur.

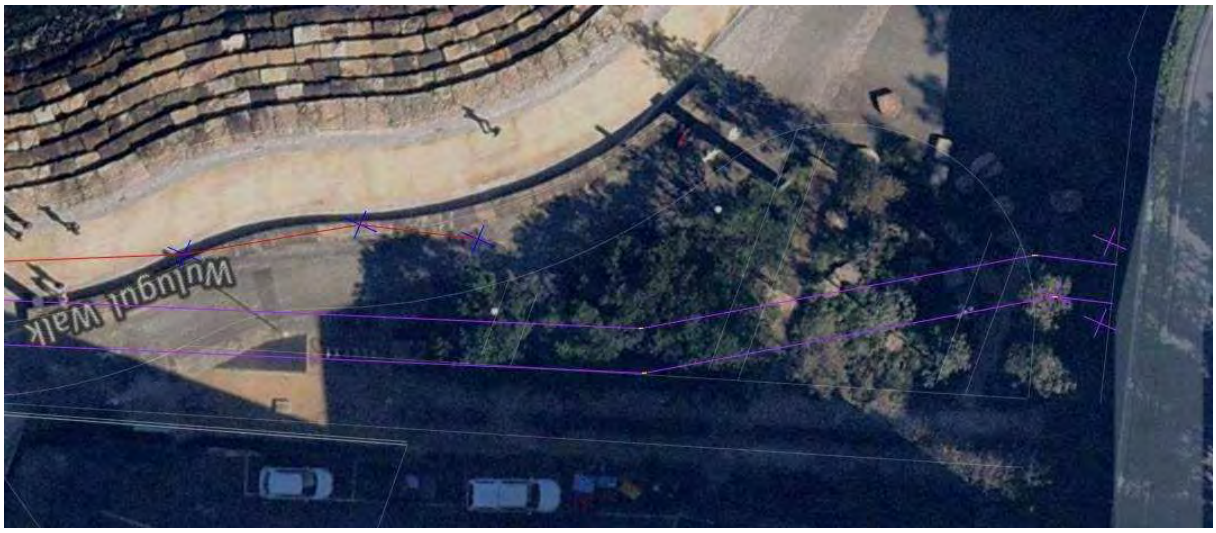


Figure 1: Snip from Nearmaps showing alignment of trench (purple)



Figure 2 – Street view of sandstone blocks to be removed

2. METHODOLOGY

Sandstone Blocks

The sandstone blocks in Nawi Cove are placed in a distinct pattern consisting of a tiered block wall and scattered blocks in the garden beds. Ward will undertake the following steps during the removal of these blocks to ensure that the area is returned to its current state post completion of the condensed water line:

1. A dilapidation report of sandstone blocks in their existing position.
2. The position of each block arrangement will be surveyed and recorded on the asset register with ID numbers corresponding to the dilapidation report (see *Figure 3)*

WARD

Asset Register

Date Recorded	Description	ID Number	Easting	Northing	Comments
22/08/2022	Sandstone Block	1			NE Corner
22/08/2022	Sandstone Block	2			NW Corner

Figure 3: Sample of Asset Register

3. The base of each block is to be exposed using a 5T/14T Excavator. Note: in some instances, there are blocks with concrete footings (see *Figure 4*). In this case, once exposed, the footing will be removed using hand tools.



Figure 4: Concrete footing beneath sandstone blocks

4. Once loose, each block is to be:

a. Lifted out of position using a forklift or posi track with a fork attachment, where a carpet mat is firstly slid under the block and the forklift lifts the block from under the carpet; and/or

b. Lifted out of position using a 5T or 14T Excavator (depending on block size), using slings or a rubber padded grab attachment (see *Figure 5*); then

transferred onto a pallet and photographed with its identification card (ID number)



Figure 5: Rubber padded grab attachment

5. Each block will be wrapped for protection. The ID number of the stone will be encased under the wrap.
6. Each pallet will then be transferred onto a flatbed truck. It will then be transferred on the flatbed truck to secure location on-site.
7. At that secure location, each pallet will be lifted from the truck using forklift or posi track with a forklift attachment and placed in the storage location. Once placed, another photograph will be taken in its storage location with the ID number visible.
8. The process will be followed in reverse to transport the blocks back to Barangaroo and replace them in their original position. This includes survey set out of block location confirming they are returned to their original location.

Safe Health Environment Work Method Statement

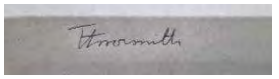
SMCSWSBR-WCE-SBR-CE-SWMS-000006 – Barangaroo Metro Station – Lifting

SHEWMS Details					
Company Name:	**Ward Civil and Environmental Engineering**	ABN/ACN:	65 098 942 459	Date:	23/08/2022
Project Name:	Barangaroo Metro Station	**Project No.:**	721		
Workplace Address:	Hickson Road	**Project Manager:**	Michael Wright		
Client:	Watpac	**Supervisor:**	Shane Morrissey		
SHEWMS Name:	Lifting	SHEWMS No.:	721-06		
Version:	D	Review Date:	23/02/2022 or post incident		
Consultation Method and Review Period:	Prepared by means of site meeting/toolbox. SHEWMS to be reviewed 6 monthly and/or following an incident	**Other requirements:**	Task observation to be completed to confirm activities are carried out as per SHEWMS		
Plant/Equipment used	Mobile Crane /Excavator Chains, Slings, hooks, shackles, Kibble	Hazardous Substances/Chemicals Used	Diesel Grease		Engine Oil Hydraulic Oil
Competency, Licences and/or qualification required:	VOC for Excavators/Dogman, high risk licence for crane operators	Reference Material (Code of Practice, Legislation, Standards etc.):	Work Health and Safety Act 2011 Work Health and Safety Regulations 2017 How to manage work health and safety risks – Code of Practice 2011 Construction work – Code of Practice 2013 AS3775.2: 2014 Chain slings for lifting purposes		

SHEWMS Approval					
SHEWMS Prepared by:	Colm Drumgoole	Signature		Date:	23/08/2022
SHEWMS Prepared in Consultation with:	Shane Morrissey	Signature		Date:	23/08/2022

Safe Health Environment Work Method Statement

SMCSWSBR-WCE-SBR-CE-SWMS-000006 – Barangaroo Metro Station – Lifting

SHEWMS Prepared in Consultation with:	Todd Arrowsmith (HSR Rep)	Signature		Date:	23/08/2022
SHEWMS Approver (Project Manager):	Michael Wright	Signature		Date:	23/08/2022

Permits Required									
☐	Confined Space Entry Permit	☐	Permit to Disturb and Excavate	☐	Lock out Tag Out Permit	☐	Working at Heights Permit	☐	Hot Work Permit
☒	Lifting Permit	☐	Access Permit	☐	Other	☐		☐	

High Risk Construction Work Indicate (☒) high risk construction work associated with the Activity/Task									
☐	A risk of **falling** more than 2 meters	☒	Work on, in or adjacent to a **traffic**	☐	In or near a **confined space**	☐	Temporary support for **structural alteration**	☐	Work involving **tilt up/pre-cast concrete**
☐	Work that involves a risk of **drowning**	☒	Working around powered **mobile plant**	☐	Work on, in or adjacent to a **railway**	☐	Work on or near **pressurised gas** mains & piping	☐	Work in **flammable/contaminated atmosphere**
☐	Removal/disturbance of **asbestos**	☒	On or near **electrical** installation/ service	☐	**Diving** work	☐	Work in **artificial temperature extremes**	☒	**Trenches/Shafts** deeper than 1.5 metres
☐	Work on a **telecommunication tower**	☐	**Demolition** of load-bearing structure	☐	Work that involves **explosives**	☐	Working on **chemical or fuel lines**	☐	Other:

Personal Protective Equipment												
MANDATORY							TASK SPECIFIC					
Long sleeves	Long pants	Safety Footwear	High Vis' Clothing	Hard Hat	Safety Eyewear	Gloves	Hearing	Dust Mask	Respirator	Face Shield	Other	Other
☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☐	☐	☐

Risk Control of Hierarchy		
BEST ⇕ WORST	1	Elimination: e.g. remove risk of electrocution by using compressed air driven tools.
	2	Substitution: e.g. Use a safer Chemical.
	3	Isolation / Separation: e.g., energy isolation
	4	Engineering Controls: e.g. Guards on power tools, effective barriers & edge protection, enclose noisy machinery, use machines to lift heavy loads.
	5	Administrative Controls: e.g. Training in lifting techniques
	6	Personal Protective Equipment: PPE

Risk Matrix	Consequence				
Likelihood	**Insignificant**	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost Certain	Low (7)	High (16)	Extreme (20)	Extreme (22)	Extreme (25)
Likely	Low (6)	Medium (12)	High (17)	Extreme (21)	Extreme (24)
Possible	Low (5)	Low (8)	Medium (13)	High (18)	Extreme (23)
Unlikely	Very Low (2)	Very Low (4)	Low (10)	Medium (14)	High (19)
Rare	Very Low (1)	Very Low (3)	Low (9)	Low (11)	Medium (15)

Residual Risk	Actions Required
Extreme (20-25)	Task cannot start. Permission from CEO in writing is required to proceed if risk cannot be lowered to an acceptable level (i.e. 15 or lower).
High (16-19)	Task cannot start. Permission from Senior Management in writing is required to proceed if risk cannot be lowered to an acceptable level (i.e. 15 or lower)
Medium (12-15)	Task can commence with a combination of Risk Control Levels 1-4 (High level controls) and 5-6 (Low level controls).
Low (5-11)	Task can commence under the following actions: a) Implement the risk control solutions as documented. b) Monitor and review effectiveness of risk control solutions as scheduled.
Very Low (1-4)	Task can commence under the following actions: a) Implement the risk control solutions as documented. b) Monitor and review effectiveness of risk control solutions as scheduled.

Descriptor	Example Detail Description – Health and Safety	Example Detail Description - Environment
Insignificant	No Injuries or health issues	Marginal environmental impact (contained on site) which can be resolved by day to day operational procedures
Minor	Minimal impact on health, First Aid Treatment	Environmental impact is minor, on site release and is reversible, immediately contained, remediation is achieved with application of internal resources, not reportable
Moderate	Medical Treatment, Potential LTI	Temporary environmental impact, off site release, contained with outside assistance, unauthorised damage or harm to native vegetation, threatened species, endangered populations or critical habitat, duty to notify regulator
Major	Extensive Injuries, Single Permanent disability or long term illness or disease	Substantial environmental impact with off-site release, rectification is difficult, unauthorised damage or destruction to any state or locally significant relic or heritage item, emission of excessive levels of dust or an offensive odour or noise that may affect neighbours
Catastrophic	Fatality(ies) or Total Permanent Disability(ies)	Highly significant environmental impact, reportable to regulator release off site with detrimental effect to surrounding environment & community, requires major clean up, fines may apply along with director liability, loss of social license

Rare	The event may occur in exceptional circumstances	0-5%	Has occurred or can reasonably be considered to occur only a few times in 100 projects
Unlikely	The event could occur at some time	5% - 35%	Has occurred 2 or 3 times over the last 10 projects
Possible	The event should occur at some time	35% - 65%	Has occurred in this organisation more than 3 times in the last 10 projects or is considered to have a reasonable likelihood of occurring in the next few projects
Likely	The event will probably occur in most circumstances	65% - 95%	Has occurred more than 7 times in this organisation over the last 10 projects or circumstances have it such that it is likely to happen in the next few projects
Almost Certain	The event is expected to occur in most circumstances	95-100%	Has occurred 9 or 10 times in the last 10 projects in this organisation or circumstances are in train that will almost certainly cause it to happen

SAFETY								
#	Work Activity (Chronological Order)	Hazards (What can hurt you)	Untreated Risk Assessment			Controls (Controls required to eliminate or minimize the potential for injury of harm based upon the hierarchy of control)	Residual Risk Rating	Control Owner
			L	C	Rating			
1	Excavator on site	▪ Worker and Excavator collision ▪ Damage to Mobile Plant or other assets ▪ Equipment failure/breakdown	Possible	Catastrophic	Extreme	▪ Plant induction including risk assessments, inspection checklists, service records, logbooks and OEM manuals for all new equipment arriving to site ▪ Daily Plant Prestart to be carried out ▪ Ensure Plant Risk Assessment is signed by Operator. ▪ Verify Excavator has been serviced and maintenance carried out as per manufacturers recommendations. ▪ Operator to have current VOC ▪ ROPs, FOPs and TOPs to be fitted to plant where there is a risk of falling objects, rollover or tip-over	Medium	Supervisor/ Operator
2	Establish exclusion zones	▪ Pedestrians and other site personnel not aware of lifting operation and enter the exclusion zone area	Possible	Catastrophic	Extreme	▪ Install physical markers (flagging, concrete barriers, water filled barriers) delineating crane work area & planned travel path ▪ Warning signage to be installed ▪ Ensure there are alternative access points for other crews working in the area if possible. Physical barriers to be installed separating pedestrians and mobile plant. ▪ Spotter to be in place for all lifts	Medium	Supervisor & Crew
3	HRCW- Working around powered **mobile plant** Slinging loads	▪ Lifting Equipment Failure. ▪ Unstable loads from incorrect rigging techniques, loads falling from height.	Possible	Catastrophic	Extreme	▪ Only certified lifting gear is to be used that has an adequate lifting capacity for the lift. ▪ Ensure excavator/crane is working within the safe working load capacity ▪ Ensure load being lifted has evenly distributed weight across slings/chains & weight does not exceed lifting capacity. ▪ Hands, feet and fingers to be clear of pinch points ▪ Lifting methodologies to be discussed with crew for scope of works and agreed upon prior to any work starting, approved lifting permit in place ▪ No dogman required if the following occurs	Medium	Dogman Operator Dogman Dogman Dogman/ Supervisor Dogman

SAFETY								
#	Work Activity (Chronological Order)	Hazards (What can hurt you)	Untreated Risk Assessment			Controls (Controls required to eliminate or minimize the potential for injury of harm based upon the hierarchy of control)	Residual Risk Rating	Control Owner
			L	C	Rating			
						▪ If There are predetermined and certified lifting points on the load ▪ The weight of the load – or load within a weight range- has been pre-determined ▪ The lifting gear has been tested and tagged and within inspection periods ▪ The load is always in view of the plant operator ▪ Qualified Dogger/Rigger to carry out a thorough check of lifting gear before lifting ▪ Exclusion Zones installed prior to lift ▪ Defective lifting gear to be locked and tagged out ▪ Ensure right lifting equipment is available for the task and used as per manufacturer instructions ▪ Ensure approved lifting permit is completed prior to lift.		Supervisor Dogman Supervisor/ Dogman Supervisor Supervisor
		▪ Ground failure	Unlikely	Catastrophic	High	▪ Visual inspection of ground conditions to be completed for routine lifts ▪ Geotechnical advice to obtained for non-routine lifts	Medium	Supervisor or Geotechnical Engineer
4	HRCW- Working around powered **mobile plant** Transport & Slew load into position.	▪ Falling Loads, Load ▪ Crane collision with obstacles & other plant or persons.	Unlikely	Catastrophic	High	▪ Establish exclusion zone around load movement area. ▪ Ensure load being lifted and moved has been correctly dogged prior to lifting. ▪ Excavator /crane operator to verify load weight in relation to the plant capacity before moving load. ▪ Tag lines to be used to control the load always ▪ Lift loads with caution and keep load as close to the ground as possible.	Low	Operator/Dogman Dogman Operator Dogman Operator

SAFETY								
#	Work Activity (Chronological Order)	Hazards (What can hurt you)	Untreated Risk Assessment			Controls (Controls required to eliminate or minimize the potential for injury of harm based upon the hierarchy of control)	Residual Risk Rating	Control Owner
			L	C	Rating			
						▪ Ensure constant communication between operator and rigger always. ▪ NO PERSON TO BE UNDER A SUSPENDED LOAD AT ANY TIME FOR ANY REASON ▪ Excavator to be fitted with Anti burst valves ▪ All crane and hoisting equipment to be in accordance with lift plans		Operator/Dogman All Supervisor Operator/Dogman
		▪ Contact with overhead powerlines	Possible	Catastrophic	Extreme	▪ Tiger tails and flagging to be installed for overhead powerlines ▪ Danger signage, voltage and height of powerlines identified ▪ VOC Spotter to be used when near lifting near overhead powerlines ▪ Ward working near overhead powerlines permit to be in place ▪ Hazard to be identified and discussed during daily pre-start	Medium	Supervisor
5	Emergency response	▪ Emergency, fire explosion, etc. ▪ Injury to personnel ▪ Property damage	Unlikely	Major	High	▪ Stop operation and follow Ward Emergency Procedure. ▪ Isolate equipment (if safe to do so) ▪ Remove or isolate any potential Hazards (only if safe to do so) ▪ Attempt to control emergency (if safe to do so)	Low	Supervisor/Work crew
6	HRCW- Working around powered **mobile plant** Positioning, Landing and Releasing Load	▪ Load Moving or slipping. ▪ Injury to personnel	Possible	Catastrophic	Extreme	▪ Ensure constant positive communication between operator and dogman always. ▪ Dogman to stand clear of load crush points always, using a tag line to control the load. ▪ Load landing area must be able to support the load weight. ▪ All personnel to use correct lifting techniques for placement of dunnage and packing away lifting equipment. ▪ Ensure that the load is made secure and supported so that it cannot move or slip before the full weight is removed from crane.	Medium	Operator/Dogman Dogman Operator Dogman Dogman/Supervisor

SAFETY								
#	Work Activity (Chronological Order)	Hazards (What can hurt you)	Untreated Risk Assessment			Controls (Controls required to eliminate or minimize the potential for injury of harm based upon the hierarchy of control)	Residual Risk Rating	Control Owner
			L	C	Rating			
7	HRCW- Work on, in or adjacent to a **traffic** Working near live traffic	▪ Collision other plant ▪ Injury from live traffic	Likely	Catastrophic	Extreme	▪ Approved Traffic Management Plan (TMP) and Traffic Control Plan (TCP) required for works adjacent to live traffic ▪ Traffic to be controlled by licenced traffic controllers ▪ Warnings signs to be in place as per TCP when working near live traffic ▪ Hard barriers to be installed to provide exclusion zone when working near live traffic ▪ Communication via 2-way radio between vehicles on site and Stage 1 C logistics team	Medium	Supervisor Supervisor Supervisor TC Crew/Supervisor Supervisor Work Crew
8	House Keeping	▪ Slip's, Trips & Falls	Likely	Moderate	High	▪ Ensure pathway free of any material, obstacles before start of lift	Low	Operator/Dog man
9	HRCW- Working around powered **mobile plant** Lifting steel road plates and positioning onto roadway.	▪ Lifting Equipment Failure. ▪ Equipment failure	Likely	Catastrophic	High	▪ Advise all staff including Traffic Controllers of exclusion zone – be aware pinch points crush zone ▪ Ensure all lifting equipment is tested & tagged & checked prior to use. ▪ Check lifting point on road plate prior to moving. ▪ Ensure "Ranger" lifting device is installed correctly by competent person ▪ Set up exclusion zone around work area. ▪ Only operator and spotter to be in immediate area of lift ▪ Keep plate at minimum distance from the ground (close to the ground as possible)	Medium	Supervisor Operator/Leading hand

SAFETY								
#	Work Activity (Chronological Order)	Hazards (What can hurt you)	Untreated Risk Assessment			Controls (Controls required to eliminate or minimize the potential for injury of harm based upon the hierarchy of control)	Residual Risk Rating	Control Owner
			L	C	Rating			
						▪ Once road plate has been removed and placed away from excavation – check again the integrity of the lifting point prior to re-use.		
10	HRCW- Working around powered **mobile plant** Lifting shoring / trench box	▪ Anchors detaching ▪ Load dropping	Unlikely	Catastrophic	High	▪ Chains to be secured and even for each of the two lifting points ▪ Load to be lifted slowly and to the side, do not swing ▪ No persons to be within 5m of lift	Medium	Supervisor Operator/Leading hand
11	HRCW- Working around powered **mobile plant** Lifting Kibble while pouring concrete	▪ Lifting Equipment Failure ▪ Load Dropping ▪ Swinging load ▪ Handling concrete	Likely	Catastrophic	High	▪ Check lifting equipment has been tested and tagged ▪ Load to be lifted slowly and to the side, do not swing ▪ No person under kibble at any time ▪ The Kibble is to be fitted securely to the lifting apparatus according to the safe lifting ability/limits of the excavator ▪ Weight of kibble and concrete to considered for Safe lifting limits of Excavator or lifting apparatus. ▪ Kibble operator to gradually release concrete preventing skin contact ▪ Operator aware of sudden release of load make cause crane boom to whip upwards	Medium	Supervisor Operator Spotter
12	HRCW- Working around powered **mobile plant** Lifting Bulka and Washout Bags	▪ Bulka Bag Failure ▪ Load Dropping ▪ Injury to personnel	Likely	Major	High	▪ Ensure Bulka bags inspected to be single or multi trip bags ▪ Single trip bags can only be filled and discharged once, whilst multi-trip bags can be filled and discharged several times. ▪ Inspect bag to ensure it has not been used and refilled if single trip.	Medium	Leading Hand Operator Supervisor

ENVIRONMENTAL								
#	Aspect	Impact	Untreated Risk Assessment			Controls (Controls required to eliminate or minimize the potential for injury of harm based upon the hierarchy of control)	Residual Risk Rating	Control Owner
			L	C	Rating			
1	Maintenance & refuelling of plant Storage & discharge of hazardous substances	▪ Impacts to land and surface water ▪ Uncontrolled spills of materials ▪ Storage of incompatible materials	Possible	Moderate	Medium	▪ Spill kit to be maintained on site at all times ▪ Storage of materials to be in a suitable containment system with bunding (110%) ▪ Maintain an SDS register on site and review material compatibility before storing.	Low	Supervisor
2	Soil erosion & water management	▪ Soil erosion and sedimentation ▪ Pollution of water ▪ Pollution to land	Almost Certain	Catastrophic	Extreme	▪ Site to comply to project specific requirements (REF, EIS) ▪ Site to maintain and implement an Erosion and sediment control plan in compliance with the Blue Book Vol.II ▪ All discharge and reuse activities to be undertaken in compliance with the relevant discharge and reuse form/ process.	Medium	Supervisor/ PE/SPE/PM
3	Disturbance to flora & fauna	▪ Spread of noxious weeds ▪ Damage to native flora and/or fauna habitat ▪ Clearing outside of boundary ▪ Impact to protected/treat	Possible	Moderate	Medium	▪ Site to comply to project specific requirements (REF, EIS) ▪ Site to implement exclusion zones around protected flora and site boundaries. ▪ Noxious weeds to be segregated when cleared and disposed of separate from clean vegetation. Weeds are not to be mulched with clean vegetation and/or reused on site.	Low	Supervisor
4	Noise emissions/vibration	▪ Nuisance ▪ Dust ▪ Discharges of excessive noise	Possible	Minor	Low	▪ Site to comply to project specific requirements (REF, EIS) ▪ All plant and equipment to be maintained in a proper and efficient manner.	Insignificant	Supervisor
5	Atmospheric emissions	▪ Dust ▪ Discharges to air of pollutants ▪ Discharges to air of odour	Possible	Major	High	▪ Site to comply to project specific requirements (REF, EIS) ▪ Site to maintain appropriate dust control measures (e.g. Wetting down, compaction) ▪ All plant and equipment to be maintained in a proper and efficient manner. ▪	Low	Supervisor

ENVIRONMENTAL								
#	Aspect	Impact	Untreated Risk Assessment			Controls (Controls required to eliminate or minimize the potential for injury of harm based upon the hierarchy of control)	Residual Risk Rating	Control Owner
			L	C	Rating			
6	Vibration	▪ Damage to structures (built and natural) ▪ Impact to human comfort levels	Unlikely	Major	Medium	▪ Site to comply to project specific requirements (REF, EIS) ▪ Conduct vibration monitoring where required ▪ Document dilapidation assessments prior to works commencing.	Low	Supervisor/ PE/SPE/PM
7	Community	▪ Community complaints ▪ Loss of reputation	Possible	Minor	Low	▪ Site to comply to project specific requirements (REF, EIS) ▪ Maintain site community register ▪ Respond to complaints and escalate to PM/ Environmental coordinator	Low	Supervisor/ PE/SPE/PM
8	Solid & liquid waste	▪ Soil/ water pollution	Possible	Catastrophic	Extreme	▪ Site to comply to project specific requirements (REF, EIS) ▪ All waste to be classified before transport and issued to waste facility ▪ All material accepted to site to be accompanied by a waste/material classification ▪ All material brought into site and sent out of site to be maintained on a waste register. ▪ All material brought into site to be visually inspected to ensure it aligns with the material classification documentation.	Medium	SE/PE/SPE/ PM

CONSULTATION AND REVIEW SIGN OFF

I confirm by my signature below that I have attended a briefing on the requirements of this SHEWMS, understand its requirement and agree to perform the associated tasks with the controls outlined in place. If there is a non-compliance with the SHEWMS, work will immediately cease and will not resume until the SHEWMS is complied with and work can be undertaken safely.

	Name	Company	Signature	Date
1				
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Appendix H
Gas Line Diversion SOHI

MEMO

DATE: 2 March 2023 **AMBS Ref**: 20870M7

TO: [redacted]

FROM: [redacted]

SUBJECT: Statement of Heritage Impact: Installation of temporary gas pipe, Hickson Road Retaining Wall and Cutting, Barangaroo

The Sydney Metro & City Southwest project was approved by the Minster for Planning on 9 January 2017 as Critical State Significant Infrastructure. AMBS Ecology & Heritage (AMBS) was responsible for managing all heritage aspects of the Sydney Metro City & Southwest Chatswood to Sydenham Metro project TSE works, and production of the overarching Construction Heritage Management Plan for the project.

The construction of the new Barangaroo Station for the project involved substantial excavations for the station box in Hickson Road, adjacent to the Hickson Road Retaining Wall. The Barangaroo Station site is within the *Millers Point & Dawes Point Village Precinct*, which is Item 01682 on the State Heritage Register (SHR). The Precinct has identified historical, associative, aesthetic, and social significance, research potential, rarity and representativeness. The Hickson Road cutting and retaining wall is a contributory element to item 01682 and shares its State significant heritage values.

In 2017 AMBS prepared the *Statement of Heritage Impact* (SoHI) for the protective measures; rock anchoring and protective mesh, used to protect the wall during construction of the station box under Hickson Road. Additionally, a memo prepared by AMBS in April 2018 outlined specific details regarding the method of fixing the rockfall protective mesh as well as recommendations surrounding its future removal. In 2021 AMBS prepared a management document for the removal of the protective mesh (20870M1). In 2022 AMBS prepared a SoHI for the temporary diversion of stormwater lines along the wall (20870M5) and a methodology review for the removal of the rockfall mesh (20870M6).

The Minister's Condition of Approval relevant to the protection of heritage generally is:

> *E10 The Proponent must not destroy, modify or otherwise physically affect any Heritage item not identified in documents referred to in Condition A1 (which refers to the project EIS and PIR).*

The current proposal for a temporary gas line to be attached to the Hickson Road cutting and retaining wall is outside the scope of works covered by the project EIS and PIR. This SoHI has been prepared to address the potential heritage impact of the proposal.

This SoHI was written by Mike Hincks, AMBS Senior Historical Heritage Consultant, with advice from Jennie Lindbergh, AMBS Director Historic Heritage, who also reviewed this report.

Proposal

The proposal is to temporarily divert an existing gas line that is currently fixed to the acoustic shed. The acoustic shed is a temporary structure erected by the project on Hickson Road between the Munn Street and Windmill Street bridges. The gas line will need to be temporarily diverted so that the acoustic shed can be dismantled and Hickson Road can be reinstated.

The gas line is a 100mm diameter copper Type B pipe. The proposed diversion requires a vertical pipe to run between the footpath and an existing connection in the concrete section of the wall, located at approximately 11m above Hickson Road. The pipe would be an external fitting, attached to the face of the sandstone cutting with dual-anchored brackets at approximately 1m intervals.

Once the dismantling of the acoustic shed is complete, and Hickson Road is permanently reinstated, the temporary gas line will be removed from the face of the wall. It is expected that the temporary gas diversion will need to be in place for six months.

Heritage Context and Significance

The High Street retaining wall and cutting is a large-scale modification that was designed to allow the continuation of Sussex Street north along the steep and rocky shoreline to Miller's Point and Dawes Point. It incorporates both a cutting into sandstone bedrock and a retaining wall above. The wall and cutting together create a vertical face bordering the eastern side of Hickson Road for 300m from the Munn Street overbridge in the north, to the High Street Steps in the south. The wall and cutting continue to the north, partially interrupted by the Munn Street and Windmill Street bridges. In this area, a 29m-long section of cut sandstone displaying clear bedding planes and fissures is the dominant form.

The wall is a contributory element of the *Millers Point & Dawes Point Village Precinct* (SHR 01682). The Statement of Significance for the item makes particular reference to the setting and layout of the precinct, and the wall forms a distinctive landscape element in that setting. The Statement of Significance notes that the modifications and changes that have taken place in response to the engineering and building challenges on the peninsula have both capitalised on, and conflicted with its original form, which give it its unique character and are evidence of its development as a maritime cultural landscape:

> *The natural rocky terrain, despite much alteration, remains the dominant physical element in this significant urban cultural landscape in which land and water, nature and culture are intimately connected historically, socially, visually and functionally.*
>
> *…The postcolonial phase is well represented by the early 20th century public housing built for waterside workers and their families, the technologically innovative warehousing, the landmark Harbour Bridge approaches on the heights, the parklands marking the edges of the precinct, and the connections to working on the wharves and docklands still evident in the street patterns, the mixing of houses, shops and pubs, and social and family histories of the local residents.*
>
> *Millers Point & Dawes Point Village Precinct has evolved in response to both the physical characteristics of its peninsular location, and to the broader historical patterns and processes that have shaped the development of New South Wales since the 1780s… The whole place remains a living cultural landscape greatly valued by both its local residents and the people of New South Wales. (HNSW)*

In February 2017, GML Heritage prepared a Heritage Assessment of the High Street wall. The report details the contributory value of the wall to the significance of the *Millers Point & Dawes Point Village Precinct.* The supporting Statement of Significance for the wall is:

> *The Hickson Road Retaining Wall is a significant, contributory built element within the Millers Point and Dawes Point Village Precinct and the Millers Point Conservation Area, an intact residential and maritime precinct of outstanding state significance. The retaining wall is a dominant and relatively intact component of the extensive alterations to the natural topography of Millers Point designed to facilitate the management of cargo into and out of the new two-level finger wharves. The wall incorporated steps at its northern and southern ends to provide improved access to the wharves for stevedores and wharf workers who resided in Millers Point.*
>
> *It provides a dramatic street edge to the eastern side of Hickson Road. The wall has landmark quality and displays an interface of fabrics, comprising the excavated rock face, cement render and masonry construction at the northern end of the wall. While there are varying degrees of erosion and deterioration to the stone/render, as well as intrusive fixtures, signage and penetrations, the retaining wall continues to define the edge of Millers Point and makes a positive contribution to the unique landscape character of Hickson Road.*
>
> *The Hickson Road Retaining Wall holds social significance as it forms part of the 'Hungry Mile', a historic stretch of Sydney's waterfront where men and women would walk from wharf to wharf in search of employment during the Great Depression of the 1930s* (2017:22-23)

Historical Context

A detailed history of the High Street wall and the surrounding area has been prepared by AMBS for the project in *High Street Cutting, Millers Point Statement of Heritage Impact* (AMBS Ecology & Heritage, 2017) and by GML in *Hickson Road Retaining Wall Heritage Significance Assessment* (GML Heritage, 2017). Comprehensive histories of the development of the Barangaroo station site and the local area including the High Street wall have also been prepared for the Barangaroo TSE works Archaeological Method Statement (Casey & Lowe, 2017) and the Barangaroo COP works Archaeological Method Statement (AMBS Ecology & Heritage, 2021).

These histories have been used to create and support the assessments and statements of significance which are referred to in this document and should be consulted if further background information is required. The below is a brief summary which contextualises the construction of the wall and its continued relevance to the local environment.

From the early nineteenth century, Millers Point was extensively quarried to supply the construction of housing and public infrastructure, such that the area around Kent and Windmill Streets was known as The Quarries. The quarry was worked by convicts who gradually formed the small local streets and modified the natural topography to form the escarpment which ran along Kent Street. The main access to the quarries and the few houses in the area was a rough path along the Darling Harbour foreshore to the northern extremity of the Point and the three windmills.

As the shoreline around the town became increasingly developed, waterfront space was at a premium, and new wharves and shipbuilding enterprises were forced to utilise the more difficult to access and less desirable parts of the harbour. As industry and trade intensified at the northern end of the eastern shore of Darling Harbour, pressures on the limited available access between - and to - the waterfront lots increased.

A new direct access was proposed from 1897 to connect the Maritime Services Board at West Circular Quay to the west side of the peninsular along Darling Harbour through Walsh Bay and Pyrmont to terminate at Harris Street. It was not until the establishment of the Sydney Harbour Trust that the proposal could be realised, and in 1909, work began on constructing Hickson Road. Between Munn Street and the present day location of the building at 30 Hickson Road, the process entailed cutting back the cliff face and constructing the retaining wall supporting High Street. The reinforced concrete bridges over Munn, Windmill and Argyle Streets were completed between 1910 and 1914.

The section along Hickson Road that is defined by the High Street wall is today representative of the depression-era district known as the 'Hungry Mile.' The name was given to the mile of wharves between Darling Harbour and Millers Point by the maritime workers who walked in the hope of casual low-paid work each day from the early twentieth century into the 1940s.

Analysis of the Proposed Works

Description of the works

The works will temporarily divert an existing gas line. The gas line is a 100mm diameter copper Type B pipe. The proposed diversion requires a vertical pipe to run between the footpath and an existing connection in the concrete section of the Hickson Road wall, located approximately 11m above Hickson Road. The pipe would be an external fitting, attached to the face of the sandstone cutting with dual-anchored brackets at approximately 1m intervals.

Reason for the new works

The existing gas line is attached to a temporary structure (an acoustic shed that was erected during the tunnelling stage of the project). The acoustic shed needs to be dismantled. The gas line has to be temporarily diverted from the structure to the wall before it can be permanently relocated once the reinstatement of Hickson Road between Munn Street and Windmill Street is complete. It is expected that the temporary gas diversion will need to be in place for six months.



Figure 1: Location of the proposed works, acoustic shed and Hickson Road cutting and wall.

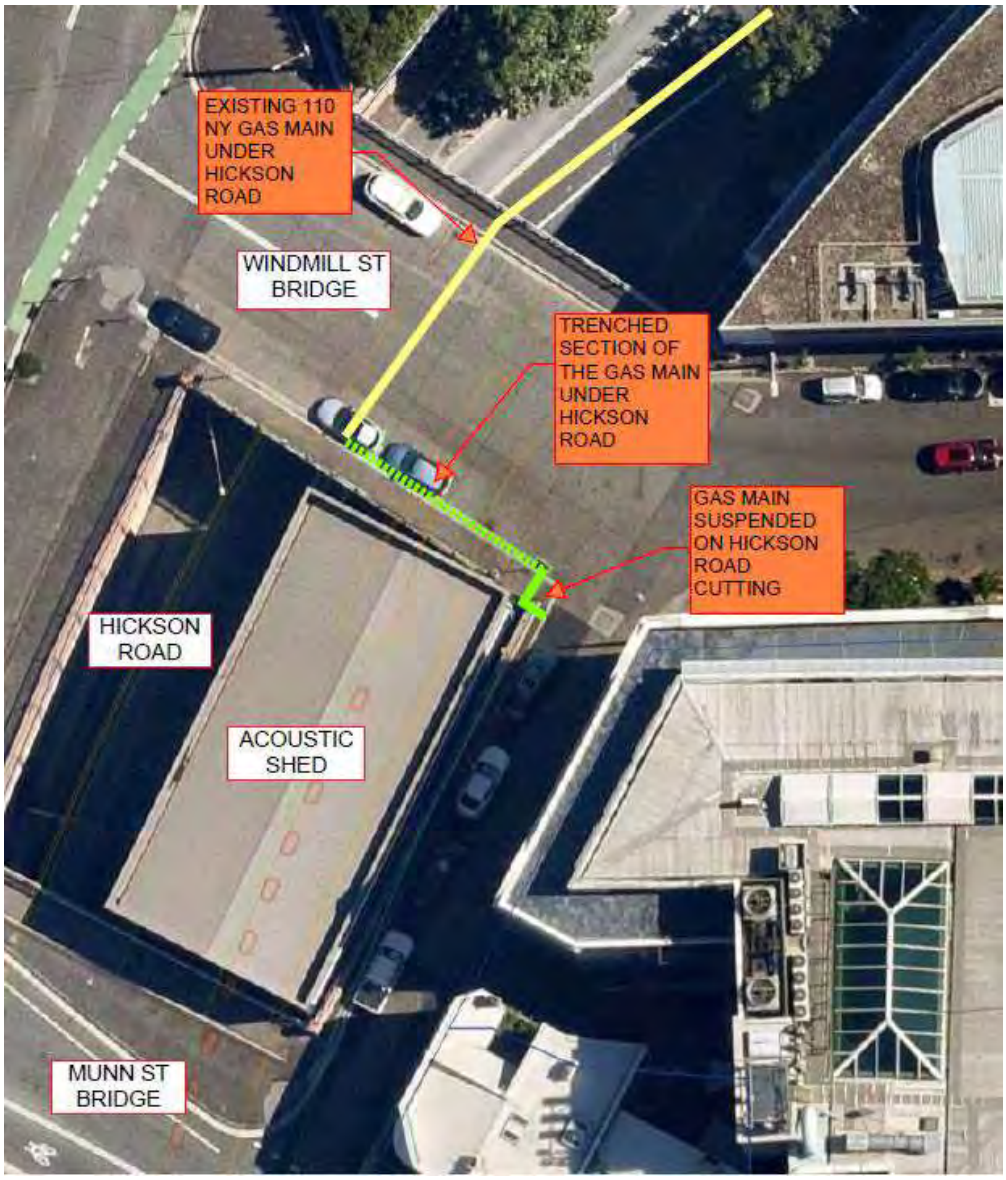


Figure 2: Detail of proposed works.

Area to be affected

The diversion will be attached to the face of the wall and cutting, partially beneath and immediately adjacent to the Windmill Street bridge, on the southern side.

The form of the wall in this location is largely cut sandstone bedrock, which rises up to 11m above the surface of Hickson Road between the two bridges. A concrete retaining wall up to 5m high has been constructed above the sandstone to support Windmill Street above.

The cut sandstone is characterised by deeply weathered bedding planes and vertical fissures. At the midpoint between the two bridges, the intersection of these perpendicular fractures has caused large pieces of sandstone to come away from the rock, either during the cutting process or in the subsequent years. The fracturing of stone at the centre of this section, as well as the strong horizontal lines created by the weathering bedding planes, creates the defining character of this section of the wall. The proposed gas diversion is located at the

northern periphery of this section, where the bedding planes are interrupted by the arch and span of the Windmill Street bridge.



Figure 3: Illustration of the diversion.



Figure 4: Proposed location of the gas diversion shown on a Google Street View capture taken in October 2014, before the acoustic shed was constructed. The Windmill Street bridge is at the left.

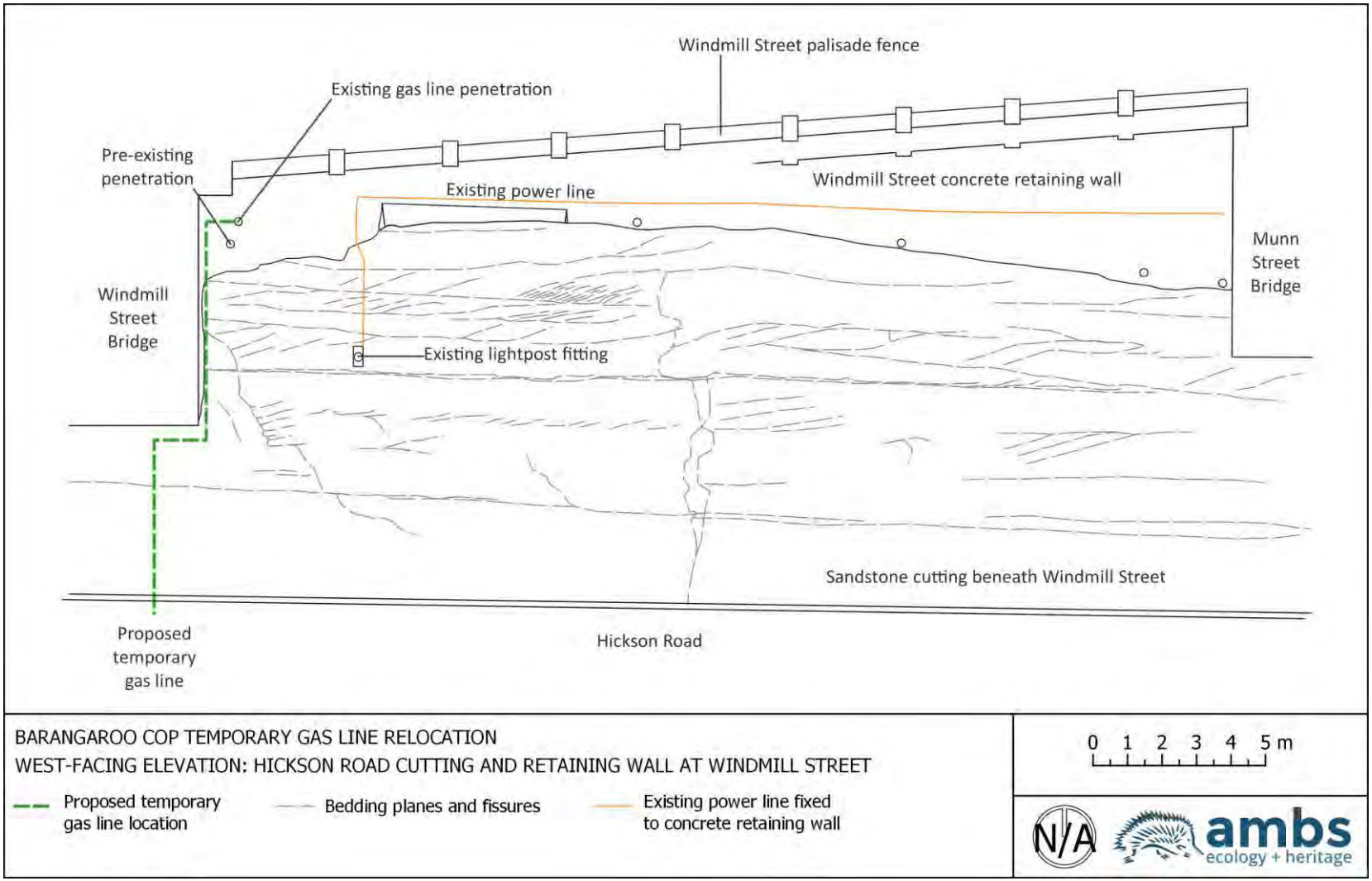


Figure 5: Elevation drawing of the wall between the Munn and Windmill Street bridges showing the fractures which characterise this part of the wall.

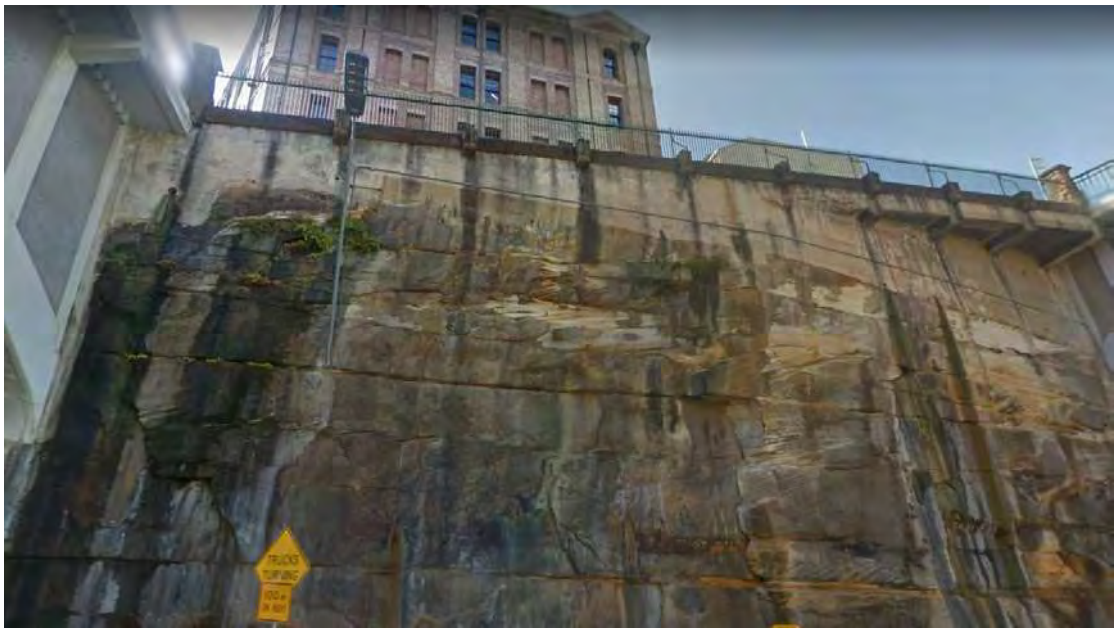


Figure 6: Google Street View capture of the affected section of the cutting taken October 2014, prior to the construction of the acoustic shed. The Windmill Street bridge is at the left.

Attaching the gas pipe to the Hickson Road wall and cutting

The pipe will be attached to the wall using 13 cantilevered two-piece channel clips (Figures 7-10). Each channel is 500mm long and will be secured to the wall with two 16mm anchors with 140mm embedment, using RE 500 epoxy. The RE 500 chemical anchor is appropriate for use in concrete and sandstone, in wet and dry conditions.

Locations for anchors will be selected that avoid natural or cut features in the sandstone surface. Anchors will be placed in flat sections of rock, uninterrupted by bedding planes or vertical fractures.

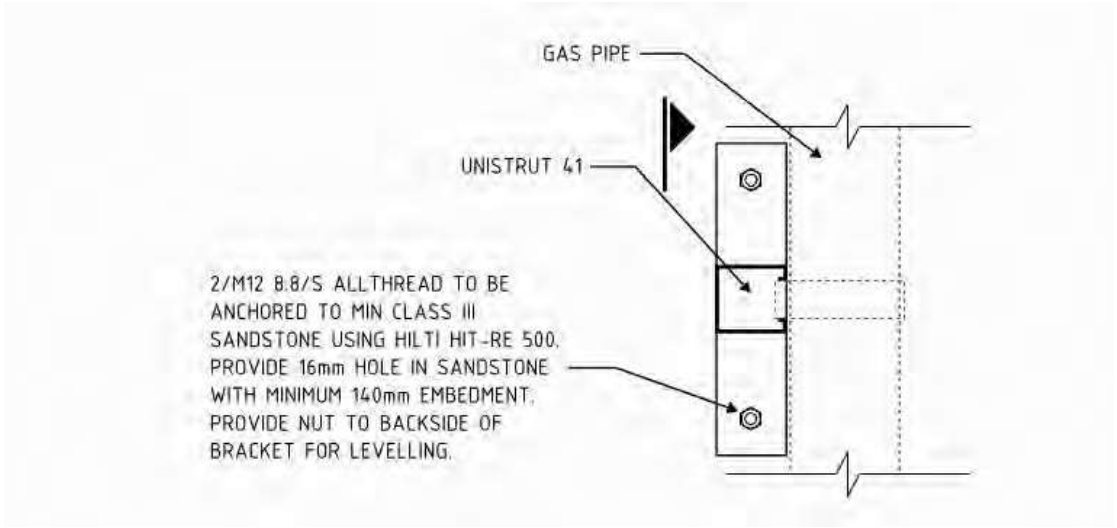


Figure 7: Type 1 bracket, vertical section, front view.

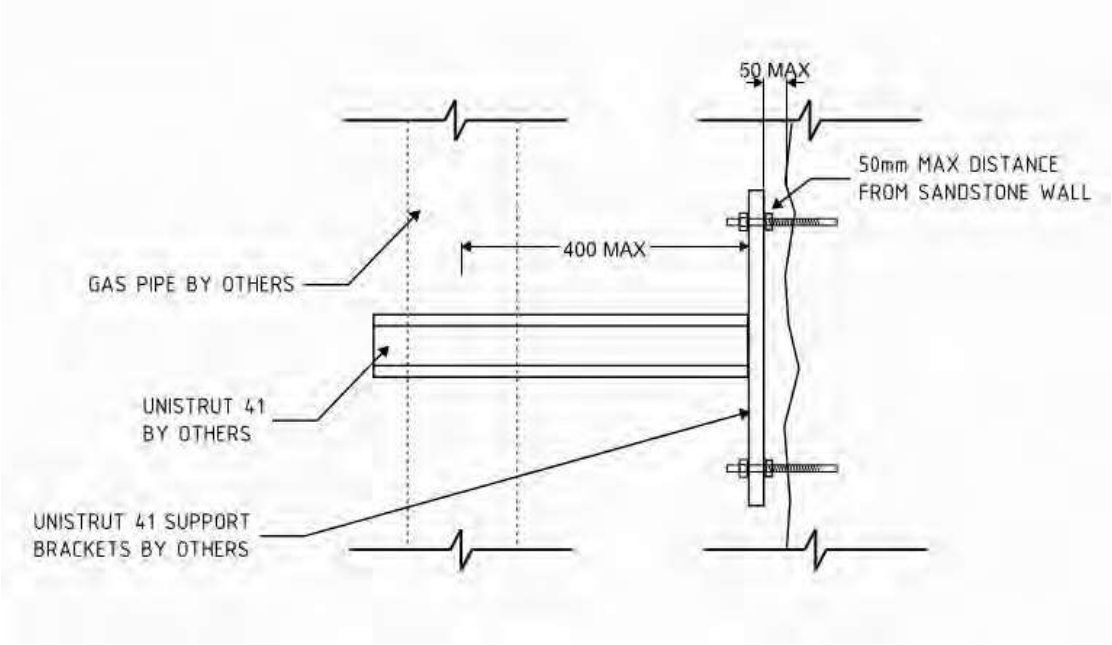


Figure 8: Type 1 bracket, vertical section, side view.

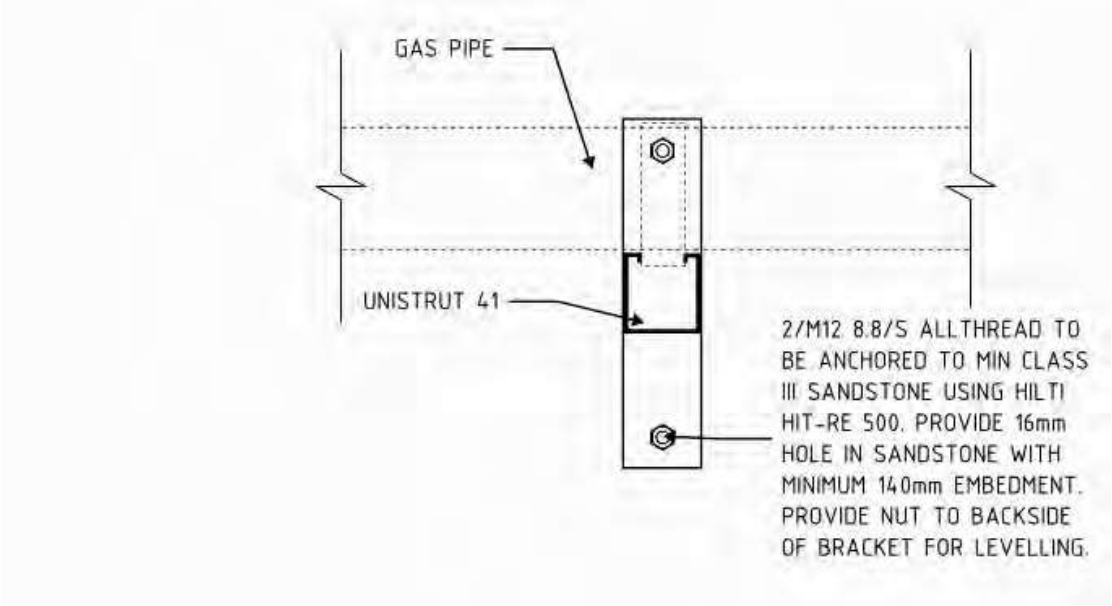


Figure 9: Type 2 bracket, horizontal section, front view.

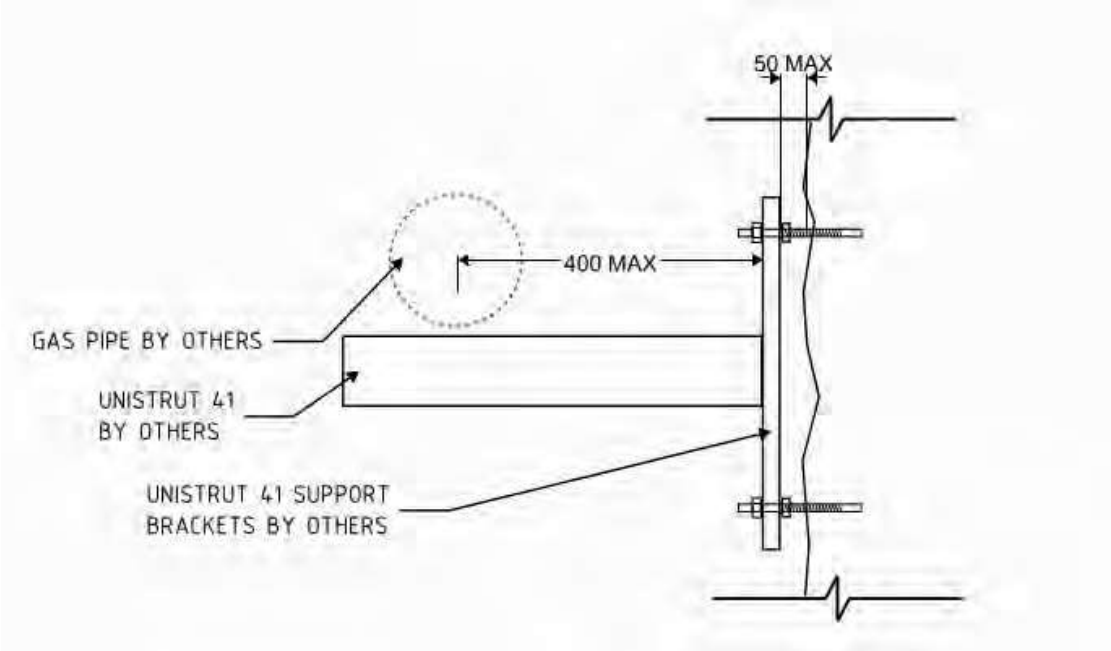


Figure 10: Type 2 bracket, horizontal section, side view.

Removing the temporary gas diversion

A stonemason will be engaged to conduct the bolt removal and undertake repairs to the wall. The chemically anchored bolt will be partially removed from the wall by coring around the anchor and removing a small amount of stone or concrete to allow each bolt and anchor to be cut back behind the face of the wall. The core will be sunk into the wall to an approximate depth of 100mm behind the existing wall line, and then the fabric around the anchor will be chiselled back to a depth of approximately 60mm.

The additional fabric removal will be required so that the bolt does not remain exposed to the elements once the bracket has been removed. Continued exposure will cause the bolt to corrode over time and expand and cause hairline fracturing in the surrounding fabric, and possible exfoliation of the sandstone.

The hole will then be cleaned out using compressed air to remove all debris from the hole. Renderoc HB40 will be used to fill the hole to a depth up to 40mm. On completion of the curing of the HB40, the area of the hole will be patched.

For areas of cement render, the hole will be patched with a render matching the existing colour and texture of the render on the wall. The outside perimeter of the patch will be dove-tailed to assist in keying in the new render patch and the wall will be primed to allow maximum adhesion.

Mortar repairs to the sandstone are to be executed using NHL-based custom repair mortar equal to Lithomex Natural Hydraulic Lime repair mortar or Westox Plastalite Hydraulic Limestone Repair Mortar. The stonemason will blend the sands on site as required to achieve a good colour match for the parent stone using inorganic pigments where necessary to achieve a good colour match to the sandstone. No cements will be used on any part of the sandstone wall.

The repairs will be misted down with clean water during the day to prevent shrinkage with the sun, wind, and other elements on the wall and cutting.

Assessment of Heritage Impact

The proposed diversion of the gas line has the potential to affect the State heritage significance of the *Millers Point & Dawes Point Village Precinct*. The High Street Retaining Wall has been identified as having historic, aesthetic and social significance, and should also be considered to have technical significance. The proposed temporary diversion represents a change to the High Street cutting and retaining wall, the impact of which is assessed below.

In 2021 GML Heritage prepared a conservation policy and guidelines document for the Hickson Road Retaining Wall (GML Heritage, 2021). The aims of the report were to address the management of physical and visual impacts to the wall and provide guidance on the management of works more generally within the heritage setting (2021, p. 1).

The document identifies key features of the wall that have a High significance value and are affected by the proposed methodology:

- The sandstone cliff face, incorporating the line dividing the sandstone from the rendered wall, the natural bedding planes of the rock, and the vertical fissures within the sandstone.
- The rendered concrete wall, consisting of concrete poured in situ, in discrete layers, the original render finish, areas of missing render exposing the concrete below, and areas of repaired render.

Conservation policies relating to the sandstone cliff face that are relevant to the current works (GML Heritage, 2021, pp. 14-15) include the following responsibilities, addressed in the table below:

Responsibility	Compliance
Minimise new fixings into the wall. If fixings are used physical fixings are preferred over chemical anchors which could be difficult to remove and repair in the future without undue damage. Do not use fixing methods that will adversely impact the structure and fabric of the wall.	The fixings will be minimised by using the most direct route possible for the gas line. Chemical anchors will be used in order to minimise stress on the weaker points in the fractured sandstone. Expansion type anchors impart stress directly into the base material and require a greater distance from fracture edges. Chemical anchors can be placed closer to edges with less risk and the load is applied to the length of the embedment rather than being concentrated at limited points. Repairs will be by a heritage stonemason.
Fixing to the wall for new services, such as lighting, security or other structures, should be managed to minimise impacts on significance, particularly in association with the temporary works for the new Barangaroo Metro Station.	The proposed diversion is located at the northern periphery of this section of the wall, where the Windmill Street bridge already interrupts the continuity of the cutting. The location of anchors will avoid bedding planes, tool marks and other fractures.
When choosing fixing locations, use existing/earlier fixing points wherever	Fixings will be minimised. There are no existing fixings that can be utilised in this location.

Responsibility	Compliance
possible in preference to creating new ones.	
When fixing to significant fabric, choose a location that will be easy to repair and disguise should the fixing be removed at a later date. Do not fix in locations that will place significant fabric at risk of fracture, damage or failure.	Locations for anchors will be selected that avoid natural or cut features in the sandstone surface. Anchors will be placed in flat sections of rock, uninterrupted by bedding planes or vertical fractures.
All fixing methods must be tested first in a discrete, out-of-the-way location to ensure methods will be appropriate and can be removed if required with minimal negative impact. Fixing method and materials used must be chemically and mechanically compatible with both the substrate and the element to be fixed. There must be no risk of accelerated corrosion, staining, damage or other adverse effect.	This method of fixing has been tested and used elsewhere on the wall on a larger scale to attach the rock mesh along the wall to the south.
Exposed services (where essential to the work) must not detract from the quality of the place.	The proposed diversion is located at the northern periphery of this section of the wall, where the Windmill Street bridge already interrupts the continuity of the cutting. The location of anchors will avoid bedding planes, tool marks and other fractures. The visual interruption of the vertical gas line will be temporary, and while in place will be located to avoid clashing with the most prominent features of the cutting, and will not further interrupt the lines of the bedding planes with the exception of those located beneath the Windmill Street bridge.
Fixing methods must be reversible, allowing later removal of the element, repair or refixing without risk of damage to the surrounding or significant material. Retain the evidence of the natural and built features within the rock, including the sandstone bedding planes, vertical fissures and evidence of former structures attached to the vertical surface.	Anchors and bolts will avoid fissures and joints between bedding planes. Anchors and bolts will not be placed in the vicinity of evidence of former structures. The repairs will imitate the qualities of the surrounding rock as best as possible to retain the natural appearance of the sandstone areas of the wall. The stonemasons will blend the sands on site as required to achieve a good colour match for the parent stone using inorganic pigments where necessary to achieve a good colour match to the sandstone. Repairs to the sandstone will be limited to a small area around each 16mm anchor.

Responsibility	Compliance
Maintain the original line defining the top of the natural sandstone cliff edge and the concrete wall.	All patching will match the surrounding fabric. No cements will be used on any part of the sandstone wall.
Avoid 'creep' of the render zone over the original sandstone surface. Original sandstone should be retained in preference to new render repairs over the sandstone surfaces as a remedy for irregular stone or 'faults'. New areas of render should only be undertaken after careful consideration of other options for surface stabilisation, and approved by a heritage consultant.	
Do not render or paint or apply coatings (including sealants) over the sandstone surface.	Mortar repairs to the sandstone will be executed using non-reactive products. Repairs will be limited to a small area of around the 16mm anchors/bolts only. No coatings or sealants will be painted over the sandstone.

Conservation policies relating to the cement-rendered concrete wall that are relevant to the current works (GML Heritage, 2021, p. 15) include the following responsibilities addressed in the table below:

Responsibility	Compliance
Retain the original cement render finish where possible.	Anchor points will be minimised to 4 locations on the concrete section of the wall. The repair methodology is to remove only what is necessary to patch the anchor/bolt locations.
Do not paint or apply coatings (including sealants) over rendered surface unless this follows specialist materials conservation advice.	No coatings or sealants will be applied over the rendered surface.
New render repairs are to involve only necessary patching which match in mix/composition, colour, grain, and texture (note: the render has visible shell aggregate in the mix). Patch the wall with a matching render in colour and texture. All new render is to respect/recreate the scored ashlar pattern which imitates large blockwork units. A specification should be prepared for all future render repairs. This would involve, in the first instance, render sample analysis (to determine materials composition/mix), sourcing of matching materials (including	The area of the repair after the anchors are removed will be patched with a cement render matching the existing colour and texture of the render on the wall. Shell aggregate will be added to the mix to match the existing render where appropriate. The outside perimeter of the patch will be dove-tailed to assist in keying in the new render patch and the wall will be primed to allow maximum adhesion. A record of the mix used will be documented for future repairs.

visible shell aggregate) and application methodology.	

The guidelines for works to heritage fabric (p. 19) include the following general principles:

- Conserve and re-use all sound original/early fabric where possible.
- Ensure that whenever early fabric is dismantled for repair, the work is done in such a way as to retain as much of the original fabric as possible.
- Ensure significant early fabric is protected from ongoing deterioration by undertaking appropriate repairs using specified and/or otherwise approved methods and materials.
- Ensure that whenever fabric is removed it is done carefully, so as to retain maximum original fabric.
- Ensure that all new work to replace damaged and/or missing components and/or fabric matches the significant early materials and detail identified on site. Prior to commencement, a selected section/component of original work will be nominated by the heritage consultant, in consultation with the contractor, as a suitable sample for matching.
- Conserve the cement-rendered concrete retaining wall – this may involve removing drummy render sections and redoing past patching that has poor render matching.

The proposed methodology for repairing the wall after the temporary gas line is removed complies with the recommendations set out in the 2021 Conservation Policy and Guidelines.

The following aspects of the proposal respect the heritage significance of the item or conservation area for the following reasons:
The proposed diversion is located at the northern periphery of this section of the wall, where the Windmill Street bridge already interrupts the continuity of the cutting. The location of anchors will avoid bedding planes, tool marks and other fractures. The visual interruption of the vertical gas line will be temporary, and while in place will be located to avoid clashing with the most prominent features of the cutting, and will not further interrupt the lines of the bedding planes with the exception of those located beneath the Windmill Street bridge. The proposed diversion respects the significance of the item by avoiding and minimising visual and physical impacts wherever possible.

The following aspects of the proposal could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:
The temporary attachment of the gas line to the face of the wall will have an adverse effect on the aesthetic values of the wall. The assessment of significance for the wall recognises that:

> *The wall is aesthetically significant and exhibits landmark quality with its dominant, fortress-like scale and gradual dipping in response to the V-shaped original topography of what became High Street. It also displays an interesting interface of fabrics, comprising the excavated rock face, cement render and masonry construction at the northern end of the wall.*

The 16mm diameter penetrations in the concrete and the cutting will have an overall minor impact on the significant fabric of the item. Penetrations into the significant fabric will be limited to the smallest area possible, at a peripheral location in this section of the wall. The

impact locations will be made good in a manner in keeping with the heritage significance of the wall.

The dominant aesthetic in this section of the wall - which is embodied in the natural and human-made fractures in the 11m-high rock face - operates on a different visual scale to that of the penetrations. As such, the proposed anchor impacts will not affect the landmark aesthetic of the wall or reduce its readability and significance in the landscape.

In addition, all visual impacts should be considered in the context of the current Hickson Road environment. Approved construction works, including the demolition of the temporary acoustic shed over Hickson Road immediately in front of the wall, will be taking place for the duration of the temporary gas diversion. Views to and from the item during this time will be obscured and limited by the lack of public access, and the movement, use and installation of plant and construction infrastructure that will be required to undertake the works. In this context, the new works are unlikely to significantly alter the existing approved visual impact. As such there will be a minor temporary impact on the aesthetic significance of the High Street wall as an integral element of the *Millers Point & Dawes Point Village Precinct*.

Statement of Heritage Impact

The High Street cutting and retaining wall is a contributory element of the state heritage significant *Millers Point & Dawes Point Village Precinct*. The cutting and retaining wall is a prominent landmark defining the separation of wharfage from the residential areas of Millers Point. The cutting and retaining wall has particular social significance as part of the 'Hungry Mile', the name given to the mile of wharves between Darling Harbour and Millers Point by the maritime workers who walked in the hope of casual low-paid work each day from the nineteenth century into the 1940s. As such, protection of the heritage significance of the High Street cutting and retaining wall as an element of the *Millers Point & Dawes Point Village Precinct* has been an important consideration in the design of the temporary gas diversion.

The temporary pipe would be in place only during the demolition of the acoustic shed and the works to reinstate Hickson Road. These works will severely limit access and views to and from the item, minimising the visual impact that the installation of the pipe will create.

There will be non-reversible impacts to significant fabric that will be minor in nature considering the relative scale of the rock face and wall. All impacts will be mitigated by make good works that will replicate the removed material. The impacts will be limited to a narrow section of the wall adjacent to the Windmill Street bridge, which itself interrupts the continuity of the wall and cutting.

There will be a minor physical impact to the significant fabric, but a negligible, if any, impact to the heritage significance of the High Street Wall. There will have a negligible short-term visual impact on the heritage significance of the *Millers Point & Dawes Point Village Precinct*, in its entirety.

Mitigation

Article 3 of the Burra Charter recommends a conservation approach based on a respect for the existing fabric, use, associations and meanings. It requires a cautious approach of changing as much as necessary but as little as possible. The repair material used to patch the anchor locations will be as near to the surrounding fabric in composition as possible to minimise an adverse effect on the aesthetic significance of the item.

The following recommendations are aimed at ensuring that heritage values are protected:

Recommendation 1

A photographic recording of the affected areas should be made prior to and on completion of works to ensure that there is a record of the changes to the face of the wall. The recording should be in accordance with the Heritage Council guideline publication Photographic Recording of Heritage Items Using Film or Digital Capture *(revised 2006).*

The significance of the High Street cutting and retaining wall as a contributory item of the state heritage *Millers Point & Dawes Point Village Precinct* should be understood by all on-site staff and construction team to ensure that no inadvertent damage is done to the wall.

Recommendation 2

Prior to works commencing, all on-site staff should be briefed on the heritage requirements of the High Street Cutting and retaining wall, its heritage significance and the value of its fabric.

There is potential for damage to the wall during the process of installing the temporary gas line, and during the dismantling of the acoustic shed. Care should be taken during all works in the vicinity of the wall and cutting.

Recommendation 3

A heritage architect should specify the mortar mix used in any repairs.

The temporary services will utilise existing hardware to attach to the High Street wall. The temporary pipes will be largely obscured by approved construction works along Hickson Road which will negate any visual impact.

All replacement services are temporary. There will be no permanent or long-term surface-mounted services. Existing service routes will be reinstated following the temporary works. Repairs to the penetrations will match the existing render in accordance with the *Hickson Road Retaining Wall Barangaroo Conservation Policy and Guidelines* (GML 2021).

The proposed works are minor in nature and will have a negligible impact on the significance of the *Millers Point and Dawes Point Village Precinct* (SHR 01682).

References

AMBS Ecology & Heritage (2017) *High Street Cutting, Millers Point Statement of Heritage Impact.* Consultancy report to John Holland CPB Ghella Joint Venture.

AMBS Ecology & Heritage (2018) *High Street Wall Rockfall Protective Mesh, Memo.* Prepared for John Holland CPB Ghella Joint Venture.

AMBS Ecology & Heritage (2017) *High Street Cutting, Millers Point Statement of Heritage Impact*, Report to John Holland CPB Ghella Joint Venture.

AMBS Ecology & Heritage (2021) *Barangaroo Metro Station Construct Only Package (COP) Historical Archaeological Method Statement*, Report to BESIX Watpac May 2021.

Casey & Lowe (2017) *Barangaroo Station Hickson Road, Barangaroo Sydney Metro Project Archaeological Method Statement*, Report to AMBS on behalf of John Holland CPB Ghella JV.

GML Heritage (2017) *Sydney Metro City & Southwest Technical Services: Hickson Road Retaining Wall Heritage Significance Assessment Technical Report* Report prepared for AECOM Australia and Parsons Brinckerhoff Australia on behalf of Transport for NSW Sydney Metro City & Southwest.

GML Heritage (2021) *Hickson Road Retaining Wall Barangaroo: Conservation Policy and Guidelines*, Report prepared for Sydney Metro April 2021.

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[redacted] 1 February 2024

Director Environment, Sustainability and Planning
Sydney Metro
Transport for NSW
PO Box K659
HAYMARKET NSW 1240

Ref: 170108(p) CHMP Rev04

Dear [redacted]

RE: Approval of Minor Amendments – Construction Heritage Management Plan (CHMP) Rev04, Sydney Metro City & Southwest – Barangaroo Station

Thank you for providing the following document for Environmental Representative (ER) review and approval of minor amendments as required by Condition of Approval A24 (j) of the Sydney Metro City & Southwest project (CSSI – 15_7400, 9 January 2017):

- Construction Heritage Management Plan – Barangaroo Station (SMCSWSBR-BWC-SBR-HE-PLN-000010 Revision 04, dated 11 January 2024) (the CHMP)

The CHMP was originally developed to address Condition C3 of the project approval. Amendments to the above Plan were for the purpose of a periodic update as required by the Construction Environmental Management Framework (CEMF). The amendments are considered to be 'minor' according to Condition of Approval A24 (j). The amendments do not trigger any additional CoAs or REMMs and are consistent with the planning approval. No additional significant risks have been identified as a result of the changes.

As an approved ER for the Sydney Metro City & Southwest project, I have reviewed and provided comment on this document and accordingly approve the amendment of the Plan for implementation.

Yours sincerely

[redacted]

Environmental Representative – Sydney Metro – City and Southwest



Appendix E
Visual Amenity Management Plan



Caption: One Central Park, Sydney

BESIX Watpac

NSW GOVERNMENT | sydney METRO



Barangaroo Station

Visual Amenity Management Sub Plan

N217

BR COP

23 November 2023

Project overview

Project Site Address:
Hickson Road
Barangaroo
NSW 2000

Project Commencement Date:
12 March 2021

BESIX Watpac State Division Address:
Level 24, 44 Market Street
SYDNEY
NSW 2000

BESIX Watpac ABN:
71 010 462 816

Document Control

Client:	Transport for NSW – Sydney Metro
Title:	BARANGAROO STATION
Subtitle:	Visual Amenity Management Plan
Owner / Approver:	Planning & Environment Manager / Project Director
TB Document Reference:	SMCSWSBR-BWC-SBR-EM-PLN-000013
TB Revision:	02

Revision history

Version	Date	Revision Description	Release Sign off
A	24/05/21	Submission for Review	[redacted]
B	01/09/21	Submission for Review	[redacted]
C	08/09/21	Submission for Review	[redacted]
00	01/12/2022	6 month review and update	[redacted]
01	28/02/2023	Updated following review and comments	[redacted]
02	23/11/2023	6 month review and minor updates	[redacted]

BESIX Watpac Approvals

Name	Role & Title	Signature	Date
[redacted]	Author / Planning & Environment Manager	[redacted]	23/11/2023
[redacted]	Reviewer / Construction Manager	[redacted]	23/11/2023
[redacted]	Reviewer / Project Director	[redacted]	23/11/2023

Note: A controlled copy of the Construction Environmental Management Plan (CEMP) will be distributed to the Sydney Metro Principal's Representative, Independent Certifier (IC) and other nominated stakeholders, and it will be made available to all BR COP employees and subcontractors in soft copy format through the project document control system.

The CEMP associated sub-plans and procedures, when printed, will be uncontrolled and it will the responsibility of each user to confirm the currency of the plan through the project document control system.

Acronym and Definitions

Acronym	Term and/or Definitions
AA	Acoustic Advisor
BR-CODD	Barangaroo 'Construct Only Delivery Deed'
BR-COP	Barangaroo Metro Station 'Construct Only Package'
BW	BESIX Watpac
CAR	Corrective Action Request
CCSBMP	Community Communications Strategy and Business Management Plan
CEMF	Construction Environmental Management Framework
CEMP	Construction Environmental Management Plan
CMP	Contract Management Plan
CoA	Conditions of Approval
CPTED	Crime Prevention through Environmental Design
DPE	Department of Planning and Environment (formerly DPIE)
DPIE	NSW Department of Planning Industry and Environment (now DPE)
EIS	The Sydney Metro City and Southwest Chatswood to Sydenham Environmental Impact Statement dated 3 May 2016 submitted to the Secretary seeking approval to carry out the CSSI and as revised if required by the Secretary under the EP&A Act.
EMS	The BESIX Watpac certified Environmental Management System
ER	Environmental Representative
GS	General Specification
HMP	Heritage Management Plan
INSW	Infrastructure New South Wales
KPI	Key performance Indicator

Acronym	Term and/or Definitions
NVMP	Noise & Vibration Management Plan
N/A	Not applicable
PS	Particular Specification
SDPP	Station Design and Precinct Plan
SFAIRP	So Far As Is Reasonably Practicable (in terms of the RSNL, NSW)
SM	Sydney Metro
SME	Subject Matter Expert, a person with expert knowledge and competency in a specified subject or topic matter area.
SMP	Sustainability Management Plan
SMCSW	Sydney Metro City & Southwest (the overall program of works, which Barangaroo Station is part of)
SWMS	Safe Work Method Statement
TfNSW	Transport for New South Wales (https://www.transport.nsw.gov.au)
VAMP	Visual Amenity Management Plan
WHS	Work Health and Safety

Terms and Definitions

Glossary	Definitions and Responsibilities
Ancillary Facility	Temporary facility for construction e.g. site office, amenities and storage compound
Business Management Plan	the Business Management Plan required by the Project Planning Approval.
Contractor	Particular Specification (PS) must be read as a reference to the “BR Contractor” as defined in the BR-CODD
Contractors Activities	Particular Specification and General Specification must be read as a reference to the “BR Contractor’s Activities” as defined in the BR-CODD
Crisis Event	an event that may have an impact on the community, commuters, environment, personnel or subcontractors or has attracted or can reasonably be expected to attract the attention of the media, the Minister for Transport, a local Member of Parliament, local Authority or the local community. This includes emergencies, incidents or crises unrelated to the Contractor’s Activities that may be deemed to be caused by the Contractor’s Activities due to locality.
Design Documentation	Means the “Final Design Documentation” as defined in the BR-CODD.
Emergency Event	A situation in which there is an unacceptable risk, to the health and wellbeing of occupants, staff, or the general public, which needs intervention by staff or emergency services to control, limit escalation, suppress or address the risk and return to normal operations.
Environmental Aspect	Element of an organisation’s activities, products or services that interacts or can interact with the environment (AS/NZS ISO 140001:2016)
Environmental Impact	Change to the environment whether adverse or beneficial, wholly or partly resulting from an organisation’s environmental aspects
Environmental Policy	Statement by an organisation on its intention and principles for environmental performance
Inspection and Test Plan	Inspection and test plans prepared and implemented by the Contractor in accordance with the requirements in AS/NZS ISO 9001 Quality Management systems – Requirements.
Interface Contractors	Any contractor, consultant, artist, tradesperson or other person engaged by Sydney Metro that is carrying out ,or that will carry out Interface Work including: • Tunnel and Station Excavation (TSE) Contractor • Train System, Operation and Maintenance (TSOM) Contactors • Metro Trains Sydney (MTS) The Operator

Glossary	Definitions and Responsibilities
	• Line Wide (LW) Contractor • Electronic Ticketing System (ETS) Contractor
Interface Work	Any activities undertaken by an Interface Contractor which interface with or affect, or are affected by, the Contractor's Activities, the Project Works or the Temporary Works.
Non Compliance	Failure to comply with the requirements of the Project Approval or any applicable license, permit or legal requirements.
Non Conformance	Failure to conform to the requirements of project system documentation including this CEMP or supporting documentation

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Appendix A Visual Amenity Compliance Matrix

1. Introduction

1.1 Purpose

This Visual Amenity Management Plan (VAMP) has been developed to manage and minimise the risk and impacts to the visual amenity during construction of the Barangaroo Metro Station Construct Only Package (BR-COP).

This VAMP has been developed in accordance with the Conditions of Approval (CoA) for the Critical State Significant Infrastructure Sydney Metro City & Southwest Chatswood to Sydenham Project. This VAMP has also been developed as a requirement of the Construction Environmental Management Framework (CEMF). The VAMP identifies visual amenity related measures that will be implemented to achieve objectives outlined within Section 2 of this plan including processes and measures that will be used to incorporate principles of Crime Prevention Through Environmental Design (CPTED) in the design and construction of temporary site facilities.

1.2 Project Background

BESIX Watpac have been engaged by Sydney Metro to build the Barangaroo Station Construct Only Package (COP), forming part of the broader Sydney Metro City & Southwest Chatswood to Sydenham project. Most of the station box primary structure has been completed by the Tunnel and Excavation Contractor (TSE), prior to Project commencement and BESIX Watpac will complete the station fit-out and associated civil and landscaping works.

1.3 Site Location

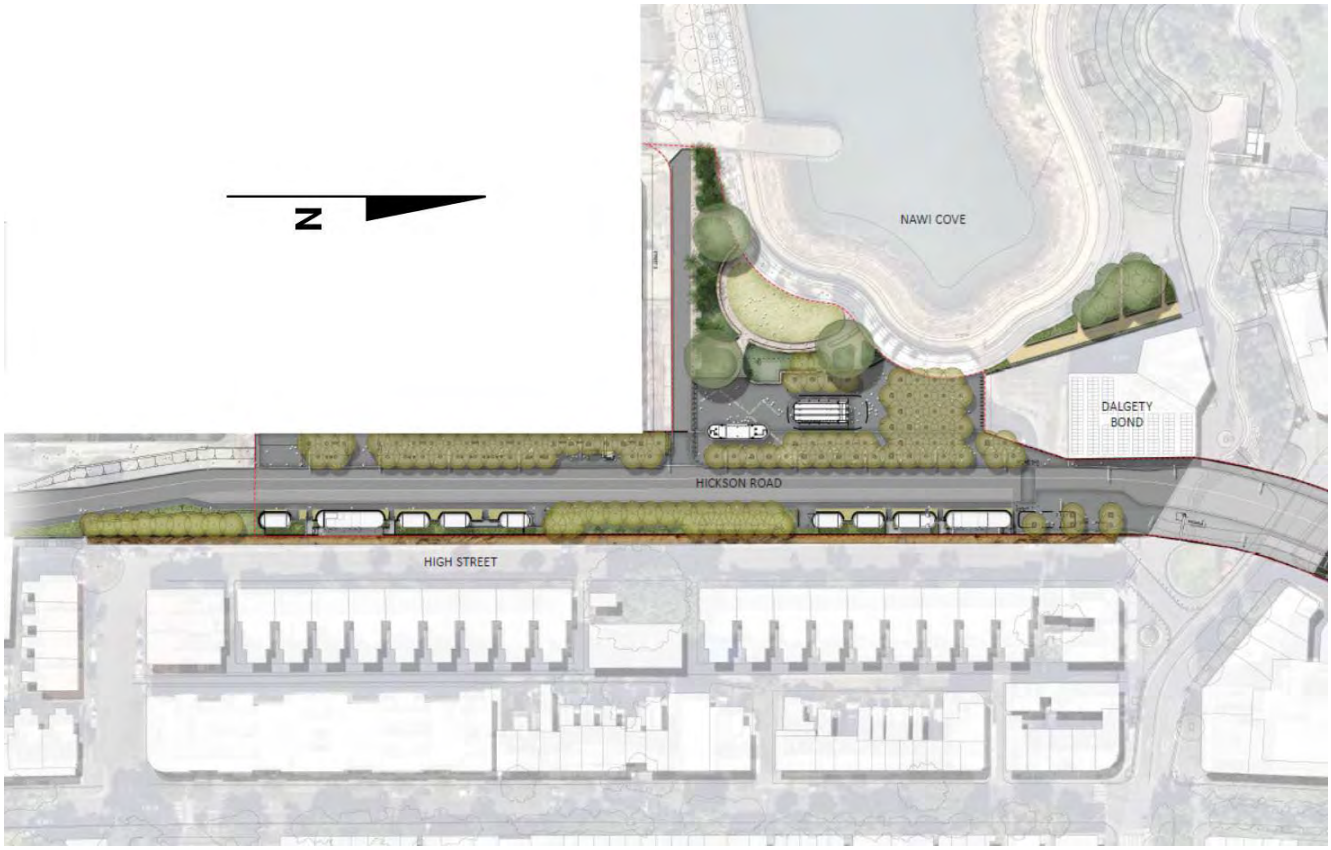
The Barangaroo Metro station is part of the Sydney Metro City & Southwest Chatswood to Sydenham project located between the future Victoria Cross and Martin Place stations as shown in Figure 1 below:

Figure 1 City & Southwest Project – Barangaroo Station Context



The project site is located north of the Barangaroo precinct below Hickson Road on the North Western edge of the Sydney CBD and adjacent to Nawi Cove as per Figure 2. The station is the most northerly of the CBD stations.

Figure 2 Location of Barangaroo Station



1.4 Scope of Works

The Project consists of the following:

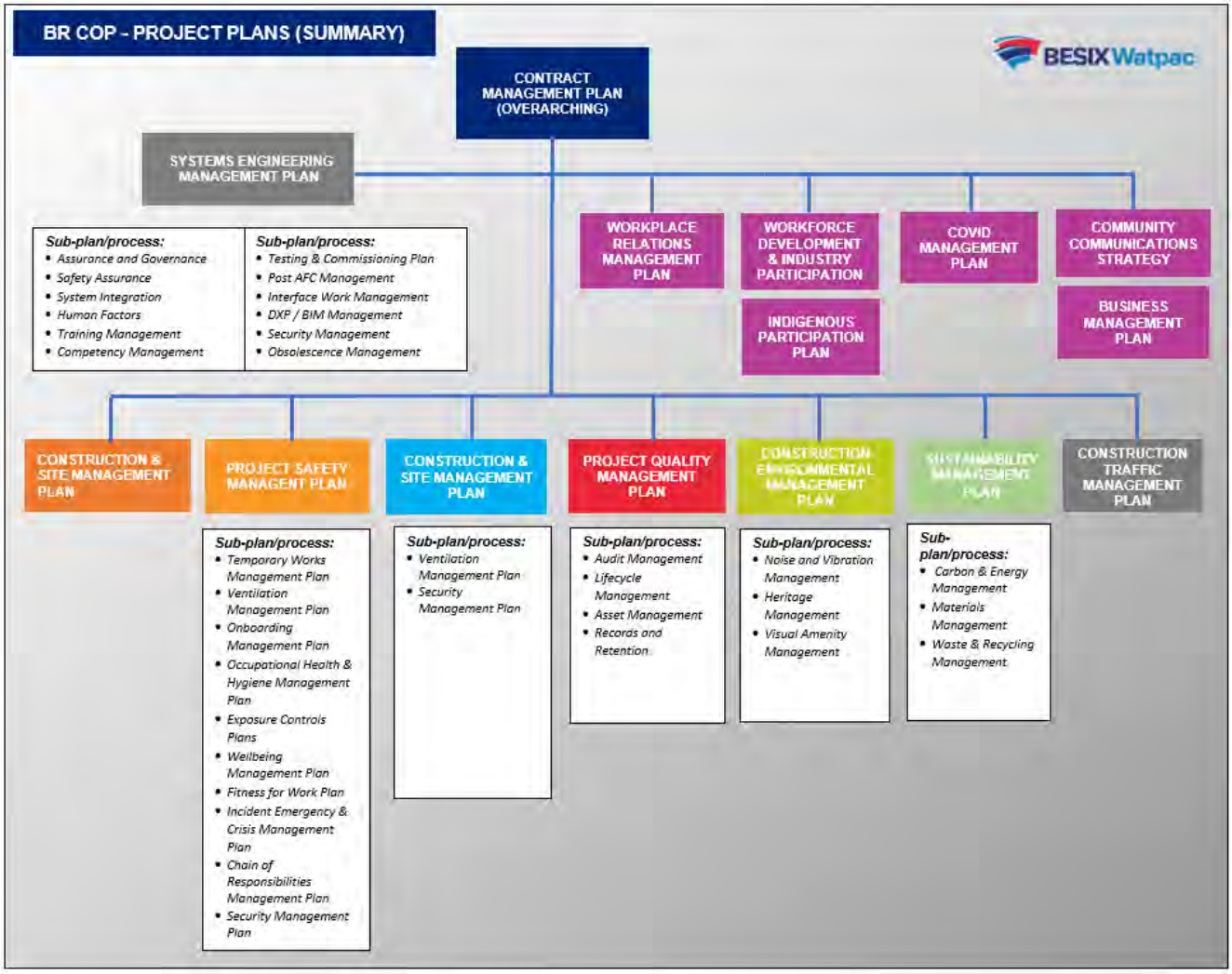
- Structural and civil completion works to the station box,
- Fitout, testing and commissioning of the new metro station
- Stormwater trunk mains works from Hickson road precinct to the existing pit at western end of the site
- Installation of a cooling water system within the Barangaroo cutaway and associated trenching and pipework
- Hickson Road precinct works including road, footpath, cycleway, landscaping, street lighting, stormwater, utilities works and ventilation pod risers
- Backfilling and surface reinstatement of the temporary northern (Hickson Road) shaft, and
- Staging and temporary works required to deliver the permanent works, including removal of the temporary Hickson Road bridge structure.

1.5 Project Plans

The Visual Amenity Management Plan exists as a sub plan to the Construction Environmental Management plan (CEMP).

The CEMP and its sub plans operate under the overarching Contract Management Plan (CM) as shown in Figure 3 below:

Figure 3 Project Management Plans



1.6 Construction Activities

Works will be staged within a constrained site located relatively close to Sydney Harbour, other development works and nearby existing heritage properties.

Detailed work components are listed in Section 1.6.1 below.

BESIX Watpac will implement The Station Design and Precinct Plan (SDPP), which has been prepared by Sydney Metro, in accordance with CoA E101 as it relates to the Barangaroo Metro station project.

1.6.1 Detail Construction Activities

The delivery of Barangaroo Station will involve the following detailed activities outlined in Table 1. The civil works and the above ground station activities are the main consideration in this VAMP.

Table 1 Detail Construction Activities

Component	Description of Work
Civil	Installation and maintenance of access routes within site Stormwater trunk drainage Demolition and reinstatement of Hickson Road Staged road, lane and footpath movements Hickson Road Civil works, trenching of in ground services

Component	Description of Work
	Demolition of perimeter capping beam and removal of steel girders, temp ramp Installation of waterproofing to station roof, Closure and backfilling to northern shaft Seawall diving, incl installation on stainless steel entry/exit cages and clearing of waterway entry/exits Main walkway, incl 2x chambers works, installation of pipe work connectors Headland Park – build and fit out seawater heat exchanger room, install pipes/systems, LV feeder cables and building services (mech, fire, lights etc) Headland to BR COP install supply/return chiller lines, LV feeder and control cables Landscaping (hard and soft), public plaza and precinct activation works Bicycle parking facilities Provisions for advertising, and public art Operation of the WTP and discharge into Sydney Harbour, and
Site Establishment	Establishment of a new site compound compromising temporary demountable site sheds, offices, toilets and showers, lunchrooms, change rooms, storage containers, rapid antigen testing and first aid sheds. Relocation of the existing TSE site compound for re-use by BESIX Watpac Establishment of site sheds, cranes, laydown areas, hoarding, refuelling areas and temp ventilation. Continual operation of the on-site Water Treatment Plant (WTP) which discharges to Sydney Harbour.
Station Works	Establishment of site sheds, cranes, laydown areas, hoarding, temp ventilation etc Construction of platform and over-track exhaust; Temp staging for installation of internal cladding and services fitout. Internal equipment and lifting gantries All station fit-out, including cladding, façade and entrance canopy, lift canopy and stair and ventilation pods Fitout trades, building services, including long run escalators and lifts Plant and equipment rooms; Back of house cleaners and waste rooms Public and staff toilets; Low-voltage electrical, earthing, fire, hydraulics, lighting and mechanical systems, including earthing and bonding as associated with works Building management control system; Select equipment and access provisions for Interface Contractors; Lifts and escalators; Signage and wayfinding; Landscaping (hard and soft), public plaza and precinct activation works; Bicycle parking facilities; Provisions for advertising, and public art; Operation of the Basement 3 de-pressurisation pumps.
Electrical & Coms (including Interface Contractors works in station)	Signalling and train control systems; Traction Power system; Track and tunnel services; Platform Screen Doors; Sydney Metro central control system; Sydney Metro communications system; Passenger information display systems; Public address systems; Audio frequency induction loop system; Sound system and intercom system for emergency purposes Closed circuit television systems; Help Point systems; Electronic access control systems; Local area networks;

Component	Description of Work
	UHF radio systems; UHF distributed antenna system; Train radio communication systems; Precise clocks system; Electronic access system; Fibre and copper backbone; High voltage power supply and distribution system; Tunnel Ventilation System; Tunnel ventilation nozzles; and Electronic ticketing system (ETS)

1.7 Temporary Works

Temporary works considered in the VAMP include:

- Site facilities
- Main tower crane
- Mobile cranes
- Temporary arrangements to divert and control pedestrians and traffic
- Construction hoardings
- Access gates to various civil works zones
- Water Treatment Plant (WTP) - both existing temporary plan and as relocated/replaced
- Temporary works to support trenching and utilities installation

1.8 Site Compound Works

Site compound works including fencing, hoardings, maintenance access, utilities works, drainage, road and transport network works, temporary site office and welfare facilities, laydown areas and works sites to support construction activities.

1.9 Working Hours

Works are proposed to be carried out during standard working hours of 7 am to 6 pm Monday to Friday and 8 am to 6 pm Saturdays.

Works may be undertaken outside of these standard construction hours where those works have been described in CoA E48 (such as station and tunnel fitout and haulage and delivery of spoil and materials) and under the circumstances described in CoA E44 (refer CEMP Section 1.2.6 for further details).

1.10 Timing and Scheduling

Staged construction works are scheduled over the course of the Project. Portion 1, comprising of Site access and establishment was expected in Q3 2021 and occurred in Q4 2021. Portion 2, compromising station fit-out works and station utility works, and Portion 3, involving the finalisation of the external landscaping and public domain works with substantial completion scheduled for Q2 2024 and the balance of the works consisting mostly defects rectification and handover activities carried out until the end of Q2 2024.

Most activities associated with demolition and structural works were completed by end Q4 2022. Utilities services works were carried out in Q1 to Q3 2022.

1.11 Consultation with Stakeholders

The VAMP was submitted for review by Sydney Metro and endorsed by the Environmental Representative (ER) and will be reviewed by BESIX Watpac on a six monthly basis and re-issued if amendments are required.

Where identified in the Community Communications Strategy (CCS) and Business Management Plan (BMP) businesses impacted by the works may need appropriate signage. A study indicated that this is minimal due to the existing construction activities and that few businesses are located within the immediate proximity of the works.

2. Objectives & Targets

The objectives of the VAMP reflect those described in the Construction Environmental Management Framework and are as follows:

- Minimise impacts on existing landscape features as far as feasible and reasonable;
- Ensure the successful implementation of the Landscape Design; and
- Reduce visual impact of construction to surrounding community.

This plan aims to achieve the following:

- Compliance with the Conditions of Approval (CoA)
- Visual amenity management and controls that are effective and properly maintained at all times.
- Alignment of outcomes with Crime Prevention Through Environmental Design (CPTED) principles as required by section 12.2 (a)(v) of the CEMF.

3. Legislative and Other Requirements

Table 2 Key legislative Requirements

Legislation	Requirement	Project Obligation
Environmental Planning and Assessment Act 1979 (EP&A Act)	This Act establishes a system of environmental planning and assessment of development proposals for the State.	The approval conditions and obligations are incorporated into this VAMP. Section 79C provides Crime Prevention Legislative Guidelines. The guidelines contain two parts. Part A details the need for a formal crime risk assessment (Safer By Design Evaluation) to be done in conjunction with trained police, and Part B outlines basic CPTED principles and strategies that can be used be consent authorities to justify the modification proposals to minimise risk.

The BESIX Watpac Planning & Environment Manager will review legislative and regulation requirements at six monthly intervals during construction, as part of the management review of this VAMP and updated with any applicable changes. The Environment and Planning Manager will consult with internal legal advisors, SM and the ER to ensure new legislation is captured in review. Any changes made to the legal and other requirements registers will be communicated to the wider project team where necessary through toolbox talks, specific training and other methods detailed in Section 5.2. The BESIX Watpac Environment and Planning Manager will consult with internal legal advisors, SM and the ER to ensure new legislation is captured in the review.

3.1 Standards & Guidelines

Guidelines and standards relating to this VAMP include:

- AS 4282-1997 Control of the Obtrusive Effects of Outdoor Lighting;
- AS/NZ 1158 — Lighting for Roads and Public Spaces;
- Crime Prevent Through Environmental Design Principles; and
- Australian Standard AS4970 the Australian Standard for Protection of Trees on Development Sites and Adjoining Properties.
- Sydney Metro Brand Style Guidelines

3.2 Planning Requirements

This project falls under the construction and operation of the section between Chatswood and Sydenham known as “CSSI_7400”. Approval was granted on 9 January 2017 followed by nine approved modifications;

MOD 1 – Victoria Cross and Artarmon Substation (determined 18 October 2017)
MOD 4 – Sydenham Station and Metro Facility South (determined 13 December 2017)
MOD 2 – Central Walk (determined 21 December 2017)
MOD 3 – Martin Place Metro Station (determined 22 March 2018)
MOD 5 – Blues Point Acoustic Shed (determined 2 November 2018)
MOD 6 – Administrative Changes (determined 21 February 2019)
MOD 7 – Administrative Changes (determined 24 June 2020)
MOD 8 – Blues Point Access Site (determined 25 November 2020)
MOD 9 – Extension to standard construction hours (determined 30 June 2022)

BESIX Watpac will be required to comply with CSSI_7400, including the relevant modifications to this approval, to the extent required by Sydney Metro.

The environmental assessments relevant to the project, which have been referenced during the preparation of this CEMP are:

- Sydney Metro City & Southwest – Chatswood to Sydenham – Environmental Impact Statement (May 2016). Referred as the 'EIS'
- Revised Environmental Mitigation Measures (REMMs) which are updated with each approval modification

The compliance matrix of how the VAMP complies with CoA, REMMs, and the CEMF is included in Appendix A.

4. Roles and responsibilities

Roles and responsibilities reflect those outlined in the management and implementation of the CEMP (refer CEMP Section 5).

BESIX Watpac Planning and Environmental Manager is responsible for overseeing the implementation and compliance with the VAMP. The Planning and Environmental Manager reports to the Project Director and has authority to direct any team member to comply with the requirements of this plan.

The Environmental Coordinator (a site engineer) will be responsible for daily surveillance and monitoring of all visual amenity aspects.

5. Existing Environment

Barangaroo is currently being redeveloped, with the area divided into three precincts:

- Barangaroo Reserve is located at the northern end of Barangaroo where it meets Millers Point. It is a six hectare foreshore park opened in 2015, designed as a contemporary interpretation of the pre-1836 headland, with bush walks, grassed areas, lookouts, walking and cycle paths. A plaza has been created at North Cove, marking a southern entry to the Reserve at Hickson Road
- Central Barangaroo is currently being planned. The site for the proposed station is in Central Barangaroo. It will be the cultural heart of Barangaroo and is expected to include civic and cultural attractions with recreational, residential, retail and commercial uses. Although the actual building heights, form and massing are not yet known, the planned site development envelopes allow for medium and high density urban form
- Barangaroo South is a major extension of the Sydney CBD with a number of high-rise buildings and stepping down to mid-rise development along the harbour foreshore. Planned as a mixed use precinct, it has office buildings, residential apartments, an international hotel, shops, cafes and restaurants, and a waterfront promenade. Transport for NSW has constructed a ferry hub at Barangaroo, which opened to customers in 2016.

The existing character of Barangaroo to consider during the construction stage is described in the Chatswood to Sydenham EIS Landscape character and visual amenity – Chapter 16.

"*Hickson Road forms the eastern boundary of the Barangaroo site. Hickson Road is located at the base of a distinctive cliff about four storeys high. The cliff is a local visual feature, with its exposed sandstone rock face and masonry, heritage railings and staircase cut into the stone. The cliff also creates a strong spatial 'edge' to the Barangaroo peninsular between Munn Street and the High Street stairs in the south, and a physical barrier to east–west movement. South of the High Street stairs, there are mixture of contemporary and heritage buildings which align with the line of the wall, addressing the road with a mix of commercial, offices and service entries. In this area, there is a second staircase, providing access to the upper levels of the peninsula along Kent Street. Hickson Road is currently two lanes with parking and an avenue of mature Fig trees on the western side, and a cluster of Livistona palms to the east, adjacent to the cliff, marking the stair entry on the eastern side of the road. High Street runs along the top of the escarpment, offering panoramic, open views across Barangaroo, and the harbour beyond. A line of heritage listed terrace houses ('Terrace duplex group' at 2–80 High Street) line the eastern side of High Street and are a visual feature in views towards the site, as well as in local streetscape views.*"

Further, during Construction, chapter 16.4.7 pf the Chatswood to Sydenham EIS Landscape character and visual amenity document states in relation to Barangaroo that

"During construction, there would be minor adverse landscape impact on Hickson Road due to the direct impacts of vehicular and pedestrian movement and the lack of mature street trees. However, it is expected that there would not be perceived change to the landscape quality of Barangaroo Reserve (resulting in negligible landscape impact) due to the context of the continuing development across the Barangaroo peninsular including works at Central Barangaroo"

Representative Viewpoints during construction, extracted from the EIS are shown below in Figure 4.

Figure 4 Representative Viewpoints during construction



Viewpoints 4 to 8 have been assessed as having a minor to moderate adverse potential visual impact temporarily during construction, mainly due to the extension of current works east across Hickson Road (refer Table 16-28 from the EIS).

Views 5 and 6 are potentially valued by a major portion of public users of that area. Views 4, 7 and 8 are views more experienced by local residents.

The following potentially sensitive receivers have been identified locally as being impacted visually by the Barangaroo Metro Station during construction:

- Local residents along High Street, Hickson Road and Dalgety Roads in Millers Point
- KU Lance childcare centre on High Street
- Local businesses including, The Argyle bar, Hotel Palisade and the Langham Hotel

During construction the following activities and elements of the site would be visible to local sensitive receivers:

- Site hoarding generally and site access gates
- Temporary site construction compound
- The existing acoustic shed over the northern access shaft on Hickson Road
- Operation of plant and equipment including the tower crane and general construction plant and equipment
- Construction activities being carried out at surface level including demolition works, the reconfiguration of Hickson Road, civil works, the construction of the station entry pods, ventilation pods and egress stairs as well as general landscaping activities.

6. Crime Prevention Through Environmental Design (CPTED)

CPTED principles identify opportunities for natural surveillance, lighting, walkways, signage and landscape.

The principles of *Crime Prevention Through Environmental Design* will be incorporated throughout the design and construction of temporary and permanent facilities. The key principles adopted in relation to the public realm at the Project site include:

- Increasing the perception of risk to criminals by increasing the possibility of detection, challenge and capture.
- Increasing the effort required to commit crime by increasing the time, energy of resources which need to be expended.
- Reducing the potential rewards of crime minimising by removing or concealing “crime benefits”.
- Removing conditions that create confusion about required norms of behaviour.

Access control minimise opportunities for crime and increase the effort required to commit crime. By making it clear where people are permitted to go or not go, it becomes difficult for potential offenders to reach and victimise people and their property. Fence and barriers are required to be secure however not create a hostile environment.

Natural surveillance increases the threat of apprehension by taking steps to increase the perception that people can be seen. Natural surveillance occurs by designing the placement of physical features, activities and people in such a way as to maximize visibility and foster positive social interaction among legitimate users of private and public space. Potential offenders feel increased scrutiny and limitations on their escape routes.

Territorial reinforcement promotes social control through increased definition of space and improved proprietary concern. By using fences, pavement, signs, lighting and landscape to express ownership and define public, semi-public and private space, natural territorial reinforcement occurs. Territorial reinforcement measures make the normal user feel safe and make the potential offender aware of a substantial risk of apprehension or scrutiny. Display security system signage at access points.

7. Visual Amenity Management

7.1 BESIX Watpac responsibilities

Table 3 below lists out the visual amenity mitigation measures to be implemented by BESIX Watpac during construction:

Table** 3 **Construction Visual Amenity Mitigation Measures

Item	Visual Amenity Mitigation Measures
General	In accordance with REMM LV4 visual mitigation would be implemented as soon as feasible and reasonable after the commencement of construction, and remain for the duration of the construction period
Temporary Site Hoardings	In accordance with REMM LV6, the design and maintenance of construction site hoardings would aim to minimise visual amenity and landscape character impacts, including the prompt removal of graffiti. Public art opportunities would be considered. In accordance with E21(b)(i), opportunities to incorporate heritage interpretation from the Metro Heritage Interpretation Plan (HIP) into the site hoarding will be considered
Graffiti and Advertising Material	Visible graffiti and advertising material will be dealt with in accordance with the following timeframes: Offensive graffiti will be removed or covered within 24 hours Highly visible graffiti will be removed or covered within 1 week Graffiti which is neither offensive or highly visible will be removed within 1 month Advertising material and bills posted on the site hoarding will be removed or covered within 1 week
Site lighting	In accordance with REMM LV3, lighting of the construction site would be oriented to minimise glare and light spill impact on adjacent receivers. Minimise glare and light spill impacts by ensuring lighting directed only downwards to work areas. Ensure compliance to AS4282:1997
Site Compound	Site sheds will be maintained to a high standard. The site office will be located within an existing adjacent building and maintained to a high standard. In accordance with CEMF Section 12.2(v), CPTED principles will be applied in the design of the temporary site sheds
Loose rubbish/ litter	Daily inspections & regular cleaning will be undertaken as well as toolbox talks highlighting the importance of a clean site to the work force
Material and Plant / Equipment storage	In accordance with REMM LV1, where feasible and reasonable, the elements within construction sites should be located to minimise visual impacts, for example materials and machinery would be stored behind fencing. Elements such as material stockpiles would be located to minimise visual impacts, where feasible and reasonable
Temporary Works	Temporary works, accessible to the general public, will be constructed to meet CPTED principles and have graffiti resistant coatings applied where required, such as on outward facing surfaces
Water treatment plant	When relocating existing plant, locate away from public site perimeter if reasonable and feasible to do so.

Item	Visual Amenity Mitigation Measures
Traffic	Ensure minimised and in line with Construction Traffic Management Plan (CTMP). Ensure signage clearly defines designated areas with respect to use
Vegetation & existing Landscaping	In accordance with REMM LV2 existing trees to be retained would be protected prior to the commencement of construction in accordance with *Australian Standard AS4970*. As per REMM LV5, opportunities for the retention and protection of existing trees would be identified during detailed construction planning An Arboricultural Impact Assessment was undertaken for the trees near the Cutaway that concluded transplantation was not feasible. As per the Landscape plans these trees will be replaced with the same species or approved equivalent, which will result in no net loss of visual amenity at the conclusion of the works.

In accordance with Section 4.4 of the CEMF the design of all temporary works will require Sydney Metro approval in relation to urban design and visual impacts.

7.2 Sydney Metro visual amenity responsibilities

Sydney Metro are responsible for the design of the station and the establishment of the Design Review Panel (DRP) as per CoA E100, and the preparation and approval of the Station Design and Precinct Plan (SDPP) as per CoAs E101, E102 and E103. The construction of Barangaroo station is a construct only contract for BESIX Watpac who are responsible for ensuring that Barangaroo station is constructed in accordance with the approved SDPP, as it relates to Barangaroo.

Sydney Metro are responsible for incorporating visual amenity mitigation measures into the design of Barangaroo Station as outlined in Table 4 below:

Table 4 Design Visual Amenity Mitigation Measures

Item	Visual Amenity Mitigation Measures
Lighting	In accordance with CoA E105, the placement of CCTV cameras associated with the CSSI must be undertaken in consultation with the relevant public authority and the NSW Police,
Lighting	In accordance with CoA E104, all permanent external lighting must be the minimum level of illumination necessary and must comply with *AS:4282:1997 – Control of the Obtrusive Effects of Outdoor Lighting* and relevant Australian Standards in the series *AS/NZ 1158 – Lighting for Roads and Public Spaces*.
Design	The Station Design and Precinct plan will be developed in accordance with CoA E101 and E102
Design	A Design Review Panel (DRP) will be established in accordance with CoA E100 to refine design objective for place making, public realm and urban and heritage interpretation

8. Training

As per CEMP Section 5.2, all relevant site personnel will undertake training via inductions and/or toolbox talks to support the VAMP.

This may include:

- Environmental awareness training and
- Specific relevant visual amenity issues such as
  - Hoarding and fencing requirements

- Storage of materials and plant in laydown areas
- General housekeeping and litter collection
- Reporting graffiti, and procedures to clean up
- Lighting and effects on external parties
- Signage and effect of traffic and pedestrian users

9. Monitoring, Auditing and Reporting

As per CEMP Section 6 there will be daily surveillance of visual amenity aspects by the Environmental Coordinator. Weekly inspections will be carried out by the Planning and Environmental Manager.

Inspections are to identify both negative and positive issues and proposed actions required to rectify.

Result and outcomes will be reported together with CEMP each month.

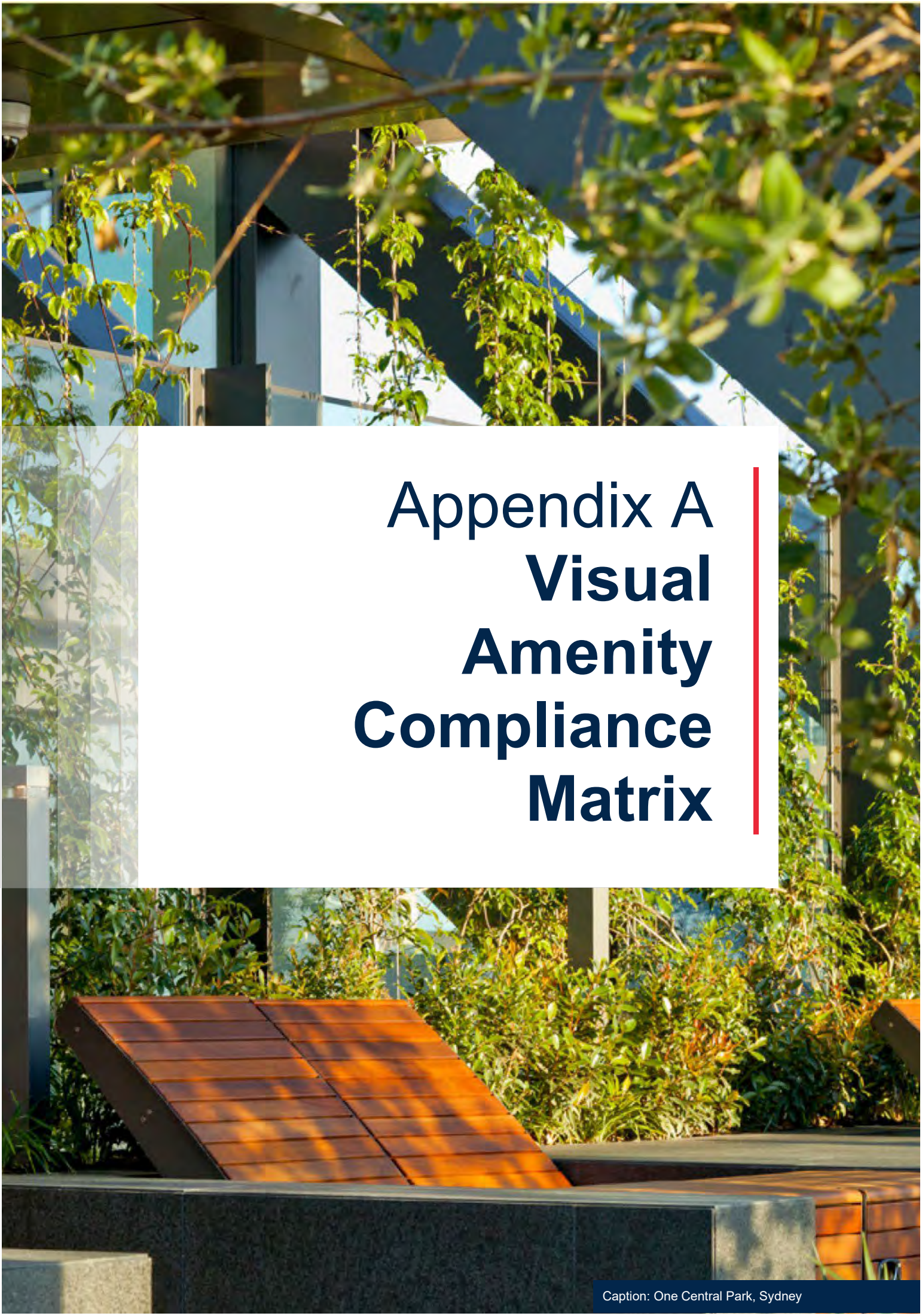
Compliance record generation and management will be carried out as required by CEMF section 12.2(a)(vi) and 12.2(c).

10. Document control

The VAMP will be reviewed annually and updated as per the CEMP (refer Section 1.11). Minor amendments will be sent to the ER for approval.

11. Complaints and Incident Management

The VAMP will follow procedures in CEMP Section 7.6 and 8 respectively and Community Communications Strategy (CCS) and Business Management Plan (BMP).



Appendix A
Visual Amenity Compliance Matrix

Caption: One Central Park, Sydney

Table 5 Compliance Matrix – CoAs, REMMs & CEMF

Category	ID	Requirement	Reference
Conditions of Approval – CSSI Sydney Metro City & Southwest Chatswood to Sydenham			
Heritage Interpretation	E21	The Proponent must prepare a Heritage Interpretation Plan which identifies and interprets the key Aboriginal and Non-Aboriginal heritage values and stories of heritage items and heritage conservation areas impacted by the CSSI. The Heritage Interpretation Plan must inform the Station Design and Precinct Plan referred to in Condition E101. The Heritage Interpretation Plan must be prepared in accordance with the NSW Heritage Manual, the NSW Heritage Office's Interpreting Heritage Places and Items: Guidelines (August 2005), and the NSW Heritage Council's Heritage Interpretation Policy and include, but not be limited to: (a) a discussion of key interpretive themes, stories and messages proposed to interpret the history and significance of the affected heritage items and sections of heritage conservation areas including, but not limited to the Sydney Terminal and Central Railway Stations Group, Martin Place Station, Sydenham Station and Sydenham Pit and Drainage Pumping Station Precincts; (b) identification and confirmation of interpretive initiatives implemented to mitigate impacts to archaeological Relics, heritage items and conservation areas affected by the CSSI including; i. use of interpretative hoardings during construction ii. community open days iii. community updates iv. station and precinct design; and (c) Aboriginal cultural and heritage values of the project area including the results of any archaeological investigations undertaken.	Section 7.1
Urban Design	E99	The CSSI must be constructed in a manner that minimises visual impacts of construction sites, including, providing temporary landscaping where appropriate to soften views of the construction sites, minimising light spill, and incorporating architectural treatment and finishes within key elements of temporary structures that reflect the context within which the construction sites are located.	This VAMP
Design Review Panel	E100	The Proponent must establish a Design Review Panel (DRP) to refine design objectives for place making, public realm and urban and heritage integration applicable to the length of the project and provide advice on the application of the objectives to key design elements in relation to place making, architecture, heritage, urban and landscape design and artistic aspects of the CSSI. The DRP must: (a) comprise five members who are experts in one of the identified design elements; (b) include the NSW Government Architect as Chair (or their representative); (c) invite the Heritage Council (or delegate) to participate in meetings on matters that have been referred to it by the Proponent in consultation with the Heritage Office. The independent heritage architect must also be invited to advise on matters relating to other heritage issues where this capability is not held by one of the members referred to in (a) or (b); (d) invite relevant Council(s) and other key stakeholders (such as UrbanGrowth NSW) to participate in meetings to advise on local issues and applicability of design review outcomes as they relate to the local context of each station; (e) meet at least four times a year, or any other timeframe agreed by the DRP; and (f) keep meeting minutes and a schedule of action items arising from each meeting.	Section 7.2
Design Review Panel	E101,	Before commencement of permanent built surface works and/or landscaping, the Proponent must prepare Station Design and Precinct Plans (SDPP) for each station. The SDPP must be prepared by a suitably qualified and experienced person(s), in collaboration and consultation with relevant stakeholders including but not limited to relevant council(s), UrbanGrowth	Section 7.2

Category	ID	Requirement	Reference
		NSW, the Department, Chambers of Commerce and the local community. The SDPP(s) must present an integrated urban and place making outcome for each station or end state element. The SDPP(s) must be approved by the Secretary following review by the DRP and before commencement of permanent aboveground work. Each SDPP must include, but not be limited to: (a) identification of specific design objectives, principles and standards based on - i. the project design objectives as refined by the DRP; ii. maximising the amenity of public spaces and permeability around entrances to stations; iii. local environmental, heritage and place making values; iv. urban design context; v. sustainable design and maintenance; vi. community safety, amenity and privacy, including 'safer by design' principles where relevant; vii. relevant urban design and infrastructure standards and guidelines (including relevant council standards, policies and guidelines); viii. minimising the footprint of the project (including at operational facilities); (b) opportunities for public art; (c) landscaping and building design opportunities to mitigate the visual impacts of rail infrastructure and operational fixed facilities (including the Chatswood Dive, Marrickville Dive, Sydney Metro Trains Facility South, Artarmon Substation, station structures and services, noise walls etc.); (d) the incorporation of salvaged historic and artistic elements onto the project design, including but not limited to the Tom Bass P&O fountain, the Douglas Annand glass screen (if present), the Douglas Annand wall frieze and heritage fabric from Martin Place Station, unless otherwise agreed by the Secretary; (e) details on the location of existing vegetation and proposed landscaping (including use of endemic and advanced tree species where practicable). Details of species to be replanted/revegetated must be provided, including their appropriateness to the area and habitat for threatened species; (f) a description of the CSSI design features, including graphics such as sections, perspective views and sketches for key elements of the CSSI; (g) the location, design and impacts of operational lighting associated with the CSSI and measures proposed to minimise lighting impacts; (h) details of where and how recommendations from the DRP have been considered in the plan; (i) the timing for implementation of access, landscaping and public realm initiatives; (j) monitoring and maintenance procedures for vegetation and landscaping (including weed control), performance indicators, responsibilities, timing and duration and contingencies where rehabilitation of vegetation and landscaping measures fail; and (k) evidence of consultation with the community, local Councils and agencies in the preparation of on the SDPP(s) and how feedback has been addressed before seeking endorsement by the DRP. Elements covered by SDPP(s) must be complete no later than the commencement of operation of the Sydney Metro to paid services, unless otherwise agreed with the Secretary. Note: The SDPP may be submitted in stages to address the built elements of the CSSI and landscaping aspects of the CSSI	
Design Review Panel	E102	The SDPP must achieve a minimum visual impact rating of at least "Minor Benefit" as defined in the EIS, as amended by the documents listed in A1, for all design elements of the project, where feasible and reasonable. Where it can be demonstrated, to the DRP's satisfaction, that a "Minor Benefit" is not achievable, then a "Negligible" visual impact rating must be achieved as a minimum	Section 7.2
Design Review Panel	E103	The Proponent must apply reasonable endeavours to negotiate with the Barangaroo Delivery Authority to integrate station ancillary components (i.e. traction substation, ventilation risers and skylights) associated with Barangaroo Station within the Barangaroo development complex. Should an integrated outcome for ancillary components not be achieved, the location and design outcome must be consistent with design objectives and endorsed by the DRP.	Section 7.2

Category	ID	Requirement	Reference
Lighting and Security	E104	All permanent external lighting must be the minimum level of illumination necessary and must comply with AS: 4282:1997 – Control of the Obtrusive Effects of Outdoor Lighting and relevant Australian Standards in the series AS/NZ 1158 – Lighting for Roads and Public Spaces.	Section 7
Lighting and Security	E105	The placement of CCTV cameras associated with the CSSI must be undertaken in consultation with the relevant public authority and the NSW Police.	Section 7.2
REMMs compliance			
Business	BI3	Appropriate signage would be provided around construction sites to provide visibility to retained businesses.	CCSBMP
Landscape	LV1	Where feasible and reasonable, the elements within construction sites would be located to minimise visual impacts, for example materials and machinery would be stored behind fencing.	Section 7
Landscape	LV3	Lighting of construction sites would be oriented to minimise glare and light spill impact on adjacent receivers.	Section 7
Landscape	LV4	Visual mitigation would be implemented as soon as feasible and reasonable after the commencement of construction and remain for the duration of the construction period.	Section 1.1
Landscape	LV6	The design and maintenance of construction site hoardings would aim to minimise visual amenity and landscape character impacts, including the prompt removal of graffiti. Public art opportunities would be considered.	Section 7
Landscape	LV7	The selection of materials and colours for acoustic sheds would aim to minimise their visual prominence.	Existing acoustic shed complies - , no change during construction
Landscape	LV10	Temporary impacts to public open space would be rehabilitated in consultation with the relevant local council and / or landowner.	Refer CTMP & CCSBMP
CEMF Compliance			
3.3		Construction Environmental Management Plan	
		d. As a minimum the CEMP will:	
		iii. For each plan under the CEMP include a matrix of the relevant Conditions of Approval or Consent referencing where each requirement is addressed;	Appendix A
		iv. For each plan under the CEMP, set objectives and targets, and identify measurable key performance indicators in relation to these;	Section 1.10
3.4		Construction Environmental Management Sub-Plans	Title
		a. Subject to Section 3.3(b) and Section 3.2(b) the Principal Contractor will prepare issue- specific environmental sub plans to the CEMP and SMP which address each of the relevant environmental impacts at a particular site or stage of the project. Issue specific sub plans will include:	Title
		vii. Visual amenity management;	This VAMP
4.4		Urban Design of Temporary Works	Title
		a. Principal Contractors will ensure as a minimum:	Title
		i. Temporary construction works including site hoardings and acoustic sheds consider urban design and visual impacts, including:	This VAMP
		s Artwork, graphics and images to enhance the visual appearance of temporary works in high visibility locations;	Section 7 Hoardings
		- Project information to raise awareness on benefits, explain the proposed works at each site and provide updates on construction progress;	Section 7 Hoardings & CCSBMP

Category	ID	Requirement	Reference
		- Community information, including contact numbers for enquiries / complaints;	Refer CEMP & CCSBMP
		- Signage and information to mitigate impacts on local businesses which may be obscured by the construction site;	This VAMP
		- Sydney Metro advertising / public awareness campaigns; and	This VAMP
		- Logos / branding, including Sydney Metro, NSW Government, and Contractor branding.	This VAMP
		b. The design of all temporary works will require TfNSW approval in relation to urban design and visual impacts.	Section 7
		c. Construction hoardings, scaffolding and acoustic sheds will be regularly inspected and kept clean and free of dust build up. Graffiti on construction hoardings, scaffolding or acoustic sheds will be removed or painted over promptly.	Section 7, 9
		d. The principles of Crime Prevention Through Environmental Design will be applied to all works, including temporary works, that have a public interface.	Section 6
12		Visual Amenity Management	Title
12.1		Visual Amenity Management Objectives	Title
		a. The following visual and landscape management objectives will apply to the construction of the project:	Title
		i. Minimise impacts on existing landscape features as far as feasible and reasonable;	Section 7
		ii. Ensure the successful implementation of the Landscape Design; and	Section 2
		iii. Reduce visual impact of construction to surrounding community.	Section 7
12.2		Visual Amenity Management Implementation	Title
		a. Principal Contractors will develop and implement a Visual Amenity Management Plan for temporary works which will include as a minimum:	
		i. The visual mitigation measures as detailed in the environmental approval documentation for construction;	Section 7
		ii. Input from an experienced Landscape or Urban Designer;	N/A due to existing site setup continuing
		iii. The maintenance of outward facing elements of site hoarding or noise barriers, including the removal of graffiti and weeds;	Section 7, CEMP Standard Procedures
		iv. Apply the principles of Australian Standard 4282-1997 Control of the obtrusive effects of outdoor lighting and relevant safety design requirements and detail mitigation measures to minimise lighting impacts on sensitive receivers for all permanent, temporary and mobile light sources;	Section 7
		v. Identify the processes and procedures that will be used for the incorporation of the principles of Crime Prevention Through Environmental Design (CPTED) in the design and construction of any temporary site facilities; and	Section 6
		vi. Compliance record generation and management.	Section 9
		b. Visual and landscape measures will be incorporated into the Principal Contractor's regular inspections including checking the health of retained vegetation around site boundaries, checking the condition of any site hoarding and acoustic sheds, and checking the position and direction of any sight lighting.	Section 7 & 9
		c. The Contractor will retain compliance records of any inspections undertaken in relation to visual and landscape measures.	Section 9

Category	ID	Requirement	Reference
12.3		Visual Amenity Mitigation	Title
		a. Examples of visual amenity mitigation measures include:	
		i. Wherever feasible and reasonable, vegetation around the perimeter of the construction sites will be maintained;	Noted Section 7
		ii. Temporary construction works will be designed with consideration of urban design and visual amenity as per Section 4.4; and	This VAMP
		iii. Temporary site lighting, for security purposes or night works will be installed and operated in accordance with AS4282:1997 Control of the Obtrusive Effect of Outdoor Lighting.	Section 7



Appendix F
BW SOP



Caption: One Central Park, Sydney

Standard Operating Procedures for Environmental Risks

Environmental Standard Operating Procedures (SOPs) have been developed to manage each environmental aspect pertinent to this project, as identified in the Environmental Risk Assessment.

These SOPs document the objective, strategy, action plan, control measures and performance targets for each identified aspect. Each SOP is outlined separately under sub-headings in the page's hereafter. SOP describe minimum standard requirements and are applied where relevant to the construction activities and environmental aspects. Where more onerous requirements and processes are be stipulated in the CEMP and sub plans they supersede these SOP. Where noted actions are deferred to a person or role, the endorsement of this role on environmental matters is always subject to endorsement of the Planning and Environmental Manager.

Site Accommodation	
Standard Environmental Protocol F.1	
Objective	Control, minimise or avoid contamination or spoiling of areas in the establishment, operation and disestablishment of temporary site accommodation facilities.
Management Strategy	Establish temporary site offices, amenities and ablution facilities, including provision for sanitary waste, in accordance with the requirements of the relevant local authority, all relevant Acts and Regulations and industry best practice. Remove all temporary buildings and facilities from site when no longer needed and make good all disturbed areas, including landscaping where required.
Action	Project Manager shall ensure: • Site offices, amenities and ablution facilities are located and operated in such a manner as not to cause environmental concern • Site offices, hoarding, crossovers and fencing complies with the approved Site Plan or approved revision • Consider materials laydown area(s). Prioritise areas that will not have a deleterious effect on vegetation or stabilisation; this includes frequency of vehicle access • Spill kits should be nearby to materials laydown areas and plant access areas • Adequate firefighting equipment is provided and maintained for the works • Required permits and approvals are received prior to commencing works • Install automatic shut-off taps to water points and utilise low voltage luminaries to site facilities • No trees or vegetation is damaged or removed for site accommodation facilities. Adequate tree protection will be provided • Construction routes are cleaned regularly at weekly intervals or as required • Efficient use of energy needed for lighting, space and water heating, and equipment in the site facilities, including offices, cafeteria and washroom facilities, toilets and any other temporary accommodation and storage areas on site.
Performance Indicators	Appropriate location and operation of all facilities. Site reinstated upon completion of project
Reference	• Approved Site Plan • Australian Standard 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites • Development Approval Conditions (extract as required) • Environmental Planning and Assessment Act 1979 (NSW) • Local Land Services Act 2013 (NSW) • Protection of the Environment Operations (Noise Control) Regulation 2008 (NSW)

Site Amenities	
Standard Environmental Protocol F.2	
Objective	Maintain hygiene and reduce nuisance created by site accommodation.
Management Strategy	Keep site clean and tidy Monitor area
Action	Project Manager shall ensure that: <u>Ablution</u> • Septic waste issues from overflowing portable toilets and unaccounted sewerage pipe burst is avoided. • Adequate lavatory systems are provided within reasonable proximity of working areas • Septic waste removal service is scheduled • Toilet facilities are well maintained • Clean up procedures are included in induction • There is bunding around temporary septic systems • There is a suitable and adequate amount of signage • Site induction demonstrate proper site behaviour <u>Waste</u> • Paper waste from site office is collected in paper recycling bins and regularly collected. • Cardboard waste bin is provided on site. • All putrescible waste is stored in secure containers until removal and disposal off site. weekly • A daily 'sweep' of the entire area is done to remove any stray/windblown litter. • Designate specific areas on site for the temporary management of waste, i.e. general domestic waste, works waste and contaminated waste • Waste streams will be segregated to enhance recycling opportunities where practicable i.e. general domestic waste, works waste and contaminated waste • All domestic and industrial waste to be disposed of in dedicated industrial bins • Waste bin lids to be closed at all times to avoid, littering, access by birds and scavenging by vermin, birds or native wildlife • Waste oils to be recycled where practicable • No waste will be burnt on site.
Performance Indicators	No odour or vermin present

Air Quality (Including Dust)	
Standard Environmental Protocol F.3	
Objective	Avoid, control or minimise contaminant emissions to the atmosphere caused by rising dust, vehicle/plant emissions, noxious fumes/odours, or paint spraying activities.
Management Strategy	Site environmental induction to address the issue of air quality and protective measures to prevent avoidable discharge of contaminant to the atmosphere Implement measures for control and suppression of dust
Action	Project Manager shall ensure: • Deposition over an averaging period not to exceed 4g/m^2/month. Visual observance of dust is low, 20km visibility is maintained • Work areas kept free of dust • Equipment to cut and grind concrete should be fitted with effective dust extractors • Cutting areas will be provided that are isolated dust extraction areas; all concrete cutting including blockwork and wall sheeting should be done in these areas • Concrete grinding should be supported an H-Class vacuum • Captured dust should be bagged and tied prior to dumping into general waste • All trades vacuum/sweep up as they go • Decks should be cleaned progressively including magnet extraction of reinforcement tailings and off-cuts to avoid a big deck blow-off prior to pouring and future-proof against strong winds • Materials deliveries such as fill, soil, sand, gravel, landscaping supplies etc, are transported to the site under covered loads • Stockpiles are stabilised with suitable materials • Site conditions are regularly inspected, and hand-held sprinklers and/or water cart are used as required to minimise dust • External paint spraying activities are undertaken in accordance with local authority requirements and not carried out during adverse weather conditions • All machinery and equipment used at the site will be maintained to relevant standards to reduce emissions to as low as possible • Disturbed areas will be re-vegetated as soon as practicable after construction of the works • Earth wetting using water cart and water sprays will be undertaken as required during construction to minimise dust generation at the site • Roads will be cleaned regularly to prevent the spread of dirt on roads surrounding the site • On-site speed restrictions and the need to control dust are formally discussed during site inductions • During the construction phase screening will be used by Watpac where necessary to prevent the spread of dust. This screening will also serve to screen the construction site from surrounding land uses and mitigate potential landscape impacts • Construction plant, machinery and vehicle access is to occur along designated access tracks only • Staff training and inductions, including: • Procedures for the application of dust suppression measures • General site management • Periodic toolbox training to be provided to relevant construction personnel to present new information or reiterate information relating to minimising potential impacts to air quality.
Performance Indicators	Visual observance of dusts levels; vehicle and plant emissions No dust complaints
Reporting	Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Reference	• Protection of the Environment Operations Act 1997 (NSW) • Protection of the Environment Operations (Clean Air) Regulation 2010 (NSW) • National Greenhouse and Energy Reporting Act 2007 (NGER Act)

Air Quality (Including Dust)	
	• National Environmental Protection Measure (NEPM) for Ambient Air Quality • Contaminated Land Management Act 1997 (NSW)

Noise	
Standard Environmental Protocol F.4	
Objective	Control, minimise or avoid environmental nuisance caused by 'unreasonable' levels of noise.
Management Strategy	Site environmental induction to address the issue of noise and protective measures to prevent 'unreasonable' noise caused by construction activities.
Action	Project Manager shall ensure: • All construction activities will be undertaken mindful of the provisions of AS 2436:1981 - Guide to Noise Control on Construction & Demolition Sites • Under the Protection of the Environment and Operations Act 1997 the occupier of any premises who operates any plant (other than control equipment) at those premises in such a manner as to cause the emission of noise from those premises is guilty of an offence if the noise so caused, or any part of it, is caused by the occupier's failure— • (a) to maintain the plant in an efficient condition, or • (b) to operate the plant in a proper and efficient manner. • The works are carried out in accordance with the Interim Construction Noise Guidelines (DECC 2009) and the Conditions of Approval CSSI 7400 MOD8 for noise management as they relate to the works under the contract. • Out of Hours Work – Watpac will provide at least five days' notice to the Principal prior to requiring access to the Site out of the access hours. A minimum of two personnel must be present on Site when work is being conducted outside the access hours. • Each item of plant is fitted with effective noise suppression devices (generally exhaust mufflers) as applicable. • Fit mufflers/silencers to pneumatic tools (e.g. breakers) • Substitute impact piling for bored piling or hydraulic piling where possible. If impact piling is adopted, place a resilient pad (dolly) between the hammer head and the pile. Enclose the hammer head and the top of the pile in an acoustic screen. • All plant, equipment and machinery are operated and maintained in accordance with acceptable industry standards and turned off when not in use. • Two-way radios are used for site signalling and communication. • When construction work is permitted outside designated hours, notice is given to occupiers of properties within the immediate precinct of the works providing details of the work to be done, together with the hours to be worked. • Power generators used for after-hours lighting are positioned and acoustically treated, as far as practical, to minimise noise emissions. • Watpac will notify the Principal a minimum of 48 hours in advance if any of the following activities are to be undertaken on Site and are likely to disturb occupants within the adjacent facilities: - Impact drilling concrete, floors or masonry - Chasing into walls - Use of explosive powered tools - Electric sawing of any material - Any noisy activity that may need to take place outside normal business hours.
Performance Indicators	No complaints concerning noise nuisance. No fines received.
Reporting	Daily monitoring reflected in daily site diary entries Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Reference	• Protection of the Environment Operations Act 1997 (NSW) • Protection of the Environment Operations (Noise Control) Regulation 2008 (NSW) • Contract Specifications • Australian Standard 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites • AS2436 – 1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites

Vibration	
Standard Environmental Protocol F.5	
Objective	Control, minimise or avoid disturbance caused by vibration in ground works or other structural activities.
Management Strategy	Site environmental induction to address the issue of vibration and protective measures to prevent disturbance/incidents caused by vibration. Identify works likely to cause high vibration—communicate this to the Principal and to neighbours.
Action	Project Manager shall ensure: • The Conditions of Approval CSSI 7400 MOD8 for vibration management as they relate to the works under the contract are adhered to. • Vibration is controlled in accordance with AS 2670.2. • A survey of properties in the immediate precinct of the site is undertaken and notes made, together with a photographic record of existing conditions • All equipment and machinery is operated and maintained in accordance with industry standards • Any blasting, rock breaking, drilling or piling activities are carried out under strictly controlled conditions • The use of heavy machinery in the proximity of retained buildings or other structures will be limited to absolutory essential activities and only upon approval by the site manager • Extra vigilance is to be exercised while using rock breaking equipment near structures, hoarding walls and underground services. Activity is to cease at the first sign of risk and a risk assessment is to be carried out and ratified by the Site management team prior to proceeding. • Watpac will notify the Principal a minimum of 48 hours in advance if any of the following activities are to be undertaken on Site and are likely to disturb occupants within the adjacent facilities: - Piling - Compacting - Use of explosive powered tools - Electric sawing of any material - In-ground, consider pre-drilling options to mitigate vibration.
Performance Indicators	No disturbances/incidents or complaints.
Reporting	Monitoring records to be maintained during construction activities with potential to generate vibration Daily monitoring reflected in daily site diary entries Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Reference	• Protection of the Environment Operations Act 1997 • Assessing vibration: a technical guideline 2006 • AS 2670.2-1990 Evaluation of human exposure to whole-body vibration Continuous and shock-induced vibration in buildings (1 to 80 Hz) • BS6472 Guide to Evaluate Exposure to Vibration in Building (1Hz to 80Hz) • DIN4150 Part 3 Structural Vibration – Effects of vibration on structures

Water Quality	
Standard Environmental Protocol F.6	
Objective	Maintain the health of any impacted nearby waterbodies.
Management Strategy	Site environmental induction to address: The issues concerned with the conservation of water usage in construction activities. The issue of water quality and protective measures to prevent avoidable discharge into, or contamination of, waterways or established drainage systems.
Action	Project Manager shall ensure: • Any water leaving the site must be compliant with the following discharge limits: • No more than 50mg/L Turbidity, or 50 NTU, after establishing correlation • pH must be between 6.5 and 8.5 • Dissolved Oxygen must be greater than 6 mg/L or 80% saturation level for a normal 24 hr period • Temperature of the receiving waters must not rise more than 2°C above seasonal mean temperature • No visible oils, films, litter, coarse material, cement or other chemicals can be present in discharge • Wet discharge must be managed. This includes designated areas for washing out of concrete trucks, concrete pumps, paint, masonry cutting, and plaster. Refer to C-PLA-014 for more information • Use of water for wet trades' clean-up is minimal, self-contained and recycled where possible, or optionally not using any washdown at all. • Paint, solvents, oils etc. are correctly stored in bunded and contained area. • Stockpiles of bulk materials are located well clear of any waterway or drainage systems, protected by sediment fences, and covered by tarp, seed, mulch or chemical binder • Where available, a recycled water source will be used for dust suppression • Where water discharge compliance can't be achieved, contaminated wastewater is to be used as dust suppressant or collected by a licenced contractor to a licenced facility • Roadways can be swept, not washed down • Work in or around watercourses should be managed to minimise impact in accordance with Watpac Erosion and Sediment Control guidelines
Performance Indicators	No incidents of inadvertent waste of water No pollution or contamination of waterways
Reporting	Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Applicable Permits	Trade Waste Approval – "Special Approval"
Reference	• Protection of the Environment Operations Act 1997 • Managing Urban Stormwater: Soils and Construction. Volume 1, 4th Edition. Blue Book. • NSW EPA Approved Methods for the Sampling and Analysis of Water Pollutants in NSW • Protection of the Environment Operations Act 1997 (NSW), Section 120 • Standard Methods for the Examination of Water and Wastewater, 20th Edition. American Public Health Association. • Water Act 1912 (NSW) • Water Management Act 2000 (NSW) and Amendment Act 2010 • Water NSW Act 2014 • Water Management (General) Regulation 2011 (NSW) • Australian and New Zealand Guidelines For Fresh and Marine Water Quality 2000 • Australian Guidelines for Water Quality Monitoring and Reporting 2000

Spill Response and Management

Standard Environmental Protocol F.8

Objective	Control, minimise or avoid spillage of hazardous or prohibited substances, and react quickly to contain spills in the event they occur.
Management Strategy	Induct all personnel to handle chemicals with care. Ensure spill kits are positioned near potential escape points.
Action	In event of spill: • Assess: Evaluate the spill to determine if it can be dealt with by an individual, the spill response team or if outside assistance is required i.e.; hazchem, police, fire brigade, specialist spill response company. • Secure: Make the site safe for all personnel and the general public. • Contain: Spill response equipment such as spill booms, drain covers or bunding can be used to contain the spill. For solids, tarps may be used to cover and prevent dampness to granules or possible dispersion by wind. • PPE: Identify the liquid and check the MSDS to ascertain the required PPE • Absorb: Once the liquid is contained, it will need to be converted to a solid by absorption. Use the appropriate absorbing pads or absorbent (according to the type of material spilled) to soak up the spill by placing them over the liquid. Remove the saturated pads and replace as necessary. On porous surfaces, sprinkle loose absorbent over the spill and broom through until surface appears dry. • Dispose: Place the spent absorbent in the disposal bags. Correctly dispose of contaminants off site using a licensed contaminated waste disposal contractor. • Report: Document the incident and include what happened, when it happened, where it happened; and what was done to eliminate or minimise the impact. • Restock: Order and replace used up PPE and absorption materials. Project Manager shall ensure: • Spill containment and treatment equipment and materials will be available near storage areas of hazardous materials and escape points of the site. Spill kits and other suitable incident response equipment will also be located at other key points around the site and maintained ready for use. • Transport of chemicals is planned and controlled to minimise change of spillage. Transport is only to occur in a bunded and secure vehicle, with checks in place to ensure container lids are secure. • Subcontractors will be required to provide and maintain their own spill kits where required. • Spills of hazardous materials will be collected by licensed contractor and collected for treatment at a licensed waste disposal facility. • All regulated waste will be tracked (as per the Sustainability Management Plan requirements) • Contaminated ground is made good and contaminated material that is to be removed from site is disposed of in an approved manner. • SWMS must be submitted and approved for the handling and use of hazardous chemicals. • Any waste oils, lubricants and contaminated cloths, resulting from maintenance of plant on-site, are placed in suitable containers prior to removal and disposal at an approved waste receiving facility.
Performance Indicators	No spillages. Spill kits readily accessible.
Reporting	Immediate contact and incident reporting through Environmental Manager in event of spill. Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Reference	• Work Health and Safety Regulation 2011 s357 • Protection of the Environment Operations Act 1997 • Protection of the Environment Operations (Waste) Regulation 2014 • EPA Waste Classification Guidelines 2014 & EPA Act 1994, s 443, s 11, s 15-17

Erosion and Sediment Control	
Standard Environmental Protocol F.7	
Objective	Avoid, or minimise and control, contamination caused by sedimentation run-off or the discharge of pollutants into waterways or established drainage systems. Conserve the use of water to minimal requirements.
Management Strategy	Site environmental induction to address: The issue of water quality and protective measures to prevent avoidable discharge into, or contamination of, waterways or established drainage systems The site-specific Erosion and Sedimentation and Control Plans are to be implemented and maintained.
Action	Project Manager shall ensure: • Any water leaving the site must be compliant with the following discharge limits: • No more than 50mg/L Turbidity, or 50 NTU, after establishing correlation • Erosion and Sediment Control to be established in accordance with the site Erosion and Sediment Control plans, and BESIX Watpac Erosion and Sediment Control Guide • Sediment fences are to be dug into the ground 200mm, using a bidim A34 product • Vehicle entry/exits will be established with shake-down grids, rumble rock and/or bunds. Rumble pad will be bottom lined with geotextile fabric material • Any batters that are to remain are promptly and appropriately treated/revegetated • Earth bunds, swales/ channels or sediment fencing should be set up around the perimeter of the site so as to minimally disturb the natural overland flow of the surrounding watercourse and provide minimal run-off into nearby waterways that are diverted through the site • Sediment basins: Refer to BESIX Watpac Erosion and Sediment Control Guidelines for establishing, managing and servicing Sediment Basins (if required) • Areas for plant and construction material storage are designated • Upstream stormwater runoff is diverted around disturbed areas of the site • Disturbed areas are stabilised as soon as practicable • Stormwater quality discharging from the site is monitored, and the implement additional measures or modify existing measures if required • Transport routes are designated and marked of across the site to minimise dust disturbance • Drainage structure protection devices are installed to existing stormwater inlet structures within the site, and within the road ways adjacent to the site. • Site personnel are educated to the sediment and erosion control measures implemented on site • Where available, a recycled water source will be used for dust suppression • Refer to C-PLA-014, Erosion and Sediment Control Guide, for a detailed manual on following ESC Plans and establishing on site.
Performance Indicators	No sedimentation run-off No pollution or contamination of waterways.
Reporting	Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Reference	• Protection of the Environment Operations Act 1997 • Soil and Construction, Volume 1, 4th Edition, March 2004 (Managing Urban Stormwater, Landcom) • EPA, A Resource guide for local councils: Erosion and sediment control, 2006 • AS/NZS 5667.1:1998 Water quality – Sampling – Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples

Weed Control	
Standard Environmental Protocol F.11	
Objective	To detect and manage identified weeds and pests.
Management Strategy	Monitor site for weeds and pests
Action	Project Manager shall ensure: • An herbicide treatment strategy should be approved with the Landscape Architect and Environmental Representative if weed treatment is required. This is to ensure the planting is not affected by the weed treatment • A company with demonstrated weed management credentials would need to be engaged to provide advice on control methods and the application of herbicide if appropriate • Sweeps should be done on a week basis before, during and after works, particularly during hydro-mulching of ground for "on-maintenance" handover • Ensure all imported fill is certified clean • All excavated spoil leaving site should be inspected for deleterious organic material • Methods for disposal include deep burying, mulching or putting the weeds in a plastic bag and leaving in bright sunlight until they are dead • Refer to C-PLA-15, “Weed Management Guide.”
Performance Indicators	No spread or release of weeds
Reporting	Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Applicable Permits	It is illegal to possess, sell or release weed or pest species without a permit
Reference	• Biosecurity Act 2015 • Biosecurity Regulation 2017

Land Contamination	
Standard Environmental Protocol F.12	
Objective	To detect and manage contaminated land, prevent leaching of contaminated materials or groundwater infiltration during earthworks, and detect services prior to commencement. Avoid or minimise contamination of land caused by the use of imported materials, or by spillage of fuels, paint, form oil, chemicals etc.
Management Strategy	• Expert Consultants are engaged to provide a detailed assessment of the quality of the earth before earthworks begin • Services will be identified before earthworks commences • Controls are in place to capture and treat tainted water and earth.
Action	Project Manager shall ensure: • Soil contamination risk for the site will be discussed in Section 3 of this Environmental Plan • Unexpected contamination may present itself during earthworks. Signs include pockets of discoloured or poorly textured soil (noticeable different from the surrounding soil); and malodours that present (e.g. oil, sulphur, chlorine, sewerage).
Performance Indicators	No release of contaminated materials or compromised water from the site.
Reporting	Immediate liaison with the Environmental Manager in event of unexpected contamination finds Incident reporting in event of release or discovery of contamination
Applicable Permits	Permits for removal and disposal of contaminated soil
Reference	• Protection of the Environment Operations Act 1997 • Protection of the Environment Operations (Waste) Regulation 2014 • EPA Waste Classification Guidelines 2014 • Contaminated Land Management Act 1997 • Contaminated Land Management Regulation 2013 • EPA Contaminated Sites: Guidelines on Significant Risk of Harm from Contamination & the Duty to Report 1999 • Assessment of Site Contamination NEPM 1999 • EPA Contaminated Sites: Guidelines for Assessing Service Station Sites 1994 • EPA Contaminated Sites Guidelines for the NSW Site Auditor Scheme (2nd edition) 2006 • EPA Guidelines for the Assessment and Management of Groundwater Contamination 2007 • EPA Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites 1997 • EPA Contaminated Sites: Sampling Design Guidelines 1995 • AS/NZS 5667.11:1998 Water quality – Sampling – Guidance on sampling of groundwaters

Protection of Cultural, Heritage and Aboriginal Artefacts	
Standard Environmental Protocol F.13	
Objective	Avoid damage or disturbance to archaeological/cultural artefacts including skeletal remains, shell middens or other cultural artefacts.
Management Strategy	Conduct a historical investigation of the site to establish, as far as practical, the likelihood of existence of archaeological/cultural artefacts. Site environmental induction to address likelihood of discovery of archaeological/cultural artefacts. Excavation personnel to remain vigilant over ground penetration points.
Action	Project Manager shall ensure: • Where archaeological/cultural artefacts are discovered, personnel cease work in the subject area and effect practical protection measures • The Principal and DES is promptly advised of significant discoveries • Directions from DES are followed • If suspected human remains are discovered that work is ceased and the Superintendent, Police and State Coroner's Office are contacted, and if applicable, the Department of Aboriginal Affairs.
Performance Indicators	No damage, or minimal disturbance, to any archaeological/cultural artefacts discovered.
Reporting	Superintendent is immediately notified of any discovery Daily monitoring reflected in daily site diary entries Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Reference	• Heritage Act 1977 • Aboriginal and Torres Strait Islander Heritage Protection Act 1984 • Aboriginal and Torres Strait Islander Heritage Protection Regulations 1984 • Australian Heritage Council Act 2003

Fire Protection	
Standard Environmental Protocol F.14	
Objective	Prevent the ignition and spread of fire.
Management Strategy	Areas prone to fire will be assessed. Site inductions will address fire risk minimisation controls.
Action	Project Manager shall ensure: • Fire extinguishers will be located as per AS-2444 • Site rules and Inductions include prohibition of smoking and lighters • Combustible materials shall be stored in cool, dry locations, protected from weather • Weekly inspections to monitor build-up of flammable organic materials which may present a fire path, e.g. understorey fuels such as loose bark, fallen leaves and branches, and spear grass • Grass may need to be mowed and organic materials collected and disposed of or burned in a controlled manner • In extreme situations, fire breaks may need to be rutted out around the perimeter of the site • Fire control advantages should be identified, such as fire trails, water supply points, dams, and helipads
Performance Indicators	No fires, minimisation of fire-spreading paths.
Reporting	Daily monitoring reflected in daily site diary entries Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form.
Applicable Permits	A bushfire management plan is required in areas of high bushfire risk as per the risk overlay mapping.
Reference	• Fire and Rescue Service Act 1990, s 62, 65, 72, 67 • AS-2444-2001 Portable fire extinguishers and fire blankets - Selection and location

Identification and Protection of Existing Utility Services	
Standard Environmental Protocol F.16	
Objective	Avoid damage to, or unplanned interruption of, utility services.
Management Strategy	Site environmental induction to address location of and protective measures for utility services. Identify, mark and protect utility services (electricity, water, gas etc.). Ensure all necessary interruptions to utility services are planned and communicated to all relevant persons and Authorities.
Action	Project Manager shall ensure: • Existing services plans will be studied and services will be located and marked prior to commencing any works • Services locations must be known prior to commencing earthworks • Vacuum excavation/Services Detection will be undertaken wherever services are likely to be encountered • Contact telephone numbers for emergency services for utilities are established and readily available in the Site Emergency Plan • Storage areas are located remote from utility services • Access ways, haul roads and turning points are arranged to avoid possible clashes with utility services • Overhead protection/warning is provided for high loads, vehicles, cranes etc • Spotters are provided when work is undertaken beneath overhead power lines • Where it is found necessary to temporarily interrupt, remove, divert or make connection to an existing service or other existing work beyond the control of the Watpac, written approval from the Principal will be sought prior to undertaking Works
Performance Indicators	No unplanned interruptions to any utility service.
Reporting	Notification to relevant authorities Daily monitoring reflected in daily site diary entries Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Applicable Permits	Dial Before You Dig Permit to Dig (Watpac NSMS Form)
Reference	• Work Health and Safety Act 2011 • Energy and Utilities Administration Act 1987 (NSW)

Waste Management	
Standard Environmental Protocol F.17	
Objective	To control the disposal of waste generated from construction activities.
Management Strategy	Site environmental induction to address the issue of waste management and protective measures to prevent environmental incidents caused by inappropriate methods of disposal of waste. Designated bin storage locations (for both Wheelie bins & skips), and an appropriate regime for clearance.
Action	Project Manager shall ensure: • All construction waste shall be taken off site and appropriately disposed of in accordance with all relevant State/Territory regulations during or at the completion of construction. • A Waste Management Plan is developed and implemented maximise the volume of waste demolition and construction waste that is reused or recycled during the project. This shall include an assessment of alternative construction waste minimisation strategies shall be undertaken and implemented as appropriate. These alternatives could include but not be limited to initiatives such as supplier take-back of packaging and off-cuts, pre-manufacturing or on-site waste grinding to produce construction materials (e.g. grinding of bricks/concrete/wood to make aggregate and woodchips), or "Ship to point of use" techniques to minimise protective wrappings or enclosures. • All topsoil affected by the construction works shall be separated and protected from degradation, erosion or mixing with fill, contamination or waste. • The MSDS of Chemicals and Hazardous Substances should be consulted before disposal instructions, which will usually involve dropping of containers to Chemical Waste/Hazardous Collection stations. Containers must not be washed out and disposed of as normal. • All PVC products shall be recycled and/or reused when being disposed, when not available, disposed of at a licensed landfill facility. • Waste is minimised through the use of careful measurement and conservative ordering to prevent oversupply of materials. • All waste will be sorted (including that from clearing, demolition, off cuts, etc.) into appropriate categories for recycling or disposal. • Watpac will ensure that appropriate recycling receptacles are provided for scrap steel. • A recycling bin will be provided separately to the bin for Construction waste material and general waste (food scraps, cans, etc). Recyclable materials will include cardboard, glass, and plastics. • Any mulch accrued as a result of tree clearing can be used as erosion stabilisation. • Waste skips/bins are easily accessible and protected from weather dispersal. • Paper recycling bins are to be maintained in the office. Used toner cartridges should be collected and deposited at head office. • The construction site is kept free from build-up of waste materials by directing regular clean-ups by subcontractors. • No burning of waste takes place on-site. • Paint washouts will be provided and when full will be taken off-site to be filtered before discharging. • Any liquid waste, including backwash of wet trades, should be treated for adequate water quality before discharge, or collected by a liquid waste contractor.
Performance Indicators	No incidents arising from the disposal of end waste.
Reporting	Weekly Inspections undertaken and recorded on the Weekly Environment Inspection.
Reference	• NEPM (Movement of Controlled Waste between States and Territories) • Protection of the Environment Operations (Waste) Regulation 2014 • Waste Avoidance and Resource Recovery Act 2001 • EPA Waste Classification Guidelines 2014 • Construction and Demolition Waste Guide - Recycling and Reuse across the Supply Chain

Waste Management	
	• National Waste Policy: less waste, more resources 2009 • National Packaging Covenant Work • AS 1940 – 2004: The Storage and Handling of Flammable and Combustible Liquids and the chemical's Safety Data Sheet (SDS)

Artificial Lighting	
Standard Environmental Protocol F.18	
Objective	Control or minimise disturbance caused by after-hours lighting.
Management Strategy	Site environmental induction to address the issue of after-hours lighting. Ensure all necessary after-hours work is planned and communicated to all relevant persons and authorities. As far as possible, plan all construction activities for normal daytime work.
Action	Project Manager shall ensure: • Minimising lighting pollution impact from external lighting provided during construction on neighbouring properties and their occupants and neighbouring ecological areas (external to the construction site), in accordance with Australian Standard "4282 Control of the obtrusive effects of outdoor lighting". • Directional lighting and type of lights used will be planned and designed with the above in mind; • Shining downwards and only where required. • Reduced by screening • Effective programming of work • Any lighting must be positioned to ensure light pollution does not enter the wildlife corridors. • All lighting equipment is installed in such a manner as not to cause a safety hazard to pedestrian or vehicular traffic within the immediate surrounds of the site. • Where required or deemed necessary, advisory/warning signs are posted in appropriate locations. • Relevant authorities are notified; approvals obtained and put into effect; adjoining property owners/occupiers are advised of when planned after hours lighting will occur.
Performance Indicators	No incidents or complaints.
Reporting	Monitoring records to be maintained for the duration of after-hours lighting. Daily monitoring reflected in daily site diary entries Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form.
Reference	• Protection of the Environment Operations Act 1997

Vehicular and Pedestrian Traffic Management	
Standard Environmental Protocol F.19	
Objective	Avoid interference of, or obstruction to, roadways, footways or access points by the use of appropriate traffic control measures.
Management Strategy	Site environmental induction to address the issues of access and delivery arrangements for materials including timing and unloading of materials. Coordinate construction programme and delivery times to avoid hold-ups and traffic congestion. Provide appropriate fencing/hoardings and protection for the public.
Access	Access to the site will be determined to minimise impact.
Action	Project Manager shall ensure: • Controls documented in the approved Traffic Management Plan are implemented • Vehicle entry/exits with shakedown grids will be established to remove the potential for vehicles departing the site to deposit debris on the roads. Watpac will deploy street sweepers as required • Site fencing/hoarding is properly secured and lockable; access points are clearly designated and appropriate signage erected • Materials set-down areas are established. • All required Approvals are obtained and Traffic Controllers are engaged where necessary when temporary road closures are required. • Traffic management controls are monitored • Construction programme and delivery times are coordinated to avoid delays and possible traffic congestion • Access points for each stage of construction are unobstructed to facilitate prompt service to set–down areas within the site • Materials handling is managed to cause least disruption to traffic and local amenity.
Performance Indicators	Reports or complaints of interruption or interference with pedestrian or vehicular traffic movement around the site.
Reporting	Daily monitoring reflected in daily site diary entries Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Applicable Permits	Road Corridor Permit Traffic Control Permit
Reference	• Public Health Act 2010 (NSW) • Road Transport Act 2013 (NSW) • Road Transport (General) Regulation 2013 (NSW) • Roads Act 1993 (NSW)

Acid Sulphate Soil	
Standard Environmental Protocol F.20	
Objective	To avoid significant impact caused by the disturbance of Acid Sulphate Soils (ASS).
Management Strategy	A soil investigation and analysis will be conducted to determine the extent of ASS on-site. Site environmental induction to address management of ASS. Excavations will be confined to minimum requirements. Bunds around all disturbed areas of ASS will be provided.
Action	Initial approach and planning A soil investigation and analysis will be conducted to determine the extent of ASS on site, including the possible and potential acid sulphate soils, and at what depths. An Acid Sulphate Soils Management Plan will be produced to outline the risks and liming rates to inform the earthworks contractors. <u>Field Indicators</u> • Field indicators for Actual Acid Sulphate include: • Water of pH <5.5 in groundwater or adjacent streams, drains, groundwater or ponding on the surface • Unusually clear or milky blue-green drain water within or flowing from the area (aluminium released by the acid sulphate soils acts as a flocculating agent) • Extensive iron stains on any drain or pond surfaces, iron-stained water or ochre deposits • Any jarositic (jarosite is a pale-yellow mineral deposit which can precipitate as pore fillings and coatings on fissures) horizons or iron oxide mottling in auger holes or recently dug surfaces. • With a fluctuating water table, jarosite may be found along cracks and root channels in the soil — however, jarosite is not always found in actual acid sulphate soils • Jarosite present in surface encrustations or in any material dredged or excavated and left exposed • Corrosion of concrete and/or steel structures • Dominance of mangroves, reeds, rushes and other swamp-tolerant vegetation – including estuarine occurrences of swamp trees • Field indicators for Potential Acid Sulphate include: • Typically waterlogged, soft muds (soft, buttery texture) or estuarine silty sands • Mid to dark grey to dark greenish-grey coloured soils or sediments • Offensive odour, predominantly due to 'rotten egg gas' (H_2S). <u>Screening process</u> • Soils are usually "screened" to isolate areas of interest to test for. pHF and pHFOX indicate possible actual acid sulphate soils (AASS) or potential acid sulphate soils (PASS). • pHF — measure of soil pH of a soil: water paste. pHF <4 indicates oxidation has occurred in the past and that AASS is present. • pHFOX — measure of soil pH after rapid oxidation with hydrogen peroxide (H_2O_2). pHFOX <3, plus a pHFOX reading at least one pH unit below pHF, plus a strong reaction with peroxide, strongly indicates the presence of PASS. • Effervescence (or reaction rate) — a visual measure of the vigorousness of the oxidation reaction where: 1 = slight; 2 = moderate; 3 = high; and 4 = extreme. <u>Assessment Process</u> • Lab tests are the only truly definitive way of measuring for actual or potential acid sulphate. This is done by the SPOCAS or Chromium Suite method. • The SPOCAS suite is effective for coarser textured sediments. • The Chromium Suite (aka SCR suite) is effective for assessing soils with lower percentages of sulphide and for soils containing organic material.

Acid Sulphate Soil

- Chromium reducible sulphur values (SCR) greater than 0.01% S indicate a significant level of sulphides, and where greater than 0.03% S then the soil has a high potential acidity level and an Acid Sulphate Soils Management Plan will be required.
- Net Acidity (TAA + SCR + SNAS – ANC/1.5) of greater than or equal to 0.03% S for soils, for greater than 1000 tonnes of disturbance.

Preparing a neutralisation zone/liming pad

- Prepare a liming pad/stockpile site of appropriate area for the volume of soil to be treated. The pad should be prepared on relatively level or gently sloping ground to minimise the risk of any potential instability issues, with a natural (or shaped) fall to the local drainage sump.
- Where the subgrade soils are other than low permeability clays, the surface of the pad should be lined with selected approved compacted clay (at least two layers to a combined compacted thickness of 0.5m) or a geosynthetic liner. Where the subgrade soils comprise low permeability clay, no clay or geosynthetic lining will be required.
- A guard layer of 'ag lime' should be applied over the clay subgrade or compacted clay liner, to neutralise downward seepage.. The guard layer of lime should be applied at a rate of approximately 5kg lime per square metre of surface area for every 1 m height of stockpiled soil.
- Liming pads should be bunded off, and a circumference drain excavated to collect and localise leachate. The drain and inner bund slopes should be covered with a layer of fine lime applied to neutralise any possible leachate migrating from the stockpiled material.

Neutralisation Process

- Supervision by a Scientist is not considered mandatory.
- Soil neutralisation can only be validated by lab tests (SPOCAS or Chromium suite).
- Ag-lime is the mandatory treatment material. Using ag-lime, over liming isn't an issue—it's not ecologically harmful as it only has neutralising properties on exposure to acid. In water it has low solubility (because water is neutral).
- Indicative liming rates can be applied before arranging lab tests, so lab tests are only done on the verification stage—rather than both the initial and verification stages.
- The excavated soil should then be spread onto the guard layer in layers of no greater than 200mm thickness, leaving a 1m flat area between the toe of the spread soil and the containment bund or drain. When spreading the first soil layer, care should be taken not to churn up the lime guard layer.
- It should be noted that saturated soil cannot be neutralised effectively with lime, particularly where it is cohesive (i.e.. comprises a majority of silt/clay sized particles). This is because the lime must be well mixed into the soil and this cannot be performed when the soil is overly wet and 'sticky'. Hence, the excavated soil must be dried back on a limed pad, before effective mixing can take place with earthmoving machinery. This is to enable the collection and separate treatment of any acid leachate formed during the soil drying and liming process. Wet weather will thus have a potential to delay the lime treatment process.
- Apply 'ag lime' to the stockpiled soil at the indicative liming rate given above over each spread layer and mix through with a harrow prior to spreading the next layer.
- ASS testing should be carried out on each layer to verify the lime dosing rates to be applied. This would confirm ASS soils have been neutralised and allow identification of problem material.
- Continue the spreading/liming/mixing cycle till excavation is finished.
- When testing indicates that lime neutralisation is complete, then the stockpiled soil may be removed from the liming/neutralisation pad.
- Verification testing of the soil is required to be conducted after the addition of lime to test whether or not mixing has been adequate, and to reduce the risk of acidic water being returned to other watercourses. The soil and water contained within the treatment bunds should not be removed until the target values have been achieved.
- Validation samples of soil should be collected and tested at a frequency of approximately one per 500m3 of treated soil. Similarly, additional layers of soil should not be added to the bunded stockpile for treatment until the underlying layers have been validated.

Acid Sulphate Soil

Water Run-off

- All water draining from the soil, once it is removed from the excavation, should be considered as potentially acidic and should be separated in a controlled area, such as the above referred bunded and lined pad, and not be allowed to flow back into waterways or stormwater until it has been tested for pH and for any other environmental tests required by the appropriate regulatory authority.
- Liming pads should be bunded off, and a circumference drain excavated to collect and localise leachate. The drain and inner bund slopes should be covered with a layer of fine lime applied to neutralise any possible leachate migrating from the stockpiled material.
- The pH of all ponded drainage water around the confines of the treatment bunds should be measured daily.

Soil Testing and Verification

- Soil sampling for verification (and assessment) will be as soon as practically possible within 66 hours (i.e.3 nights). Large shells (>2 mm), fragments of wood, charcoal and stones will be noted before being removed from the samples in the field. Biological remnants such as small roots will not be removed from the soil sample as they may contain sulphides:
- Divide the treatment pad area into areas containing a volume of soil equivalent to the nominated verification testing rate (e.g. for a treatment pad holding 2000m3 and a test rate of 1 per 1000m3, divide the pad into two sections). A treatment pad holding 500m3 at a test rate of 1 per 1000m3 is considered as 'one' treatment area/section.
- Within each area, use a randomised procedure to nominate at least six random sampling locations.
- Within each area, use a consistent-volume sampler to gather subsamples of treated soil from each of the pre-defined locations on the treatment pad (at least 4 x 250g subsamples). Subsamples should extend through the total depth of the treated material but avoid sampling the underlying guard layer.
- Composite the subsamples thoroughly together in a container with a secure lid (e.g. clean plastic 5L plastic pail).
- Subsample approximately 400g of the composited material and submit it for analysis.
- Leave the soil on the treatment pad until the results are available.
- Samples will be collected in laboratory supplied acid sulphate soil bags, stored on ice in a cool box and submitted to a laboratory (with chain of custody documentation) that is accredited by the National Association of Testing Authorities (NATA) for acid sulphate soil analysis. Visual and olfactory monitoring of the surrounding receiving environment to identify and report any potential concerns or impacts as a result of the activities conducted within the Acid Sulphate Soil Treatment Area.

Off-Site Treatment

- The following excavation procedures will be adopted during works onsite:
- All excavations below the upper ASS horizon shall be programmed to ensure that the period of open excavation is kept to a minimum;
- Any exposed walls of excavations shall be treated by "dusting" with fine agricultural lime prior to backfilling;
- Where provisions have been made, all ASS material is to be immediately placed onto trucks and transported to a licenced treatment facility;
- Where the immediate transfer to trucks is not feasible, on-site storage of untreated ASS is not permitted for more than 18 hours for sandy material, and 70 hours for peat or clays.
- In the event temporary stockpiling of soils is required, the soils should be placed on bunded limestone pad approximately 300mm thick, in a location up gradient of the development area to prevent potential leaching or run off into undisturbed areas.

Performance Indicators	No acid discharge from site. Satisfactory laboratory results of tests on stockpiled ASS.
Reporting	Daily monitoring reflected in daily site diary entries

Acid Sulphate Soil	
	Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Reference	• ANZECC/NHMRC Guidelines • NEPM for Assessment of Site Contamination.

Asbestos	
Standard Environmental Protocol F.22	
Objective	To avoid threat to human health or contamination of the environment in the removal of asbestos materials.
Management Strategy	Investigation of the site to determine the extent and type of asbestos contaminated materials. Site environmental induction to make personnel aware of the presence of asbestos contaminated materials and procedures for their identification and removal. Engagement of a certified, licensed asbestos removal contractor in terms of Environmental Protection regulations.
Action	Generally speaking, asbestos management requires: • Asbestos Management Plan by an Environmental Scientist-- • Asbestos Removal Control Plan by a Licenced Asbestos Removalist—the plan for how to safely undertake the works by the people actually doing it. • Watpac's Project Safety Management Plan. Project Manager shall ensure: • Asbestos contaminated areas are identified and restricted to authorised personnel until the contaminated materials have been removed and the area declared safe. • The project hygienist is engaged to assess materials suspected of containing asbestos • The project hygienist is engaged to develop a fully documented Asbestos Management Plan to detail the requirements and controls for removal of all asbestos containing materials • A licensed asbestos removal contractor is engaged to manage the removal and disposal of all asbestos contaminated materials • The licensed Asbestos Removalist to comply with the Watpac Asbestos Management Procedure; the Asbestos Management Plan and the Australian Government Code of Practice for the Safe Removal of Asbestos. • The project hygienist is to provide Clearance Certificates
Performance Indicators	Satisfactory post-removal monitoring results.
Reporting	Project hygienist to provide site safety clearance certificate and documented evidence of proper disposal.
Applicable Permits	Licence under WHS Regulations
Reference	• Work Health and Safety Regulation 2011 Ch 8 • Watpac NSMS Asbestos Management Procedure • Asbestos Management Plan • Code of Practice for the Safe Removal of Asbestos

Hazardous Substances and Dangerous Goods	
Standard Environmental Protocol F.23	
Objective	To avoid contamination of the environment or risk to human health To appropriately manage the discovery of Hazardous Materials on site
Management Strategy	• Site environmental induction to make personnel aware of the project handling and storage procedures to manage Hazardous Substances and Dangerous Goods • All hazardous materials introduced onto site must be accompanied by a MSDS and the material entered onto the project register. • All hazardous materials must be stored in compliance with the manufacturer's recommendations and in accordance with Australian Standards • No bulk fuels are to be retained on site. Refuelling of plant is to be undertaken on a just-in-time basis and only within a prepared designated area. • Any discovery of a hazardous material is immediately reported to the Principal
Action	Project Manager shall ensure that: • Hazardous chemicals are stored in an impervious storage area, which is cool and dry, vented, lockable, and bunded to 110% the volume of the chemical container. • Conflicting chemicals are kept segregated in accordance with AS 3833 and AS 1940. • The quantities of Hazardous Substances and Dangerous Goods on site are minimised. • No bulk diesel is to be stored on site. • Fuelling and maintenance of vehicles and equipment on site is avoided. Where refuelling is unavoidable, the location and procedures will be strictly controlled. Refer to NSMS procedures on refuelling. • Subcontractors are trained in the use and precautions of their hazardous substances in accordance with the MSDS. • Subcontractors advise the Site Manager of the type of material, location, volume and any special handling / storing precautions in relation to any dangerous gases or flammable materials that are proposed to be brought on site. • Subcontractors do not use any materials which are classified as Hazardous in or adjacent to occupied areas without the prior approval of the Site Manager. • Subcontractors provide a current MSDS for all Hazardous Substances and Dangerous Goods proposed to be brought onto site. A Site MSDS Register is to be developed and maintained. • A Spill Kit and Site Emergency Plan are readily accessible. Clean up materials are disposed of in compliance with regulatory requirements • All oxygen and acetylene cylinders are properly stored in an upright position and adequately restrained away from heat sources. • Persons handling dangerous chemicals and materials will wear appropriate PPE and receive appropriate training in its use • Fuels and hazardous chemicals will not be decanted or handled in the vicinity of the central drainage line and major stormwater inlet points. Decanting of liquids is to be done in temporary bunded area. • Paint storage does not need to incorporate 110% volumetric bund but should be sufficient to envelope an incidental spill. • Material Safety Data Sheets (MSDS) will be located at the site office for all hazardous and dangerous goods used during construction operations. The contractor will ensure that all materials are handled, used and disposed of in accordance with their MSDS
Performance Indicators	No spillages, incidents or complaints
Reporting	Licenced removal contractor to provide site safety clearance certificate and documented evidence of proper disposal.
Reference	• Work Health and Safety Regulation 2011, s 357 • National Code of Practice "Managing Risks of Hazardous Chemicals in the Workplace" • National Code of Practice "Labelling of Workplace Hazardous Chemicals"

Pest Animals, Vermin, and Infestation Control	
Standard Environmental Protocol F.24	
Objective	Minimise the possibility of infestation from rats, mice, insects, or other scavenging wildlife.
Management Strategy	Keep site clean and tidy Monitor area for infestation Consult Pest Management Contractor if required
Action	Project Manager shall ensure that: • Keep site clean and tidy with daily clean-ups. • Ensure all putrescible waste is disposed of in an appropriately sealed receptacle. • Six weeks prior to the commencement of any demolition, individual blocks, properties and the surrounding area should be inspected in order to identify the presence and extent of any infestations. Where infestations are identified, appropriate treatments must be implemented by licenced Pest Control Contractors to eliminate infestation before demolition. • Pest animals include: - European rabbits and hares - Mice - Feral or wild pigs - Wild dogs and dingoes - Red foxes • It is not incumbent on Watpac to destroy these animals, particularly it if it is unsafe to do so. • Minimise ponding and exposed water sources to prevent mosquitos and midges. • Ideally, licenced Pest Control Contractors should be consulted for management strategies after the substructure is completed. Frequently the dark cold environment can be a pest habitat which presents an unacceptable working environment. • To prevent rat egress from live drains and sewers to new systems, the live systems should be temporarily sealed off with expanding drainage stoppers until connection to new drainage is completed. • Where vermin presents itself as a problem on site, consult a Pest Control company for advice. Do not attempt to address the problem internally.
Performance Indicators	No infestations.
Reporting	None
Reference	• Work Health and Safety Regulation 2011 • Plant Protection Act 1989

Site Demobilisation	
Standard Environmental Protocol F.25	
Objective	Control and minimise damage to the receiving environment as a result of site demobilisation.
Management Strategy	Ensure ground is stabilised and operational stormwater controls are commissioned prior to demobilisation. Clean up during after demobilisation.
Action	Project Manager shall ensure: • Ensure any landscaping is sufficiently stabilised, either of their own accord or supported by an erosion blanket such as jute mesh. Any permanent stormwater that can't be relied on must be continue to supported by erosion and sediment controls that are maintained during the planting establishment period • Tenting of erosion blankets can prevent vegetation growth, and trap wildlife. Ensure good ground contact is made and pinned • Hydroseeding and hydro-mulching can be used for accelerated grass growth for cover and stabilisation • Basins should be removed or integrated into permanent stormwater system. Temporary sediment controls must be installed downslope of this process, and captured water must be properly disposed of. The footprint of the basin will require revegetation • Plan routes of plant access, such as removal of sheds, so that it can be accessed without disturbing earth or vegetation • Conduct a site clean-up before and after shed removal. Invariably a fair amount of rubbish will have accumulated under the sheds
Performance Indicators	Minimal disturbance because of site demobilisation.
Reporting	None
Reference	None



Appendix G
Site Establishment Plans

Caption: One Central Park, Sydney

PHASE 1:
EARLY SITE ACESS
FROM 15 AUGUST 2021
TO 29 SEPTEMBER 2021

BR CONTRACTOR CONSTRUCTION SITE

BR VEHICLE ACCESS

G4

Eco Toilets

Waste Tank

TSE CONTRACTOR CONSTRUCTION SITE

Temp. Water Treatment Plant

Temp. Substation

TSE CONTRACTOR

G1

GATE MANAGED BY TSE CONTRACTOR

G2

Existing Hickson Road

High Street

Heritage wall to High Street

TSE CONTRACTOR CONSTRUCTION SITE

Crossover Cavern

Existing Hickson Road

G3

TSE CONTRACTOR CONSTRUCTION SITE

Northern Shaft

LEGEND:

PEDESTRIAN ACCESS:
- PEDESTRIAN ACCESS
- FENCE / HOARDING
- PERSONNEL SITE ENTRY
- UNDERCOVER PERSONNEL ACCESS
- OPEN PERSONNEL ACCESS
- STAIR ACCESS TO STATION BOX
- EMERGENCY ASSEMBLY POINT
- FIRST AID ROOM

CONSTRUCTION VEHICLE & MATERIAL:
- CONSTRUCTION VEHICLE ACCESS
- SITE GATE
- Gx GATE NUMBER
- WD RUMBLE GRIDS / WASHDOWN BAYS
- SLAB OPENING AT SURFACE LEVEL
- SLAB OPENING BELOW SURFACE LEVEL
- VERTICAL MATERIAL HANDLING

EARLY SITE ACCESS:
- BESIX WATPAC CONSTRUCTION SITE
- TSE CONSTRUCTION SITE
- CONSTRUCTION WORKER ACCESS TO CROSSOVER CAVERN

Sydney Metro City & South West

Barangaroo

Construct Only Package

NOT TO SCALE
NOT FOR CONSTRUCTION

DRAWING NAME:
BR COP - SITE ESTABLISHMENT - PHASE 1

DWG #: SE - 001
REV #: C
DATE #: 28/09/2021

BESIX Watpac

PHASE 2:
EARLY SITE ACCESS
FROM 30 SEPTEMBER 2021
TO 27 OCTOBER 2021

NOTE:

ADDITONNAL SUBCONTRACTOR'S AMENITIES WILL BE SETUP IN THE CROSSOVER CAVERN FOR STAGE 2 DURATION

Meeting R.
TSOM Offices
Lunch R.
Lunch R.
Lunch R.
Lunch R.
SC off
Change R. Male
Change R. Male
Change R. Male
Change R.
Tank
Toil M/F
Sh M/F
Toilets M
Toilets M
Site compound progressively relocated
BR CONTRACTOR CONSTRUCTION SITE
G4
Eco Toilets
BR VEHICLE ACCESS
15 m
Waste Tank
TSE CONTRACTOR CONSTRUCTION SITE
Temp. Water Treatment Plant
Temp. Substation
15 m
30 m
PLANT YARD
BR CONTRACTOR CONSTRUCTION SITE
WASHDOWN AREA
G1
GATE MANAGED BY TSE CONTRACTOR
G5
G6
G2
WASHDOWN AREA
OFFICE
BR CONTRACTOR CONSTRUCTION SITE
Crossover Cavern
Existing Hickson Road
Existing Hickson Road
G8
BR CONTRACTOR CONSTRUCTION SITE
Turnstile access to Northern Shaft
Northern Shaft
Temp. stairs Surface to B6
Hoist Surface to B6
High Street
Heritage wall to High Street

LEGEND:

PEDESTRIAN ACCESS:
- PEDESTRIAN ACCESS
- FENCE / HOARDING
- PERSONNEL SITE ENTRY
- UNDERCOVER PERSONNEL ACCESS
- OPEN PERSONNEL ACCESS
- STAIR ACCESS TO STATION BOX
- EMERGENCY ASSEMBLY POINT
- FIRST AID ROOM

CONSTRUCTION VEHICLE & MATERIAL:
- CONSTRUCTION VEHICLE ACCESS
- SITE GATE
- Gx GATE NUMBER
- WD RUMBLE GRIDS / WASHDOWN BAYS
- SLAB OPENING AT SURFACE LEVEL
- SLAB OPENING BELOW SURFACE LEVEL
- VERTICAL MATERIAL HANDLING

EARLY SITE ACCESS:
- BESIX WATPAC CONSTRUCTION SITE
- TSE CONSTRUCTION SITE
- CONSTRUCTION WORKER ACCESS TO CROSSOVER CAVERN

Sydney Metro City & South West

Barangaroo

Construct Only Package

NOT TO SCALE
NOT FOR CONSTRUCTION

DRAWING NAME:
BR COP - SITE ESTABLISHMENT - PHASE 1

DWG #: SE - 001
REV #: C
DATE #: 28/09/2021

BESIX Watpac

PHASE 3:
FROM 28 OCTOBER 2021
TO 31 DECEMBER 2021

Meeting R.
TSOM Offices
Lunch R.
Lunch R.
Lunch R.
Lunch R.
Change R. Male
Change R. Male
Change R. Male
Change R.
Tank
Toil M/F
Sh M/F
Toilets M
Toilets M
SC off
G4
WASHDOWN AREA
G7
GATE MANAGED BY TSE CONTRACTOR
TSE CONTRACTOR CONSTRUCTION SITE
10kPa Pedestrian Bridge
Temp. Water Treatment Plant
PLANT YARD
Perm. penetration 5000x5400mm Surface to B2
Temp. stairs Surface to B0
Retractable loading platform 8500x3200mm on B1
Temp. Substation
PATHWAY MAINTAINED AT ALL TIME REFER TO ROAD STAGING
ACCESS TO BLOCK 6 MAINTAINED AT ALL TIME REFER TO ROAD STAGING
Temp. penetration 5300x6200mm Surface to B3
2No.Man-Material Hoists in Public Lift Shafts Surface to B3
G1
G5
G6
G2
OFFICE
Existing Hickson Road
High Street
Heritage wall to High Street
Crossover Cavern
G3
Turnstile access to Northern Shaft
Northern Shaft
Temp. stairs Surface to B6
Hoist Surface to B6

LEGEND:

STAGING ZONES:
- POSSESSION UNTIL 30/06/22
- POSSESSION UNTIL 1/02/23
- POSSESSION UNTIL 23/12/23

PEDESTRIAN ACCESS:
- PEDESTRIAN ACCESS
- FENCE / HOARDING
- PERSONNEL SITE ENTRY
- UNDERCOVER PERSONNEL ACCESS
- OPEN PERSONNEL ACCESS
- STAIR ACCESS TO STATION BOX
- EMERGENCY ASSEMBLY POINT
- FIRST AID ROOM

CONSTRUCTION VEHICLE & MATERIAL:
- CONSTRUCTION VEHICLE ACCESS
- SITE GATE
- Gx GATE NUMBER
- WD RUMBLE GRIDS / WASHDOWN BAYS
- SLAB OPENING AT SURFACE LEVEL
- SLAB OPENING BELOW SURFACE LEVEL
- VERTICAL MATERIAL HANDLING

EARLY SITE ACCESS:
- BESIX WATPAC CONSTRUCTION SITE
- TSE CONSTRUCTION SITE
- CONSTRUCTION WORKER ACCESS TO CROSSOVER CAVERN

Sydney Metro City & South West

Barangaroo

Construct Only Package

NOT TO SCALE
NOT FOR CONSTRUCTION

DRAWING NAME:
BR COP - SITE ESTABLISHMENT - PHASE 1

DWG #: SE - 001
REV #: C
DATE #: 28/09/2021

BESIX Watpac

PHASE 4:
FROM 1 JANUARY 2022
TO 22 FEBRUARY 2022

Meeting R.
TSOM Offices
Lunch R.
Lunch R.
Lunch R.
Lunch R.
SC off
LAYDOWN AREA
Temp. Water Treatment Plant TBC with SM
Change R. Male
Change R. Male
Change R.
Change R. Male
Toil M/F
Sh M/F
Toilets M
Toilets M
G4
WASHDOWN AREA
10kPa Pedestrian Bridge
TC
Perm. penetration 5000x5400mm Surface to B2
Temporary substation likely to be relocated
PATHWAY MAINTAINED AT ALL TIME REFER TO ROAD STAGING
Temp. stairs Surface to B0
Retractable loading platform 8500x3200mm on B1
Temp. Substation
PLANT YARD
LAYDOWN AREA
Temp. penetration 5300x6200mm Surface to B3
ACCESS TO BLOCK 6 MAINTAINED AT ALL TIME REFER TO ROAD STAGING
1No.Man-Material Hoists in Public Lift Shafts Surface to B3
G5
G6
OFFICE
Existing Hickson Road
Crossover Cavern
Existing Hickson Road
G3
Turnstile access to Northern Shaft
Northern Shaft
Temp. stairs Surface to B6
Hoist Surface to B6
High Street
Heritage wall to High Street

LEGEND:

STAGING ZONES:
- POSSESSION UNTIL 30/06/22
- POSSESSION UNTIL 1/02/23
- POSSESSION UNTIL 23/12/23

PEDESTRIAN ACCESS:
- PEDESTRIAN ACCESS
- FENCE / HOARDING
- PERSONNEL SITE ENTRY
- UNDERCOVER PERSONNEL ACCESS
- OPEN PERSONNEL ACCESS
- STAIR ACCESS TO STATION BOX
- EMERGENCY ASSEMBLY POINT
- FIRST AID ROOM

CONSTRUCTION VEHICLE & MATERIAL:
- CONSTRUCTION VEHICLE ACCESS
- SITE GATE
- Gx GATE NUMBER
- WD RUMBLE GRIDS / WASHDOWN BAYS
- SLAB OPENING AT SURFACE LEVEL
- SLAB OPENING BELOW SURFACE LEVEL
- VERTICAL MATERIAL HANDLING

EARLY SITE ACCESS:
- BESIX WATPAC CONSTRUCTION SITE
- TSE CONSTRUCTION SITE
- CONSTRUCTION WORKER ACCESS TO CROSSOVER CAVERN

Sydney Metro City & South West

Barangaroo

Construct Only Package

NOT TO SCALE
NOT FOR CONSTRUCTION

DRAWING NAME:
BR COP - SITE ESTABLISHMENT - PHASE 3

DWG #: SE - 004
REV #: A
DATE #: 24/05/2021

BESIX Watpac

PHASE 5:
FROM 23 FEBRUARY 2022
TO 31 AUGUST 2023

Meeting R.
TSOM Offices
Lunch R.
Lunch R.
Lunch R.
Lunch R.
SC off
LAYDOWN AREA
Temp. Water Treatment Plant TBC with SM
Change R. Male
Change R.
Change R. Male
Change R. Male
Toil M/F
Sh M/F
Toilets M
Toilets M
G4
WASHDOWN AREA
10kPa Pedestrian Bridge
TC
PLANT YARD
Perm. penetration 5000x5400mm Surface to B2
Temporary substation likely to be relocated
Retractable loading platform 8500x3200mm on B1
Temp. Substation
PATHWAY MAINTAINED AT ALL TIME REFER TO ROAD STAGING
ACCESS TO BLOCK 6 MAINTAINED AT ALL TIME REFER TO ROAD STAGING
Temp. penetration 5300x6200mm Surface to B3
WASHDOWN AREA
G6
sydney METRO
OFFICE
G5
1No.Man-Material Hoist in Public Lift Shafts Surface to B3
1No.Builders Lift Surface to B3
Hickson Road
2nd Emergency Exit Surface to B1
G10
WASHDOWN AREA
G10
WASHDOWN AREA
G8
Emergency Exit Surface to B1
Existing Hickson Road
Crossover Cavern
G3
Turnstile access to Northern Shaft
PATHWAY MAINTAINED AT ALL TIME REFER TO ROAD STAGING
Shaft serviced by mobile crane Surface to B1
Penetration approx 2.7x3.2m B1 to B3
Penetration Surface to B1
5t jib crane on 00
High Street
Heritage wall to High Street
5t jib crane on 00
Penetration Surface to B1
Penetration approx 2.4x3.2m B1 to B3
Shaft serviced by mobile crane Surface to B1
Northern Shaft
Temp. stairs Surface to B6
Hoist Surface to B6

LEGEND:

STAGING ZONES:
- POSSESSION UNTIL 30/06/22
- POSSESSION UNTIL 1/02/23
- POSSESSION UNTIL 23/12/23

PEDESTRIAN ACCESS:
- PEDESTRIAN ACCESS
- FENCE / HOARDING
- PERSONNEL SITE ENTRY
- UNDERCOVER PERSONNEL ACCESS
- OPEN PERSONNEL ACCESS
- STAIR ACCESS TO STATION BOX
- EMERGENCY ASSEMBLY POINT
- FIRST AID ROOM

CONSTRUCTION VEHICLE & MATERIAL:
- CONSTRUCTION VEHICLE ACCESS
- SITE GATE
- Gx GATE NUMBER
- WD RUMBLE GRIDS / WASHDOWN BAYS
- SLAB OPENING AT SURFACE LEVEL
- SLAB OPENING BELOW SURFACE LEVEL
- VERTICAL MATERIAL HANDLING

EARLY SITE ACCESS:
- BESIX WATPAC CONSTRUCTION SITE
- TSE CONSTRUCTION SITE
- CONSTRUCTION WORKER ACCESS TO CROSSOVER CAVERN

Sydney Metro City & South West

Barangaroo

Construct Only Package

NOT TO SCALE
NOT FOR CONSTRUCTION

DRAWING NAME:
BR COP - SITE ESTABLISHMENT - PHASE 4

DWG #: SE - 005
REV #: A
DATE #: 24/05/2021

BESIX Watpac

PHASE 6:
FROM 1 SEPT 2023
TO 30 DEC 2023

Meeting R.
TSOM Offices
Lunch R.
Lunch R.
Lunch R.
Lunch R.
SC off
LAYDOWN AREA
Temp. Water Treatment Plant TBC with SM
Change R. Male
Change R. Male
Change R.
Change R. Male
Toil M/F
Sh M/F
Toilets M
Toilets M

10kPa Pedestrian Bridge
Temporary substation likely to be relocated
Temp. Substation
WASHDOWN AREA
1No.Builders Lift Surface to B3
G6
OFFICE
HICKSON ROAD MAINTAINED OPEN AT ALL TIME REFER TO ROAD STAGING
Hickson Road
Crossover Cavern
G3
Turnstile access to Northern Shaft
Northern Shaft
Temp. stairs Surface to B6
Hoist Surface to B6
High Street
Heritage wall to High Street

LEGEND:

STAGING ZONES:
- POSSESSION UNTIL 30/06/22
- POSSESSION UNTIL 1/02/23
- POSSESSION UNTIL 23/12/23

PEDESTRIAN ACCESS:
- PEDESTRIAN ACCESS
- FENCE / HOARDING
- PERSONNEL SITE ENTRY
- UNDERCOVER PERSONNEL ACCESS
- OPEN PERSONNEL ACCESS
- STAIR ACCESS TO STATION BOX
- EMERGENCY ASSEMBLY POINT
- FIRST AID ROOM

CONSTRUCTION VEHICLE & MATERIAL:
- CONSTRUCTION VEHICLE ACCESS
- SITE GATE
- Gx GATE NUMBER
- WD RUMBLE GRIDS / WASHDOWN BAYS
- SLAB OPENING AT SURFACE LEVEL
- SLAB OPENING BELOW SURFACE LEVEL
- VERTICAL MATERIAL HANDLING

EARLY SITE ACCESS:
- BESIX WATPAC CONSTRUCTION SITE
- TSE CONSTRUCTION SITE
- CONSTRUCTION WORKER ACCESS TO CROSSOVER CAVERN

Sydney Metro City & South West
Barangaroo
Construct Only Package

NOT TO SCALE
NOT FOR CONSTRUCTION

DRAWING NAME:
BR COP - SITE ESTABLISHMENT - PHASE 5

DWG #: SE - 006
REV #: A
DATE #: 24/05/2021

BESIX Watpac



Appendix H
Compliance with the CEMF

Caption: One Central Park, Sydney

Extracted from the Metro's document "Chatswood to Sydenham – Staging Report v7.0"

The applicability of the CEMF to each stage allows for effective and efficient management of environmental issues that is commensurate to the impacts of each stage on each environmental management category (refer to Sections 3.2(b) and 3.3(b) of the CEMF). The requirements of the CEMF have been allocated to this project as per Table 2 below which indicates the applicability of the requirements relating to each CEMF environmental management category. This includes for each environmental management category (from the highest risk level to the lowest risk level):

- Whether a stand-alone 'CEMP sub-plan', 'CTMP', 'SMP sub-plan' or 'WFDIP Plan' will be prepared.
- Whether the category risks will be addressed in the main CEMP/SMP document in the form of a procedure ('CEMP-P' or 'SMP-P'),
- Whether the category risks will be addressed in the main CEMP/SMP document only ('CEMP' or 'SMP'), or
- Whether the category risks are not applicable to the stage ('N/A').

This assessment from Metro was based on each stage's scope of work, relevant CoA and REMM requirements and the relevant environmental risks and impacts identified in the C2S EIS and modification reports

Table 13 CEMF Applicability to Barangaroo

CEMF Environmental Management Category	Location
Spoil	CEMP
Groundwater	CEMP
Noise & Vibration	CEMP sub-plan
Heritage	CEMP sub-plan
Flora & Fauna/Biodiversity	CEMP-Procedure
Visual Amenity	CEMP sub-plan
Soil & Water	CEMP-Procedure
Air Quality	CEMP-Procedure

The general and environmental issue specific CEMF requirements relevant to this CEMP are addressed in Table 14. Other environmental issue specific CEMF requirements are addressed in the CEMP sub-plans and procedures.

Table 14 CEMF Compliance

Section	Requirement	Reference
3.1 a	Principal Contractors are required to have a corporate Environmental Management System certified under AS/NZS ISO 14001:2004 and to have transitioned this accreditation into AS/NZS ISO 14001:2015 by September 2018	BESIX Watpac environmental management system (EMS) Section 9.1
3.1 b	Principal Contractors are required to develop a project based Environment and Sustainability Management System (E&SMS). The E&SMS will: (i) Be consistent with the Principal Contractors corporate Environmental Management System and AS/NZS ISO 14001:2004 or 2015; (ii) Be supported by a process for identifying and responding to changing legislative or other requirements; (iii) Include processes for assessing design or construction methodology changes for consistency against the planning approvals;	BESIX Watpac environmental management system (EMS)

Section	Requirement	Reference
	(iv) Include processes for tracking and reporting performance against sustainability and compliance targets; (v) Include a procedure for the identification and management of project specific environmental risks and appropriate control measures; and (vi) Be consistent with the SM C&SW Sustainability Strategy and Sydney Metro Environment and Sustainability Policy	
3.1 c	All sub-contractors engaged by the Principal Contractor will be required to work under the Principal Contractor's E&SMS	BESIX Watpac environmental management system (EMS)
3.1 d	The relationship between key documents within the Sydney Metro Environment and Sustainability Management System and the Principal Contractor's Environment and Sustainability Management System is shown in Figure 2.	This Plan
3.3 a	Principal Contractors are required to prepare and implement a Construction Environmental Management Plan (CEMP) relevant to the scale and nature of their scope of works. The CEMP shall comprise of a main CEMP document, issue specific sub plans, activity specific procedures and site based control maps. The CEMP shall illustrate the relationship between other plans required by the contract, in particular those that relate to design management	This Plan
3.3 b	Depending on the scope and scale of the works. Sydney Metro may decide to streamline the CEMP and sub-plan requirements. For example, depending on the risk associated with particular environmental issues it may be appropriate to remove the need for sub plan, or replace with a procedure as part of the ECMP.	Staging Plans
3.3 c	The CEMP will cover the requirements of the relevant planning approval documentation, the conditions of all other permits and licences, the Principal Contractors corporate EMS, the environmental provisions of the contract documentation and this Construction Environmental Management Framework	This Plan
3.3 d	As a minimum the CEMP will:	
3.3 d	i) Include a contract specific environmental policy	BESIX Watpac Environmental Policy – Appendix A
	ii) Include a description of activities to be undertaken during construction;	Section 1.2.1 - Detail Construction Activities
	iii) For each plan under the CEMP include a matrix of the relevant Conditions of Approval or Consent referencing where each requirement is addressed	Refer Compliance Matrix in individual plans
	iv) For each plan under the CEMP, set objectives and targets, and identify measurable key performance indicators in relation to these	Section 1.3 - CEMP Purpose
	v) For each role that has environmental accountabilities or responsibilities, including key personnel, provide a tabulated description of the authority and roles of key personnel, lines of responsibility and communication, minimum skill level requirements and their interface with the overall project organisation structure	Section 5.0 - Roles and Responsibilities
	vi) Assign the responsibility for the implementation of the CEMP to the Environment Manager, who will have appropriate experience. The Principal Contractor's Project Director will be accountable for the implementation of the CEMP;	Section 5.1.1 - Project Director
	vii) Identify communication requirements, including liaison with stakeholders and the community	Section 7 - Communication and Consultation
	viii) Include induction and training requirements and a summary of the Training Needs Analysis required in Section 3.9(b);	Section 5.2 - Environmental Training
	ix) Management strategies for environmental compliance and review of the performance of environmental controls;	Section 6 - Implementation

Section	Requirement	Reference
	x) Processes and methodologies for surveillance and monitoring, auditing and review, and reporting on environmental performance including environmental compliance tracking;	Section 6.1.3
	xi) Include procedures for emergency and incident management, non-compliance management, and corrective and preventative action	Section 8 Incident and Emergency Management
	xii) Include procedures for the control of environmental records	Section 6.3.1 Records
3.3 e	The CEMP and associated sub-plans will be reviewed by Sydney Metro and/or an independent environmental representative (see Section 3.11) prior to any construction work commencing. Depending on the Conditions of Approval, the CEMP and certain sub-plans may also require the approval of the Department of Planning and Environment (DP&E).	Section 1.11.2
3.3 f	Where a corresponding system document exists within the Sydney metro Integrated Management System, the Principle Contractor's procedures will be required to be consistent with any requirements in those documents	Section 8
3.4	a. Subject to Section 3.3(b) and Section 3.2(b) the Principal Contractor will prepare issue specific environmental sub plans to the CEMP and SMP which address each of the relevant environmental impacts at a particular site or stage of the project. Issue specific sub plans will include: i. Spoil management; ii. Groundwater management; iii. Traffic and transport management; iv. Noise and vibration management; v. Heritage management; vi. Flora and fauna management; vii. Visual amenity management; viii. Carbon and energy management; ix. Materials management; x. Soil and water management; xi. Air quality management; and xii. Waste management and recycling. b. Additional detail on the minimum requirements for these sub plans is provided in Sections 6-17 of this CEMF.	Refer Appendix B.1, to B.5 inclusive Staging Report
3.5 a	The Principal Contractor will prepare and implement activity specific environmental procedures. These procedures should support environmental management sub plans, but may substitute for sub plans in agreement with Sydney Metro if a reasonable risk based justification can be made and the sub plans in agreement with Sydney Metro if a reasonable risk based justification can be made and the sub plan is not a requirement of any approval	Appendix L Appendix M Appendix N
3.5 b	The procedures will include; (i) A breakdown of the work tasks relevant to the specific activity and indicate responsibility for each task; (ii) Potential impacts associated with each task; (iii) A risk rating for each of the identified potential impacts; (iv) Mitigation measures relevant to each of the work tasks; and (v) Responsibility to ensure the implementation of the mitigation measures	Appendix L Appendix M Appendix N
3.5 c	The Principal Contractor will prepare and implement site based progressive Environmental Control Maps (ECM's) which as a minimum: (i) Is a progressive document depicting a current representation of the site; (ii) Indicates which environmental procedures, environmental approvals, or licences are applicable; (iii) Illustrates the site showing significant structures, work areas and boundaries; (iv) Illustrates environmental control measures and environmentally sensitive	Section 9.1 BESIX Watpac Environmental Management System

Section	Requirement	Reference
	receivers; (v) Is endorsed by the Principal Contractors Environmental Manager or delegate; and (vi) Relevant workers will be trained in the requirements of and will sign off the procedures prior to commencing works on the specific site and / or activity.	
3.6	a. Where the requirement for an additional environmental assessment is identified, this will be undertaken prior to undertaking any physical works. The environmental assessment will include: i. A description of the existing surrounding environment; ii. Details of the ancillary works and construction activities required to be carried out including the hours of works; iii. An assessment of the environmental impacts of the works, including, but not necessarily limited to, traffic, noise and vibration, air quality, soil and water, ecology and heritage; iv. Details of mitigation measures and monitoring specific to the works that would be implemented to minimise environmental impacts; and v. Identification of the timing for completion of the construction works, and how the sites would be reinstated (including any necessary rehabilitation).	Section 1.6.1 Consistency Assessments
3.7	a. Prior to the commencement of construction the Principal Contractors will offer Pre-construction Building Condition Surveys, in writing, to the owners of buildings where there is a potential for construction activities to cause cosmetic or structural damage. If accepted, the Principal Contractor will produce a comprehensive written and photographic condition report produced by an appropriate professional prior to relevant works commencing. b. Prior to the commencement of construction the Principal Contractor will prepare a Road Dilapidation Report for all local public roads proposed to be used by heavy vehicles.	Refer Construction Noise and Vibration Management Sub Plan
3.8	a. Principal Contractors will identify hold points, beyond which approval is required to proceed with a certain activity. Example activities include vegetation removal and water discharge. Hold points will be documented in relevant CEMPs. b. Table 1.4 provides the structure for the register of hold points as well as a preliminary list of hold points which will be implemented.	Section 4.4 Register of Hold Points
3.9	a. Principal Contractors will be responsible for determining the training needs of their personnel. As a minimum this will include site induction, regular toolbox talks and topic specific environmental training as follows: i. The site induction will be provided to all site personnel and will include, as a minimum: ▪ Training purpose, objectives and key issues; ▪ Contractor's environmental policy and key performance indicators; ▪ Due diligence, duty of care and responsibilities; ▪ Relevant conditions of any environmental licence and/or the relevant conditions of approval; ▪ Site specific issues and controls including those described in the environmental procedures; ▪ Reporting procedure for environmental hazards and incidents; and ▪ Communication protocols. ii. Toolbox talks will be held on a regular basis in order to provide a project or site wide update, including any key or recurring environmental issues; and iii. Topic specific environmental training should be based upon, but is not limited to, Issue specific sub-plans required under Section 3.4 (a) (i-xi). b. Principal Contractors will conduct a Training Needs Analysis which: i. Identifies that all staff are to receive an environmental induction and undertake environmental incident management training; ii. Identifies the competency requirements of staff that hold environmental roles and responsibilities documented within the Construction Environmental Management Plan and sub-plans;	Section 5.2 Environmental Training

Section	Requirement	Reference
	iii. Identifies appropriate training courses/events and the frequency of training to achieve and/or maintain these competency requirements; and iv. Implements and documents as part of the CEMP a training schedule that plans attendance at environmental training events, provides mechanisms to notify staff of their training requirements, and identifies staff who do not attend scheduled training events or who have overdue training requirements.	
3.10	a. Principal Contractors will develop and implement a Pollution Incident Response Management Plan, in accordance with the requirements of the POEO Act. Contractors' emergency and incident response procedures will also be consistent with any relevant SMDO procedures and will include: i. Categories for environmental emergencies and incidents; ii. Notification protocols for each category of environmental emergency or incident, including notification of TfNSW and notification to owners / occupiers in the vicinity of the incident. This is to include relevant contact details; iii. Identification of personnel who have the authority to take immediate action to shut down any activity, or to affect any environmental control measure (including as directed by an authorised officer of the EPA); iv. A process for undertaking appropriate levels of investigation for all incidents and the identification, implementation and assessment of corrective and preventative actions; and v. Notification protocols of incidents to the EPA, DP&E or OEH that are made by the Contractor or TfNSW. b. The Contractor will make all personnel aware of the plan and their responsibilities.	Section 8 Incident and Emergency Management
3.11	a. Sydney Metro will engage Independent Environmental Representatives (ERs) to undertake the following, along with any additional roles as required: i. Review, provide comment on and endorse (where required) any relevant environmental documentation to verify it is prepared in accordance with relevant environmental legislation, planning approval conditions, Environment Protection Licences, relevant standards and this CEMF; ii. Monitor and report on the implementation and performance of the above mentioned documentation and other relevant documentation; iii. Provide independent guidance and advice to Sydney Metro and the Contractors in relation to environmental compliance issues and the interpretation of planning approval conditions; iv. Be the principal point of advice for the DP&E in relation to all questions and complaints concerning the environmental performance of the project; v. Ensure that environmental auditing is undertaken in accordance with all relevant project requirements; and vi. Recommend reasonable steps, including 'stop works', to be taken to avoid or minimise adverse environmental impacts.	ER Appointed by Sydney Metro
3.12	a. In relation to Roles and Responsibilities the CEMP will: i. Describe the relationship between the Principal Contractor, Sydney Metro, key regulatory stakeholders, the independent environmental representative and the independent certifier; ii. For each role that has environmental accountabilities or responsibilities, including key personnel, provide a tabulated description of the authority and roles of key personnel, lines of responsibility and communication, minimum skill level requirements and their interface with the overall project organisation structure; iii. Provide details of each specialist environment, sustainability or planning consultant who is employed by the Principal Contractor including the scope of their work; and iv. Provide an overview of the role and responsibilities of the Independent Environmental Representative, the Independent Certifier and other regulatory stakeholders. b. All sub-contractors engaged by the Principal Contractor will be required to operate within the EMS documentation of that Principal Contractor.	Section 5 Roles and Responsibilities
3.13	a. Issue specific environmental monitoring will be undertaken as required or as additionally required by any approval, permit or licence conditions.	Section 6.3

Section	Requirement	Reference
	b. The results of any monitoring undertaken as a requirement of the EPL will be published on the Principal Contractor's, or a project specific, website within 14 days of obtaining the results. c. Environmental inspections will include: i. Surveillance of environmental mitigation measures by the Site Foreman; and ii. Periodic inspections by the Principal Contractor's Environmental Manager (or delegate) to verify the adequacy of all environmental mitigation measures. This will be documented in a formal inspection record. d. Regular site inspections by the ERs and Sydney Metro representatives at a frequency to be agreed with the Principal Contractor. e. Principal Contractors must undertake internal environmental audits. The scope will include: i. Compliance with any approval, permit or licence conditions; ii. Compliance with the E&SMS, CEMP, SMP, sub-plans and procedures; iii. Community consultation and complaint response; iv. Environmental training records; and v. Environmental monitoring and inspection results. f. Sydney Metro (or an independent environmental auditor) will also undertake periodic audits of the Principal Contractor's E&SMS and compliance with the environmental aspects of contract documentation, including this Construction Environmental Management Framework.	
3.14	a. Principal Contractors will document and detail any non-compliances arising out of the above monitoring, inspections and audits. Sydney Metro will be made aware of all non-compliances in a timely manner. b. Principal Contractors will develop and implement corrective actions to rectify the non-compliances and preventative actions in order to prevent a re-occurrence of the non-compliance. Contractors will also maintain a register of non-compliances, corrective actions and preventative actions. c. Sydney Metro or the Environmental Representative may raise non-compliances against environmental requirements.	Section 6.2 Section 8
3.15	a. Principal Contractors will maintain appropriate records of the following: i. Site inspections, audits, monitoring, reviews or remedial actions; ii. Documentation as required by performance conditions, approvals, licences and legislation; iii. Modifications to site environmental documentation (e.g. CEMP, sub-plans and procedures); and iv. Other records as required by this Construction Environmental Management Framework. b. Records will be retained onsite for the duration of works. c. Additionally records will be retained by the Principal Contractor for a period of no less than 7 years. Records will be made available in a timely manner to Sydney Metro (or their representative) upon request. d. Compliance reports detailing the outcome of any environmental surveillance activity including internal and external audits (refer to Section 3.13) will be produced by the Principal Contractors Environmental Manager or delegate. These reports will be submitted to Sydney Metro at an agreed frequency.	Section 6.3.1 Records
3.16	a. Principal Contractors will ensure the continual review and improvement of the E&SMS. This will generally occur in response to: i. Issues raised during environmental surveillance and monitoring; ii. Expanded scope of works; iii. Environmental incidents; and iv. Environmental non-conformances. b. A formal review of the E&SMS by the Principal Contractor's Senior Management Team will also occur on an annual basis, as a minimum. This review shall generate actions for the continual improvement of the E&SMS and supporting management plans.	Section 9.1 BESIX Watpac Environmental Management System



Appendix I
Risk Assessment

Caption: One Central Park, Sydney

Barangaroo Metro Station - Environmental Risk Register
Rev 2

Risk Number	Key Environmental Aspects											Construction Activity	Equipment	Zone	Out of Hours potential	Cause What could cause environmental impact	Risk What could go wrong and what might happen as a result	Risk Rating before any Control Measures are Implemented			Control Measures Incorporated into Activity (Consider Hierarchy of Control - Avoidance, Reduction, Transfer, Retention)	Comments	Residual Risk Rating after Existing Control Measures were implemented		
	Soil/Water	Noise/Vibration	Heritage	Contamination	Flora/Fauna/Biodiversity	Dust/Air quality	Community	Traffic	Visual Amenity	Approvals /Licensing	Waste							Consequence	Likelihood	Rating			Consequence	Likelihood	Risk Rating
1	Y			Y								Site establishment including bringing temporary demountable site sheds onto the site which include a temporary grey water storage tank	Hiab	Zone 1	No	The grey water tank could overflow if not pumped out correctly and frequently enough	Grey water could run onto the hardstand in the site compound and find its way into the local environment	C1 - Insignificant	L3 - Possible	D - Low	Grey water will be pumped out by a licensed contractor and disposed of correctly. The level of grey water in the tank will be monitored daily	activities to be managed with SOP	C1 - Insignificant	L5 - Rare	D - Low
2	Y	Y				Y	Y					Prepare trenching area including saw cut and remove existing slab / remove tarmac / overburden	concrete saw, 30t Excavator	Zone 2	No	Dust combined with wind and equipment movements	Dust and noise in proximity to public using foreshore walk	C1 - Insignificant	L2 - Likely	C - Medium	Hoarding and water spray dust suppression. Noisy works will only be carried out during allowable construction hours	activities to be managed with SOP	C1 - Insignificant	L3 - Possible	D - Low
3	Y								M			Stockpile saw cut concrete and removed tarmac	30t Excavator	Zone 1	No	loose soil connected to materials being held for reuse or classification prior disposal	soil mixing with rainwater making its way into drains close to the harbour	C3 - Moderate	L3 - Possible	C - Medium	keep soil separate from concrete. Cover stockpile with geotextile. Silt controls to perimeter	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium
4					Y							Relocate site hoarding closer toward Sydney Harbour to excavate Western civil pit	Telehandler	Zone 1	No	The hoarding needs to be repositioned to site over 2 juvenile trees along the foreshore	Damage to these trees	C2 - Minor	L2 - Likely	C - Medium	Trees will be removed by an arborist and stored off site until the works are complete.		C2 - Minor	L5 - Rare	D - Low
5		Y					Y					Installation of nom 10m long sheet piling for stormwater trench	150t Crawler crane, high frequency vibrodriver type PTC 24 HVF or similar	Zone 1	No	crawler crane movements and vibrodriver operation	potentially annoying noise to public using foreshore walk and childcare operation	C1 - Insignificant	L3 - Possible	D - Low	choice of high frequency vibrohammer will reduce noise, only work in standard hours, breaks to coincide with childcare nap time if necessary	activities to be managed in accordance with NVMP	C1 - Insignificant	L3 - Possible	D - Low
6		Y										Installation of propping to protect trench	Franna Crane	Zone 1	No	Steel cutting and fixing	potentially annoying noise to public using foreshore walk	C1 - Insignificant	L3 - Possible	D - Low		activities to be managed in accordance with NVMP	C1 - Insignificant	L5 - Rare	D - Low
7	Y			M		Y						Excavation of trench to formation level	30t Excavator	Zone 1	No	Silt and possibility of contaminated soil	mixing of contaminated material with clean	C3 - Moderate	L3 - Possible	C - Medium	regularly assess material for contaminants, applied unexpected finds procedure, control risk of silt to stormwater run off	activities to be managed with SOP for soil water and unexpected finds.	C3 - Moderate	L5 - Rare	D - Low
8	Y											Form sump and dewatering of stormwater trench	Water Pumps	Zone 1	Yes	groundwater seepage into trench	untreated groundwater making its way into harbour	C3 - Moderate	L2 - Likely	B - High	pump all seepage water to water treatment plant, ensure sufficient storage and capacity to not overload plant	to be included in water discharge impact assessment	C2 - Minor	L4 - Unlikely	D - Low
9	Y			M		Y						Stock pile excavated material from within trench	30t Excavator	Zone 1	No	significant volume of materials being held for reuse or classification prior disposal	soil mixing with rainwater making its way into drains close to the harbour	C3 - Moderate	L2 - Likely	B - High	Cover stockpiles with geotextile. Silt controls to perimeter. Testing prior to excavation to dispose non reusable spoil during activity and reduce quantity of stockpiles	activities to be managed with SOP	C3 - Moderate	L3 - Possible	C - Medium
10		M										Install stormwater pipework	Franna Crane	Zone 1	No	equipment operation	potentially annoying noise to public using foreshore walk	C1 - Insignificant	L3 - Possible	D - Low	hoarding and works will only be carried out during allowable construction hours, muffler on Franna to comply with NVMP	activities to be managed with SOP	C1 - Insignificant	L4 - Unlikely	D - Low
11						Y						Fill excavated trench to levels	30t Excavator	Zone 1	No	Tipper and excavator movements	dust generation in proximity of foreshore walk	C2 - Minor	L3 - Possible	C - Medium	water spray for dust suppression, 'hoarding, works will only be carried out during allowable construction hours, muffler on Franna to comply with NVMP	activities to be managed with SOP	C1 - Insignificant	L3 - Possible	D - Low
12	Y											FRP storm water pits	Franna Crane, concrete vibrators	Zone 1	No	concrete works, sawing cutting materials	concrete and cut materials mixing with water flushing into harbour,	C3 - Moderate	L3 - Possible	C - Medium	plan pours in dry weather, plug stormwater outlets until concrete set	activities to be managed with SOP	C3 - Moderate	L5 - Rare	D - Low
13	Y	Y		M		Y						Remove and demolish existing stormwater services	30t Excavator, Tipper	Zone 1	No	ground disturbance	soil mixing with rainwater making its way into drains close to the harbour	C3 - Moderate	L3 - Possible	C - Medium	silt protection, water spray for dust suppression, works will only be carried out during allowable construction hours, equipment to comply with NVMP	activities to be managed with SOP	C3 - Moderate	L5 - Rare	D - Low
14	Y			M			M					Remove sheet piles	150t Crawler crane, high frequency vibrodriver type PTC 24 HVF or similar	Zone 1	No	ground disturbance, and cleaning of piles	soil mixing with rainwater making its way into drains close to the harbour	C3 - Moderate	L3 - Possible	C - Medium	silt protection, water spray for dust suppression, works will only be carried out during allowable construction hours, equipment to comply with NVMP	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium
~~15~~	~~Y~~											~~Dewatering of the Western Civil pit into Sydney Harbour~~	~~60 litre / second pump~~	~~Zone 1~~	~~No~~	~~Water not meeting the discharge criteria required by the WDIA being pumping into Sydney Harbour~~	~~Breach of CoA E107 or pollution of the harbour~~	~~C4 - Major~~	~~L3 - Possible~~	~~B - High~~	~~Water quality will be checked prior to and following pumping at the pumping location and in Sydney Harbour. Turbidity, Oil and Grease and pH will be checked throughout the pumping process.~~	~~Process is outlined in the Soil and Water Management Procedure.~~	~~C4 - Major~~	~~L4 - Unlikely~~	~~C - Medium~~
16	Y										M	Waterproofing of station concrete roof and install protective screed	concrete agitator, concrete pump, finishing screed	Zone 2	No	wet concrete screed mixing with rainwater, leftover screed dumped on ground	concrete mixing with water making its way into drains	C2 - Minor	L2 - Likely	C - Medium	water collected at roof interface level is below surrounding ground, to be pumped to water treatment plant, protect perimeter from risk of overland flow from areas outsides.	activities to be managed with SOP. Consider staging	C2 - Minor	L5 - Rare	D - Low
17	Y	Y									M	Install services over sharks fin and back filling	truck mounted crane, tower crane, roller compacter	Zone 2	No	wet concrete, rubbish and mixing with rainwater,	concrete and rubbish mixing with water making its way into drains	C2 - Minor	L2 - Likely	C - Medium	regular clean-ups, divert collected water to treatment plant	activities to be managed with SOP	C2 - Minor	L5 - Rare	D - Low
18	Y								M			Complete station entry pods. Install lifts and escalators and cladding over entry pods	scissor lifts, powered hand tools	Zone 2	No	cutting, rubbish	rubbish mixing with water making its way into drains	C3 - Moderate	L2 - Likely	B - High	regular clean-up of rubbish, allocate cutting areas	activities to be managed with SOP	C3 - Moderate	L5 - Rare	D - Low
19		Y					Y					Complete landscaping	hand tools, wet saw	Zone 2	No	processing and cutting of pavers and other materials	annoying noise to sensitive receivers	C2 - Minor	L3 - Possible	C - Medium	noisy works limited during select times - refer NVMP	activities to be managed with SOP	C2 - Minor	L4 - Unlikely	D - Low
20	Y											Waterproofing of station concrete roof and install screed	hand tools	Zone 3	No	Run off from surrounding roads (Hickson Rd and High St) and overland surface will collect in the low point above the stationbox causing potential flood risk	Unprecedented rain event may cause excessive collection of water in the low point of site, which could flood the stationbox	C3 - Moderate	L3 - Possible	C - Medium	Temporary civil engineer to review of rainfall quantities and temporary pumping needed to mitigate flooding effects and ensure capacities of pumps can accommodate rainfall Temporary civil engineer to review of rainfall quantities and temporary pumping needed to mitigate flooding effects and ensure capacities of pumps can accommodate rainfall Design and installation of waterproofed hobs to penetrations in the station box lid at surface level. All hobs to be constructed to the PMF level, or if not achievable then a risks assessment to be conducted Temporary works civil connections for the Hickson Road demolition will be designed with the temporary civil works engineer and approved by Sydney Metro and METRON prior to undertaking the works.	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium
21		Y					Y				M	Demolish piled wall and capping beam to correct levels	30t excavator with rock breaking tool	Zone 3	No	concrete breaking and loading to tippers	excessive noise and vibration impacting local sensitive receivers	C3 - Moderate	L3 - Possible	C - Medium	noisy works limited during select times - refer NVMP	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium
22		Y					Y					Remove steel beams and girders	150t crawler crane. Rattle guns	Zone 3	No	crawler crane movements and loading to trucks	annoying noise to sensitive receivers	C3 - Moderate	L3 - Possible	C - Medium	noisy works limited during select times - refer NVMP	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium
23		Y					Y		M			Stockpile steel beams, cut down to transportable sizes and remove from site	150t crawler crane. Oxy Acetylene torch	Zone 9	No	steel sections material handling	moving dropping sections causing annoying noise and vibration	C2 - Minor	L3 - Possible	C - Medium	undertaken are area away from sensitive receivers. detailed works to be controlled to minimise unnecessary dropping, banging etc	activities to be managed with SOP	C2 - Minor	L4 - Unlikely	D - Low
24		Y					Y					Demolish access bridge concrete and remove steel beams	Concrete pecker / rock hammer, 150t crawler crane	Zone 3	No	concrete breaking and loading to tippers	excessive noise and vibration impacting local sensitive receivers,	C3 - Moderate	L3 - Possible	C - Medium	noisy works limited during select times - refer NVMP,	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium
25						Y	Y					Demolish access bridge concrete and remove steel beams	Concrete pecker / rock hammer, 150t crawler crane	Zone 3	No	concrete breaking and loading to tippers	generation of dust	C1 - Insignificant	L2 - Likely	C - Medium	use of water sprays for dust suppression	activities to be managed with SOP	C1 - Insignificant	L4 - Unlikely	D - Low
26						Y						Back fill, install primary and secondary service and compact fill	30t excavator, tipper trucks, roller compactor	Zone 3	No	Tipper and excavator movements, Franna crane	dust generation in proximity of foreshore walk	C2 - Minor	L4 - Unlikely	D - Low	'water spray for dust suppression,	activities to be managed with SOP	C2 - Minor	L4 - Unlikely	D - Low
27		Y					M					Back fill, install primary and secondary service and compact fill	30t excavator, tipper trucks, roller compactor	Zone 3	No	Tipper and excavator movements, Franna crane	noise generation in proximity of foreshore walk	C2 - Minor	L3 - Possible	C - Medium	works will only be carried out during allowable construction hours, muffler on Franna to comply with NVMP	activities to be managed with SOP	C2 - Minor	L4 - Unlikely	D - Low
28		Y										Install road, FRP, kerb and guttering and landscaping works	Asphalt trucks, rollers, concrete trucks, concrete pumps, wet saws to cut pavers	Zone 3	No	processing of materials, delivery and installation of concrete and asphalt	concrete and rubbish mixing with water making its way into drains, annoying noise	C3 - Moderate	L2 - Likely	B - High	noisy works limited during select times - refer NVMP	activities to be managed with SOP	C3 - Moderate	L3 - Possible	C - Medium
29		Y					Y	Y				Shift road from East to West	Lighting towers, Truck mounted crane	Zone 3	Yes	traffic impacts require nightworks	light pollution, noise to sensitive receivers	C4 - Major	L3 - Possible	B - High	scope works to minimise noisy activities, ensure equipment exhausts have compliant attenuation	activities to be managed with SOP	C4 - Major	L4 - Unlikely	C - Medium
30			Y	Y								Zone 3.1 activities occurring to the South of the Station	N/A	Zone 3.1	No	Activities occurring to the South of the Station excavation, which has not been excavated previously have a greater risk of heritage finds or contamination	Higher risk of contamination and Heritage discoveries as this areas has not recently been excavated	C4 - Major	L3 - Possible	B - High	This area will be managed under the project Heritage and Soil and Water / Contamination Management plans and the works will be more closely monitored during construction	Actives to be managed under the Heritage Management Plan and Soil Plan	C4 - Major	L5 - Rare	C - Medium
31												Suspend stormwater pipework off the Hickson Road wall temporarily to enable demolition of the Hickson road bridge deck and steel support structure. Includes coring into the concrete section of the wall to locate existing downpipes behind the wall	Stitch coring rig, PVC pipe	Zone 4	No	Coring into the wall	Damage to the Hickson Road wall which located in a heritage precinct	C4 - Major	L3 - Possible	B - High	A heritage consultant will produce a methodology document in support of these works. Coring will occur through concrete section of the wall only. No impact on sandstone sections of the wall will be allowed. Concrete will be re-instated in consultation with heritage consultant		C4 - Major	L4 - Unlikely	C - Medium
32		Y					Y					Demolish temporary Hickson road, remove propped steel girders and services hanging under Hickson Road	Concrete pecker / rock hammer, 150t crawler crane, 30t excavator, rattle guns	Zone 4	Yes	steel cutting and loading	excessive noise impacting local sensitive receivers,	C2 - Minor	L3 - Possible	C - Medium	noisy works limited during select times - refer NVMP	activities to be managed with SOP	C2 - Minor	L4 - Unlikely	D - Low
33	Y	Y										FRP concrete ventilation and stair pods	Concrete trucks, concrete vibrators	Zone 4	No	concrete works, sawing cutting materials	concrete and cut materials mixing with stormwater	C3 - Moderate	L3 - Possible	C - Medium	regular clean-up of rubbish, allocate cutting areas	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium
34	Y	Y										Waterproofing of station concrete roof, waterproof pods and install screed	concrete agitator, concrete pump, finishing screed	Zone 4	No	wet concrete screed mixing with rainwater, leftover screed dumped on ground	concrete mixing with water making its way into drains	C2 - Minor	L2 - Likely	C - Medium	water collected at roof interface level is below surrounding ground, to be pumped to water treatment plant, protect perimeter from risk of overland flow from areas outsides.	activities to be managed with SOP. Consider staging	C2 - Minor	L2 - Likely	C - Medium
35	Y	Y					Y					Back fill, install primary and secondary service and compact fill	30t excavator, tipper trucks, roller compactor	Zone 4	No	Tipper and excavator movements, Franna crane	noise and dust generation in proximity of sensitive receivers	C2 - Minor	L3 - Possible	C - Medium	water spray for dust suppression, works will only be carried out during allowable construction hours, muffler on Franna to comply with NVMP	activities to be managed with SOP	C3 - Moderate	L3 - Possible	C - Medium

36	Y	Y					Y					Install road, FRP, kerb and guttering	Asphalt trucks, rollers, concrete trucks, concrete pumps	Zone 4	No	processing of materials, delivery and installation of concrete and asphalt	concrete and rubbish mixing with water making its way into drains, annoying noise	C3 - Moderate	L2 - Likely	B - High	noisy works limited during select times - refer NVMP	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium
37			Y									Remove Heritage Wall Rock fall mesh and protection and repair render locally around fixing points (note provisional sum so scope TBC)	Scissor lift, cherry picker	Zone 4	No	unknown causes of deterioration of wall e.g. increased hydraulic pressure behind wall	damage to wall during works	C3 - Moderate	L3 - Possible	C - Medium	undertake in stages, confirm via survey or inspection wall is competent prior to works		C3 - Moderate	L4 - Unlikely	C - Medium
38			Y	Y								Zone 4 activities occurring to the South of the Station	N/A	Zone 4.1	No	Zone 4 activities occurring to the South of the Station excavation, which has not been excavated previously have a greater risk of heritage finds or contamination	Higher risk of contamination and Heritage discoveries as this areas has not recently been excavated	C4 - Major	L3 - Possible	B - High	This area will be managed under the project Heritage and Soil and Water / Contamination Management plans and the works will be more closely monitored during construction	Activities to be managed under the Heritage Management Plan and Soil Plan	C4 - Major	L5 - Rare	C - Medium
39					Y							Remove trees in Zone 5 in advance of Zone 5 construction activities	Chainsaw and chipper truck	Zone 5	No	Incorrect approvals in place	Non-compliance with planning approval by removing trees without approval.	C2 - Minor	L3 - Possible	C - Medium	Tree Report to be approved and removal documented in the Fauna and Flora Management procedure.		C2 - Minor	L5 - Rare	D - Low
40			M	M								Excavate trench to install condenser water pipework between station sharks fin and the headland park including excavating the carpark in front of the Dalgety Bond Store	30t excavator	Zone 5	No	The carpark in front of the Dalgety Wool Store has not previously been excavated as part of the development of Barangaroo so has the potential to contain contamination or heritage artifacts	Heritage items of significance could be damaged or lost	C3 - Moderate	L5 - Rare	D - Low	This area will be managed under the project Heritage management plan. Works to be monitored during construction for items of heritage significance	Activities in this area will be managed under the project Heritage Management Plan	C3 - Moderate	L5 - Rare	D - Low
41	Y			Y								Decommission the existing water treatment plant	Tower crane	Zone 5	No	dismantling and removal works	chemical spills ~~and sludge mixing with stormwater~~	C3 - Moderate	L3 - Possible	C - Medium	ensure all elements, tanks and vessels are cleaned prior to dismantling	consider decommissioning plan to be developed at later stage	C3 - Moderate	L4 - Unlikely	C - Medium
42												Install condensed water pipework in trench, other services and fill	30t excavator	Zone 5	No	loose and stockpiled excavated materials	soil mixing with rainwater making its way into drains close to the harbour	C3 - Moderate	L4 - Unlikely	C - Medium			C2 - Minor	L4 - Unlikely	D - Low
43	Y											Remediated pavement and landscaping excavated to complete condensed water pipework, complete new landscaping, public lighting and bollards	General landscaping equipment, wet saw	Zone 5	No	landscape activities such as cutting pavers	potentially annoying noise to public using foreshore walk	C1 - Insignificant	L3 - Possible	D - Low		activities to be managed in accordance with NVMP	C2 - Minor	L6 - Almost Unprecedented	D - Low
44		Y					Y					Remove transformers, install and operate back up power	Generator	Zone 5	No	Operation of generator 24/7	attenuation is insufficient and noise impacts sensitive receivers out of hours	C3 - Moderate	L2 - Likely	B - High	ensure noise performance certified prior to installation. - refer to NVMP		C3 - Moderate	L4 - Unlikely	C - Medium
45		Y					Y					Operate the Northern access shaft acoustic shed, ventilation fan and gantry crane throughout the course of the works	Vehicle movements reversing into the Northern shaft to deliver goods into the crossover cavern	Zone 6	Yes	heavy usage out of hours	insufficient noise mitigations, causing annoyance to sensitive receivers	C3 - Moderate	L2 - Likely	B - High	ensure compliant equipment and operations considerate to potential noise impacts. Aim to minimise noise after 10pm. Refer to NVMP		C3 - Moderate	L3 - Possible	C - Medium
46		Y					Y					Backfill the northern access shaft with stabilised sand, compact and cap with concrete lid	Gantry crane used to lower stabilised sand into the shaft, compactors, small excavators to move material around in the northern shaft	Zone 6	Yes	heavy usage out of hours	insufficient noise mitigations, causing annoyance to sensitive receivers	C3 - Moderate	L2 - Likely	B - High	ensure compliant equipment and operations considerate to potential noise impacts. Aim to minimise noise after 10pm. Refer to NVMP	ensure community is well informed prior to works	C3 - Moderate	L3 - Possible	C - Medium
47	Y	Y					Y					Demolish existing road, kerb and guttering along Hickson Road in vicinity of the Northern access shaft	Concrete pecker/ rock hammer, 30t excavator, trucks to remove excavated concrete, asphalt and other material	Zone 6	Yes	heavy use of various plant out of hours	insufficient noise mitigations, causing annoyance to sensitive receivers	C3 - Moderate	L2 - Likely	B - High	ensure compliant equipment and operations considerate to potential noise impacts. Aim to minimise noise after 10pm. Refer to NVMP	ensure community is well informed prior to works	C3 - Moderate	L3 - Possible	C - Medium
48	Y	Y		M			Y					Install new services under road, install new FRP kerb and guttering and complete landscaping works	Asphalt trucks, rollers, concrete trucks, concrete pumps	Zone 6	No	heavy use of various plant	insufficient noise mitigations, causing annoyance to sensitive receivers	C2 - Minor	L2 - Likely	C - Medium	ensure compliant equipment and operations considerate to potential noise impacts. Aim to minimise noise after 10pm. Refer to NVMP	ensure community is well informed prior to works	C2 - Minor	L3 - Possible	C - Medium
49		Y										Platform precast installation & over track steelwork	14t forklift, Franna crane	Station Box	Yes	supply of precast, transport and handling equipment	noisy deliveries of precast into station	C3 - Moderate	L3 - Possible	C - Medium	ensure compliant equipment and operations considerate to potential noise impacts. Aim to minimise noise after 10pm. Refer to NVMP		C3 - Moderate	L3 - Possible	C - Medium
50		M				Y						Blockwork installation	14t forklift, hand tools, wet saw	Station Box	Yes			C3 - Moderate	L2 - Likely	B - High	ensure allocated areas for cutting are away from open vents refer NVMP		C2 - Minor	L2 - Likely	C - Medium
51	Y											Seawall diving, incl installation on stainless steel entry/exit cages and clearing of waterway entry/exits	15t mobile crane	Zone 7	No	modification of existing infrastructure	use of materials and rubbish going directly into harbour	C3 - Moderate	L4 - Unlikely	C - Medium	ensure all rubbish is controlled and cleaned up each day		C3 - Moderate	L5 - Rare	D - Low
52	Y											Main walkway, incl 2x chambers works, install pipe work connectors	Suction truck	Zone 7	No	installation pipework, commissioning	spoil mixing with stormwater going directly to harbour	C3 - Moderate	L3 - Possible	C - Medium	ensure spoil contained in operation		C3 - Moderate	L3 - Possible	C - Medium
53	Y											Headland to BR COP install supply/return chiller lines, LV feeder and control cables	cable roll feed, hand tools	Zone 7	No	installation pipework, commissioning	use of materials and rubbish going directly into harbour	C3 - Moderate	L4 - Unlikely	C - Medium	ensure all rubbish is controlled and cleaned up each day		C3 - Moderate	L4 - Unlikely	C - Medium
54		Y				Y			Y			Main laydown area, materials, equipment and vehicle park	14t forklift, Franna,	Zone 9	Yes	arrangement of materials and equipment	reduced quality of surrounding aesthetics, generation of rubbish	C3 - Moderate	L3 - Possible	C - Medium	daily monitoring and clean-up		C3 - Moderate	L3 - Possible	C - Medium
55			Y									Demolish temporary Hickson road, remove propped steel girders and services hanging under Hickson Road	Various equipment	Zone 4	No	Accidental plant equipment impact to heritage wall	Damage to Heritage Wall	C2 - Minor	L3 - Possible	C - Medium	Footpath between works and wall to have hoarding. Any works within footpath to be supervised to ensure no impact to wall		C2 - Minor	L4 - Unlikely	D - Low
56					Y							Excavate trench to install condensed water pipework between station sharks fin and the headland park including excavating the carpark in front of the Dalgety Bond Store	30t excavator	Zone 5	No	Excavation in root zone, impact to canopy	Damage to existing trees (not contemplated for removal under the Tree Report).	C1 - Insignificant	L3 - Possible	D - Low	During works, apply tree protection zone in accordance with arborist recommendations	Note - trees are relatively juvenile	C1 - Insignificant	L5 - Rare	D - Low
57	Y		M									Construction of new SW drainage along Hickson Rd	Various equipment	Zone 4	No	Temporary diversion of existing SW	Local Flooding to properties in High St	C3 - Moderate	L4 - Unlikely	C - Medium	Review staging in detail with SW consultant to assess expected flooding in High st and eliminate likelihood of affecting properties by amending cutover times and provision of overflows		C3 - Moderate	L6 - Almost Unprecedented	D - Low
58									Y			Site sheds	15t Mobile Crane	Zone 1	No	Long term arrangement of site compound having negative impact on surrounding aesthetic	Unsightly sheds and associated plant , noisy workers	C1 - Insignificant	L3 - Possible	D - Low	Sheds are low rise and located behind shoring/fencing		C1 - Insignificant	L3 - Possible	D - Low
59									Y			Main laydown area, materials, equipment and vehicle park	Various	Zone 9	No	Long term arrangement of laydown area having negative impact on surrounding aesthetic	Unsightly, noisy workers, generation of rubbish	C1 - Insignificant	L3 - Possible	D - Low	Located behind shoring. Laydown material and plant to be arranged in orderly way. Rubbish to be regularly cleaned		C1 - Insignificant	L6 - Almost Unprecedented	D - Low
60						Y						General - Diesel powered plant, and equipment	Various	All	Yes	poorly maintained equipment leading to incomplete combustion and increased noxious gases and particulates	increased air pollution and irritant to locals and workers in vicinity of exhausts	C2 - Minor	L3 - Possible	C - Medium	All diesel powered plant subject to visual assessment on exhaust (not visible min 10 seconds) . Excavators and mobile cranes on site more than three months must comply with USA EPA Tier 4 emissions standards		C2 - Minor	L4 - Unlikely	D - Low
61					Y							General - above ground works and buildings - fauna	N/A	All	N/A	unexpected find of native animal or bird nest	disturbance or injury from construction activities	C2 - Minor	L5 - Rare	D - Low	Remove animal using qualified ecologist in accordance with Flora and Fauna procedure	very low chance due to lack of native environment	C2 - Minor	L5 - Rare	D - Low
62							Y	Y				General - construction worker vehicles & parking	small vehicles	N/A	Yes	workers parking in surrounding streets	loss of on street parking affecting local residents and businesses	C2 - Minor	L2 - Likely	C - Medium	regular inductions to encourage use of public transport, car pooling and off street public car parking		C2 - Minor	L3 - Possible	C - Medium
63								Y				General - trucks waiting to access site	trucks	N/A	Yes	trucks standing in surrounding streets awaiting delivery to site	disturbance to local residents and businesses resulting in complaints	C3 - Moderate	L2 - Likely	B - High	Vehicles making deliveries must comply with Traffic Management plan and not wait in sensitive areas prior to commencement of working hours		C1 - Insignificant	L6 - Almost Unprecedented	D - Low
64										Y		General - Pre Planning of construction activities	N/A	All	N/A	Not identifying appropriate approvals, licenses or permits and proceeding without them	works delayed, infringements, prosecution, poor community relations, reputational loss	C4 - Major	L3 - Possible	B - High	Identify and implement approval requirements within the CEMP and sub-plans		C4 - Major	L4 - Unlikely	C - Medium
65				Y								General - Potential discovery of contaminate soil or asbestos	N/A	All	N/A	encountering asbestos in works	transferring material to previously uncontaminated areas	C3 - Moderate	L3 - Possible	C - Medium	Inspect excavated material during construction. apply unexpected finds procedure. Conduct further investigations	conduct regular toolbox talks on how to manage unexpected finds	C3 - Moderate	L4 - Unlikely	C - Medium
66											Y	General - recycling	N/A	All	N/A	Poorly arranged or insufficient recycling facilities	creation of non recyclable waste streams, not meeting sustainability targets	C2 - Minor	L2 - Likely	C - Medium	ensure waste managed in accordance with sustainability management plan, waste bins are regularly checked for categories, regular inductions to all subcontractors		C1 - Insignificant	L4 - Unlikely	D - Low
67											Y	General - waste to landfill	N/A	All	N/A	Poor planning of works	site adjustments and cutting leading to more waste materials going to landfill than necessary, increased cost to subcontractors	C2 - Minor	L3 - Possible	C - Medium	ensure all key fitout works are preceded with site measure		C2 - Minor	L4 - Unlikely	D - Low
68	Y	M							Y			Installation and commissioning of Temporary Water Treatment Plant (TWTP)	Various equipment	Zone 1	N/A	Discharge of contaminated or non treated water into the harbour receiving water Noise from the TWTP compressor Leaking chemicals	TWTP is not commissioned to treat water to the same performance as the existing WTP, or the TWTP fails and does not treat water before water is discharged to the harbour Noise from the TWTP may carry to, and be audible at sensitive receivers Storage containers holding chemicals are damaged or leak	C3 - Moderate	L3 - Possible	C - Medium	Temporary Water Treatment Plant Water quality Testing Program had been developed by our Environmental Consultant PRA. During the commissioning process the treated water from the TWTP will sampled and tested before it is pumped to and treated by the existing WTP prior to discharge into the harbour. A water sampling program must be followed when commissioning the TWTP to ensure it meets the requirements set out in the WDIA. The TWTP holding tanks will be connected to the concrete bund constructed for the relocation of the existing WTP to provide detention for overflow if the TWTP. The site also falls away from the perimeter to prevent any overflow from spilling into the public domain. Backup compressor to be hard wired so it cannot be unplugged If IBCs containing chemicals are to be relocated then they will be inspected prior to being moved with the forklift. Noise blankets will be installed around the compressor. Works will be done during Standard Construction Hours		C3 - Moderate	L5 - Rare	D - Low

69	Y	M							Y			Relocation and commissioning of Water Treatment Plant	Various equipment	Zone 1	N/A	Discharge of contaminated or non treated water into the harbour receiving water Noise from the WTP compressor Leaking chemicals	WTP is not commissioned to treat water to the same performance as the existing WTP, or the TWTP fails and does not treat water before water is discharged to the harbour Noise from the WTP may carry to, and be audible at sensitive receivers Storage containers holding chemicals are damaged or leak	C3 - Moderate	L3 - Possible	C - Medium	Water quality Testing Program had been developed by our Environmental Consultant PRA. During the commissioning process the treated water from the WTP will sampled and tested before it is pumped to and treated by the TWTP before being discharged into the harbour. A water sampling program has been developed by PRA detailing the sampling and testing regime that must be followed when commissioning the WTP to ensure it meets the requirements set out in the WDIA. The WTP will be constructed on a raft slab with upturn walls to act as a bund to contain water in the event that the holding tanks overflow. The site also falls away from the perimeter boundary to prevent any overflow from spilling into the public domain. Backup compressor to be hard wired so it cannot be unplugged If IBCs containing chemicals are to be relocated then they will be inspected prior to being moved with the forklift. Noise blankets will be installed around the compressor. Works will be done during Standard Construction Hours		C3 - Moderate	L5 - Rare	D - Low
70	Y											Installation of temporary stormwater diversion from High Street wall to the new permanent stormwater networks to allow new HV pit construction	Various equipment	Zone 4	N/A	GPT has not yet been installed on the permanent stormwater system.	Rubbish from the catchment area in High Street may wash through the stormwater system and into the harbour.	C4 - Major	L2 - Likely	B - High	Baffle trash screen to be installed into pit H01-06 that will be cleaned out regularly whilst the GPT is installed as part of the permanent stormwater system. Connection to new temporary stormwater pipework to be done during dry weather	Pit H01-06 will be inspected on weekly environmental walks.	C2 - Minor	L4 - Unlikely	D - Low
71	Y							Y		Y	Y	Installation of pedestrian bridge over Nawi Cove	Various equipment	Zone 5	Yes	Rubbish from bridge construction ending up in harbour and out of hours works impact to neighbours.	Debris from bridge construction falling into the harbour, or making its way into stormwater outlets and contaminating the harbour water. Scaffolding damages the sandstone to Nawi Cove Out of hours works to build the bridge ramps could disturb neighbours.	C3 - Moderate	L3 - Possible	C - Medium	All cutting of plywood to be done within the site boundaries where ERSED controls are established. Ply and geomesh to be used under the scaffold standards to protect the sandstone OOH works are limited to assembling the bridge tie ins. All cutting to be done during normal hours. OOH prestart to be carried out. Notifications to be issued to community, signage for pedestrian diversion installed and permits for works issued by INSW.		C2 - Minor	L4 - Unlikely	D - Low
73		Y						Y		Y		HV power outage to connect Stage 1B HV Power to the Cutaway	Generator	Zone 5	Yes	Operation of generator 24/7	attenuation is insufficient and noise impacts sensitive receivers out of hours	C3 - Moderate	L2 - Likely	B - High	ensure that noise attenuation is designed by acoustic consultant and installed and certified prior to operation of the generators. - refer to NVMP		C3 - Moderate	L4 - Unlikely	C - Medium
74			Y						Y			Removal of protective mesh from Hickson Road Wall	EWP, Hand Tools, Patching/Repair materials	Zone 4	No	Working on Hickson Road Wall (Heritage Listed). Removal of bolts/mesh and tap test to determine extent of required render removal/repair	Structural/Aesthetic Damage to Hickson Road Wall	C2 - Minor	L3 - Possible	C - Medium	Works to be undertaken by appropriately trained subcontractor following a predefined and approved methodology. Tap tests for for render repair to be supervised and extent to be approved before render repair undertaken	EWMS 02 produced to cover Mesh Removal Works	C2 - Minor	L5 - Rare	D - Low

Y - Yes
N - No
M - Maybe



Appendix J
Head Contract Specification Compliance



Caption: One Central Park, Sydney

Compliance Table

Table 15 Compliance Table - Particular Specification & General Specification (CEMP)

Clause	PS/GS Paragraph *[Note: updated to Addenda 7 requirements]*	Reference Section
Particular Specification - Plans and Reporting		
5.1(g)	*For the purposes of section 5.1.4.2.3 of the General Specifications, the Contractor must comply with Sydney Metro Risk Management Standard (SM-17-00000182) rather than SM RM-ST-201.*	CEMP, Section 10 & Appendix H
Particular Specification - Planning and Environmental Management		
2.6 (a)	*(ii) Materials which are not suitable for incorporation in the Project Works must be removed from the Construction Site and disposed in accordance with the contract.* *(iii) Stockpiles must not be placed in drainage lines, channels or paths.* *(iv) All stockpiles must be managed in accordance with "managing urban stormwater: soils and construction volume 1 (Blue Book)".*	CEMP, Section 9.2.3
2.6.1 (a)	*The Contractor must develop, implement and maintain a corporate environmental management system that complies with AS/NZS ISO 14001 for the duration of the Contractor's Activities.*	CEMP, Section 9.1
2.6.1 (b)	*The Contractor must comply with the Sydney Metro Construction Environmental Management Framework (CEMF) (SM ES-ST-204).*	CEMP, Section 1.5 & Appendix G (Compliance matrix) Appendix C,D & E sub plans
General Specification – Independent Environmental Representatives		
2.6.3 (i)	*Environmental inspections (led by ER) will be held weekly, unless otherwise agreed with the Principal's Representative*	CEMP, Section 6.1
Particular Specification – Spoil Management		
2.7.13(b)	*(b) Beneficial reuse of spoil must be in accordance with the following spoil reuse hierarchy, in order of preference:* *(i) within the project;* *(ii) environmental works;* *(iii) other development projects;* *(iv) land restoration; and* *(v) landfill management.*	Refer Sustainability Management Plan. The CEMP will adopt objectives of 2.7.13 (b) in Section 9.3.3
2.7.13 (c)& (d)	*(c) The Contractor must utilise reuse appropriate site-won materials onsite.* *(d) The Contractor must ensure that landscape mounding and gabion wall features use site-won materials if they meet quality requirements.*	CEMP Section 9.3.3
Particular Specification –Pollution Control		
2.7.14 (a)	*The Contractor must identify and implement pollution control initiatives and target zero major pollution incidents.*	CEMP Section 1.8, Appendix A Environmental Policy
2.7.14 (b)	*The Contractor must, where practicable, ensure that all excavators and mobile cranes used for the Contractor's Activities, which are onsite for more than three months, comply with United States Environmental Protection Agency (US EPA) Tier 4 exhaust emission standards.*	CEMP Section 9.3.2
Particular Specification – Temporary Site Facilities		
2.7.15 (a) (i) and (ix)	*(a) The Contractor must ensure that, where reasonable and feasible, any temporary site facilities provided by the Contractor incorporate:* *- energy efficient lighting schemes and light fittings;*	Appendix D Visual Amenity Sub Plan

Clause	PS/GS Paragraph *[Note: updated to Addenda 7 requirements]*	Reference Section
	- *crime prevention through environmental design principles.*	
2.7.15 (b)	*(b) Any security and warning lighting used by the Contractor must be installed so that light is not directed at neighbouring properties or in such a way that light reflects onto structures or neighbouring properties.*	Appendix D Visual Amenity Sub Plan
***General Specification –** Site Investigations and survey*		
3.11.1 (c)	*The Contractor must undertake site investigation work associated with Contamination in accordance with the NSW Environment Protection Authority requirements.*	CEMP Section 6.1,
3.11.1 (d) part	*The Contractor must maintain records of all site investigations….*	CEMP Section 6.1,
3.11.1 (h)	*All contamination laboratory test results must be provided in environmental data management software (ESDAT) electronic lab data format.*	CEMP Section 6.1,
General Specification – Construction Environmental Management Plan (CEMP) and sub-Plans		
5.1.4.8(a)	*(a) The Contractor must submit Construction Environmental Management Plan and Sub-Plans to the Principal for Review in accordance with Table 1.*	(4) CEMP, Section 4.1
5.1.4.8(c)	*(c) The Construction Environmental Management Plan and Sub-Plans must comply with the Sydney Metro Construction Environmental Management Framework.*	(4) CEMP, Appendix G
5.1.4.8(d)	*(d) The Contractor must develop, submit for Review, implement and maintain all plan and sub-plans required by the Construction Environmental Management Framework.*	(4) CEMP, Section 1.10
General Specification – Notifications		
6.8.3 (a)	*The Contractor must proactively notify stakeholders and the community of current and upcoming Contractor's Activities, and any Interface Contractors' activities, with the potential to impact on stakeholders and the community, in agreement with outcomes of the CICG.*	CEMP, Section 7.7 Refer Contract Management Plan - Community Communications and Business management Sub Plan
6.8.3 (b)	*Contractor should issue notifications on a regular basis for:* *(i) start of work;* *(ii) new work with a new activity that has the potential to impact on stakeholders and the community; and* *(iii) those required to comply with relevant Environmental Protection Licence (EPL).*	CEMP, Section 7.7 Refer Contract Management Plan - Community Communications and Business management Sub Plan
6.8.3 (c)	*In the event of works to address an Emergency Event, the Contractor must provide written and verbal notification to occupiers of properties immediately adjacent to or impacted by any works to address an Emergency Event within two hours after commencing such works. The use of email and phone call is acceptable for providing notification. In cases where contact details are not available, the Contractor must doorknock the property and provide a written (paper) notification to the occupier.*	CEMP, Section 7.7 Refer Contract Management Plan - Community Communications and Business management Sub Plan
6.8.3 (d)	*The Contractor must provide an Emergency Event notification to the Principal's Representative for distribution via the digital application (see the "Social Media Application (App)" section of this General Specification). This should occur during the Business Day immediately preceding the Emergency Event (where works have been anticipated), or within 2 hours of the start of the following Business Day.*	CEMP, Section 7.7 Refer Contract Management Plan - Community Communications and Business management Sub Plan
General Specification – Building Surveys		
2.9.5 (ii)	*The Contractor must utilise an independent Surveyor to survey all existing buildings on each Site and each Extra Land site in accordance with:*	Where relevant - Heritage sub Plan

Clause	PS/GS Paragraph *[Note: updated to Addenda 7 requirements]*	Reference Section
	(i) Sections 4 and 5 of the "Royal Institute of Chartered Surveyors (RICS) Guidance Note 63/2010 Building surveys and technical due diligence"; or *(ii) "AS 4349 Inspection of Buildings – General Requirements", and with specific regard to the heritage element*	
General Specification – Reporting (CEMP)		
5.2.1(a)	*During the Contractor's Activities, the Contractor must provide regular Progress Reports to the Principal's Representative in accordance with this section.*	CMP, Section 6 & 7 CEMP, Section 6.3
5.2.2.8(a)	***Environment Management:*** *The monthly Progress Report must include an "Environment Management" section which must address and detail:* *(i) an executive summary;* *(ii) the Contractor's performance against the environmental management requirements of the Construction Environmental Management Plan;* *(iii) the status of the Construction Environmental Management Plan including all sub-plans and environmental construction method statements;* *(iv) management strategies for environmental compliance;* *(v) management strategies to identify the need for, and to undertake, consistency reviews under the Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act);* *(vi) the status of environmental obligations including those identified in the Contractor's compliance tracking program;* *(vii) the status of and performance against environmental licences held for the Contractor's Activities;* *(viii) details of compliance with relevant Environmental Law;* *(ix) the Contractor's performance against environmental key performance indicators;* *(x) graphical representation of the monthly frequency of environmental issues and incidents each month for the previous 12 months, including an analysis of trends and what actions are being taken to improve performance;* *(xi) details of environmental incidents or emergencies;* *(xii) environmental inspection reports;* *(xiii) the results, findings and any environmentally relevant actions of any internal or external audits carried out;* *(xiv) reports that include the number of employees that have received environmental training and the type of training they received; and* *(xv) a sustainability section within the report which must, as a minimum, include:* *A. a summary of performance in meeting sustainability requirements and targets, which includes the identification of areas of actual or potential non-compliance; and* *B. data on resource consumption, carbon emissions, waste recycling and disposal, spoil management and concrete mixes in the form of a completed Sydney Metro Sustainability Reporting Template (SM-18-00043350).*	CEMP, Section 6.3.3 (8) SMP Section
5.2.2.8(b)	*The Contractor must maintain a current documented description of evidence for each Minister's condition of approval and Revised Environmental Mitigation Measure allocated to the Contractor and submit this record to the Principal's Representative promptly upon request.*	CEMP, Section 1.6
5.2.2.8(c)	*Where reference is made to a piece of evidence in (b), that reference must include a document reference number and be retrievable from the PDCS.*	CEMP, Section 1.6
5.2.2.8(d)	*The Contractor must submit via the PDCS the documented evidence of (b) in a format and frequency specified by the Principal's Representative.*	CEMP, Section 1.6
5.2.2.8(e)	*In addition to (d), a PDCS submission is required 2 weeks prior to the anticipated date for commencement of construction which documents all evidence that all Minister's conditions of approval and Revised Environmental Mitigation Measures which have a pre-construction requirement have been met and are compliant.*	CEMP, Section 1.6



Appendix K
CEMP Consultation Matrix

Caption: One Central Park, Sydney

Table 16 CEMP Consultation Matrix

Authority / Organisation	Contact(s)	Date Issued	Status
Noise and Vibration Management Plan - CoA C3(a)			
City of Sydney Council	Elise Webster	15-06-21	City of Sydney responded 6th July 2021 finding the plan satisfactory (accepted)
Noise and Vibration Monitoring Plan – C9(a)			
NSW Environmental Protection Authority (EPA)	Mark Jansons	9-07-21	The EPA responded on 13th July 2021 with no comment made on the CNVMP (accepted)
City of Sydney Council	Elise Webster	15-06-21	City of Sydney responded 6th July 2021 finding the plan satisfactory (accepted)
Heritage Management Plan – C3(g)			
Heritage Council	Rajeev Maini Siobhan Lavelle	8-06-21	Plan issued on the 9th of June 2021 with follow up email 9th July 2021. The Heritage Council responded on 12th July 21 committing to provide comment by 16th July 21. The Heritage Council responded on 6th August 21 finding the Heritage Management Plan to be "fit for purpose" document.
City of Sydney Council	Elise Webster	11-06-21	City of Sydney responded 6th of July 2021 finding the plan satisfactory (accepted)
Darug Land Observations	Gordon Workman Jamie Workman	18-06-21	No comments received. Followup phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Murra Bidgee Mullangari Aboriginal Corporation	Ryan Johnson	18-06-21	Endorsement received on the 21st of June 21 (accepted)
Tocomwall	Danny Franks Sarah Franks Scott Franks	18-06-21	Endorsement received on 14th July 21 (accepted)
Kamilaroi-Yankuntjatjara Working Group	Pollowan Phillip Kahn	18-06-21	Endorsement received on the 29th of June 21 (accepted)
Woronora Plateau Gundangarra Elders Council	Kayla Williamson	18-06-21	No comments received. Followup phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Aboriginal Archaeology Service	Tony Williams Andrew Williams	18-06-21	No comments received. Followup phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Metropolitan Local Aboriginal Land Council	Nathan Moran	18-06-21	No comments received. Followup phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Gundungurra Tribal Technical Services	Christopher Payne Peter Foster David Bell	18-06-21	No comments received. Followup phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Darug Aboriginal Cultural Heritage Assessments	Celestine Everingham	18-06-21	No comments received. Followup phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Bilinga Cultural Heritage Technical Services	Robert Brown Wandai Kirkbright	18-06-21	No comments received. Followup phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Gunyuu Cultural Heritage Technical Services	Darlene Hoskins-McKenzie	18-06-21	No comments received. Followup phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Munyunga Cultural Heritage Technical Services	Robert Brown Suzanne McKenzie Levi McKenzie-Kirkbright	18-06-21	No comments received. Followup phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)

Authority / Organisation	Contact(s)	Date Issued	Status
Wingikara Cultural Heritage Technical Services	Suzannah McKenzie Wandai Kirkbright	18-06-21	No comments received. Followup phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)
Duncan Suey & Associates	Darren Duncan	18-06-21	No comments received. Followup phone call on the 9th of July 21 and email resent 9th of July 21 (overdue)



Appendix L
Fauna & Flora / Biodiversity Procedure

Caption: One Central Park, Sydney

BESIX Watpac



Barangaroo Station

Fauna & Flora / Biodiversity Management Procedure

N217

BR COP

28 February 2023

Project overview

Project Site Address:
Hickson Road
Barangaroo
NSW 2000

Project Commencement Date:
12 March 2021

BESIX Watpac State Division Address:
Level 24, 44 Market Street
SYDNEY
NSW 2000

BESIX Watpac ABN:
71 010 462 816

Document Control

Client:	Sydney Metro
Title:	BARANGAROO STATION
Subtitle:	Fauna & Flora / Biodiversity Management Procedure
Owner / Approver:	Planning & Environment Manager / Senior Construction Manager
TB Document Reference:	SMCSWSBR-BWC-SBR-EM-PRO-000030
TB Revision:	01

Revision history

Version	Date	Revision Description	Release Sign off
A	18/06/21	Submission for Review	[redacted]
B	9/7/21	Updated following SM comments	[redacted]
C	19/07/21	Updated following ER comments for submission to DPIE	[redacted]
00	01/04/2022	Six monthly update	[redacted]
01	28/02/2023	Update during CEMP review	[redacted]

BESIX Watpac Approvals

Name	Role & Title	Signature	Date
[redacted]	Author / Planning & Environment Manager	[redacted]	28/02/2023
[redacted]	Reviewer / Construction Manager	[redacted]	28/02/2023

Name	Role & Title	Signature	Date
[redacted]	Reviewer / Contractor's Representative	[redacted]	28/02/2023

Note: A controlled copy of the Fauna & Flora / Biodiversity Procedure will be distributed to the Sydney Metro Principal's Representative, Independent Certifier (IC) and other nominated stakeholders, and it will be made available to all BR COP employees and subcontractors in soft copy format through the project document control system.

This procedures, when printed, will be uncontrolled and it will the responsibility of each user to confirm the currency of the plan through the project document control system.

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1.1 Document Purpose

The purpose of the Flora and Fauna and / Biodiversity Procedure is to minimise the impacts of construction activities related to the Barangaroo Construct Only Package (BR COP) to flora and fauna.

1.2 Construction Overview

An overview of BR COP construction activities has been presented below::

- Structural and civil completion works to the station box,
- Stormwater trunk mains works from Hickson Road precinct to the existing pit at the western end of the site
- Installation of a cooling water system within the Barangaroo cutaway and associated trenching and pipework including the connection of the system to an existing network of pipes in Sydney Harbour.
- Hickson Road precinct works including road, footpath, cycleway, landscaping, street lighting, stormwater, utilities works and ventilation pod risers
- Backfilling and surface reinstatement of the temporary northern (Hickson Road) shaft, and
- Staging and temporary works required to deliver the permanent works, including removal of the temporary Hickson Road bridge structure.

1.3 Key Risks and Potential Impacts

The majority of the construction activities taking place occur in an area that is already a construction site which has been extensively excavated with the bulk of the fauna and flora cleared from the site.

There are a group of newly planted trees to the west of the Dalgety Bond Store at 25 Hickson Road, Barangaroo, as shown below in Figure 1 which will need to be removed to facilitate the installation of civil services through the area. In accordance with the requirements of CoA E6, a Tree Report, for the removal of these trees, has been prepared by a suitably qualified arborist and submitted to the Secretary. The removal of, and replacement of, trees in this area will be carried out in accordance with the recommendations made in the Tree Report.

Figure 1 Bond Store and adjacent trees



It was initially planned that two trees located to the West of the site, adjacent to the entry to Nawi Cove, as shown below in Figure 2 would be temporarily relocated to facilitate civil works in this area. These trees were to be removed from site and replanted at the conclusion of construction activities in this area. An

arborist prepared a Tree Transplantation Specification to manage this activity, however the civil works were able to be undertaken in Q3 and Q4 2022 without requiring the removal of the trees.

Figure 2 Trees to West of site for temporary removal



Potential impacts to Flora and Fauna will include:

- Removal of the existing trees shown in Figure 1 during the construction of the civil services in this area, resulting in a loss of habitat for local fauna.
- Risk of proliferation of weeds on the construction site and subsequent spread of weeds from within the construction site to adjacent areas of Barangaroo (low risk due to lack of soil)
- Any native fauna unexpectedly finding its way onto the site such a bird, bat, possum etc needing removal to a safer environment (low likelihood, low risk)

Figure 3 below shows the location of a network of cooling water pipes existing in Sydney Harbour. BESIX Watpac will use divers to enter Sydney Harbour in this location to carry out an inspection of these pipes to check for any damage to, or degradation of the pipes and to clean them out if necessary. There is not anticipated to be any impact to marine flora or fauna resultant from this activity.

Figure 3 Nawi Cove Headland - Location of cooling water pipework existing in Sydney Harbour



1.4 Fauna & Flora Management Objectives

The Chatswood to Sydenham Submissions and Preferred Infrastructure Report (SPIR) nominates the following environmental performance outcome during construction:

- The project would minimise impacts to biodiversity.

Further, in Section 11.1 of the Chatswood to Sydenham Construction Environmental Management Framework (CEMF) identifies the following flora and fauna management objectives applicable to construction:

- Minimise impacts on flora and fauna
- Appropriately manage the spread of weeds and plant pathogens, and
- Retain and enhance existing flora and fauna habitat wherever possible.

1.5 Roles and Responsibilities

An overview of the specific responsibilities for flora and fauna management as they relate to each role on the project are outlined in Table 1 below:

Table 1 Roles and Responsibilities

Activity	Responsibility
Responsibility for the implementation of the CEMP and this Fauna & Flora / Biodiversity Procedure Observation of Hold Points/Release Records and Tree Report Requirements	**Project Director** **Construction Manager** **Planning and Environment Manager**
Implementation of mitigation measures Recording and reporting on effectiveness of mitigation measures Visual inspection for weeds on site	**Environmental Coordinator**
Visual inspection for weeds on site Implementation of mitigation measures Disposal of weeds	**Site Foreman**

Activity	Responsibility
The management, action and discharge of any complaints received in accordance with the process as outlined in the CCS and BMP	**Stakeholder & Community Relations Manager**

1.6 Requirements Specific to Flora and Fauna

The following fauna and flora requirements specific to this project have been extracted from the CEMF, Revised Environmental Mitigation Measures (REMMs) and Conditions of Approval (CoA) as below:

Table 2.1 Relevant CEMF requirements

CEMF reference	Requirement
11.1	Flora and Fauna Management Objectives
	i. Minimise impacts on flora and fauna;
	ii. Design waterway modifications and crossings to incorporate best practice principles;
	iii. Retain and enhance existing flora and fauna habitat wherever possible; and
	iv. Appropriately manage the spread of weeds and plant pathogens.
11.2	Flora and Fauna Management Implementation
	a. Principal Contractors will develop and implement a Flora and Fauna Management Procedure which will include, as a minimum:
	i. The ecological mitigation measures as detailed in the environmental approval documentation;
	ii. The responsibilities of key project personnel with respect to the implementation of the plan;
	iii. Procedures for the clearing of vegetation and the relocation of flora and fauna;
	iv. Details on the locations, monitoring program and use of nest boxes by fauna;
	v. Procedures for the demarcation and protection of retained vegetation, including all vegetation outside and adjacent to the construction footprint;
	vi. Plans for impacted and adjoining areas showing vegetation communities; important flora and fauna habitat areas; locations where threatened species, populations or ecological communities have been recorded;
	vii. Vegetation management plan(s) for site where native vegetation is proposed to be retained;
	viii. Identification of measures to reduce disturbance to sensitive fauna;
	ix. Rehabilitation details, including identification of flora species and sources, and measures for the management and maintenance of rehabilitated areas (including duration of the implementation of such measures);
	x. Weed management measures focussing on early identification of invasive weeds and effective management controls;
	xi. A procedure for detailing with unexpected EEC threatened species identified during construction, including cessation of work and notification of the Department, determination of appropriate mitigation measures in consultation with the OEH (including relevant relocation measures) and updating of ecological monitoring or off-set requirements;
	xii. Details on the methodology for vegetation mapping and survey;
	xiii. Ecological monitoring requirements; and
	xiv. Compliance record generation and management.
	b. Principal Contractors would undertake the following ecological monitoring as a minimum: i. A pre-clearing inspection will be undertaken prior to any native vegetation clearing by a suitable qualified ecologist and the Contractor's Environmental Manager (or delegate). • The pre-clearing inspection will include, as a minimum: • Identification of hollow bearing trees or other habitat features;

CEMF reference	Requirement
	• Identification of any threatened flora and fauna; • A check on the physical demarcation of the limit of clearing; • An approved erosion and sediment control plan for the worksite; and • The completion of any other pre-clearing requirements required by any project • approvals, permits or licences.
	ii. The completion of the pre-clearing inspection will form a HOLD POINT requiring sign-off from the Contractor's Environmental Manager (or delegate) and a qualified ecologist; and
	iii. A post clearance report, including any relevant Geographical Information System files, will be produced that validates the type and area of vegetation cleared including confirmation of the number of hollows impacted and the corresponding nest box requirements to offset these impacts.
	c. The Principal Contractor's regular inspections will include a check on the ecological mitigation measures and project boundary fencing.
	d. The following compliance records would be kept by the Principal Contractor: i. Records of pre-clearing inspections undertaken; ii. Records of the release of the pre-clearing hold point; and iii. Records of ecological inspections undertaken.
11.3	Flora and Fauna Mitigation
	a. Examples of flora and fauna mitigation measures include: i. Areas to be retained and adjacent habitat areas will be fenced off prior to works to prevent damage or accidental over clearing; ii. Clearing will follow a two-stage process as follows: • Non-habitat trees will be cleared first after sign-off of the pre-clearing inspection; and • Habitat trees will be cleared no sooner than 48 hours after non-habitat trees have been cleared. A suitably qualified ecologist will be present on site during the clearing of habitat trees. Felled habitat trees will be left on the ground for 24 hours or inspected by the ecologist prior to further processing. iii. Weed management is to be undertaken in areas affected by construction prior to any clearing works in accordance with the Noxious Weeds Act 1993.

Table 2.2 Relevant REMMs requirements

REMMs Reference	Requirement
B1	An ecologist would be present during the removal of any hollow-bearing trees.
B3	The local WIRES group and / or veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation.

Table 2.3 Relevant CoA requirements

CoA Reference	Requirement
E6	The CSSI must be designed to retain as many trees as possible and provide replacement trees such that there a net increase in the number of trees. The Proponent must commission an independent, experienced and suitably qualified arborist to prepare a comprehensive Tree Report before removing any trees as detailed in the EIS, as amended by the documents listed in A1. The Tree Report must include: (a) a description of the conditions of the tree(s) and its amenity and visual value; (b) consideration of all options to avoid tree removal, including relocation of services, redesign or relocation of ancillary components (such as substations, fencing etc.) and reduction of standard offsets to underground services; and (c) measures to avoid tree removal, minimise damage to, and ensure the health and stability of those trees to be retained and protected. This includes details of any proposed canopy or root pruning, root protection zone, excavation, site controls on waste disposal, vehicular access, materials storage and protection of public utilities. In the event that tree removal cannot be avoided, then replacement trees are to be planted within, or in close proximity to the CSSI or other location in consultation with the Relevant Councils and agreed by the Secretary. The size of the replacement trees will be determined in consultation with the relevant Council. A copy of the

CoA Reference	Requirement
	Tree Report must be submitted to the Secretary before the removal, damage and/or pruning of any trees, including those affected by the site establishment works. All recommendations of the Tree Report must be implemented by the Proponent, unless otherwise agreed by the Secretary. The Tree Report may be prepared for the entire CSSI or separate reports may be prepared for individual areas where tree removal and/or pruning is proposed.

1.7 Mitigation Measures

The following mitigation measures will be implemented during construction to minimise the risk of adverse impacts on fauna and flora and to meet the requirements as outlined in the CEMF and Revised Environmental Mitigation Measures (REMMs):

CEMF Section 11.2 requirements include for this site:

- v. Procedures for the demarcation and protection of retained vegetation, including all vegetation outside and adjacent to the construction footprint;
- x. Weed management measures focusing on early identification of invasive weeds and effective management controls;
- xi. A procedure for dealing with unexpected EEC threatened species identified during construction, including cessation of work and notification of the Department, determination of appropriate mitigation measures in consultation with the OEH (including relevant relocation measures) and updating of ecological monitoring or off-set requirements;

REMMs requirements include:

- Item B3 – The local WIRES group and / or veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation.

In accordance with the requirements of CoA E6, those trees which are nominated in the Tree Report as needing to be removed will be replaced. The size of the replacement trees will be determined in consultation with Infrastructure NSW and City of Sydney Council.

1.7.1 Tree Management

The trees located to the west of the Dalgety Bond Store indicated in Figure 1 are to be managed and removed in accordance with the Tree Report approved as per CoA E6.

The trees located to the west of the site adjacent to Nawi cove, as indicated in Figure 2 which are to be removed from site temporarily and transplanted will be done so in accordance with the Tree Transplantation Specification prepared by an arborist. These trees are not recorded in the Tree Report as they were not identified in the EIS and have been recently planted as part of the project. They are being temporarily removed from sight and will be stored off-site, cared for, and re-instated as the completion of the civil construction works in the area.

1.7.2 Fauna Mitigation

As required by REMMs Condition B3, the local WIRES group and / or veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation.

1.7.3 Flora Mitigation

Weed manage management will be undertaken in areas affected by construction prior to any clearing works in accordance with the *Biosecurity Act 2015*.

1.7.4 Marine Mitigation

Remediation activities include pipe cleaning, repairing underwater pipework and provision of new underwater bell mouths. High pressure water jetting of the pipework will be carried out so that dislodged marine materials impacting water quality and any chemicals used to disinfect or scour are collected for disposal and not discharged into the harbour. These works will be subject to a separate environmental risk assessment.

1.7.5 Biodiversity impact mitigation

Due to the already highly modified and barren nature of the site, construction activities will have little to no measurable impacts to local biodiversity in most areas of the site. An impact to biodiversity will result from the removal of those trees nominated for removal in the Tree Report. This will be mitigated by these trees being replaced. The size of the replacement trees will be determined in consultation with Infrastructure NSW and City of Sydney Council.

1.8 Records Management

Records will be maintained by the project Environmental Co-ordinator, as follows:

- Records of any pre-clearing weed management inspections undertaken
- Records of ecological inspections undertaken
- Records of any fauna removed from site
- Photographic record of trees contemplated for removal in the Tree Report
- Record of trees removed from the site
- Record of trees pruned on site



Appendix M
Air Quality Management Procedure

Caption: One Central Park, Sydney

BESIX Watpac

Barangaroo Station

Air Quality Management Procedure



N217

BR COP

28 February 2023

Project overview

Project Site Address:
25 Hickson Road
Barangaroo
NSW 2000

Project Commencement Date:
12 March 2021

BESIX Watpac State Division Address:
Level 24, 44 Market Street
SYDNEY
NSW 2000

BESIX Watpac ABN:
71 010 462 816

Document Control

Client:	Sydney Metro
Title:	BARANGAROO STATION
Subtitle:	Air Quality Management Procedure
Owner / Approver:	Planning & Environment Manager / Senior Construction Manager
TB Document Reference:	SMCSWSBR-BWC-SBR-EM-PRO-000029
TB Revision:	01

Revision history

Version	Date	Revision Description	Release Sign off
A	18/06/21	Submission for Review	[redacted]
B	09/07/21	Updated following SM comments	[redacted]
C	19/07/21	Updated following ER comments for submission to DPIE	[redacted]
00	01/04/22	Six Monthly update	[redacted]
01	28/02/23	Six Monthly update	[redacted]

BESIX Watpac Approvals

Name	Role & Title	Signature	Date
[redacted]	Author / Planning & Environment Manager	[redacted]	28/02/2023
[redacted]	Reviewer / Construction Manager	[redacted]	28/02/2023
[redacted]	Reviewer / Project Director	[redacted]	28/02/2023

Note: A controlled copy of the Air Quality Management Procedure will be distributed to the Sydney Metro Principal's Representative, Independent Certifier (IC) and other nominated stakeholders, and it will be made available to all BR COP employees and subcontractors in soft copy format through the project document control system.

This procedure, when printed, will be uncontrolled and it will the responsibility of each user to confirm the currency of the plan through the project document control system.

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1.1 Document Purpose

The purpose of the Air Quality Management Procedure is to minimise the impacts of construction activities related to the Barangaroo Construct Only Package (BR COP) to air quality and receivers in proximity to the construction site.

1.2 Construction Overview

An overview of BR COP construction activities is presented below:

- Structural and civil completion works to the station box;
- Stormwater trunk mains works from Hickson Road precinct to the existing pit at the western end of the Site;
- Installation of a cooling water system within the Barangaroo cutaway and associated trenching and pipework including the connection of the system to an existing network of pipes in Sydney Harbour;
- Demolition works associated with the removal of the Hickson Road temporary steel structure, road deck and concrete demolition;
- Hickson Road precinct works including road, footpath, cycleway, landscaping, street lighting, stormwater, utilities works and ventilation pod risers;
- Backfilling and surface reinstatement of the temporary northern (Hickson Road) shaft; and,
- Staging and temporary works required to deliver the permanent works, including removal of the temporary Hickson Road bridge structure.

1.3 Potential Impacts

Dust, and other emissions, being generated on Site because of construction activities may have the following negative impacts:

- Dust and the emissions from vehicle and other construction plant and equipment can have adverse health impacts on local residents as well as people working and carrying out recreational activities in proximity to the Site;
- Dust can settle on and impact property, resulting in community complaints and the need to carry out significant cleaning and potentially damage to property;
- Dust emissions offsite can cause the Site to be shut down and/or result in prosecution by the regulator; and,
- Odours from construction activities can travel beyond the boundary of the Site causing nuisance to local receivers and users of the adjacent Sydney Harbour.

1.4 Air Quality Management Objectives

The Chatswood to Sydenham Construction Environment Management Framework (CEMF) is part of a broader report, the Chatswood to Sydenham Environmental Impact Assessment (EIS) and the Chatswood to Sydenham Submissions and Preferred Infrastructure Report (SPIR).

The CEMF nominates the following environmental performance outcome during construction:

- Dust and exhaust emissions during construction would be minimised.

Further, Section 16.1 of the CEMF identifies the following air quality objectives applicable to construction:

- Minimise gaseous and particulate pollutant emissions from construction activities as far as feasible and reasonable; and,
- Identify and control potential dust and air pollutant sources.

1.5 Roles and Responsibilities

An overview of the specific responsibilities for air quality management as they relate to each role on the project is outlined in Table 1 below:

Table 1 Roles and Responsibilities

Activity	Responsibility
Development and implementation of Site plans Responsibility for implementation of the CEMP and this Air Quality Management Procedure	**Project Director** **Construction Managers** **Environment and Planning Manager**
Environmental monitoring and visual inspections of mitigation measures Implementing mitigation measures Recording and reporting of effectiveness of mitigation measures Weekly look ahead of expected weather patterns	**Environmental Coordinator**
Daily weather monitoring Implementation of mitigation measures Inspection of mitigation measures Recording implementation of mitigation measures	**Site Foreman** **Environmental Coordinator**
The management, action and discharge of any complaints received in accordance with the process as outlined in the CCS and BMP	**Community Relations Manager**

1.6 Requirements Specific to Air Quality

The following air quality requirements specific to this project have been extracted from the CEMF, Revised Environmental Mitigation Measures (REMMs) and Conditions of Approval (CoA) as below:

Table 2.1 Relevant CEMF requirements

CEMF reference	Requirement
16.1	Air Quality Management Objectives
	a. The following air quality management objectives will apply to construction:
	i. Minimise gaseous and particulate pollutant emissions from construction activities as far as feasible and reasonable; and
	ii. Identify and control potential dust and air pollutant sources.
16.2	Air Quality Management Implementation
	a. Principal Contractors will develop and implement an Air Quality Management Plan which will include, as a minimum:
	i. The air quality mitigation measures as detailed in the environmental approval documentation;
	ii. The requirements of any applicable EPL conditions;
	iii. Site plans or maps indicating locations of sensitive receivers and key air quality / dust controls;
	iv. The responsibilities of key project personnel with respect to the implementation of the plan;
	v. Air quality and dust monitoring requirements; and
	vi. Compliance record generation and management.
	b. Air quality and dust monitoring will involve the following as a minimum:
	i. Meteorological conditions will be monitored and appropriate responses will be organised and undertaken periodically by the Principal Contractor;
	ii. Regular visual monitoring of dust generation from work zones; and

CEMF reference	Requirement
	iii. Monitoring emissions from plant and construction vehicles to ensure they have appropriate emission controls and are being maintained correctly.
	c. The following compliance records will be kept by the Principal Contractor:
	i. Records of any meteorological condition monitoring;
	ii. Records of any management measures implemented as a result of adverse, windy weather conditions; and
	iii. Records of air quality and dust inspections undertaken.
16.3	Air Quality Mitigation
	a. Examples of air quality mitigation measures include:
	i. Plant and equipment will be serviced and maintained in good working order to reduce unnecessary emissions from exhaust fumes;
	ii. Water suppression will be used for active earthwork areas, stockpiles, unsurfaced haul roads and loads of soil being transported to reduce wind-blown dust emissions;
	iii. Wheel-wash facilities or rumble grids will be provided and used near the site exit points, as appropriate; and
	iv. Dust extraction and filtration systems will be installed for tunnel excavation works and deep excavation with limited surface exposure.

Table 2.2 Relevant REMMs requirements

REMMs Reference	Requirement
AQ1	The engines of all on-site vehicles and plant would be switched off when not in use for an extended period.
AQ2	Plant would be well maintained and serviced to minimise emissions. Emissions from plant would be considered as part of pre-acceptance checks.
AQ3	Construction site layout and placement of plant would consider air quality impacts to nearby receivers.
AQ4	Hard surfaces would be installed on long term haul routes and regularly cleaned.
AQ5	Unsurfaced haul routes and work area would be regularly damped down in dry and windy conditions.
AQ6	All vehicles carrying loose or potentially dusty material to or from the site would be fully covered.
AQ7	Stockpiles would be managed to minimise dust generation.

Table 2.3 Relevant CoA requirements

CoA Reference	Requirement
E5	In addition to the performance outcomes, commitments and mitigation measures specified in PIR, all reasonably practicable measures must be implemented to minimise the emission of dust and other air pollutants during the construction and operation of the CSSI.

1.7 Key Risk Activities to Air Quality

Air quality is largely affected by any construction activities with the potential to generate dust in combination with wind and dry weather. The environmental risk assessment included in Appendix I of the CEMP identified the following activities:

- Trenching and backfilling;
- Stockpiling of soil;
- Concrete cutting and demolition;

- Vehicles tracking soil;
- Blockwork and drywall cutting;
- Topsoil, compost, and organics; and,
- Diesel powered plant and vehicle emissions too can contribute to poor air quality.

1.8 Mitigation Measures

The following mitigation measures will be implemented during construction to minimise the risk of adverse air quality and dust impacts as outlined in the CEMF and REMMs:

- Plant and equipment will be serviced in good working order to reduce unnecessary emissions from exhaust fumes;
- Emissions from plant will be considered as part of pre-acceptance checks;
- Water suppression will be used for active earthwork areas, stockpiles, unsurfaced haul roads and loads of soil being transported to reduce wind-blown dust emissions;
- Wheel-wash facilities or rumble grids will be provided and used near the site exit points where appropriate;
- Construction Site layout and placement will consider air quality impacts to nearby receivers;
- All vehicles carrying loose or potentially dusty material to or from the site will be fully covered;
- Stockpiles will be managed to minimise dust generation including being covered when not used for longer than seven (7) days, or during dry and windy conditions;
- Vehicles and plant being used on site will be switched off when not in use for an extended period;
- The construction hoarding and site compound will be inspected regularly, and dust build up cleaned off when required;
- Water will be used during saw-cutting activities likely to generate dust; and,
- Gaseous plant and equipment used for construction, including the on-site water treatment plant (WTP) will be correctly stored, monitored and maintained to prevent the accidental release of gas.

1.9 Monitoring

Monitoring activities, as outlined in Table 3, will be implemented during construction to minimise adverse impacts resultant from dust and emissions:

Table 3 Monitoring Activities

Monitoring Activities	Frequency
Visual inspections for air borne dust being generated on, and leaving the site, dust settling on hoardings and in the local vicinity to the project	**Daily**
Weather conditions being experienced on site (focusing on those which are likely to adversely impact dust and emissions such as hot weather, windy conditions)	**Daily**
Weather conditions expected to be experienced on site (focusing on those likely to increase the risk of dust propagation (dry, hot and windy conditions, bushfires, etc)	**Weekly look ahead in advance on construction activities**
Construction activities will be monitored to confirm that dust mitigation measures are in place and functioning correctly (wheel wash facilities, water trucks, misters, and the like)	**Daily**

Where monitoring identifies visible dust leaving the Site, the construction activities causing the dust will be ceased immediately and an inspection carried out by the Environmental Coordinator and Site Manager to agree corrective actions to be implemented. The Site Manager will be responsible for ensuring actions are implemented prior to construction activities recommencing.

1.10 Record Management

Records will be maintained by the project Environmental Co-ordinator, as follows:

- Inspections of dust and air quality on site undertaken;
- Corrective actions raised and close out;
- Records of weather patterns throughout construction;
- Records of implementation measures used; and,
- Acceptance records for plant and equipment being used on the Site.



Appendix N
Soil and Water Management Procedure



Caption: One Central Park, Sydney

BESIX Watpac



Barangaroo Station

Soil & Water Management Procedure

N217
BR COP
28 March 2025

Project overview

Project Site Address:
25 Hickson Road
Barangaroo
NSW 2000

BESIX Watpac State Division Address:
Level 15, 210 George Street
SYDNEY
NSW 2000

Project Commencement Date:
12 March 2021

BESIX Watpac ABN:
71 010 462 816

Document Control

Client:	Sydney Metro
Title:	BARANGAROO METRO STATION
Subtitle:	Soil & Water Management Procedure
Owner / Approver:	Planning & Environment Manager / Senior Construction Manager
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A	17/06/21	Submission for Review	[redacted]
B	09/07/21	Submission for Review	
C	19/07/21	Updated following ER comments for submission to DPIE	
D	22/09/21	General Update	
E	25/09/21	Update to address ER comments	
00	01/04/22	6 monthly update	
01	28/02/23	6 monthly update	
02	22/06/23	Update for Southern Entrance Wall DSI works	
03	23/11/23	6 monthly update, removal of Southern Entrance Wall Works	
04	11/01/24	6 monthly update – Comments Addressed	
05	11/06/24	6 monthly update	
06	28/03/2025	Post-Completion Revision	

BESIX Watpac Approvals

Name	Role & Title	Signature	Date
[redacted]	Rev 05 Author / Planning & Environment Manager	[redacted]	28/3/2025
[redacted]	Reviewer / Project Manager	[redacted]	28/3/2025

Note: A controlled copy of the Soil and Water Management Procedure will be distributed to the Sydney Metro Principal's Representative, Independent Certifier (IC) and other nominated stakeholders, and it will be made available to all BR COP employees and subcontractors in soft copy format through the project document control system.

This procedure, when printed, will be uncontrolled and it will the responsibility of each user to confirm the currency of the plan through the project document control system.

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ID	Requirement	Reference
Conditions of Approval (CoAs) – SSI 7400 (Mod 9)		
E65	All reasonably practicable erosion and sediment controls must be installed and appropriately maintained to minimise any water pollution. When implementing such controls, any relevant guidance in the Managing Urban Stormwater Series must be considered.	Section 6
E66	A Site Contamination Report, documenting the outcomes of Phase 1 and Phase 2 contamination assessments of land upon which the CSSI is to be carried out, that is suspected to be, or known to be, contaminated must be prepared by a suitably qualified and experienced person in accordance with guidelines made or approved under the Contaminated Land Management Act 1997 (NSW).	Section 6
E67	If a Site Contamination Report prepared under Condition E66 finds such land contains contamination, a site audit is required to determine the suitability of a site for a specified use. If a site audit is required, a Site Audit Statement and Site Audit Report must be prepared by a NSW EPA Accredited Site Auditor. Contaminated land must not be used for the purpose approved under the terms of this approval until a Site Audit Statement is obtained that declares the land is suitable for that purpose and any conditions on the Site Audit Statement have been complied with	Section 6
E69	An Unexpected Contaminated Land and Asbestos Finds Procedure must be prepared and must be followed should unexpected contaminated land or asbestos be excavated or otherwise discovered during construction.	Section 6.3
E70	The Unexpected Contaminated Land and Asbestos Finds Procedure must be implemented throughout construction.	Section 6.3
E107	The CSSI must be constructed and operated so as to maintain the NSW Water Quality Objectives where they are being achieved as at the date of this approval, and contribute towards achievement of the NSW Water Quality Objectives over time where they are not being achieved as at the date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the NSW Water Quality Objectives, in which case those requirements must be complied with.	Section 7
Revised Environmental Mitigation Measures (REMMs)		
SWC1	Updated desktop contamination assessments would be carried out for Chatswood dive site, **Victoria Cross Station, Artarmon substation,** Blues Point temporary site, Barangaroo Station, Central Station and Waterloo Station **and the Sydenham Maintenance Centre site within surface track works south.** If sufficient information is not available to determine the remediation requirements and the impact on potential receivers, then detailed contamination assessments, including collection and analysis of soil and groundwater samples would be carried out. Detailed contamination assessment would also be carried out for the Barangaroo power supply route within Hickson Road and the Marrickville power supply route adjacent to Sydney Park and Camdenville Oval. In the event a Remediation Action Plan is required, these would be developed in accordance with Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) and a site auditor would be engaged.	Section 6
SWC2	Prior to ground disturbance in high probability acid sulfate areas at Barangaroo Station, Waterloo Station and Marrickville dive site, **Sydenham Station and the surface track works south,** testing would be carried out to determine the presence of acid sulfate soils. If acid sulfate soils are encountered, they would be managed in accordance with the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998).	Section 6
SWC3	Erosion and sediment control measures would be implemented in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and Construction Volume 2 (Department of Environment and Climate Change, 2008a). Measures would be designed as a minimum for the 80th percentile; 5-day rainfall event.	Section 6
SWC4	Discharges from the construction water treatment plants would be monitored to ensure compliance with the discharge criteria in an environment protection licence issued to the project.	Section 7

FH1	Detailed construction planning would consider flood risk at Barangaroo Station, Martin Place Station and the Waterloo Station construction sites. This would include identification of measures to avoid, where feasible and reasonable, not worsen existing flooding characteristics up to and including the 100 year annual recurrence interval event in the vicinity of the project. Not worsen is defined as: › A maximum increase flood levels of 50mm in a 100 year Average Recurrence Interval flood event › A maximum increase in time of inundation of one hour in a 100 year Average Recurrence Interval flood event › No increase in the potential for soil erosion and scouring from any increase in flow velocity in a 100 year Average Recurrence Interval flood event.	Section 8
HR1	All hazardous substances that may be required for construction would be stored and managed in accordance with the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005) and Hazardous and Offensive Development Application Guidelines: Applying SEPP 33 (Department of Planning, 2011).	Section 9
WM1	All waste would be assessed, classified, managed and disposed of in accordance with the *NSW Waste Classification Guidelines*	Section 6
WM2	100 per cent of spoil that can be reused would be beneficially reused in accordance with the project spoil reuse hierarchy.	Section 6
CEMF		
15.1a	Soil and Water Management Objectives a. The following soil and water management objectives will apply to construction: i. Minimise pollution of surface water through appropriate erosion and sediment control; ii. Maintain existing water quality of surrounding surface watercourses; and iii. Source construction water from non-potable sources, where feasible and reasonable.	Section 4
15.3	Soil and Water Mitigation a. Examples of surface water and flooding mitigation measures include: i. Clean water will be diverted around disturbed site areas, stockpiles and contaminated areas; ii. Control measures will be installed downstream of works, stockpiles and other disturbed areas; iii. Exposed surfaces will be minimised, and stabilised / revegetated as soon feasible and reasonable upon completion of construction; iv. Dangerous good and hazardous materials storage will be within bunded areas with a capacity of 110 per cent of the maximum single stored volume; and v. Spill kits will be provided at the batch plants, storage areas and main work sites.	Section 8 & 9

1 Document Purpose

The purpose of the Soil and Water Management Procedure is to minimise potential adverse soil and water environmental impacts occurring during BESIX Watpac's construction activities.

2 Construction Overview

The following construction activities have been identified as having the potential to impact upon soil and water:

- Structural and civil completion works to the station box;
- Alterations and installation of underground service infrastructure including, gas, electricity and communications;
- Stormwater trunk mains works from Hickson road precinct to the existing pit at western end of the Site;
- Installation of a cooling water system within the Barangaroo cutaway and associated trenching and pipework;
- Hickson Road precinct works including road, footpath, cycleway, landscaping, street lighting, stormwater, utilities works and ventilation pod risers;
- Backfilling and surface reinstatement of the temporary northern (Hickson Road) shaft;
- Staging and temporary works required to deliver the permanent works, including removal of the temporary Hickson Road bridge structure;
- Discharge of water off site from the Water Treatment Plant (WTP);
- Relocation of the WTP on Site, including the use of a Temporary Water Treatment Plant (TWTP) during relocation works;
- Discharge of water off site from the western civil pit (bypassing the WTP); and,
- Southern Entrance Wall investigation and excavation works.

3 Potential Impacts

Construction activities occurring on Site may result in the following negative impacts to soil and water:

- Soil erosion;
- Soil contamination; and
- Water pollution.

4 Soil and Water Management Objectives

The following soil and water management objectives will apply to construction activities:

- Minimise pollution of surface water through appropriate erosion and sediment control measures;
- Ensure that all contaminated soil is managed in accordance with relevant legislation and the Spoil Management Plan Sampling, Analysis & Quality Plan (SMPSAQP);
- Ensure that acid sulfate soil is manage in accordance with relevant legislation and the Acid Sulfate Soils Management Plan (ASSMP);
- Maintain existing water quality of surrounding surface watercourses;

- Ensure compliance with *NSW Water Quality Objectives* through the adoption of the Water Discharge Impact Assessment (WDIA) and implementation of a Water Quality Monitoring Program (WQMP);
- Ensure no uncontrolled surface water run-off from the site into Sydney Harbour;
- Re-use 100% of spoil that can be reused in the project; and,
- Mitigate flooding risk through an engineered approach with robust planning and controls.

5 Roles and Responsibilities

5.1 Key BESIX Watpac Personnel

An overview of the specific responsibilities of the BESIX Watpac project team for water and soil management as they relate to each role on the project are outlined in Table 1 below:

Table 1 Roles and Responsibilities

Role	Authority and Responsibility
Project Director **Construction Managers**	• Manage the delivery of Barangaroo Metro Station including overseeing the implementation of the CEMP, associated sub-plans and procedures.
Environment and Planning Manager	• Oversee the implementation of all environmental, soil, water and groundwater management initiatives; • Report on environmental performance; • Authority to direct personnel and subcontractors to carry out actions to avoid or minimise environmental impacts; • Review of water quality monitoring reports (CWQMR) prepared by the water quality monitoring consultant; • Conduct an investigation in the event of a water quality exceedance; and • Authority to discharge water offsite from the WTP during BESIX Watpac operation of the WTP.
Environmental Co-ordinator/Site Engineer	• Daily weather monitoring; • Visual inspection to establish whether mitigation measures are required; • On site environmental monitoring and visual inspections of mitigation measures in place; • Records keeping and reporting in implemented mitigation measures; • Monitoring and record keeping of the on-site WTP during BESIX Watpac operation of the WTP; • Collection of water quality samples and undertaking of field analysis of certain samples collected; and, • Coordinate on site testing with agencies undertaking testing and laboratories analysing sampling results.
Site Manager **Project Engineers** **Construction Foremen**	• Visual inspections of mitigation measures in place; • Establishment of mitigation measures; • Record keeping in relation to mitigation measures; • Ensure compliance with the CEMP and soil and water procedure; • Conduct inductions and toolbox talks in relation to soil and water responsibilities; and, • Authority to direct personnel and subcontractors to carry out actions to avoid or minimise environmental impacts.
Sustainability Manager	• Track and report soil and water elements against sustainability targets, Conditions of Approval and the Revised Environmental Mitigation Measures; and, • Provide evidence for Compliance Tracking Reviews.
Commercial Manager	• Ensure that relevant soil and water and groundwater management requirements are considered in procurement.

5.2 Specialist Consultants

5.2.1 Contamination and Acid Sulphate Soils Expert

At the commencement of the project BESIX Watpac engaged Douglas Partners, a consultancy specialist in geotechnical, environmental and groundwater engineering, to carry out a desktop analysis of existing environmental investigations undertaken in the vicinity of the Barangaroo Metro Station and to produce a Spoil Management Plan Sampling, Analysis & Quality Plan (SMPSAQP), Acid Sulphate Soils Management Plan (ASSMP) and establish the spoil testing regime to be implement by BESIX Watpac during construction. Douglas Partners also reviewed the Remediation Action Plan (RAP) and Site Audit Statement (SAS) produced by the TSE Contractor for the excavation of the station.

5.2.2 Environmental Engineering

BESIX Watpac engaged WSP Australia Pty Ltd as the specialist environmental engineering consultant responsible for producing the Water Discharge Impact Assessment (WDIA) for the existing on-site Water Treatment Plant (WTP) to assess its fitness for purpose for in treating ground and surface water collected as part of BESIX Watpac's construction activities and to ensure that *NSW Water Quality* objectives are being maintained in accordance with CoA E107. WSP have also produced two memorandum amendments to the WDIA as outlined below.

- The first memorandum contemplates discharge of water directly off site, bypassing the WTP, to enable dewatering required for the installation of civil stormwater pipework and junction pits. This activity is limited to the discharge of water from the western civil pit as shown below in Figure 1, to allow the put base slab to be poured and the pit constructed.
- The second memorandum covers the change in discharge location from the assumed location in the WDIA, to the existing and actual discharge location adjacent to Duke's Pier. The memorandum changes the discharge capacity at the existing outlet from 15L/s to 7L/s to mitigate disturbance of the sediment on the seabed floor, however, continues to permit a discharge of 15L/s during or following inclement weather events. The memorandum also confirms that the discharge capacity at the assumed location in the WDIA, which is the permanent stormwater outlet at Nawi Cove, can remain at 15L/s.

Figure 1 Western Civil Pit



5.2.3 Water Quality Monitoring

BESIX Watpac engaged Property Risk Australia Pty Ltd, an independent environmental consultancy to undertake monitoring of the water quality in Sydney Harbour (SW_B_01), the discharge point of the WTP (BN-3) and groundwater within the station box at Basement levels 3 (GR-2) and 6 (GR-1), in accordance with the requirements of the Water Quality Monitoring Program (WQMP) on a monthly and quarterly basis.

During the relocation of the WTP on Site in 2023, a temporary WTP was established for use while the original WTP was decommissioned and re-established. During this period a Temporary Water Treatment Plant – Water Quality Testing Program was developed prior to the work to confirm the TWTP and re-established WTP were performing to specifications.

Following the completion of works the maintenance and operation of the WTP is no longer be the responsibility of BESIX Watpac. The WTP was handed over to MTS on 20th December 2024. At this point the ongoing water quality monitoring is the responsibility of the entity with maintenance and operational control of the WTP or a designated subcontractor.

6 Soil Management

The following mitigation measures will be implemented during construction to minimise potentially adverse impacts on soil, and to meet the requirements as outlined in the CEMF and Revised Environmental Mitigation Measures (REMMs):

6.1 Contamination and Acid Sulfate Soils

Extensive environmental investigations, and remediation, have been undertaken in the Barangaroo area in the vicinity of the Barangaroo Metro Station as summarised in Table 2 below:

Table 2 Summary of Key Environmental Investigations undertaken in the vicinity of Barangaroo Metro Station

No	Date	Author	Title	Scope/Purpose	Comment
1	1 June 2010	ERM	Overarching Remedial Action Plan for the Barangaroo Project Site, Sydney	Covers 22 Ha area including Hickson Road and former gasworks site. Identifies the remediation options on the Remediation area and makes recommendations	Engaged by the Barangaroo Delivery Authority. Summarises contamination issues identified in previous Environmental Site Assessments (those key being two by ERM 2007&2008 which include Stage One and Stage Two investigations, one by Coffey 2008 focussing on road section between Nos 30 and 38 Hickson Rd, one by URS 2001, and various earlier other studies). The declared Remediation Site covers the former gasworks and portion Hickson Road adjacent.
2	May 2016	Jacobs	Technical Paper 8: Phase 1 Contamination Investigation (incorporating Preliminary Site Investigation)	Forms part of Environmental Impact Statement (EIS) for the Sydney Metro Chatswood to Sydenham.	Engaged by TfNSW. Uses information provided by the Barangaroo Delivery Authority on seven previous studies in 2012, 2013, six from JBS, and one from Environ in and around Barangaroo Central. Recommendations informed CoA and REMMs as relating to Contamination.
3	May 2018	Douglas Partners	Remediation Action Plan Sydney Metro City & South West - Tunnel and Station	Covers the basement bulk excavation footprint only. Purpose is to render site suitable for proposed land use.	TSE's Remediation Action Plan. Commissioned by John Holland CPB Ghella JV. Referenced previous Douglas Partners report on Preliminary site investigation March 2018, detailed site investigation May

No	Date	Author	Title	Scope/Purpose	Comment
			Excavation Works Package Proposed Barangaroo Station, Hickson Road, Barangaroo		2018, PSM Hydrogeological Interpretive Report 19 March 2018, all the above referenced reports and two reports from Golder May 2016, and January 2017.
4	27 February 2019	Douglas Partners	Addendum to Remediation Action Plan (TSE)	Provides qualification on limits to groundwater modelling, and proposed alternative assessment approach with inspections and sampling	Addendum is a brief letter
5	September 2021	Douglas Partners	Report on Validation of Remediation (TSE)	Assesses the suitability of the site for the proposed station following completion of remediation works. Report considers sources of contamination within the bulk excavation and contaminated groundwater potentially present outside of the bulk excavation.	Undertaken by the preceding TSE Contractor confirming remediation carried out.

The excavation of the station footprint was undertaken by the TSE Contractor and remediated in accordance with the TSE Remediation Action Plan (RAP). The Site was assessed as suitable for its intended future use as a station by others (Table 2 report No. 5), and further contamination assessment for this purpose was not required. This assessment did not, however, assess (nor is it reliant on the absence of) contamination at the Site outside of the station box bulk excavation footprint. The remainder of the Site therefore potentially contained contaminated soils which may require management during works.

BESIX Watpac engaged Douglas Partners as the specialist consultant responsible for preparing a Spoil Management Plan Sampling, Analysis & Quality Plan (SMPSAQ) which sets out the requirements for managing spoil excavated during the works to meet the requirements of the POEO Act. BESIX Watpac prepared an Unexpected Contaminated Land and Asbestos Finds Procedure (UCLAFP) based on the requirements as outlined in the SMPSAQ and to meet the requirements of CoA E69 and E70. The adopted thresholds for on-site re-use have been determined with consideration of waste minimisation in accordance with CoA E106 and environmental risk associated with keeping contamination impacted soil on site.

At the start of the COP works it was determined that for the portion of the Site outside of the station box bulk excavation footprint, the land use will not be changed for the proposed works. Therefore Douglas Partners considered that these works did not to trigger the need for contamination assessment under the *Contaminated Land Management Act (CLM Act) 1997*.

To satisfy Condition E66 of the COA at the start of the COP works Douglas Partners undertook a desktop review of the existing contamination and acid sulfate soil assessments listed in Table 2 as well as other documentation provided by Sydney Metro. The subsequent Preliminary Site Investigation (PSI) Report (issued November 2021) summarised the current understanding of contamination issues at the Site and identified what further investigation was required to meet the above objectives. At this time, it was determined no contamination requiring remediation was identified and therefore no Site Audit Statement or Site Audit Report was required under condition of E67 of the COA. The 2021 PSI also addresses REMM condition SCW1.

The 2021 PSI provided advice on any contamination specific work health and safety measures that were considered appropriate for the works, based on the available data and works boundary at the time. Subsequent to the 2021 PSI in-situ soil investigation works were undertaken for the purpose of waste classification. Stockpiled spoils excavated from Site have also been subject to waste classification. Classification reports undertaken also provide an assessment of the suitability of the material to be reused on Site following excavation. A peer review of material classification reports will be undertaken to confirm waste classification and land use assessment has been undertaken in accordance with the relevant

guidelines, currently the 2014 NSW Waste Classification Guidelines and the National Environmental Protection (Assessment of Site Contamination) Measure 2013.

Acid Sulfate Soil (ASS) was expected to be present at the site, and Douglas Partners prepared an Acid Sulfate Soil Management Plan (ASSMP) describing the works required to treat and manage ASS to mitigate on-site pollution incidents and for disposal in accordance with the POEO Act. The ASSMP has been developed in accordance with the requirements of the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998) (ASSMAC, 1998). This item addresses REMM SCW1.

Prior to ground disturbance in high probability ASS areas testing will be carried out to determine the presence of ASS in accordance with the requirements of REMM SCW2. ASS was identified within an excavation required for the installation of a GPT in 2023. Excavation and neutralisation works were undertaken in accordance with the ASSMP and the neutralised soil was removed from Site as General Solid Waste.

BESIX Watpac implement the SMPSAQ during all excavation works, and the ASSMP where required. BESIX Watpac include the contamination risks identified by the above reports listed in Table 2 in the applicable Work Method Statement(s) where relevant.

Stockpiled spoil is managed in accordance with the recommendations of the SMPSAQ. Erosion and sediment control measures are implemented on site and surrounding stockpiled materials in accordance with *Managing Urban Stormwater: Soil and Construction* (Landcom, 2008) – the "Blue Book" and REMM Condition SCW3 to ensure there is no risk of contaminated spoil, or water runoff, from Site.

6.2 Waste Classification and Disposal

Soils to be disposed of off-site will be classified in accordance with the *POEO (Waste) Regulation 2014*, and POEO Act (including the NSW EPA Waste Classification Guidelines, where applicable) prior to leaving the site in accordance with REMM WM1.

Each excavated area/stockpile will be tracked on the Material Tracking Register to identify where the material was excavated from and document the soil classification and volumes of each stockpile. The Material Tracking Register will be read in conjunction with a site map mark-up of the stockpiles, to assist in managing where material was excavated from and tracking the different classification of materials on site. Once waste classification reports are issued, it will be determined whether the spoil can be reused, or whether it needs to be taken to a licenced landfill in accordance with the SMPSAQ and/or ASSMP. All material that is taken to licenced landfills will be tipped at locations licenced to take the classification of spoil. Tipping dockets from the licenced landfill will be provided by the civil subcontractor and be recorded in the Material Tracking Register. Waste Classification Report references will also be recorded in the relevant section of the Materials Tracking Register.

If in-situ waste classification identifies contamination, ex-situ waste classification will be conducted. If upon visual inspection excavated material does not look or smell like its in-situ classification, an ex-situ waste classification will be undertaken. The visual inspection of all stockpiles will be undertaken and documented as required.

6.3 Unexpected Contamination

Where unexpected contamination in the form of contaminated soil, ASS or asbestos is discovered on site, the SMPSAQ outlines the process to be followed to mitigate environmental risks from unexpected contamination. In addition, and to meet the requirements of CoA E69 and E70, an Unexpected Contaminated Land and Asbestos Finds Procedure (UCLAFP) has been prepared by BESIX Watpac to outline the responsibilities of all site personnel as they relate to unexpected contamination and the process to be followed, and individual responsibilities, should it be observed or suspected on site. The UCLAFP is an appendix of the CEMP.

6.4 Erosion and Runoff

In accordance with REMM Condition SCW3 erosion and sediment control measures will be implemented in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and *Managing Urban Stormwater: Soils and Construction Volume 2* (Department of Environment and Climate Change, 2008a). The measures will be designed as a minimum for the 80th percentile, 5-day rainfall event. Control measures will be placed downstream of stockpiles and disturbed excavation works and stockpiles will not be located in drainage lines, channels or overland flow paths.

Erosion and Sediment Control Plans (ESCPs) were developed and implemented to detail all required erosion and sediment control measures for the site prior to any works commencing. These ESCPs are reviewed and updated progressively throughout the project on a regular basis and as Site conditions change to reflect the current Site conditions and the required controls. Any amendments to the ESCP will be approved by the Planning and Environment Manager.

6.5 Soil Monitoring

Monitoring activities, as outlined in Table 3 will be implemented during construction to minimise adverse impacts to soil and testing of excavated material will be undertaken in accordance with the SMPSAQ:

Table 3 Monitoring Activities

Monitoring Activities	Frequency
Inspections of erosion and sediment control measures in place including a record of issues identified and rectification	**Weekly and before any significant inclement weather event**
Additional inspections will be undertaken prior to and following significant rainfall events, classed as greater than 20mm over a 24-hour period	**Prior to and following significant rainfall events (>20mm in 24 hours)**

It is noted that following the completion of BESIX Watpac Construction works erosion and sediment controls were removed as part of demobilisation activities and no further soil monitoring activities will be undertaken by BESIX Watpac.

6.6 Material Importation

Where soil is required to be imported for backfill of the station box to form the new Hickson Road alignment, and/or other excavations where on-site spoil is not deemed suitable for use as fill. Imported materials, including a suitable growth medium, will be used for landscaping.

Soil imported to the site will meet the following requirements:

- The soil must be legally able to be imported onto the site in accordance with the *Protection of the Environment Operations (Waste) Regulation 2014* and any required works specific approvals;
- The soils must meet the assessment criteria in Appendix C of the SMPSAQP;
- The soils must meet the geotechnical requirements for their proposed use;
- The soils must be classified as VENM, Excavated Natural Material (ENM) or other materials legally able to be imported onto the site based on a Resource Recovery Order and Exemption. Soils must be assessed in accordance with the EPA requirements. For VENM this generally includes having no signs of concern, metal concentrations at background levels and organic compounds below appropriate laboratory limits of reporting. For non-VENM materials the EPA requirements would generally include assessment in accordance with the appropriate Resource Recovery Order. Prior to importation, appropriate documentation should be provided to, and approved by, the Environment and Planning Manager or Construction Manager and the materials should, where practicable, be inspected at the source site to confirm that there are no signs of contamination. Quarried materials (i.e., materials sourced from a quarry that are not recycled) need not be subject to assessment by the Environmental Consultant, however other inspection and record keeping requirements still apply to these materials;

- The material must be inspected during importation, and any materials not meeting the description given in the provided documentation or displaying signs of contamination will be rejected. The Environmental Consultant may also conduct inspections during and / or following importation to check the same; and,

Additional testing of the imported material may be required, as recommended by the Environmental Consultant, commensurate with the documentation provided for review and the material type/classification. The contractor will track and keep a record of all soil materials imported onto the site in the material tracking register.

7 Water Management

7.1 Background Information

BESIX Watpac was awarded the Barangaroo Metro Station package, which includes the below scope of works;

- Station fitout works including secondary structural elements;
- Third party works including Hickson Road construction, public domain works, utilities, and landscaping; and,
- Interface works including the provision of facilities, plant and equipment for Interface Contractors.

The Tunnel and Excavation Contractor (TSE) was a JV between John Holland, CPB and Gheller (JHCPBG), who carried out the excavation of the Barangaroo station box and shark's fin underground structure. TSE were responsible for managing groundwater, surface water, and construction surface water on site, managed in accordance with their documentation as follows:

- Construction Environmental Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002010);
- Construction Soil, Water and Groundwater Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002014);
- Stormwater and Flooding Management Plan (SMCSWTSE-JCG-TPW-DN-PLN-0020032);
- Water Reuse and Discharge Management Procedure (SMCSTSEJCG-TPW-EM-MPR-003002); and,
- Surface Water Quality Monitoring Program (SMCSWTSE-JCG-TPW-EM-RPT-097238)

As part of the requirement to manage the groundwater, surface water and construction water TSE installed a Water Treatment Plant (WTP) that has been maintained by Aquatic Engineering Pty Ltd. At the commencement of BESIX Watpac works the WTP was handed over to BESIX Watpac who were responsible for the operation and management of the WTP during station construction works. At the completion of the construction works the WTP was handed over to MTS and responsibility for the operation and management of the WTP is no longer be the responsibility of BESIX Watpac.

During work the WTP was configured to treat 7L/s under day to day operations but could be increased to a maximum of 15L/s of water during extreme weather events. The WTP was initially located adjacent to Nawi Cove as shown in Figure 2 and later relocated as shown in Figure 3. The initial WTP location discharged into a stormwater drainage pit that discharged into Sydney Harbour at the discharge point shown in Figure 4 and Figure 5. Following relocation the WTP discharged into a different stormwater drainage pit with the discharge point shown in Figure 3.

7.2 Water Management Arrangements During Construction

The station box is fully tanked up to basement level 3 (B3), where there is a break in the tanking behind the shoring wall to allow for the construction of the future southern entrance between Barangaroo Station and the neighbouring Block 7 development. The TSE works included installing a 250mm diameter civil drainage depressurisation pipe at B3 level that reduces the hydrostatic pressure on the Hickson Road heritage wall,

also known as the High Street Cutting, and drains groundwater to a holding tank on B3. Water entering the un-tanked section of the shoring wall at the southern entrance is drained to this holding tank via a series of geotechnical strip drains. The groundwater in the holding tank is then pumped to the WTP for treatment prior to being discharged into Sydney Harbour. This depressurisation system will remain in place until the southern entrance between Block 7 and Barangaroo Station is constructed, after BESIX Watpac have completed all works on Barangaroo Station.

Sump pumps were in place at the bottom of the northern shaft at basement level 6 (B6) that captured groundwater entering the northern shaft through the rock face and pumped it to the WTP for treatment prior to discharge into Sydney Harbour. The Northern Shaft was filled in May 2023, with no more water to pumped to the WTP from this point.

During works the WTP was required to be moved to enable a condenser water pipe to be installed between the seawater plant room in the Headland Park Cutaway and the chiller plant room in the shark's fin area of the station. During this process a temporary water treatment plant was installed on Site as the WTP was relocated. Relocation works were completed in April 2023. The Relocated WTP location is shown in

Figure 3.

The WTP and all associated pipework and pumps were nominated as ‘Handover Items’, being a key piece of equipment used for the operation of the Site that were transferred from TSE to BESIX Watpac on Site possession. Until the completion of construction works BESIX Watpac operated the WTP to treat groundwater and surface water collected on Site during construction activities and utilised the same network of pits and pumps to collect water and transfer it to the WTP for treatment prior to discharge into Sydney harbour (subject to water quality monitoring parameters being met as per the WQMP).

Figure 2 Initial Location of the on site existing Water Treatment Plant (WTP)



Figure 3 Relocated Water Treatment Plant Location and Discharge

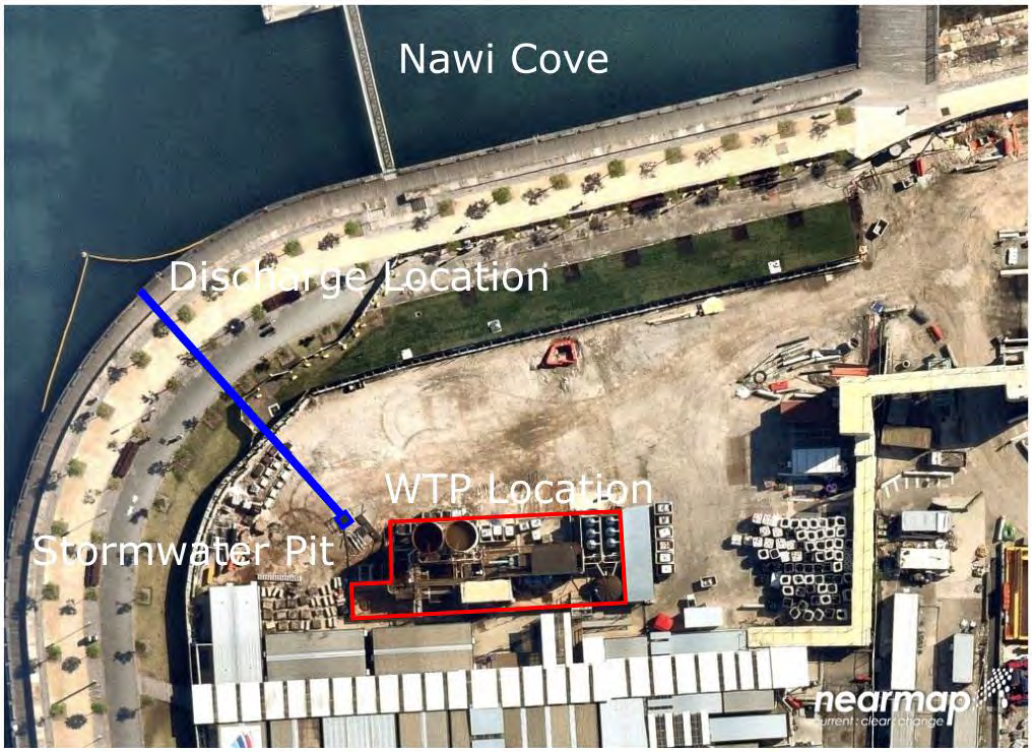


Figure 4 Initial WTP Discharge Point through existing stormwater network



Figure 5 Initial WTP Discharge Point through existing stormwater network



7.3 Water Treatment Plant

The TSE Contractor previously discharged water from the WTP under an Environmental Protection Licence (EPL 20971), which nominated discharge criteria for key pollutants, as per Table 4 below.

Table 4 Barangaroo WTP discharge Criteria under TSE EPL 20971 condition L2.8

Parameter	Unit	Discharge Criteria
pH	pH units	6.5 – 8.5
Total Suspended Solids	mg/l	50
Oil and Grease	Visible	Not visible

Once the Site was handed over to BESIX Watpac on 16 September 2021, the project was no longer required to operate under an EPL. BESIX Watpac engaged WSP to produce a Water Discharge Impact Assessment (WDIA) to assess the fitness for purpose of the WTP for treating ground and surface water collected as part of BESIX Watpac's construction activities and to ensure that *NSW Water Quality Objectives* are being maintained in accordance with CoA E107 and Section 120 of the POEO Act. Section 2 of the WDIA sets out the regulatory obligations which BESIX Watpac must comply with when operating the WTP. A Water Quality Monitoring Program (WQMP) has been prepared to outline the type and frequency of water quality monitoring to be undertaken, based on the recommendations made in the WDIA and the process to be followed if a water quality exceedance event occurs.

BESIX Watpac engaged Aquatic Engineering Australia (AEA) to undertake the ongoing maintenance of the WTP. AEA is the incumbent WTP installer and maintenance contractor who has been responsible for the installation and maintenance of numerous water treatment plants established by TSE as part of the Project.

The Barangaroo WTP is a coagulation/flocculation clarification type WTP. The process for coagulation/flocculation clarification follows with further detailed provided in the AEA operation and maintenance manual which has been included in Appendix A:

- Pre-treatment (water collection and initial solids removal);
- Coagulation (pH control and oxidant dosing);
- Flocculation (including removal of emulsified oil);
- Clarification (sludge to sludge holding tank and filter press); and,

- Post pH correction and media filtration.

The WTP has an internal automatic water quality monitoring system which checks turbidity and pH, including a secondary back up, which monitors water and transmits results to an online portal where they can be viewed in real time. Water is not discharged from the WTP until discharge parameters are correct. The outlet from the WTP compromises single 675mm diameter pipes which discharge by gravity into Nawi Cove which is part of Sydney Harbour. Refer to Figures 3 for the discharge location of WTP.

The regulatory obligations which BESIX Watpac must comply with regarding the WTP for the management of water discharging to Sydney Harbour are addressed in detail in Section 2 of the WDIA and include:

- Section 120 of the POEO Act;

  (1) A person who pollutes any waters is guilty of an offence.

  Note— An offence against subsection (1) committed by a corporation is an offence attracting special executive liability for a director or other person involved in the management of the corporation—see section 169.

  (2) In this section— pollute waters includes cause or permit any waters to be polluted.

CoA E107 states: "*The CSSI must be constructed and operated so as to maintain the NSW Water Quality Objectives where they are being achieved as at the date of this approval, and contribute towards achievement of the NSW Water Quality Objectives over time where they are not being achieved as at the date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the NSW Water Quality Objectives, in which case those requirements must be complied with".*

The NSW Water Quality Objectives are the agreed environmental values and long-term goals for NSW's surface waters. They set out:

- The community's values and uses for our rivers, creeks, estuaries and lakes (i.e. healthy aquatic life, water suitable for recreational activities like swimming and boating, and drinking water); and
- A range of water quality indicators to help us assess whether the current condition of our waterways supports those values and uses.

The Objectives are consistent with the agreed national framework for assessing water quality set out in the Australian and New Zealand Guideline for Fresh and Marine Water Quality (ANZECC 2000 Guidelines). These guidelines provide an agreed framework to assess water quality in terms of suitability for a range of environmental values (including human uses). The Water Quality Objectives provide environmental values for NSW waters and the ANZECC 2000 Guidelines provide the technical guidance to assess the water quality needed to protect those values. To determine the receiving water quality criteria, the ANZECC 2000 guidelines provide standardised criteria relevant to achieving the public health and environmental water quality for the water body (Sydney Harbour Lower Estuary). Appendix A of the WQMP identifies the water quality parameters to be monitored against the NSW Water Quality and ANZECC 2000 guidelines.

7.4 Water Discharge Impact Assessment (WDIA)

BESIX Watpac engaged WSP in the role of environmental engineer to undertake a Water Discharge Impact Assessment (WDIA) for the discharge of water from the WTP to validate the requirements of CoA E107 to maintain the *NSW Water Quality Objectives* and determine if modification or improvements to the performance of the WTP need to be considered to treat surface and groundwater collected by BESIX Watpac during their construction activities.

A summary of the key findings made by the WDIA and recommendations which BESIX Watpac will adopt are as follows:

- The 15L/s treatment capacity of the WTP is adequate under both typical and worst-case flow condition scenarios;

- Discharge when operated by the TSE Contractor generally achieved the ANZECC (2000) guidelines trigger values for 95% species protection of aquatic ecosystems for toxicants, with the exception of ammonia, cyanide, copper and zinc;
- The marine environment at the outlet of the WTP where water discharges into Sydney Harbour should be considered to be a *highly disturbed system* based on the ANZECC (2000) ecological condition;
- For a *highly disturbed system* the ANZECC (2000) 80% or 90% species protection for toxicants is acceptable;
- Given the WTP is generally achieving ANZECC (2000) 95% species protection of aquatic ecosystems these trigger values will be adopted for toxicants other than ammonia, copper, cyanide and zinc;
- Copper, cyanide and zinc will be monitored against the 80% species criteria;
- An Environmental Protection License (EPL) will no longer be in place for BESIX Watpac's use for discharge from the WTP. Whilst BESIX Watpac are not required to operate in accordance with the TSE EPL discharge from the WTP will continue to be tested, prior to discharge off site, for the same turbidity and pH parameters as were nominated in the TSE EPL; and,
- An addendum to the WDIA has been prepared to address dewatering from the western civil pit shown in Figure 1 back to Sydney Harbour, bypassing the WTP as described in Section 5.2.2.

An addendum to the WDIA was prepared to address the change in the initial discharge location to what was assumed in the WDIA to where it was initially discharged, adjacent to Duke's Pier. The addendum also amends the discharge capacity from 15L/s to 7L/s at the Duke's Pier discharge location but maintains the 15 L/s discharge capacity at the assumed discharge location, being the outlet pipes of the H01-02 pit. Following the relocation of the WTP in April 2023 the discharge point was switched to the H01-02 pit as originally planned.

Based on the recommendations made in the WDIA, BESIX Watpac will continue to operate the WTP in its current configuration and adopt the monitoring frequency, locations and monitoring parameters recommended by the WDIA and as outlined in the WQMP.

Monitoring undertaken by BESIX Watpac up to the date of this report has shown that discharge from the WTP has generally met the requirements of the WQMP and recommendations made in the WDIA. Where exceedances have occurred an investigation has been undertaken to establish the cause.

7.5 Water Quality Monitoring

The Sydney Metro City and Southwest Chatswood to Sydenham Staging Report Revision 7 (Staging Report) sets out the planning approval requirements relevant to each project site. The Staging Report 'switches on' Construction Monitoring Program requirement CoA C9(a) only for the Barangaroo Station project (Noise and Vibration). According to the Staging Report, Construction Monitoring Program requirements CoAs C9(c) & (d) to CoA C17 are not applicable to the Barangaroo Station project in relation to water quality and groundwater monitoring programs.

Notwithstanding this, a Water Quality Monitoring Program (WQMP) was produced to monitor the impact of BESIX Watpac's construction activities on groundwater and surface water in the vicinity of the Site and to monitor the effectiveness of mitigation measures implemented to meet the requirements of CoA E107 and Section120 of the POEO Act. The WTMP sets out a program of monitoring to be undertaken to check the quality of water, which is being discharged from the WTP, and within Sydney Harbour, to meet the recommendation made in the WDIA and to maintain the NSW Water Quality Objectives in accordance with CoA E107.

Water quality monitoring records were issued in Water Quality Monitoring Reports.

BESIX Watpac used water quality monitoring locations BN-3 and SW_B_01 as the locations for monitoring water quality associated with BESIX Watpac's construction activities. These were existing monitoring

locations utilised by the TSE Contractor and are shown below in Figure 7 and Figure 8. Note that following the relocation of the WTP the location of the BN-3 sample moved with the WTP and that the discharge outlet point was changed. Water quality monitoring was undertaken at these locations monthly. Additionally, groundwater was monitored at monitoring locations GW-1 on B3 and GW-2 on B6 on a quarterly basis. Location GW-2 was monitored until the Northern Shaft filling works commenced in April 2023 and the location no longer existed.

Water quality monitoring activities were undertaken by BESIX Watpac during construction works with the responsibility for maintenance and operation of the WTP being handed over to MTS along with the WTP 20th December 2024. No further monitoring activities were undertaken by BESIX Watpac after this date.

Figure 7 Initial Water Quality Monitoring Locations



Figure 8 Water Quality Monitoring Locations – Post WTP Relocation



7.6 Water Mitigation Measures

The following water mitigation measures were implemented during construction:

- Clean water was diverted around disturbed site area, stockpiles and contaminated areas;
- Control measures were installed downstream of works, stockpiles and other disturbed areas;
- Dangerous goods and hazardous materials storage was within bunded areas with a capacity of 110 per cent of the maximum single stored volume;

- Spill kits were provided on site and a spill management procedure followed in the event of a spill
- The WTP was correctly maintained by AEA;
- All accumulated water was checked and treated to ensure that *NSW Water Quality Objectives* are met prior to re-use or discharge from the site as required by Condition of Approval (CoA) E107 and as outlined in the WDIA;
- All discharge from the WTP ws monitored to ensure compliance with the discharge criteria and monitoring program as outlined in the WQMP with monitoring reports issued in the CWQMR;
- A hold point was put in place (as required by *Table 1.4 Preliminary Register of Hold Points* of the CEMF) where water will be tested to verify compliance and not discharged unless discharge requirements are met;
- Any rainwater or surface water flowing into the site, including from the Linewide contractor laydown areas, was collected and pumped to the WTP for treatment prior to discharge; and,
- Water pumped from areas where Linewide were working on the site, to the WTP, was done so under a pre-pump inspection record.

8 Environmental Planning and Flooding

Uncontrolled overland flow of water or unmanaged stormwater could potentially lead to flooding and environmental impact to the project and the adjacent waterway. The environmental impact and mitigation measures are outlined below in Table 5.

Table 5 Flood impact and migration measures

Environmental Aspect	Potential Impact	Mitigation Measure
Rainfall in excavated areas/zones	• Rainfall falling into trenches or onto the station lid (low point) has the potential to cause flooding in these areas and in the station and adjoining tunnel network if this is not appropriately managed	• Detail construction planning including the development and implementation of ESCPs . • Review of the stormwater quantity inputs that are treated by the WTP to confirm capacity of the plant and if detention tanks are required.
Flooding during extreme rainfall from adjacent roads and stormwater systems	• Overland flows/flooding from adjacent surface areas such as Hickson Road, High Street, and the existing hardstand area on Block 7. • It is important to note that worksites may not be experiencing rain at the time of the incident as water could be from discharge into the stormwater system • The sumps and holding tank in the station will not have sufficient capacity for flood waters in extreme storm events (i.e. the Probably Maximum Flood (PMF) event).	• Temporary civil engineer to review rainfall quantities and temporary pumping needed to mitigate flooding effects and ensure capacities of pumps can accommodate rainfall • Design and installation of waterproofed hobs to penetrations in the station box lid at surface level. All hobs to be constructed to the PMF level, or if not achievable then a risks assessment to be conducted • Temporary works civil connections for the Hickson Road demolition will be designed with the temporary civil works engineer and approved by Sydney Metro and METRON prior to undertaking the works.
Localised flow paths causing nuisance flooding on the worksite	• Nuisance flooding as result of localised overland flow paths could make the worksite un-trafficable in areas of excavation for workers.	• Diversion drains and swales will be implemented in the ESCPs

9 Spill Response Management

Spill prevention measures and monitoring will be adopted as outlined below and in accordance with the BESIX Watpac Spill Response Management Procedure (F.8).

9.1 Spill Mitigation Measures

- Dangerous goods and hazardous chemicals including fuel to be stored within bunded areas with a capacity of 110% of the maximum single stored volume;
- Chemicals and fuel to be labelled and stored in bunded areas in accordance with the safety data sheet (SDS);
- Spill kit and fire response equipment to be located where chemical and fuel using plant or equipment is stored or operated and outlined in Environmental Control Maps (ECMs);
- All hazardous chemicals are to be stored and managed in accordance with the NSW *Work Health and Safety Regulation 2017*, the NSW Code of Practice for Managing Risks of Hazardous Chemicals in the Workplace 2019, and the NSW Code of Practice for Labelling of Workplace Hazardous Chemicals 2019; and,
- Spill kits will be provided on Site.

9.2 Storage and Handling – Hazardous Chemicals

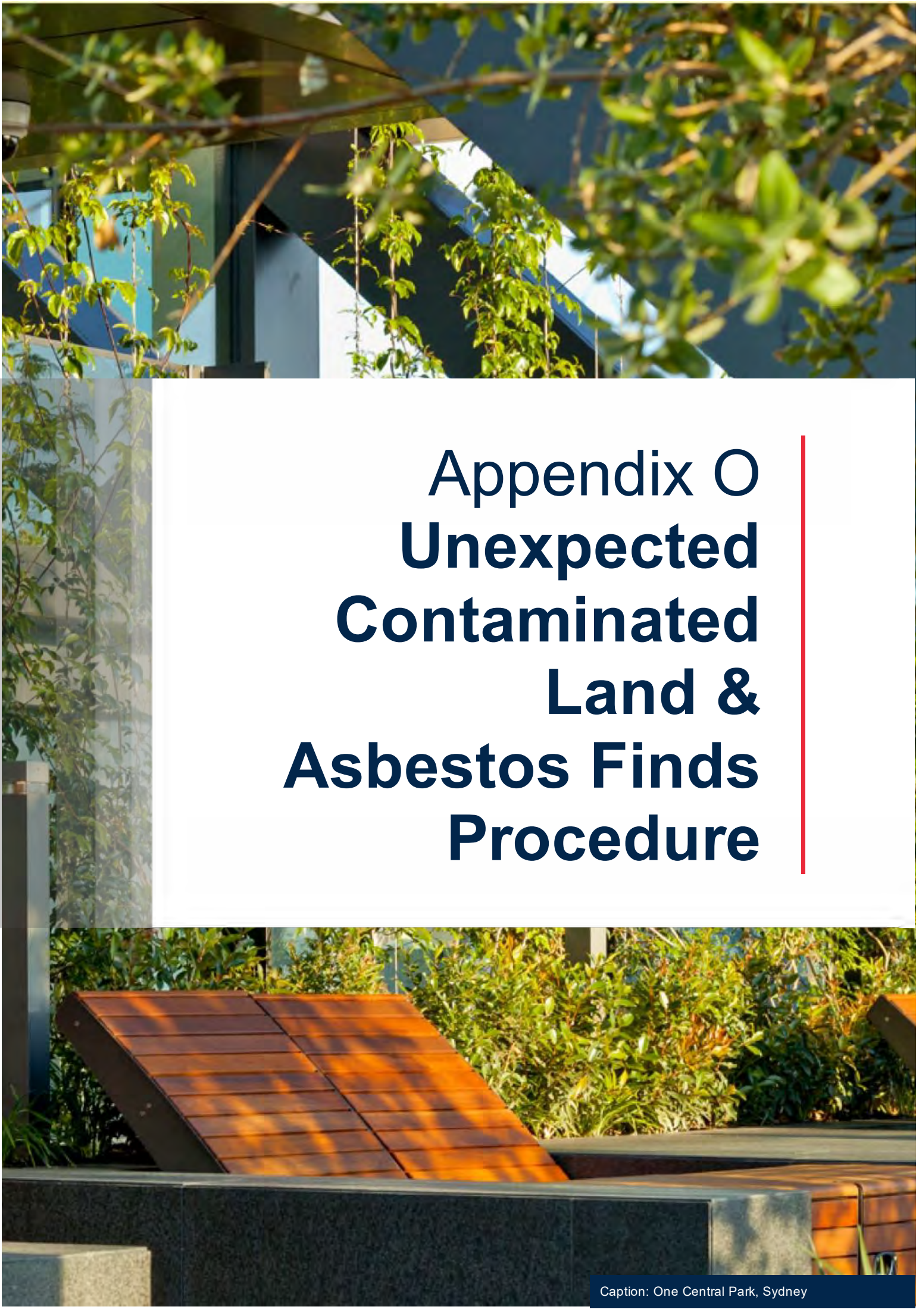
Hazardous chemicals, must be stored and handled strictly in accordance with:

- All relevant Australian Standards and legislation;
- For liquids, a minimum bund volume of requirement of 110% of the volume of the largest single stored volume within the bund;
- *Storage and Handling Liquids: Environmental Protection – Participants Manual* (Department of Environment and Climate Change, May 2007); and,
- The *Environmental Compliance Report: Liquid Chemical Storage, Handling and Spill Management – Part B Review of Best Practice and Regulation* (Department of Environment and Conservation (NSW), 2005).

10 Record Management

Records will be maintained by the project Planning and Environment Manager and Environmental Co-ordinator and transmitted to Sydney Metro / ER via TeamBinder for compliance tracking purposes, as follows:

- Copies of current ESCPs for all active construction sites and areas;
- Records of soil and water inspections undertaken;
- Records of testing (monitoring program results) of any water prior to discharge and quality of water discharged in the CWQMR;
- Records of the release of the hold point to discharge water from the construction site to the receiving environment;
- Records of the treatment of contaminated material in accordance with the SMPSAQ;
- Records of the treatment of acid sulfate soils in accordance with the ASSMP;
- Copies of waste classification reports;
- Copies of all trucking and tipping dockets for spoil that is tipped at landfill;
- Discharge under the COS will be recorded in a Controlled Overflow Strategy Summary Report (COSSR);
- Material Tracking Register; and,
- Water Quality Monitoring Reports.



Appendix O
Unexpected Contaminated Land & Asbestos Finds Procedure

Caption: One Central Park, Sydney

UNEXPECTED CONTAMINATION AND ASBESTOS FINDS PROCEDURE

MANAGEMENT AND RESPONSIBILITY

INDICATORS OF CONTAMINATION:

ODOROUS OR STAINED SOIL, FIBRE CEMENT MATERIALS, PETROLEUM OR OTHER CHEMICAL ODOURS, UNNATURAL STAINING OR BURIED TANKS OR DRUMS

DEVELOP SPOIL MANAGEMENT PLAN AND SAMPLING, ANALYSIS & QUALITY PLAN

ENVIRONMENT AND PLANNING MANAGER PROJECT DIRECTOR

INDUCTION / TOOLBOX TALKS:

All site personnel will be inducted into their responsibilities in relation to unexpected contamination or asbestos

ALL SITE PERSONNEL (Subcontractors and BR Contractor personnel)

SUSPECTED CONTAMINATION / ASBESTOS OBSERVED



ALL SITE PERSONNEL

IMMEDIATE RESPONSE:

- Cease work in the immediate area
- Notify the Construction Manager and Planning and Environmental Manager
- Notify authorities needed to obtain emergency response for any health or environmental concerns if required (e.g., fire brigade or ambulance)
- Place barricades around the affected area
- If the unexpected find has potential to impact air flow into a ventilated area, isolate the area, turn off all fans and protect all air inlets within the area
- Water spray if asbestos is the risk to keep dust level down

SUBCONTRACTOR UNDERTAKING WORKS, SITE MANAGER, FOREMEN, ENVIRONMENT AND PLANNING MANAGER, ENVIRONMENTAL CO-ORDINATOR, PROJECT / SITE ENGINEERS, CONSTRUCTION MANAGERS

SECONDARY RESPONSE:

- Restrict affected workers from moving around site or leaving site with contamination on clothes and boots (if applicable)
- Establish decontamination area for workers to remove contaminated items (if required)
- Notify relevant stakeholders (Sydney Metro / ER)
- Planning and Environment Manager to assess if additional specialist expertise required and that management, monitoring established to minimise risk.
- Comply with Sydney Metro reporting and notification requirements; and
- Notify any authorities that the contractor is legally required to notify (e.g., NSW EPA, Council, etc.).

SITE MANAGER, FOREMEN, ENVIRONMENT AND PLANNING MANAGER, ENVIRONMENTAL CO-ORDINATOR, PROJECT / SITE ENGINEERS, CONSTRUCTION MANAGERS

ASSESSMENT:

If required, the Environment and Planning Manager will obtain assistance from a suitably qualified environmental scientist, environmental engineer or occupational hygienist (Environmental Consultant) in identifying the potential hazard to human health or the environment in accordance with NSW regulatory requirements.

This may include sampling and laboratory analysis.

ENVIRONMENT AND PLANNING MANAGER, ENVIRONMENTAL CONSULTANT

MANAGEMENT STRATEGY:

- The Environmental Consultant will inspect the issue of concern and determine the nature of the issue, whether it comprises an Area of Environmental Concern (AEC), and the appropriate approach to assessing or managing the issue
- The Environmental Consultant will undertake an assessment considered necessary to determine the management strategy for the AEC in conjunction with the Environment and Planning Manager
- If considered necessary, the environmental consultant will prepare a remediation strategy for the AEC;
- If any potentially unacceptable risks to construction workers from contamination are identified during any stage of the UFP assessment, the contractor will be advised by the Environmental Consultant;

ENVIRONMENT AND PLANNING MANAGER, ENVIRONMENTAL CONSULTANT

IMPLEMENT STRATEGY:

The remediation strategy or management activity will be undertaken to address the contamination.

ENVIRONMENT AND PLANNING MANAGER, ENVIRONMENTAL CONSULTANT SUB-CONTRACTOR SITE PERSONNEL

RE-COMMENCE WORK:

Once the contamination / asbestos find has been correctly addressed the Construction Manager will approve the re-commencement of work in the vicinity of the find. This will be based on the advise of the Environment and Planning Manager and Environmental Consultant, as required.

CONSTRUCTION MANAGER

PROCEED WITH CONSTRUCTION ACTIVITIES

BESIX Watpac

23/06/2022
Rev 00

HBI Healthy Buildings International Pty Ltd
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[redacted]

1 September 2022

Director Environment, Sustainability & Planning
City & Southwest
Sydney Metro
PO Box K659
HAYMARKET NSW 1240

HBI Ref: 170108 (p)

[redacted]

RE: Endorsement of Barangaroo Station Construction Environmental Management Plan (CEMP) Rev00 – Sydney Metro City & Southwest

Thank you for providing the following document for Environmental Representative (ER) review and endorsement as required by the Condition of Approval A24 (d) of the Sydney Metro City & Southwest project (SSI 15_7400, 9 January 2017):

- Sydney Metro City & Southwest, Barangaroo Station Construction Environmental Management Plan (CEMP) (SMCSWSBR-BWC-SBR-EM-PLN-000006 Revision 00, dated 29 August 2022)

The most significant updates to the CEMP Rev00 include the following:

- Methodology for dewatering the western civil pit, including the discharge to harbour, bypassing the Water Treatment Plant, including updates to the Soil and Water Management Procedure, Appendix N to the CEMP
- Updates to the management of soil, stockpiles, unexpected finds, contamination, material importation and waste management to be more prescriptive, including updates to the Soil and Water Management Procedure, Appendix N to the CEMP
- The management of operational groundwater from the station box Basement Level B3 (pending approval for discharge to sewer)
- Incorporation of MOD 9 Extension to standard construction hours (determined 30 June 2022)
- Inclusion of an Unexpected Finds Procedure for Asbestos or Contaminated Land, and
- Updates to Roles and Responsibilities.

It is noted that:

- The above Plan has been developed in accordance with the Sydney Metro City & Southwest Chatswood to Sydenham Staging Report v7.0_Final as submitted to DPIE for information
- Previous versions of the above Plan have been reviewed and updated following comments from the ER

- Sydney Metro has also reviewed and provided comments on the above Plan

As an approved ER for the Sydney Metro City & Southwest project, I have reviewed and provided comment on the CEMP and associated procedures for consistency with the requirements in or under the Infrastructure Approval and now consider them appropriate for submission to the Planning Secretary for approval as required by Condition C7.

Yours sincerely



Environmental Representative – Sydney Metro – City and South West

Department of Planning and Environment

Our ref: SSI-7400-PA-288

[redacted]
Director of Sustainability, Environment and Planning
Sydney Metro
Level 43, 680 George Street
Sydney, NSW, 2000

Attention: [redacted], Senior Environment Manager

23/09/2022

Subject: Sydney Metro Chatswood to Sydenham – Barangaroo Station Construction Environmental Management Plan Revision 00

Dear [redacted]

I refer to your submission dated 2 September 2022, requesting approval of the Barangaroo Station Construction Environmental Management Plan Revision 00, dated 29 August 2022 (the revised CEMP).

I note the revised CEMP:

- has been reviewed by proponent and no issues have been raised with the Department;
- has been endorsed by the ER; and
- contains the information required by the conditions of approval.

Accordingly, as nominee of the Planning Secretary, I approve the revised CEMP.

You are reminded that:

- If there are any inconsistencies between the CEMP and the conditions of approval, the conditions prevail; and
- Section 120 of the Protection of the Environment Operations Act 1997 (POEO Act), applies to the project independently of its approval under the EP&A Act. Neither this letter nor SSI 7400 provide any exemption or defence if the project pollutes waters as defined under the POEO Act.

Please ensure you make the document publicly available on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Grant Rokobauer at grant.rokobauer@dpie.nsw.gov.au.

Yours sincerely

[redacted]

[redacted]
Acting Director
Infrastructure Management

As nominee of the Planning Secretary

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[redacted]

18 May 2023

Director Environment, Sustainability and Planning
Sydney Metro
Transport for NSW
PO Box K659
HAYMARKET NSW 1240

Ref: 170108(p) CEMP Rev03

[redacted]

RE: Approval of Minor Amendments – Construction Environmental Management Plan (CEMP) Rev03, Sydney Metro City & Southwest – Barangaroo Station

Thank you for providing the following document for Environmental Representative (ER) review and approval of minor amendments as required by Condition of Approval A24 (j) of the Sydney Metro City & Southwest project (SSI – 15_7400, 9 January 2017).

- Construction Environmental Management Plan – Barangaroo Station, Rev03, dated 18 May 2023 (SMCSWSBR-BWC-SBR-EM-PLN-000006) (the CEMP).

The CEMP was originally developed to address Condition C2 of the project approval. Rev03 amends the Plan by:

- Introducing an Environmental Work Method Statement (EWMS) process to provide for the internal approval of variation scope by the Contractor Planning and Environment Manager (or delegate)

The reasoning behind this change is to reduce the administrative burden from frequent variations and scope changes experienced due to the nature of the Barangaroo Station project, thereby avoiding a full CEMP revision and update for each activity. The use of the EWMS process in each instance is still subject to agreeance by Sydney Metro and the ER, and the EWMS will be provided to Sydney Metro and the ER for review.

The above-listed amendments are considered to be 'minor' according to Condition of Approval A24 (j). The amendments do not trigger any additional CoAs or REMMs and are consistent with the planning approval.

As an approved ER for the Sydney Metro City & Southwest project, I have reviewed and provided comment on this document and accordingly approve the amendment of the Plan for implementation subject to the following condition:

NB: Approval of minor amendments to the CEMP does not include approval of the WDIA, Water Quality Monitoring Program (WQMP), Spoil Management Plan (SpMP) or Acid Sulfate Soil Management Plan (ASSMP), which is outside the scope of the ER's role under the planning approval for Barangaroo Station.

Yours sincerely



Environmental Representative – Sydney Metro – City and South West

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1 February 2024

[redacted]
Director Environment, Sustainability and Planning
Sydney Metro
Transport for NSW
PO Box K659
HAYMARKET NSW 1240

Ref: 170108(p) CEMP Rev06

[redacted]

RE: Approval of Minor Amendments – Construction Environmental Management Plan (CEMP) Rev06, Sydney Metro City & Southwest – Barangaroo Station

Thank you for providing the following document for Environmental Representative (ER) review and approval of minor amendments as required by Condition of Approval A24 (j) of the Sydney Metro City & Southwest project (SSI – 15_7400, 9 January 2017):

- Construction Environmental Management Plan – Barangaroo Station, Rev06, dated 12 January 2024 (SMCSWSBR-BWC-SBR-EM-PLN-000006) (the CEMP).

The CEMP was originally developed to address Condition C2 of the project approval. Rev06 amends the Plan by:

- Updating the frequency for compliance tracking reporting in Section 1.6 to align with the Sydney Metro Compliance Tracking Program/Environmental Audit Program
- Inclusion of requirement to conduct condition surveys in accordance with CoA E91 in Section 4.2
- Inclusion of requirement for consultation for rehabilitation works to public open space in accordance with REMM LV10 in Section 4.3
- Adding reference to CoA E60 in Section 4.3
- Specifying relevant government agencies as EPA and City of Sydney Council in relation to Construction Monitoring Reporting consultation and submission requirements in Section 6.4, and
- Inclusion of reference to CoA A41 in relation to incident notification in Section 8.1.

The above-listed amendments are considered to be 'minor' according to Condition of Approval A24 (j). The amendments do not trigger any additional CoAs or REMMs and are consistent with the planning approval.

As an approved ER for the Sydney Metro City & Southwest project, I have reviewed and provided comment on this document and accordingly approve the amendment of the Plan for implementation.

NB: Approval of minor amendments to the CEMP does not include approval of the WDIA, WQMP, SpMP or ASSMP, which is outside the scope of the ER's role under the planning approval for Barangaroo Station.

Yours sincerely



Environmental Representative – Sydney Metro – City and South West

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[redacted]

12 May 2025

Director Environment, Sustainability and Planning
Sydney Metro
Transport for NSW
PO Box K659
HAYMARKET NSW 1240

Ref:170108(p) CEMP Rev 09

[redacted]

RE: Approval of Minor Amendments – Construction Environmental Management Plan (CEMP) Rev 09, Sydney Metro City & Southwest – Barangaroo Station

Thank you for providing the following document for Environmental Representative (ER) review and approval of minor amendments as required by Condition of Approval A24 (j) of the Sydney Metro City & Southwest project (SSI – 15_7400):

- Construction Environmental Management Plan – Barangaroo Station (SMCSWSBR-BWC-SBR-EM-PLN-000006) (the CEMP) Rev 08 (dated 28 March 2025, submitted on 08 April 2025) and Rev 09 (dated 24 April 2025, submitted on 6 May 2025).

The CEMP was originally developed to address Condition C2 of the project approval. Revision 08 of the CEMP was reviewed by SM, the ER and AA; with Revision 09 of the CEMP submitted on 6 May 2025, addressing SM, ER and AA review comments on Revision 08.

Rev 08 and 09 amends the Plan by:

- Update to Revision History
- Update to Section 1.2.5 – Timing and Scheduling
- Update to Section 4.1 - Environmental Control Maps
- Update to Section 6.3.3 - Monthly Reporting
- Update to Section 6.4 - Construction Monitoring Programs (completion of construction monitoring requirements and final monitoring reports)

The above-listed amendments are considered to be 'minor' according to Condition of Approval A24 (j). The amendments do not trigger any additional CoAs or REMMs and are consistent with the planning approval. As an approved ER for the Sydney Metro City & Southwest project, I have reviewed and provided comment on this document and accordingly approve the amendment of the Plan.

Yours sincerely

[redacted]

Environmental Representative – Sydney Metro – City and South West

[redacted]
Director Sustainability, Environment and Planning
Sydney Metro
Level 43, 680 George Street
Sydney, NSW, 2000

08/09/2021

[redacted]

Sydney Metro City & Southwest - Chatswood to Sydenham (SSI-7400)
Barangaroo Construction Environmental Management Plan and sub Plans

I refer to your submissions of the Barangaroo Construction Environmental Management Plan (CEMP), Construction Heritage Management sub Plan (CHMP) and the Construction Noise and Vibration Management sub Plan (CNVMP) submitted in accordance with Condition C7 of SSI 7400. I also acknowledge your responses to the Department's requests for information.

I note that the CEMP, CHMP and CNVMP:

- have been reviewed by Sydney Metro and no issues have been raised;
- have been prepared in consultation with relevant councils and agencies where required;
- have been endorsed by the Environmental Representative (ER); and
- contain the information required by the conditions of approval.

As nominee of the Planning Secretary, I approve the following documents, pursuant to condition C7:

Document	Revision and date
Construction Environmental Management Plan	Revision E, dated 10 August 2021
Construction Heritage Management sub Plan	Revision F, dated 1 September 2021
Construction Noise and Vibration Management sub Plan	Revision E, dated 6 August 2021

You are reminded that if there is any inconsistency between the approved CEMP, CHMP, CNVMP and the conditions of approval then the requirements of the conditions will prevail.

If you wish to discuss the matter further, please contact Grant Brown at grant.brown@dpie.nsw.gov.au.

Yours sincerely

[redacted]

Director – Infrastructure Management
As nominee of the Planning Secretary